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CEO Compensation and Real Estate Prices: Pay for Luck and Responses to Luck

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ABSTRACT

We use changes in real estate prices to study the sensitivity of CEO compensation to luck and to *responses to luck*. Pay for luck can be optimal when CEOs are expected to react to luck. To identify responses to luck we rely on the fact that accounting performance, unlike market performance, only reflects changes to real estate prices if the CEO responds to the real estate shocks. We show that CEO compensation is linked to responses to real estate luck, which can partially explain pay for luck.

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1 Introduction

Top executive compensation has increased substantially over the last four decades: the average total remuneration for CEOs of S&P 500 firms (in 2002 constant dollars) increased from $850,000 in 1970 to over $14 million in 2000, and in the same period, the average value of option compensation soared from near zero to over $7.0 million (Minnick, Unal, and Yang, 2011). Part of the existing literature explains that this increase was, at least partially, due to "pay for luck": that is, due to observable lucky events not under the CEO's control (Bertrand and Mullainathan, 2001; Bebchuk and Fried, 2003; Fich, Starks and Yore, 2014).[1] Under the simplest optimal contracting framework, shareholders should not compensate CEOs for observable luck (Holmström, 1979). However, in more complex agency models such as Axelson and Baliga (2009), Gopalan, Milbourn and Song (2010), or Noe and Rebello (2012), pay for luck can be optimal if the principal wants to incentivize an optimal exposure to industry or market performance.

Chaigneau, Edmans and Gottlieb (2016) rationalize pay for luck by showing it can be optimal in settings where it can reinforce effort incentives. In this paper we argue that the empirically measured pay for luck can be rationalized if the manager is being paid for responding to a lucky event. In the typical empirical approach to identify pay for luck, optimal responses to lucky events are indistinguishable from pay for luck, and therefore treated as such. We study the sensitivity of CEO compensation to luck using real estate prices to identify pay for responses to luck. We rely on the fact that under US accounting principles (GAAP), accounting returns only reflect changes in real estate market values when there is managerial action, such as selling property. We find evidence that CEO compensation is associated with responses to luck.

[1] Albuquerque (2009) call these results into question by showing supporting evidence on presence of Relative Performance Evaluation (RPE) in CEO compensation.

Moreover, we find that pay for luck in general is partially explained by CEO responses to lucky events. As a first step we explore changes in accounting returns that are associated to changes in real estate prices as a way to comprehensively capture any action the manager might have taken as a response to luck. As a second step, we isolate specific actions as we look at *direct* responses: namely selling real estate property, and issuing debt.

It might be optimal for shareholders to reward a CEO for responding to a lucky event when that action improves firm performance. Therefore, as pointed out in Bertrand and Mullainathan (2001), finding evidence of pay for luck does not necessarily provide support for a skimming model. For example, it might make sense to reward a CEO that experiences a positive shock in real estate prices in the location of its headquarters to relocate to a less expensive area by selling its existing real estate. Selling real estate as a response to a positive shock is an optimal action if real estate stock prices exhibit reversal as shown by Capozza, Hendershott, Mack and Mayer (2002).[2] Another example of responses to real estate luck is sale-and-leaseback transactions to relax financial constraints should they exist. There is an extensive literature which finds that corporate real estate sale-and-leasebacks generate positive cumulative abnormal stock returns around the announcement date (Ben-David, 2005), which suggest that these actions add value to shareholders (see for instance Slovin, Sushka and Polonchek, 1990, Rutherford, 1990 and Whitby, 2013 for more recent evidence)[3]. Given that the empirical evidence suggests that, on average, reactions to real estate shocks create shareholder value, we proceed by estimating the sensitivity of CEO pay to responses to lucky events.

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[2] If real estate prices exhibit momentum selling is not the optimal response.

[3] As anecdotal evidence, in 2007, the Spanish bank Santander raised more than €4.3bn through a series of sale-and-leaseback transactions that generated about €1.7bn of capital gains. This included the sale of the bank's Madrid headquarters, Boadilla del Monte, which was worth €1.9 billion on its own. J.C. Penney sold its headquarters in Texas for $353 in 2017 with the purpose of alleviating financial constraints.

Empirically, we start by estimating pay for luck in reduced form using real estate prices as luck variable. Consistent with existing empirical literature, we find that CEOs are rewarded for lucky events. Our estimated sensitivity of CEO pay to real estate luck suggests that a one standard deviation change in real estate prices is associated with an increase in CEO compensation of 2.2%, which corresponds to $100,000 evaluated at the mean.

Next, we investigate how CEO compensation relates to her responses to lucky events. Our strategy to identify responses to real estate luck (i.e. action) in a comprehensive way takes advantage of the accounting treatment of shocks to the market value of real estate assets. Assuming market efficiency, stock market performance reflects any change in the value of firm's real estate, irrespective of the CEO action. More specifically, stock market performance will capture: 1. "Pure luck" plus 2. Responses to unpredicted luck plus 3. Prediction ability. Contrarily, accounting performance only reflects changes in the value of real estate when there is CEO action (point 2. above), because under US GAAP, firms cannot mark-to-market these assets. Following a shock in real estate prices, net income and book values only change if the CEO decides to buy or sell existing assets.[4] With this procedure, we capture the sensitivity of pay to responses to luck.

Note that despite being a comprehensive approach to capture all different actions associated to real estate shocks this is still a conservative measure. First, in cases when the optimal response of the manager is "no action" that is, not selling there will not be any changes in accounting performance and the response to luck is still embedded in the estimate of pay for luck as in the

[4] This is always the case except for two situations: extremely negative real estate shocks, when the firm can write off real estate assets; and the case of real estate rentals. We deal with the first case by excluding the extreme shocks from the analysis, and with the second by adjusting accounting returns for the effect of rental expenses. Further, since non-current real estate assets held for sale, or investment property, are marked-to-market, both accounting and market performance are expected to be affected by real estate shocks despite managerial action. These assets typically represent a very small fraction of the firms' assets, and most of firms do not hold them.

previous literature. Second, while allowing us to isolate CEO responses *ex-post* to unexpected luck in a clean way, in this set up we do not account for the prediction ability of the CEO. If CEO are really good at predicting future real estate prices and act accordingly this might still be captured by market performance and not in full by accounting performance. Gopalan, Milbourn and Song (2010) propose the distinction between pay for luck and CEO's ability to forecast assuming this is captured by the CEOs choice of exposure to industry shocks. In our setting we go one step forward because we can capture, at least in part the CEOs ability to forecast, but fully capture any action taken in response to a complete exogenous and not necessarily predictable event.

Controlling for peer effects (as in Albuquerque, DeFranco, and Verdi, 2012), we find that the sensitivity of CEO compensation to changes in accounting performance associated with real estate prices shocks is positive and significant, which suggests that CEOs are rewarded for their responses to real estate shocks. This result is broadly in line with Lewellen (2017), who decomposes firm performance into "luck" and "skill", and finds that CEOs are only compensated for skill. By controlling for peer effects we ensure these responses are not just common responses followed by all managers in the same industry (Albuquerque, 2009), but that they are associated with abnormal industry returns. The magnitude of the effect is economically significant: for a 1 percent change in firm accounting performance as measured by the ROA (adjusted for rental expense) that is driven solely by real estate shocks, and therefore by reactions to luck, average CEO compensation increases by $31,500.

We still find evidence that CEO compensation correlates with real estate shocks regardless of CEO action, however the economic magnitudes are significantly smaller when CEO responses to real estate shocks are taken into account.[5] Controlling for CEO responses to lucky events, we find that for a one percentage point increase in the value of firm real estate holdings CEO compensation increases by only three basis points.

It only makes sense for the board to incentivize the CEO to respond to luck if such responses are optimal from the point of the view of the shareholders. Even though it is arguably difficult to evaluate and directly test the optimality of such actions, because we do not observe a counterfactual, we can still evaluate if, on average, responses to real estate luck add value to shareholders. To address this, we explore cross sectional variation in the quality of corporate governance of the firms and we run an event study on sale-and-leaseback (SLB) transactions. In addition, we explore cross sectional variation in the level of firms' financing constraints. The rationale is that most actions taken as a response to real estate luck, such as sale-and-leaseback transactions or debt issues using real estate as collateral, are more valuable for financially constrained firms.

We find that real estate sale-and-leaseback transactions are associated with significant positive cumulative abnormal returns (CARs) on the announcement date, suggesting that these CEO actions are value creating. We also find that pay for luck is mainly explained by these CEO responses to luck, which suggests that, in the case of real estate shocks, pay for luck is mostly pay for action. This is especially true in well-governed firms, suggesting that well-governed firms incentivize the firm management to react to lucky (real estate) events, or just compensate the manager ex-post for these observable actions. Further, we find this also holds in the case of financially constrained firms. Financial constraints can act as pressure to firm management to

[5] With our identification strategy we still cannot capture the ability of the CEO to forecast, and that compensating for this ability will still be considered pay for luck.

respond to real estate shocks, for instance by issuing debt when there is a positive shock to the value of collateral (Cvijanović, 2014). Taken together, these results do not constitute direct evidence that pay for responses to luck is optimal, but they do provide suggestive evidence that these actions create value to shareholder. They also echo the results from the large literature that tries to assess the impact of CEOs on firm outcomes (Adams, Almeida, and Ferreira, 2005).

In order to address the concern that house prices might be correlated with some unobserved variable that is also correlated with CEO compensation, for instance aggregate demand, we use the inelasticity of land supply as an exogenous regressor for real estate prices. We also address the concern of reverse causality in two ways: first, we use lagged changes in real estate prices and second, by restricting our analysis to small firms in large areas, where it is less likely that the firm performance can affect real estate prices. To address the concern that the majority of a firm's real estate holdings may not be located in the same location as its headquarters, we use data on a firm's location-specific real estate holdings from Garcia and Norli (2012). Last, to show that our results are robust beyond our identification strategy, which relies on ROA capturing real estate responses in an extensive way, we further make use of two specific actions that we can identify as being a response to real estate luck: debt issues and real estate assets sales. We test whether CEO compensation is linked to debt issues and assets sales associated with real estate shocks. We find that CEO pay is positively related to these two actions, which suggests that CEOs are paid for responses to luck.

We contribute to the literature on CEO compensation by providing new insights on pay for luck–pay for responses to luck, and by providing empirical evidence consistent with pay for luck being optimal in some settings. We also contribute to the open debate between the managerial power and competitive market views of CEO compensation. There is evidence supporting both views, but neither of the views is fully supported (Frydman and Jenter, 2010). Pay for luck is typically used as an argument in favor of the managerial power hypothesis, as pay for luck occurs mostly in badly governed firms (Bertrand and Mullainathan, 2001, Harford and Li, 2007, Chhaochharia and Grinstein, 2009, Garvey and Milbourn, 2006, and Bebchuk, Grinstein and Peyer, 2010). We provide a new insight where pay for luck is associated with managerial actions and not fully consistent with rent extraction by the CEO.

We also add to the literature that examines CEO skill, and how the learning process about CEO ability can affect their pay (Taylor, 2013) and stock return volatility and value creation (Pan, Wang, and Weisbach, 2015; Hermalin and Weisbach, 2017). Further, we contribute to the recent literature that studies the links between real investment decisions and CEO's incentives (Edmans, Fang and Lewellen, 2016).

The rest of the paper is organized as follows: in Section 2 we analyze the existing literature on pay for responses to luck and provide theoretical underpinning for our analysis. Institutional background is described in Section 3. In Section 4 we describe data and methodology, and in Section 5 we discuss the main findings. Section 6 contains the discussion of the robustness tests, and in Section 7 we conclude.

2 Pay for luck and responses to luck

Our paper contributes to the extensive debate about CEO pay: the managerial power view and the optimal contracting approach. Under the optimal contracting approach, managers' pay contracts are structured in such a way to alleviate (some of) the agency problems. Boards are assumed to design compensation schemes to provide managers with efficient incentives to maximize shareholder value (Murphy, 1999 and Core, Guay and Larcker, 2002). On the other hand, the managerial power hypothesis by Bebchuk and Fried (2003) posits that weak corporate governance and acquiescent boards allow CEOs to (at least partly) determine their own pay, resulting in inefficiently high levels of compensation. This theory predicts that much of the rent extraction occurs through forms of pay that are less observable or more difficult to value, such as stock options, perquisites, pensions, and severance pay.

Empirical literature on pay for luck offers consistent evidence that CEOs are paid for good performance that is driven by exogenous lucky events, but mixed evidence with respect to the relationship between compensation and CEO dismissal and bad luck. The managerial power view has been supported by the notion that CEOs are paid for luck: they are rewarded for lucky events not under their control and not penalized for unlucky ones. Bertrand and Mullainathan (2001) show that CEO pay in oil industries is equally sensitive to general firm performance as it is to performance driven by oil shocks. Moreover, firms with poorer corporate governance mechanisms are the ones that tend to reward more their CEOs based on the exogenous shocks. Garvey and Milbourn (2006) make the argument that pay for luck, specifically rewarding CEOs for market or industry performance, can be optimal to compensate managers for bearing systematic risk. However they find that CEOs are indeed rewarded for good market conditions but not penalized when the market is doing poorly.[6] On the other hand, after analyzing CEO turnover events Jenter and Kanaan (2015) provide evidence that CEOs tend to be fired after bad firm performance that was not caused by their own actions.

Given the extensive empirical evidence on pay for luck, a number of papers offer a rationale for this phenomenon, which we broadly categorize in to two groups. In the first group of studies, the

[6] Bizjak, Lemon and Naveen (2008) argue that the documented asymmetry in CEO pay for luck is a result of competitive benchmarking.

models rationalize pay for luck as a mechanism to incentivize effort, for instance, effort to generate informative signals about the market. Axelson and Baliga (2009) question the standard point made by Holmstrom (1979) that CEO pay should be linked to the performance measure that is the most informative about managerial effort to avoid pay for luck. They argue that when managers receive private signals about industry or market performance it is optimal to pay them for exogenous performance. Gopalan, Milbourn and Song (2010) make a similar argument that pay for industry performance is optimal when the principal wants to incentivize an optimal exposure to sector movements and this exposure is under the CEO control. Empirically they find that pay for industry luck is mostly found in firms where the CEO has greater strategic flexibility with respect to sector exposure. Noe and Rebello (2012) argue that pay for luck can also work as an incentive mechanism to ensure continued survival of the firm after adverse shocks.

In a second group, Oyer (2004) focuses on the participation constraint of managers: he argues that pay for luck can be optimal when outside options of managers are positively correlated with industry performance and it is costly to re-write a new compensation contract. Chaigneau, Edmans and Gottlieb (2016) propose a model where pay-for-luck interacts with the strength of the incentives managers have to start with.

Our paper makes a new and distinct point: we argue that pay for luck might be optimal when the board wants to incentivize an ex-post optimal response to a lucky event that is not verifiable. Alternatively, evidence of pay for luck can also be rationalized by the CEO being compensated ex-post for responding optimally to the luck shock, this response being observable by the firm. In the previous empirical literature we could not reject these two possibilities. We identify these responses and test whether managers are paid for responding to exogenous changes in market conditions. A potential rationale comes from Axelson and Baliga (2009), who argue that in order to make long-term contracts renegotiation proof, managers must have private information in the short-term that make them optimistic about their long-term compensation prospects. In our setup, all managers observe a public signal (aggregate real estate shock); however, they have different private interpretations of that signal. Depending on the private interpretation, managers choose whether to respond to a (positive) exogenous (real estate) shock, in such a way to improve the firm's performance. This is consistent with their argument: contracts should tie compensation not only to measures that are related to pure effort, but also to measures about which the manager is likely to have better information than the market but that are outside the control of the manager. This is precisely the case in our setting, because the manager can choose whether and how to respond to the exogenous events, contracts should incentivize these ex-post optimal responses.

An alternative explanation draws on the argument by Axelson and Bond (2014), and DeMarzo et al (2012), who predict that rewarding the manager for luck is optimal in good times, since the boards want to incentivize managers to seek positive NPV projects when the times are good, and to do so they may want to tie their compensation to measures that are beyond managers' control. In this paper, we show that CEOs are indeed compensated for positive NPV projects during good (real estate) times.

3 Institutional background

3.1 Accounting treatment of long-lived assets under US GAPP

Real estate assets are typically recognized in the balance sheet as property plant and equipment, at acquisition cost, and depreciated on a systematic basis. Shocks to the value of firm real estate are reflected in its market and accounting performance in different ways. When the value of a firm's real estate changes as a result of a positive shock in real estate prices in the location of the firm's headquarters, this change in firm value should be reflected in its market capitalization (and therefore in its stock market performance) immediately. However, according to US GAAP, the exact same shock should not be reflected in the firm's accounting performance. Based on the historical-cost principle, under GAAP, long-lived assets (such as real estate) and most other assets held on the balance sheet are to be recorded at the historical cost even if they have significantly changed in value over time. Historical-cost is a measure of value used in accounting in which the price of an asset on the balance sheet is based on its nominal or original cost when acquired by the company. Given that the value of a firm's real estate assets is not marked-to-market, any changes to the firm's accounting performance we observe following a real estate shock must come from a firm (or its CEO) reacting to that shock in some way: for instance, when it decides to sell the real estate and then realizes a capital gain (or loss). The US GAAP historical-cost principle thus allows us to estimate the sensitivity of CEO pay to responses to luck because accounting performance is not affected by real estate shocks unless there is an action taken by the CEO.

Real estate assets can be also accounted for as investment property—held for sale, when the firm holds the asset with the purpose of selling it in the future. In this case the asset is measured at the lower of its carrying amount or fair value less costs to sell, and the assets are not depreciated. For those assets, because they are marked-to-market both accounting and market performance are expected to be affected by real estate shocks despite managerial action. Non-current real estate assets held for sale, or investment property, typically represent a very small fraction of the firms' assets, and most of firms do not hold them (in our sample only 4 firm-year observations had such assets).

3.2 Reactions to events that are not under CEO control: example from sale and leaseback transactions

Following an increase in the value of the firm's real estate holdings, the CEO can respond in several different ways. For example, she can decide to sell the real estate assets, or to sell them and lease them back (to perform the sale and leaseback transaction or the SLB), or to change the financing policy of the firm by issuing more debt, just to name a few. To the extent that the process of issuing debt is well understood in the existing literature, in this section we will discuss the institutional detail behind the sale and leaseback transactions.

As argued in Whitby (2013) the choice to enter into a sale-and leaseback (SLB) transaction is a simple example of the instance when the manager of a firm has changed her mind about the best way to finance their assets. In an SLB transaction, an asset is sold to a third party and then simultaneously leased back with little or no impact to the daily operations of the firm and the use of that asset.

The majority of corporate SLBs involve real estate. Whitby (2013) shows several examples of SLB transactions: the sale and subsequent leaseback of a distribution center to TriNet Corporate Realty Trust, Inc.by Nike, and the completed sale-and-leasebacks of three restaurant locations to Franchise Financial Corp. of America by Famous Dave's of America. A notable example of an SLB transaction is the Santander Bank sale of their Madrid HQ in January 2008 for a reported capital gain of $886 million. Santander pocketed 1.9 billion-euros at the time by entering a deal which saw them lease the complex for 40 years with the option to purchase at the end of the lease[7].

Ben-David (2005) reports that the most common assets involved in SLB transactions in his sample were the company's headquarters followed by retail locations. As he shows, the top two declared motives for entering into an SLB transaction are to reduce debt and for expansionary purposes.

3.3 Data and methodologyMethodology

The question whether CEOs are rewarded for lucky events has been addressed in the literature by a large number of studies. The standard approach by Bertrand and Mullainathan (2001) consists of estimating the sensitivity of CEO compensation to changes in firm performance driven by luck, using exogenous determinants of firm performance such as oil prices or exchange rates. However, when estimating the sensitivity of compensation to luck in this framework, one cannot disentangle the sensitivity of pay to luck from the sensitivity of pay to reactions to luck (action).

The accounting treatment of real estate assets described in Section 3.1 allows us to do just that: given that any shocks to the value of a firm's real estate should only be reflected in the firm's balance sheet if there was an action in response to the shock, we are able to disentangle the sensitivity of CEO pay to luck (measured by the market value of its real estate assets) from the sensitivity of pay to reactions to luck.

[7] As reported in http://www.reuters.com/article/santander-property/update-1-santander-makes-605-mln-euros-on-hq-leaseback-deal-idUSL2573823720080125, Santander shares closed 0.7 percent higher on the SLB transaction announcement date.

To confirm the results in the existing literature (Bertrand and Mullainathan, 2001, Garvey and Milbourn, 2006, and Chhaochharia and Grinstein, 2009), we start by testing whether CEOs are compensated for lucky events, as proxied by changes in real estate values.[8] We estimate the following specification:

$$\log\left(TotalComp_{i,t}\right) = \alpha + \beta_1 HPI_{m,t-1} + \beta_2 Exp_{i,t0} + \beta_3 Exp_{i,t0} HPI_{m,t-1}$$

$$+ \textstyle\sum_x \beta_X X_{i,t} + \delta_m + \gamma_{i,c} + \mu_{j,t} + \varepsilon_{i,t} \quad (1)$$

Where $TotalComp_{i,t}$ is total CEO compensation in firm i at time t; $Exp_{i,t0}$ is defined as the value of real estate assets (Plant, Property, & Equipment less Plant, Property, & Equipment Machinery, Equipment and Leases, divided by total assets) in 1992; $Exp_{i,t0}HPI_{m,t-1}$ represents the luck measure, in this case the level of the House Price Index (HPI) at the MSA *m* of firm i at time $t-1$ interacted with the value of real estate assets for firm i at time t_0, $X_{i,t}$ are firm and CEO-specific controls such as ROA, total assets, Tobin's Q, stock return volatility, stock return, CEO age etc.; δ_m are MSA fixed effects, , $\gamma_{i,c}$ are firm-CEO fixed effects, and $\mu_{j,t}$ are industry-year fixed effects.

As noted by Albuquerque, DeFranco, and Verdi (2012), and Bizjak, Lemmon, and Naveen (2008) among others, boards tend to structure CEO compensation contracts based on peer CEO (firm) compensation. The inclusion of industry-year fixed effects $\mu_{j,t}$ serves as a control for peer effects: thus β_3 captures the general sensitivity of pay to (real estate) luck *relative* to other CEO-firm pairs that operate in the same industry. To address a potential concern that there is matching

[8] An alternative way of estimating the sensitivity of pay to lucky events is to run an instrumental variable regression, however, in the case of real estate luck the exclusion restriction is likely to be violated. Nonetheless, we run the IV regressions as a robustness check in Section 6.1.

between a firm's real estate exposure and CEO type, or between a firm's location and CEO type that might be driving our results, we include firm-CEO fixed effects $\gamma_{i,c}$. In this way, our main source of variation comes from tracking the same CEO-firm pair over time, which should alleviate potential matching concerns.

The coefficient of interest is β_3, which captures the sensitivity of CEO pay to (real estate) luck for a given firm-CEO pair over time, controlling for location specific- and time-varying industry-specific characteristics that might be driving our results. Essentially, it compares two CEO-firm pairs that operate in the same location, in the same industry-time, but with different exposures to local real estate market, as captured by $Exp_{i,t0}$.

As described in Section 3.1, given that any shocks to the value of a firm's real estate should only be reflected in the firm's balance sheet if there was an action in response to the shock, we are able to disentangle the sensitivity of CEO pay to luck (measured by the market value of its real estate assets) from the sensitivity of pay to reactions to luck. Given that the value of a firm's real estate assets is not marked-to-market, any changes to the firm's accounting performance we observe following a real estate shock must come from a firm (or its CEO) reacting to that shock in some way: for instance, when it decides to sell the real estate and then realizes a capital gain (or loss).

Our measure of accounting performance is *ROA*, defined as *Net income* divided by *Total Assets*. We use net income to make sure we capture any type of action that the manager might have taken as response to real estate shocks. We adjust *ROA* for *rental expenses* because these might not be associated to CEO action. We also use debt issues and real estate asset sales as alternative measures for CEO actions. This motivates the following specification:

$$\log(TotalComp_{i,t}) = \alpha + \beta_1 HPI_{m,t-1} + \beta_2 Exp_{i,t0} + \beta_3 ROA_{i,t} + \beta_4 Exp_{i,t0} HPI_{m,t-1} +$$

$$+ \beta_5 ROA_{i,t} HPI_{m,t-1} + \beta_6 ROA_{i,t} Exp_{i,t0} + \beta_7 ROA_{i,t} HPI_{m,t-1} Exp_{i,t0} +$$

$$+ \sum_x \beta_X X_{i,t} + \delta_{m,t} + \gamma_{i,c} + \mu_{j,t} + \varepsilon_{i,t} \quad (2)$$

To address a potential concern that there is an omitted variable driving our results (for example, local demand shocks can be driving both local real estate prices and CEO compensation in that location), we also include MSA-year fixed effects $\delta_{m,t}$, which should absorb any time-varying MSA-specific factors, such as an increase in local growth opportunities, or an increase in local investment etc.

The coefficient of interest is β_7, and it captures the sensitivity of CEO pay to reactions to luck, as proxied by the changes in accounting performance (that is, the *ROA*). Hence, in Specification 2, we are comparing the sensitivity of CEO pay to reactions to luck for a given CEO-firm pair over time, controlling for time-varying location specific characteristics that might be driving our results. The inclusion of time-varying industry specific characteristics $\mu_{j,t}$ ensure that we are comparing the CEO pay sensitivity to reactions to luck, *relative* to other CEO-firm pairs that operate in the same industry.

3.4 Data

This section describes data sources and presents summary statistics. Our initial sample consists of a panel of CEO-firm-years of Standard and Poor's (S&P) 1,500 firms drawn from the Execucomp database, from 1992-2011. We then match this sample to CRSP and Compustat databases to obtain stock returns and accounting data, and to the Federal Housing Finance

Association's (FHFA) database of CBSA-level house price data. Following previous literature, we exclude firms in the finance, insurance, real estate, construction, and mining industries, as well as firms involved in a major takeover operation. By excluding such firms we also make sure real estate assets are not market-to-market, which is key to our identification.

Following Chaney, Sraer and Thesmar (2012), we measure the market value of a firm's real estate holdings at the beginning of the sample, in 1992, and then identify firm real estate asset value changes coming from variation in real estate prices across geographical locations and time. We choose to measure the value of a firm's real estate assets in 1992 and then inflate it with subsequent variations in local MSA-level real estate prices to arrive at the changes in the market value of a firm's real estate, since 1992 is the first year when the compensation data from Execucomp becomes available[9]. Given that the Execucomp's full coverage of S&P 1500 firms only begins in 1994, this allows us to measure the firms' real estate exposure *prior* to our estimation sample[10].

Following Chaney, Sraer and Thesmar (2012), there are three major categories of property, plant, and equipment that are included in the definition of real estate assets: Buildings, Land and Improvement, and Construction in Progress (FATB, FATC and FATP). These assets are not marked-to-market, but valued at historical cost. To arrive at the measure of a firm's real estate assets in 1992 we follow a procedure that yields equivalent values to the ones in Chaney, Sraer

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[9] Execucomp data for 1992 and 1993 are largely based on S&P 500 firms. Full coverage of S&P 1500 firms only began in 1994.

[10] Following Cvijanović (2014), by using only the initial value of real estate holdings we can address a potential concern associated with using a firm's contemporaneous real estate holdings in that in response to real estate price growth, firms may be buying up and increasing their real estate asset base, which may capture parts of the variation in a firm's response to the real estate shocks we are trying to capture, and introduce endogeneity in our estimation.

and Thesmar (2012)[11][12]. The real estate exposure variable is defined as Property, Plant, and Equipment Total (Net) less Property, Plant, and Equipment Leases (Net), less Property, Plant, and Equipment Machinery and Equipment (Net), (Compustat (PPENT-PPENME-PPLENLS)[13], thus yielding the total value of a firm's land and improvements, buildings, and construction in progress. Under the U.S. GAAP these items represent the respective capitalized values, less accumulated depreciation[14], and as such give the same value distribution as the one in Chaney, Sraer and Thesmar (2012). That variable is then scaled by total assets to get the portion of the firm's assets related to its real estate holdings (RE(92)). In order to maintain a similar sample size to the most standard analysis we replace missing observations with zeros.

To obtain the cumulative real estate price increase needed for the 1992 value calculation, we use house price data, which is obtained from the Federal Housing Finance Association's (FHFA). They are calculated at the level of a Core Based Statistical Area (CBSA). A CBSA is a geographic area defined by the Office of Management and Budget (OMB) based around an urban center of at least 10,000 people and adjacent areas. CBSAs largely overlap with Metropolitan Statistical Areas (MSA) also defined by the OMB, and we will use the two acronyms interchangeably throughout the paper. The data contains a quarterly CBSA-level house-price index for 369 CBSAs from 1986 to 2012. The choice to use residential prices instead of

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[11] Their procedure looks as follows: they start by calculating the ratio of the accumulated depreciation of buildings (DPACB) to the historic cost of buildings (FATB) and multiply it by the assumed mean depreciable life of 40 years (Nelson, Potter, and Wilde, 2000). This calculation yields an estimate of the age of the firm in 1992. To arrive at the real estate value in 1992, they then use the book value (FATB + FATC + FATP in Compustat) and multiply it the sum by the cumulative price increase from the acquisition year to 1992.

[12] Similar strategy is also used in Cvijanović (2014), Kumar and Vergara-Alert (2016), and Chen, Hartford and Lin (2017).

[13] Property, Plant and Equipment Total (Net) (PPENT) is defined in Compustat as Property, Plant and Equipment Total (Gross) (PPEGT) less Depreciation, Depletion, and Amortization (Accumulated) (DPACT).

[14] Note that Property, Plant and Equipment Total (Net) PPNT excludes land and property held for investment purposes or for development and resale.

commercial real estate prices is driven by the lack of availability of reliable commercial real estate data at *MSA* level for the period in question. Namely, most publicly available sources report *state* prices indexes for offices, excluding other types of commercial real estate.

The CEO-firm year data is merged to the house price data by linking each firm's headquarters zip code (from Compustat) with its particular CSBA using data from US Department of Housing and Urban Development (HUD) database. HUD provides HUD-USPS crosswalk files which allocate zip codes to CBSAs. Finally, to obtain the market value of each firm's real estate assets for each year in the sample period (1993 to 2011) we multiply the market value of real estate assets in 1992, RE(92) by the real estate price index for the given year.

We use Execucomp to obtain or calculate the following compensation variables used in our analysis: cash compensation, equity compensation, total compensation, tenure, and age. Our primary dependent variable is total pay, which consists of salary, bonus, value of restricted stock granted, value of options granted, long-term incentive payout, and other compensation (Execucomp item TDC1). In our regressions we control for firm size using the logarithm of firm revenue, firm growth opportunities using Tobin's Q, accounting profitability, using ROA, stock return and stock price volatility. Following Bertrand and Mullainathan (2001), we also control for CEO age, CEO age squared, CEO tenure, CEO tenure squared, a trend, a quadratic trend, and firm fixed effects.

The final dataset includes 16,614 CEO-firm year observations from 1992-2011. All variables are winsorized at the 1st and 99th percentile values. Table A.I in the Appendix provides variable definitions and data sources.

Table 1 reports summary statistics of CEO compensation, firm characteristics, and real estate market variables. The average CEO in this sample has a total compensation of 4.5 million dollars. The average cash component is 1.2 million, while the average equity component corresponds to 3.2 million. These numbers are in line with the literature on CEO compensation using similar data (Chhaochharia and Grinstein, 2009, Fahlenbrach, 2009, and Gopalan, Milbourn, Song, and Thakor, 2014). The average real estate holdings as a percentage of assets are 32%.

Table 2 breaks the data into 2 groups: high and low real estate exposure. A firm is defined to have high (low) real estate exposure if *Real Estate Assets* is above (below) the yearly median *Real Estate Assets*. In this univariate setting, we find that total compensation is significantly higher for firms that have low real estate exposure. This result is mainly driven by higher equity pay.

4 Results

4.1 Pay for luck

This section presents the main results. Table 3 presents our initial test of the effect of real estate prices on CEO pay. We follow the methodology described in Section 4.1. The dependent variable in all regressions is the log of total compensation. The independent variable of interest is the interaction term between real estate assets and HPI, which captures the exposure of the firm to real estate markets and shocks to the price of these assets. In column 1, we run the regression with industry-year interacted fixed effects and MSA-year fixed effects to exploit within industry-year variation and within MSA-year variation. In other words, we compare two firms that operate in the same industry and are located in the same MSA at the same time but have different exposures to real estate. The variable of interest coefficient is positive but not statistically significant. We then move to specifications with firm fixed effects and firm-CEO fixed effects where we explore within firm, and within firm-CEO variation. In this case the variation in the independent variable of interest is coming from changes in the market value of the real estate assets over time for the same firm in the case of firm fixed effects, and for the same firm-CEO pair in the case of firm-CEO fixed effects. We estimate a coefficient of 0.022 in column 2 and of 0.034 in column 4 that are statistically significant at 5% and 1% respectively. This means that for a one standard deviation change in the market value of assets of a given firm, CEO compensation increases by between $30,000 and $45,000. The specification with firm-CEO fixed effects is relevant because the variation in the market value of real estate prices cannot be explained by firm-CEO endogenous matching, or by CEO characteristics that are time invariant such as innate talent.

In columns 3 and 5, we add MSA-year fixed effects to the previous specifications with firm and firm-CEO fixed effects. In these specifications we are restricted to within firm/firm-CEO variation that is not driven by price changes at the MSA level because we include MSA-year fixed effects and HPI is defined exactly at the MSA-year level. Therefore, identification in these regressions is coming from firms changing their headquarters to a different MSA. We estimate a coefficient between 0.03 and 0.04, which suggests that a one standard deviation change in HPI associated with a new location increases average CEO compensation by between $45,000 and $60,000.

The results in this table show a positive association between real estate prices and CEO pay. This association is typically interpreted as pay for luck, because changes in real estate prices are not under the control of the CEO. However, this association can also be driven by responses of the

CEO to these real estate shocks: responses to luck. The results in columns 4 and 5 are suggestive of this possibility, because this correlation is driven by firms that change their location, which requires CEO action.

4.2 Pay for responses to luck

We proceed to test if CEO compensation is correlated with responses to luck. Table 4 shows the results. In this table, the main variable of interest is the triple interaction term between real estate exposure, HPI and ROA. This term captures changes in ROA associated to shocks to the market value of the firm's real estate assets. These changes in ROA only occur if there is some managerial response to real estate prices and therefore we interpret the coefficient of this variable as the sensitivity of pay to responses to real estate luck. Because we run all regressions with industry-year fixed effects, we filter out the common yearly industry component of ROA, which means that we only capture responses to real estate shocks that are not commonly taken by the whole industry. In column 1, we estimate our model with MSA-year and industry-year fixed effects, which is synonymous with comparing two firms in the same industry, year and location but with different exposure to real estate assets. We find a coefficient of 0.148 that is not very precisely estimated. In columns 2 and 4, we estimate the model with MSA, but not MSA-year, fixed effects and with firm or firm-CEO fixed effects respectively. When looking only at within firm variation, and when we restrict this variation to the tenure of the CEO we find a point estimate for our variable of interest between 0.279 and 0.228 (columns 2 and 4 in Table 4) that is statistically significant at 1% level. This means that for a one standard deviation change in HPI (0.51) associated with a one standard deviation change in ROA (0.11) CEO compensation changes by $76,500 at the mean.

In columns 3 and 5, we further saturate the regressions with MSA-year fixed effects. In this case identification is achieved in one the following two ways: one, by comparing firms in the same MSA-year and same industry that respond in different ways to the same real estate shock. Because HPI is varying at the MSA-year level, the coefficient is estimated based on changes in ROA across firms. The other possibility is that a given firm changes MSA. In each of these two cases, this coefficient captures the sensitivity of CEO compensation to some action taken as a response to luck in real estate prices. Our estimated coefficients in columns 3 and 5 is 0.257 and 0.200 respectively. These estimates suggest that for a one standard deviation in HPI associated with a standard deviation in ROA, average CEO compensation changes by 1.5% (or $67,500).

If we focus on the coefficient of the interaction term between exposure and HPI, we find some evidence that CEO compensation correlates with real estate shocks irrespective of action. The magnitude of the estimated coefficient is smaller than in previous regressions and not precisely estimated in specifications 1, 2 and 4. When the coefficient is estimated with more precision, we find that for a one standard deviation change in HPI, CEO compensation changes between $35,600 and $50,500. This result is consistent with pay for luck being, at least partially, explained by pay for responses to luck.

4.3 Cash and equity pay

In Table 5, we run our analysis differentiating between cash and equity compensation. We expect most of pay for luck to occur through equity compensation, as the stock price of the company, assuming some level of market efficiency, should reflect the market value of the real estate assets of the firm. When we run our pay for luck test, we find evidence mostly consistent with our conjecture. We find a positive and significant correlation between the market value real estate assets and CEO equity compensation. The coefficient varies between 0.047 and 0.082 and is precisely estimated. We do not find cash compensation to be significantly correlated with real estate shocks. When we test for pay for responses to luck we find that both cash and equity compensation correlate with responses to luck, but only equity compensation is significant in one of the specifications. The significant coefficient is 0.409, which means that for a one percentage point change in ROA and a one point change in HPI, CEO equity compensation increases by $18,000.

This table suggests that pay for responses to luck is not strongly associated to a specific form of compensation – cash or equity, since the results are more robust when using total pay as opposed to using cash and equity pay separately.

4.4 Is pay for responses to luck optimal?

So far we have not discussed the optimality of incentivizing and paying CEOs to respond to real estate luck. It only makes sense for the board to incentive the CEO to respond to luck if such responses are optimal from the point of the view of the shareholders. Even though it is arguably difficult to evaluate and directly test the optimality of such actions because we do not observe a counterfactual, we can still evaluate if, on average, responses to real estate luck add value to shareholders, and which companies pay for responses to luck. To address this, we explore cross sectional variation in the strength of corporate governance mechanisms of the firms and we run an event study on sale-and-leaseback (SLB) transactions. In addition, we explore cross sectional variation in the level of firms' financing constraints. The rationale is that most actions taken as a response to real estate luck such as sale and lease back transactions or debt issues using real estate as collateral are more valuable for financially constrained firms.

Table 6 shows the results of pay for responses to luck in subsamples of strong and weak governance. Following the existing literature (Bertrand and Mullainathan, 2001; Dittmar and Mahrt-Smith, 2007), we use the following measures of corporate governance strength and product market competition: institutional ownership, and the Herfindahl index (HHI) of industry concentration. Institutional ownership is defined as the sum of all ownership positions greater than 5% held by institutional investors, as collected from the 13-F filings by Thomson Financial. Higher values of institutional ownership indicate more oversight and hence better corporate governance[15]. In our second test, we analyse the role played by the relative role of the product market competition of the industry the firm operates in: we construct the HHI index for each firm in our sample following Giroud and Mueller (2011). The idea here is simple: we expect to see stronger responses to luck in industries with low industry concentration. In less concentrated industries managers have greater competitive pressure to take actions that maximize firm value, or, in other words, they have less slack to behave sub optimally. Therefore we should expect managers in more competitive industries to more actively respond to real estate luck.

While we recognize that there are other aspects of corporate governance that may have a significant role in our setting, we focus on these measures because they are well founded in the existing literature and they offer clear predictions for what constitutes ‘‘good’’ governance.

We proceed by splitting our sample into firms with high and low institutional ownership (high and low HHI, respectively) based on the median value of institutional ownership (HHI, respectively). We find much larger coefficients of pay for responses to luck in the subsamples of

[15] As shown in the Appendix (Table IA5), we also run our analysis using alternative governance proxies: the G-index by Gompers, Ishii, and Metrick (2003), and the E-index by Bebchuk, Cohen, and Ferrell (2008). Our results remain unchanged.

firms with high institutional ownership and in industries with low industry concentration. Only the subsample of firms with high institutional ownership show statistically significant coefficients. However, the coefficients for low industry concentration firms are almost significant (with p-values between 0.16 and 0.11).

In Table 7, we perform an event study around SLB transaction announcement dates and find significant positive abnormal returns, suggesting that this specific CEO action, on average, creates value for shareholders. We find that SLB transactions in general generate significant cumulative abnormal returns (CAR) between 1.3% and 1.4%. When restricting the sample to SLB of real estate assets only CAR are between 2.1% and 2.3%. As for SLB that occur as response to increases in real estate prices, we find CAR between 1.9% and 2%. These results are consistent with the idea that incentivizing managers to respond to real estate luck might be optimal.

Table 8 shows the results for firms with different levels of financial constraints. Following the existing literature (Almeida, Campello and Weisbach, 2011; Campello and Hackbarth, 2012), we use firm age and firm size as proxies for the level of financial constraints and split our sample based on firms being above/below yearly age and size medians[16]. In all four specifications of the financially constrained subsets, we find the pay for luck coefficient positive and significant at the 5% level. On the other hand, in the non-financially constrained groups, we find that the pay for responses to luck coefficient is not significant except for one specification. These results are consistent with the notion that responses to luck are more valuable for financially constrained (young and small) firms, as they might relax such constraints.

[16] Our results remain unchanged when we use alternative measure of financing constraints, such as: payout ratio, and bond ratings.

Taken together these results provide suggestive evidence that responses to luck are valuable actions from a shareholder's point of view.

4.5 Specific actions: debt issues and real estate asset sales

Lastly, we also study alternative, specific CEO responses to luck. Specifically, we focus on debt issues and real estate assets sales.

Cvijanović (2014) shows that there is a spillover effect of real estate markets on firm investment through the value of its collateral, which influences the debt capacity of the firm. Therefore, a possible response of the CEO to a positive real estate shock is to issue new debt. Another possible reaction to real estate shocks is buying/selling real estate assets or doing a sale-and-lease back transaction. We focus on real estate asset sales because it is more likely for the CEO to sell real estate as a response to a positive shock, or do a sale-and-leaseback transaction, than to buy real estate as a response to a negative shock. Table 9 shows the results of these tests. The coefficients of interest for debt issues (columns 1 and 2) are 0.009 and 0.015 respectively, both highly significant. The coefficients of interest on real estate sales (columns 3 and 4) are 0.015 and 0.007 respectively, with only the former being significant at the 10% level. Here again we find that CEOs are paid to respond to lucky events and identify some specific actions CEOs use to respond to real estate shocks.

4.6 Ex-ante real estate exposure and pay for luck

Can corporate boards of firms with high real estate holdings anticipate potential windfalls on behalf of CEOs coming from their exposure to real estate luck? If so, do they structure the compensation contracts ex-ante in such a way to limit pay for luck while at the same incentivizing pay for *responses* to luck?

To try to answer this question, we run our analysis by splitting the sample of the firms based on the level of their real estate holdings prior to the estimation period (in 1992). We classify firms as ex-ante High (Low) Real Estate Exposure firms if they are in the top (bottom) quintile of real estate holdings in 1992. As shown in Table 10, the "pay for luck" coefficient on $Exp_{i,t0}HPI_{m,t-1}$ is either positive, very small and insignificant (column 1), or negative and highly significant (column 3) for High Real Estate Exposure firms. This suggests that corporate boards can anticipate the sensitivity of CEO pay to lucky events and structure their compensation contracts in such a way that CEOs are in a position to extract smaller rents from such lucky events.

On the other hand, the "response to luck" coefficient on $ROA_{i,t}HPI_{m,t-1}Exp_{i,t0}$ is positive and highly significant for High Real Estate Exposure firms (columns 1 and 3), suggesting that firms with high real estate holdings tend to incentivize their CEOs ex-ante for responding to lucky events ex-post.

5 Robustness tests and discussion

5.1 Endogeneity of real estate prices

There are two potential sources of endogeneity in our analysis. The first concern is that real estate prices might not be exogenous to the performance of firms, and hence CEO compensation. That is, there might be an unobservable variable that is driving both location specific real estate prices and CEO compensation, which would then in turn affect our results. The second concern relates to the real estate ownership decision: firms that are more likely to own their real estate can also be more likely to compensate their CEOs for responses to luck

To address the first concern, the omitted variable bias, we follow the instrumental variable approach of Chaney, Sraer and Thesmar (2012) and use land supply elasticity (Saiz, 2010) at the

MSA level, interacted with changes in national real estate prices (as proxied by the S&P Case-Shiller U.S. House Price index) to predict real estate prices at the MSA level (HPI). We then use the predicted MSA real estate prices (HPI) in our tests with compensation as the dependent variable. More precisely, we estimate a series of two-stage OLS (2SLS) specifications, where the second stage is as in Equation (1) and Equation (2) (and with fixed effects structures as shown in Table 3 and Table 4), and the dependent variable is total compensation. We estimate the following first-stage regression for house prices at the MSA level:

$$HPI_t^m = \beta_1 P_t^{US} e_0^m + \delta_t + \mu_m + \varepsilon_t^i \qquad (3)$$

Where P_t^{US} denotes the value of the S&P Case-Shiller U.S. House Price index at time *t*, e_0^m denotes land supply elasticity in MSA *m*, HPI_t^m denotes the value of the house price index in MSA *m* at time *t*. δ_t and μ_m capture year and MSA fixed effects, thus abstracting from location specific and time specific trends. To account for using the predicted HPI values from the first-stage as the regressor in the second stage regression, we bootstrap our standard errors.

The results of the first stage regression are shown in column 1 in Table IA1[17]. As expected, the interaction of housing supply elasticity and U.S. Case-Schiller House Price Index has a positive and statistically significant coefficient at the 99% confidence level. The associated F-statistic for the weak instruments is 38.43, suggesting that the chosen IV does not suffer from the weak instrument problem. Overall, we find significant pay for responses to luck (columns 2-5). The estimates found using this setting (between 0.043 and 0.087) are qualitatively similar, although smaller than those in Table 4.

[17] All of our internet appendix tables and specifications include all controls and the fixed-effects structure used in Tables 3 and 4, but for brevity we suppress their coefficients.

The second potential source of endogeneity is that firms that are more likely to own real estate are also more sensitive to local demand shocks. To address this concern, we follow the standard procedure in the literature (Chaney, Sraer and Thesmar, 2012) by including the interactions between firms' initial characteristics and the HPI: in particular, we include five quintiles of firm age, firm size, ROA, as well as two-digit SIC industry dummies and MSA dummies. The results of these regressions are shown in Table IA1, and they remain unchanged.

In a recent critique, Davidoff (2016) argues that land supply elasticity is not a good instrument for house prices, as they are not useful for comparisons across MSAs. However, he notes that the interactions with firm characteristics such as those included here "obviate the need for a price instrument conditional on different assumptions from those evaluated in this paper." Furthermore, his critique does not apply to comparisons between real estate owning and non-real estate owning firms that operate within the same MSA, as we do here and throughout the paper.

5.1.1 Small firms in large MSAs

A possible concern with the previous analysis is that of reverse causality, whereby large firms are able to affect real estate prices in given geographical areas. To ensure this possibility is not driving our results, we exclude large firms operating in small geographical areas and run the same tests as in Table 3 and 4. More precisely, we restrict our sample to firms belonging to the bottom three quartiles of the asset size distribution, whose headquarters are located in one of the top 30 MSAs based on the MSA rank by population as of July 1, 2012, as estimated by the United States Census Bureau. The results are shown in Table IA2, and are similar in nature to the ones in Table 4, where we find significant evidence of pay for responses to luck and no evidence of pay for luck.

5.2 Measurement: state-level real estate prices

In Table IA3 we run our baseline specification using a state-weighted HPI for each firm based on its real estate holdings across the U.S. instead of only using the real estate holdings in the state of its headquarters, as defined by Compustat. Since Compustat does not contain data on the location of each piece of firm's real estate holdings, we test the validity of previous results by using state-level data on firms' operations obtained from García and Norli (2012), who extract state name counts from annual reports filed with the SEC on Form 10 K. The authors parse of all 10 Ks filed with the SEC during the period 1994 through 2008, which gives them information on the firm's real estate holdings, such as factories, warehouses, and sales offices. This procedure yields a count of the number of times each 10 K mentions a U.S. state name. Based on the state name counts, we construct a relative exposure of each firm to local, state level real estate market. Results from replicating the tests of Tables 3 and 4 with this revised measure of real estate market values are shown in Table IA3. The results using this state-level measure are consistent in both significance and magnitude with our previous analysis. We find significant pay for responses to luck and marginally significant evidence of pay for luck.

6 Measuring responses to luckConclusion

In this paper we show evidence that CEOs are rewarded for responding to lucky events. We also show that pay for luck, as typically measured, can be partially explained by these responses to luck. We propose a novel empirical strategy that relies on the different exposure of firms to real estate shocks and on the fact that market and accounting performance do not reflect the changes in the value of real estate in the same way. While stock market returns should promptly reflect any changes in the value of real estate assets of the firm, accounting returns should not, unless some action is taken by the manager. When we explore this difference we find that CEOs are being rewarded for their reactions to luck and not purely for lucky events, at least when it comes to luck associated with the real estate market.

Pay for responses to luck affects equity pay, not cash pay. When we explore the cross section of firms, we find that firms with better governance and/or financial constraints value and pay for responses to luck more than their counterparts with poor governance and/or fewer financial constraints. We also find evidence that pay for responses to luck is optimal as viewed by the stock market. Specifically, we find positive, significant abnormal returns associated with announcements of sale-and-leasebacks by firms in our sample.

This paper brings a new perspective on the topic of pay for luck, and contributes to the active debate on CEO compensation. We provide empirical evidence that shows pay for luck might not necessarily be consistent with rent extraction by the CEO.

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8 Appendix

Variable Definitions

CEO Level Variables

Total Compensation	Total CEO pay in thousand $, which consists of salary, bonus, value of restricted stock granted, value of options granted, longterm incentive payout, and other compensation (Execucomp TDC1).
Cash Compensation	Salary plus bonus in thousand $ (Execucomp TOTAL_CURR).
Equity Compensation	Value of restricted stock granted plus value of options granted in thousand $ (Execucomp RSTKGRNT + OPTION_AWARDS_BLK_VALUE (pre adoption of FAS 123R) and post FAS 123 adoption: Execucomp STOCK_AWARDS_FV + OPTION_AWARDS_BLK_VALUE from 2006–2011.)
Equity Percentage	Equity compensation divided by total compensation.
CEO Age	Age of CEO in years (ExecuComp).
CEO Tenure	Number of years as CEO in the current position (ExecuComp).

Firm Level Variables

Log Sales	Log of sales in thousands of $ (Compustat SALE).
Log MVE	Log of market capitalization in thousands of $ (Compustat PRCC_F * CSHO).
Log Debt	Log of debt in thousands of $ (Compustat DLC + DLTT).
RE Sales	Scaled RE Assets less previous year's Scaled RE Assets $ (Compustat (PPENT - PPENLS - PPENME) / AT).
Tobin's Q	Sum of total assets plus market value of equity minus book value of equity divided by total assets [Compustat (AT + CSHO x PRCC_F - CEQ) / AT)].
ROA	Net income plus rental expenses multiplied by one minus income taxes scaled by pretax income divided by total assets (Compustat (NI+XRENT*(1-TXT/PI))/AT).
Volatility	Annualized standard deviation of monthly stock returns (CRSP).
Stock Return	Annual stock return [Compustat (PRCC_F(t) / AJEX(t) + DVPSX_F(t) / AJEX(t)) / (PRCC_F(t-1) / AJEX_F(t-1))].
Real Estate Assets	Property, Plant, and Equipment Total (Net) less Property, Plant, and Equipment Leases (Net), less Property, Plant, and Equipment Machinery and Equipment (Net), divided by total assets (Compustat (PPENT-PPENME-PPLENLS) / AT).

HPI	Level of the House Price Index for a particular Core Based Statistical Area (Federal Housing Finance Association), obtained from the Federal Housing Finance Association's (FHFA).

9 Tables and Figures

Table 1: Summary Statistics

This table presents summary statistics for CEO compensation and firm characteristics. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. HPI denotes CBSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All variables are winsorized at the 1st and 99th percentile values. Variable definitions are as defined in the Appendix.

	Mean	Median	St. dev	Min	Max	Obs.
Total compensation	4506.81	2529.35	5502.86	168.41	33228.69	16,614
Cash compensation	1211.05	910.00	1050.14	3.00	7000.00	16,614
Equity compensation	3263.30	1395.78	4869.84	0.00	29424.73	16,614
Equity percentage	0.54	0.59	0.28	0.00	0.98	16,593
Total assets	7421.12	1572.37	27319.32	5.08	797769.00	16,614
Tobin's Q	1.90	1.51	1.21	0.75	8.35	16,614
ROA	0.05	0.06	0.11	-0.55	0.31	16,614
Volatility	0.11	0.10	0.06	0.03	0.39	16,614
Stock Return	0.14	0.08	0.54	-0.92	4.63	16,614
Real Estate Assets (1992)	0.25	0.16	0.24	0.00	0.94	16,614
Real Estate Assets	0.32	0.26	0.23	0.00	0.97	16,614
HPI	157.93	147.02	51.81	85.31	363.43	16,614
CEO age	56.19	56.00	7.21	30.00	95.00	15,909
CEO tenure	7.38	5.00	7.63	0.00	60.00	16,076
Firm age	19.08	17.00	12.23	1.00	43.00	16,614

Table 2: CEO Compensation and Exposure to Real Estate Shocks

This table presents mean differences for CEO compensation variables between CEOs whose firms have above median Real Estate Assets' holdings and those who have below median Real Estate Assets' holdings. All variables are winsorized at the 1st and 99th percentile values. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	High RE Exposure	Low RE Exposure	Difference	t-stat
Total compensation	4291.30	4782.39	-491.09	5.71
Cash compensation	1206.26	1217.18	-10.92	0.67
Equity compensation	3069.53	3511.07	-441.54	5.81
Equity percentage	0.53	0.55	-0.03	5.98
Obs.	9323	7291		

Table 3: Pay for Luck – Total Compensation

This table presents estimates of OLS regressions of the logarithm of CEO total compensation on the lag of HPI and the lag of HPI interacted with Real Estate (R.E.) Assets (in 1992) and other CEO and firm level control variables. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. HPI denotes CBSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)
RE(92) x HPI(t-1)	0.007	0.022**	0.028***	0.034***	0.044***
	[0.664]	[2.151]	[2.671]	[2.628]	[2.688]
HPI(t-1)		-0.006		-0.014	
		[-0.552]		[-0.995]	
ROA(t)	0.172**	0.336***	0.364***	0.383***	0.375***
	[2.176]	[3.528]	[3.137]	[5.205]	[3.967]
Stock Return(t)	0.077***	0.053***	0.056***	0.051***	0.052**
	[3.245]	[3.184]	[2.660]	[2.821]	[2.147]
Log(Assets)	0.453***	0.382***	0.384***	0.335***	0.332***
	[18.598]	[13.553]	[9.884]	[9.767]	[7.394]
Log(Assets) x HPI(t-1)	0.001	-0.001	-0.001	0.000	0.000
	[0.667]	[-0.574]	[-0.906]	[-0.196]	[-0.126]
Tobin's Q	0.100***	0.109***	0.097***	0.118***	0.108***
	[6.878]	[8.528]	[6.186]	[6.743]	[4.640]
Volatility	0.106	-0.082	-0.334	0.071	-0.085
	[0.548]	[-0.457]	[-1.568]	[0.332]	[-0.377]
ROA(t-1)	-0.064	0.103	0.097	0.207**	0.184*
	[-0.898]	[1.315]	[1.108]	[2.355]	[1.728]
Stock Return(t-1)	0.105***	0.091***	0.081***	0.089***	0.080***
	[5.399]	[7.868]	[6.247]	[8.475]	[6.735]
CEO Age	0.024	0.028	0.027	0.005	-0.005
	[0.962]	[1.395]	[1.135]	[0.186]	[-0.159]
CEO Age Squared	-0.000	0.000	0.000	0.000	0.000
	[-1.223]	[-1.618]	[-1.293]	[0.054]	[-0.294]
RE(92)	-0.338**				
	[-2.167]				
Observations	14,509	14,509	14,509	14,509	14,509
R-squared	0.548	0.357	0.461	0.289	0.420
Firm FE		yes	yes		
Firm-CEO FE				yes	yes
Ind-year FE	yes	yes	yes	yes	yes
MSA FE	yes	yes		yes	
MSA-year FE	yes		yes		yes

Table 4: Pay for Action – Total Compensation

This table presents estimates of OLS regressions of the logarithm of CEO total compensation on all possible two and three way interactions of the lag of HPI, Real Estate (R.E.) Assets (in 1992) & ROA and other CEO and firm level control variables. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. HPI denotes CBSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All specifications include all control variables used in Table 3, but for brevity, their coefficients are suppressed (Other controls). All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)
ROA x RE(92) x HPI(t-1)	0.148	0.279***	0.257***	0.228***	0.200**
	[1.501]	[3.277]	[2.932]	[2.917]	[2.032]
RE(92) x HPI(t-1)	-0.000	0.009	0.015	0.024*	0.034**
	[-0.031]	[0.911]	[1.571]	[1.815]	[2.118]
HPI(t-1)		-0.005		-0.014	
		[-0.480]		[-0.978]	
ROA x HPI(t-1)	-0.023	-0.049***	-0.040**	-0.039**	-0.035*
	[-1.250]	[-3.172]	[-2.273]	[-2.382]	[-1.948]
ROA x RE(92)	-1.060	-3.038**	-2.635*	-2.421*	-1.76
	[-0.691]	[-2.216]	[-1.772]	[-1.813]	[-1.026]
ROA(t)	0.406	0.980***	0.853**	0.879***	0.786**
	[1.224]	[3.072]	[2.223]	[2.660]	[2.023]
RE(92)	-0.288*				
	[-1.702]				
Observations	14,509	14,509	14,509	14,509	14,509
R-squared	0.548	0.359	0.462	0.29	0.421
Other controls	yes	yes	yes	yes	yes
Firm FE		yes	yes		
Firm-CEO FE				yes	yes
Ind-year FE	yes	yes	yes	yes	yes
MSA FE	yes	yes		yes	
MSA-year FE	yes		yes		yes

Table 5: Pay for Luck & Action – Cash and Equity Compensation

This table presents estimates of OLS regressions of the logarithm of CEO cash and equity compensation on all possible two and three way interactions of the lag of HPI, Real Estate (R.E.) Assets (in 1992) & ROA and other CEO and firm level control variables. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. HPI denotes CBSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All specifications include all control variables used in Table 3, but for brevity, their coefficients are suppressed (Other controls). All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Panel A: Pay for Luck	Cash		Equity	
	(1)	(2)	(3)	(4)
RE(92) x HPI(t-1)	-0.002	-0.003	0.047**	0.082**
	[-0.168]	[-0.249]	[2.274]	[2.600]
HPI(t-1)				
ROA(t)	0.345***	0.351***	0.531*	0.609**
	[5.093]	[5.456]	[1.938]	[2.397]
Observations	14,472	14,472	14,527	14,527
R-squared	0.461	0.495	0.381	0.341

Panel B: Pay for Action				
	(1)	(2)	(3)	(4)
ROA x RE(92) x HPI(t-1)	0.056	0.032	0.334	0.409*
	[0.866]	[0.485]	[1.250]	[1.867]
RE(92) x HPI(t-1)	-0.005	-0.006	0.031	0.063*
	[-0.503]	[-0.471]	[1.494]	[1.891]
HPI(t-1)				
ROA x HPI(t-1)	-0.056***	-0.047***	-0.027	-0.058
	[-4.945]	[-4.040]	[-0.687]	[-1.411]
ROA x RE(92)	-0.315	0.146	-3.378	-4.005
	[-0.293]	[0.121]	[-0.681]	[-1.074]
ROA(t)	1.220***	1.073***	0.748	1.270
	[5.531]	[3.838]	[0.810]	[1.326]
Observations	14,472	14,472	14,527	14,527
R-squared	0.375	0.498	0.381	0.342
Other controls	yes	yes	yes	yes
Firm-CEO FE		yes		yes
Firm FE	yes		yes	
Ind-year FE	yes	yes	yes	yes
MSA-year FE	yes	yes	yes	yes

Table 6: Pay for Action – Governance

This table presents estimates of OLS regressions of the logarithm of CEO total compensation on all possible two and three way interactions of the lag of HPI, Real Estate (R.E.) Assets (in 1992) & ROA and other CEO and firm level control variables. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. HPI denotes CBSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All specifications include all control variables used in Table 3, but for brevity, their coefficients are suppressed (Other controls). Panels are differentiated by whether firms have below/above median institutional ownership and above/below median Herfindahl Index (HHI). All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)
	Panel A: High IO		Panel B: Low IO	
ROA x RE(92) x HPI(t-1)	0.408*	0.428**	0.149	0.025
	[1.837]	[2.048]	[1.052]	[0.176]
RE(92) x HPI(t-1)	-0.011	-0.003	0.014	0.028
	[-0.344]	[-0.082]	[0.480]	[1.063]
Observations	6,002	6,002	5,550	6,825
R-squared	0.525	0.518	0.553	0.550
	Panel C: Low HHI		Panel D: High HHI	
ROA x RE(92) x HPI(t-1)	0.203	0.209	0.103	0.066
	[1.565]	[1.497]	[0.698]	[0.305]
RE(92) x HPI(t-1)	0.036	0.048*	-0.008	0.031
	[1.385]	[1.845]	[-0.311]	[1.015]
Observations	7,684	7,684	6,825	5,550
R-squared	0.493	0.442	0.563	0.592
Other controls	yes	yes	yes	yes
Firm-CEO FE		yes		yes
Ind-year FE	yes	yes	yes	yes
Firm FE	yes		yes	
MSA-year FE	yes	yes	yes	yes

Table 7: Cumulative Abnormal Returns at the Announcement of Sale-and-Leasebacks

The table presents the wealth effects associated with the announcement of a sale and leaseback transaction. The cumulative abnormal return (CAR) is calculated using the market model, which is estimated using the CRSP equally-weighted stock returns over 252 days. Day 0 is the announcement date of the sale and leaseback (SLB). The sample consists of SLB transactions from 1980 – 2011 and is from Whitby (2013). Significance at the 1%, 5%, and 10% level is denoted by ***, **, and *, respectively.

	Full Sample of Sale-Leasebacks (N = 358)		
	Mean	Pos/Neg	Patell Z
CAR (-1,1)	0.0127	194/164	4.183***
CAR (-2,2)	0.0134	192/166	3.583***
CAR (-3,3)	0.0137	192/166	3.382***
	Sale-Leasebacks of Real Estate only (N = 206)		
	Mean	Pos/Neg	Patell Z
CAR (-1,1)	0.0205	115/91	4.349***
CAR (-2,2)	0.0229	117/89	3.744***
CAR (-3,3)	0.0216	111/95	3.153***
	Sale-Leasebacks of Headquarters only (N = 69)		
	Mean	Pos/Neg	Patell Z
CAR (-1,1)	0.0094	39/30	1.895**
CAR (-2,2)	0.0112	44/25	2.019**
CAR (-3,3)	0.0019	40/29	1.272
	Sale-Leasebacks following Positive Real Estate Shocks (N = 240)		
	Mean	Pos/Neg	Patell Z
CAR (-1,1)	0.0185	127/113	3.525***
CAR (-2,2)	0.0204	126/114	2.777***
CAR (-3,3)	0.0187	122/118	2.519***

Table 8: Financial Constraints

This table presents estimates of OLS regressions of the logarithm of CEO total compensation on all possible two and three way interactions of the lag of HPI, Real Estate (R.E.) Assets (in 1992) & ROA and other CEO and firm level control variables broken into subsets based on proxies for financial constraints. Young/Old (Small/Big) are based on above/below median firm age (assets). The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. HPI denotes CBSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All specifications include all control variables used in Table 3, but for brevity, their coefficients are suppressed (*Other controls*). All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Panel A: Age	Young		Old	
	(1)	(2)	(3)	(4)
ROA x RE(92) x HPI(t-1)	0.456**	0.449**	0.065	0.027
	[2.310]	[1.990]	[0.417]	[0.243]
Obs	6,676	6,676	6,702	6,702
R-squared	0.553	0.565	0.533	0.546
Other controls	yes	yes	yes	yes
Firm-CEO FE	yes	yes	yes	yes
Ind-year FE	yes	yes	yes	yes
MSA FE	yes		yes	
MSA-year FE		yes		yes

Panel B: Size	Small		Big	
	(1)	(2)	(3)	(4)
ROA x RE(92) x HPI(t-1)	0.309**	0.312**	0.118	0.311*
	[2.396]	[2.197]	[0.768]	[1.901]
Obs	6,933	6,933	7,569	7,569
R-squared	0.563	0.569	0.518	0.551
Other controls	yes	yes	yes	yes
Firm-CEO FE	yes	yes	yes	yes
Ind-year FE	yes	yes	yes	yes
MSA FE	yes		yes	
MSA-year FE		yes		yes

Table 9: Other "Lucky" Channels

This table presents estimates of OLS regressions of the logarithm of CEO total compensation on all possible two and three way interactions of the lag of HPI, Real Estate (R.E.) Assets (in 1992) and one of: Log(debt) or RE Sales and other CEO and firm level control variables. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. HPI denotes CBSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All specifications include all control variables used in Tables 3 and 4, but for brevity, their coefficients are suppressed (*Other controls*). All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)
Log(Debt) x RE(92) x HPI(t-1)	0.009*	0.015***		
	[1.847]	[4.858]		
Log(Debt) x HPI(t-1)	0.000	0.000		
	[0.452]	[0.112]		
Log(Debt) x RE(92)	-0.169**	-0.229***		
	[-2.032]	[-3.392]		
RE Sales x RE(92) x HPI(t-1)			0.015*	0.007
			[1.855]	[0.806]
RE Sales x HPI(t-1)			0.000	0.001
			[0.100]	[1.282]
RE Sales x RE(92)			-0.009	-0.024
			[-0.446]	[-1.515]
RE(92) x HPI(t-1)	-0.031	-0.059**	0.026**	0.042***
	[-0.818]	[-2.112]	[2.538]	[2.695]
HPI(t-1)				
Observations	14,509	14,509	14,494	14,494
R-squared	0.462	0.421	0.461	0.420
Other controls	yes	yes	yes	yes
Firm-CEO FE		yes		yes
Ind-year FE	yes	yes	yes	yes
Firm FE	yes		yes	
MSA-year FE	yes	yes	yes	yes

Table 10: Real Estate Exposure and Pay for Luck

This table presents estimates of OLS regressions of the logarithm of CEO total compensation on all possible two and three way interactions of the lag of HPI, Real Estate (R.E.) Assets (in 1992) & ROA and other CEO and firm level control variables. The sample is split based on Real Estate Exposure of firms in 1992. Hi (Lo) RE Exposure are all firms in the top (bottom) quintile of firms. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. HPI denotes CBSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All specifications include all control variables used in Table 3, but for brevity, their coefficients are suppressed (*Other controls*). All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)
Real Estate Exposure(92)	Hi	Lo	Hi	Lo
ROA x RE(92) x HPI(t-1)	0.360*	-0.377	0.262**	0.031
	[1.753]	[-0.693]	[2.051]	[0.084]
RE(92) x HPI(t-1)	0.007	-0.110	-0.070**	0.147
	[0.100]	[-0.306]	[-2.330]	[0.752]
HPI(t-1)	0.019	-0.023		
	[0.221]	[-0.343]		
ROA x HPI(t-1)	-0.081	0.003	-0.057	-0.033
	[-1.525]	[0.109]	[-1.035]	[-0.976]
ROA x RE(92)	-3.836	1.428	-1.495	0.852
	[-1.069]	[0.240]	[-0.719]	[0.183]
ROA(t)	0.633	0.220	0.307	0.647
	[0.690]	[0.372]	[0.360]	[0.988]
Observations	2,930	2,818	2,930	2,818
R-squared	0.830	0.661	0.514	0.432
Other Controls	yes	yes	yes	yes
Firm FE			yes	yes
Firm-CEO FE	yes	yes		
Ind-year FE	yes	yes	yes	yes
MSA FE	yes	yes		
MSA-year FE			yes	yes

Table IA 1: Inelasticity

This table presents estimates of two stage panel regressions of the Log(Total Compensation) on all possible two and three way interactions of the lag of HPI, Real Estate (R.E.) Assets (in 1992) & ROA and other CEO and firm level control variables. The first stage regressions use the lag of HPI predicted by land supply elasticity and the Case-Shiller House Price Index to predict HPI. The second stage regressions includes the predicted HPI and its interaction terms as independent variables. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. HPI denotes CBSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All specifications include all control variables used in Table 3, but for brevity, their coefficients are suppressed (*Other controls*). All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	HPI	Log(Total Comp)	Log(Total Comp)	Log(Total Comp)	Log(Total Comp)
Stage	1st	2nd	2nd	2nd	2nd
Case-Shiller Inelasticity	0.027***				
	[6.673]				
RE(92) x Pred HPI(t-1) x ROA		0.045	0.085**	0.043	0.087*
		[1.193]	[2.160]	[1.067]	[1.899]
RE(92) x Pred HPI(t-1)		0.045	0.075	-0.019	-0.082
		[0.246]	[0.382]	[-0.091]	[-0.318]
Pred HPI(t-1)		0.047		0.051	
		[0.903]		[0.664]	
ROA x Pred HPI(t-1)		0.017	0.021	-0.000	-0.010
		[0.526]	[0.604]	[-0.006]	[-0.261]
ROA x RE(92)		4.702	-0.599	6.790	1.386
		[0.909]	[-0.155]	[1.100]	[0.384]
ROA(92) Quintiles x HPI(t-1)		yes	yes	yes	yes
Size(92) Quintiles x HPI(t-1)		yes	yes	yes	yes
Age(92) Quintiles x HPI(t-1)		yes	yes	yes	yes
Other Controls		yes	yes	yes	yes
Observations	12,794	12,794	12,794	12,369	12,369
R-squared	0.909	0.350	0.449	0.282	0.412
F-stat	38.43				
Firm FE		yes	yes		
Firm-CEO FE				yes	yes
Ind-Yr FE		yes	yes	yes	yes
MSA FE	yes	yes		yes	
Year FE	yes				
MSA-Yr FE			yes		yes

Table IA 2: Small Firms in Large MSAs

This table presents estimates of OLS regressions of the logarithm of CEO total compensation on all possible two and three way interactions of the lag of HPI, Real Estate (R.E.) Assets (in 1992) & ROA and other CEO and firm level control variables. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive and belonging to the bottom three quartiles of the size distribution whose headquarters are located in one of the top 30 MSAs based on the CBSA rank by population. HPI denotes MSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All specifications include all control variables used in Table 3, but for brevity, their coefficients are suppressed. All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)
ROA x RE(92) x HPI(t-1)			0.289**	0.261**
			[2.480]	[2.473]
RE(92) x HPI(t-1)	0.020	0.029	0.007	0.018
	[0.948]	[1.091]	[0.345]	[0.729]
Firm controls	yes	yes	yes	yes
CEO controls	yes	yes	yes	yes
Observations	9,570	9,570	9,570	9,570
R-squared	0.441	0.411	0.303	0.442
Firm-CEO FE		yes		yes
Ind-year FE	yes	yes	yes	yes
Firm FE	yes		yes	
MSA-year FE	yes	yes	yes	yes

Table IA 3: State Level HPI – Pay for Luck/Action

This table presents estimates of OLS regressions of the logarithm of CEO total compensation on all possible two and three way interactions of the lag of State-level HPI, Real Estate (R.E.) Assets (in 1992) & ROA and other CEO and firm level control variables. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. State-weighted HPI for each firm is based on its real estate holdings across the U.S. instead of only using the real estate holdings in the state of its headquarters. All specifications include all control variables used in Table 3, but for brevity, their coefficients are suppressed. All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)
ROA x RE(92) x HPI(t-1)			0.391***	0.323**
			[3.419]	[2.534]
RE(92) x HPI(t-1)	0.255	0.666**	0.063	0.486**
	[1.351]	[2.470]	[0.354]	[1.983]
Firm controls	yes	yes	yes	yes
CEO controls	yes	yes	yes	yes
Observations	10,768	10,768	10,768	10,768
R-squared	0.435	0.422	0.436	0.423
Firm-CEO FE		yes		yes
Ind-year FE	yes	yes	yes	yes
Firm FE	yes		yes	
MSA-year FE	yes	yes	yes	yes

Figure IA1: Sale-and-Leaseback Transactions

This figure presents the annual number of Real Estate/Headquarter Sale-and-Leaseback transactions by US firms between 1990 and 2012. The data is from Whitby (2013) and limited to Firm HQ SLBs.

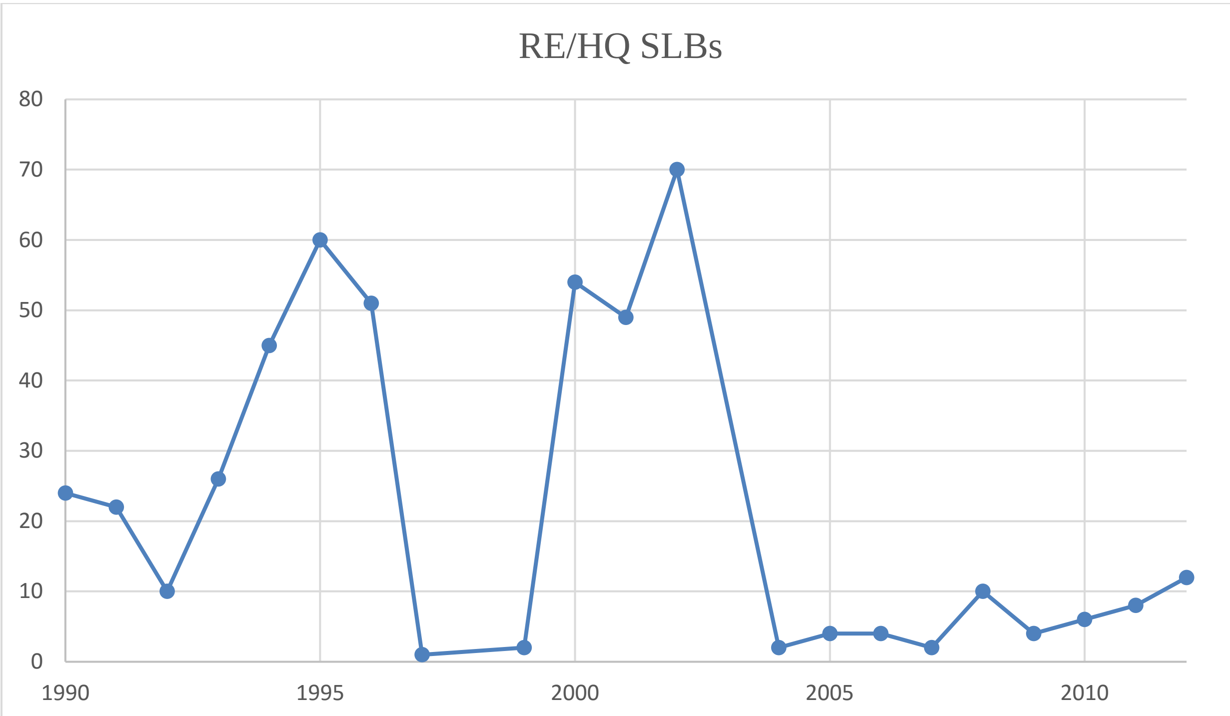
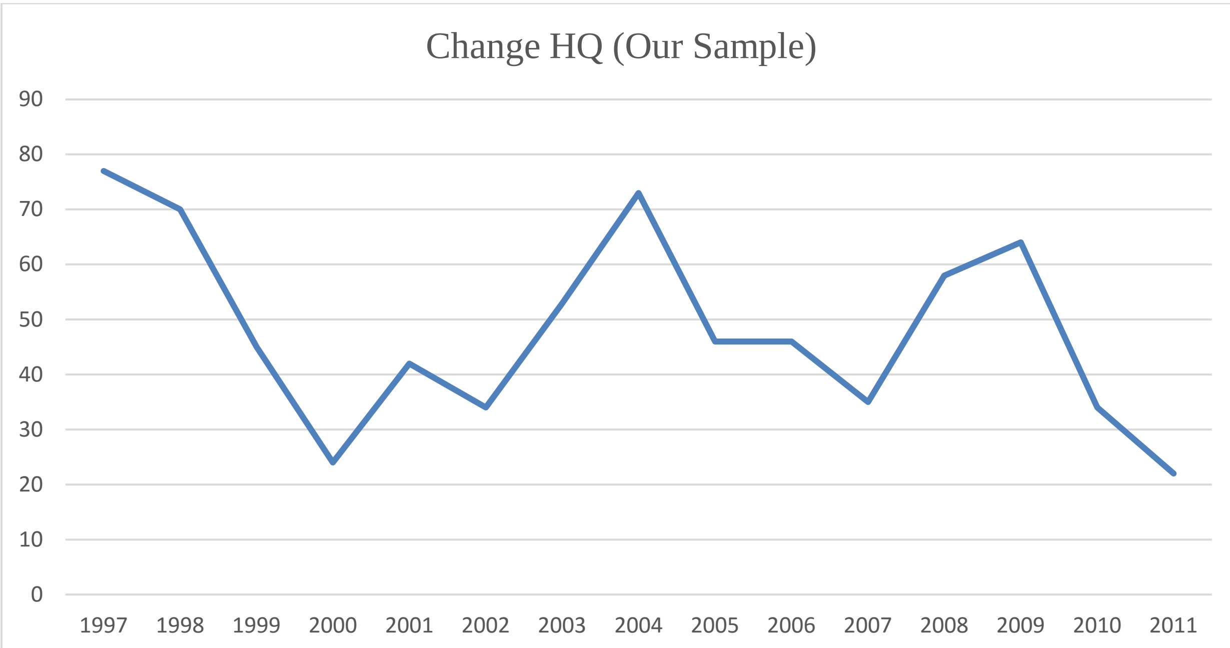


Figure IA2: Headquarter Changes

The below figures present the number of firms in our sample (Panel A) and in the entire Compustat universe (Panel B) which change headquarter states between 1997 and 2011. The state headquarter data is from Scott Dyreng's website. The headquarter data in Compustat is historical data and does not change over time even if the firm changes locations.



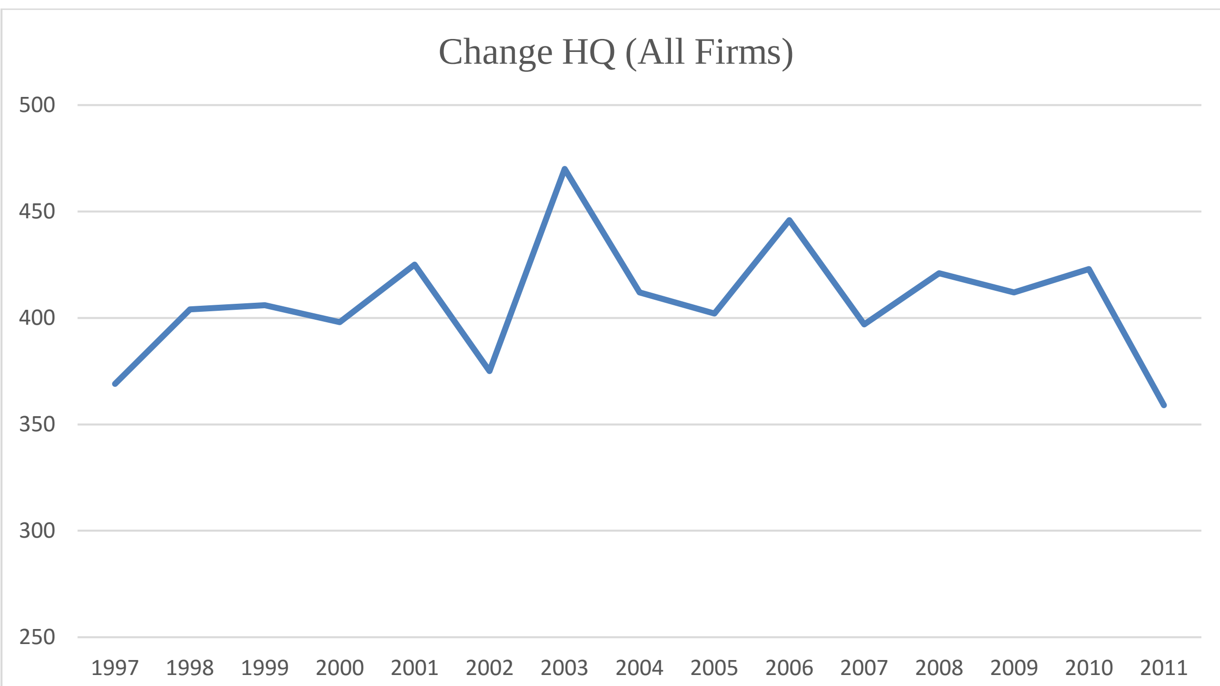


Table IA4: Percent of Firms Changing Headquarter Location

This panel presents the number and percentage of firms in our sample that change their HQ location and the total number of firms in our sample between 1997 and 2011. The state headquarter data is from Scott Dyreng's website. The headquarter data in Compustat is historical data and does not change over time even if the firm changes locations.

Year	% Change HQ	No of Firms Change HQ	Total no of firms
1997	7.30%	77	1052
1998	6.70%	70	1038
1999	4.50%	45	1002
2000	2.50%	24	975
2001	4.40%	42	953
2002	3.60%	34	932
2003	5.80%	53	921
2004	8.00%	73	912
2005	5.20%	46	880
2006	5.40%	46	859
2007	4.10%	35	859
2008	6.50%	58	886
2009	7.40%	64	863
2010	4.00%	34	848
2011	2.70%	22	818

Table IA5: Pay for Action – Governance

This table presents estimates of OLS regressions of the logarithm of CEO total compensation on all possible two and three way interactions of the lag of HPI, Real Estate (R.E.) Assets (in 1992) & ROA and other CEO and firm level control variables. The sample consists of all firms in Execucomp and Compustat for which Real Estate Assets data and HPI data is available for the years 1992 – 2011 inclusive. HPI denotes CBSA-level house prices, as obtained from the Federal Housing Finance Association's (FHFA) database. All specifications include all control variables used in Table 3, but for brevity, their coefficients are suppressed (Other controls). Panels are differentiated by whether firms have below/above median G-Index and E-Index. All variables are winsorized at the 1th and 99th percentile values. The standard errors are robust to heteroscedasticity and clustered at the MSA level. Variable definitions are as defined in the Appendix. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)
	Panel A: Low G-Index		Panel B: High G-Index	
ROA x RE(92) x HPI(t-1)	0.426***	0.292**	0.056	0.190
	[3.711]	[2.420]	[0.447]	[1.138]
RE(92) x HPI(t-1)	0.024	0.027	0.045	0.063
	[0.899]	[1.175]	[1.236]	[1.655]
Observations	7,950	7,950	6,559	6,559
R-squared	0.605	0.577	0.520	0.509
	Panel C: Low E-Index		Panel D: High E-Index	
ROA x RE(92) x HPI(t-1)	0.379**	0.261	0.210	0.186
	[2.310]	[1.271]	[1.261]	[1.013]
RE(92) x HPI(t-1)	-0.039	0.010	0.043	0.071**
	[-1.204]	[0.225]	[1.435]	[2.176]
Observations	5,477	5,477	9,032	9,032
R-squared	0.697	0.698	0.467	0.452
Other controls	yes	yes	yes	yes
Firm-CEO FE		yes		yes
Ind-year FE	yes	yes	yes	yes
Firm FE	yes		yes	
MSA-year FE	yes	yes	yes	yes