

When in doubt:  
Why is there a director-specific component in CEO pay after SOX? \*

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**Abstract**

Following the enactment of the Sarbanes-Oxley Act of 2002 (SOX), we find a statistically and economically significant director-specific component in CEO pay: in the cross-section of firms, directors that award relatively higher (lower) CEO pay in one firm also award relatively higher (lower) CEO pay in other firms of whose boards they are members during the year. Based on our estimates, the director-specific component is responsible for around  $\pm 3.5\%$  of total CEO pay or around  $\pm \$230,000$  per CEO-year on average. In addition to affecting CEO pay levels, the director-specific component also has a significant effect on the changes and the composition of CEO pay, thus affecting CEO incentives. We pursue two potential explanations for our findings—changes in board composition and changes in director behavior after SOX. We do not find evidence that the director-specific component in CEO pay is due to changes in board composition. Instead, we find evidence that the director-specific component in CEO pay is due to changes in director behavior related to the additional risks and employment concerns imposed on directors after SOX. Our findings are consistent with the view that SOX discourages directors from taking risks when awarding CEO pay and so directors award CEO pay that they can more easily justify through direct experiences in other firms. These findings have wide implications about the importance of directors in setting CEO pay, the existence of agency problems within the board, and the consequences of regulation in general and SOX in particular.

*Keywords:* executive compensation; board of directors; reputation concerns; government policy

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## 1. Introduction

There is little doubt that the Sarbanes-Oxley Act (SOX) of 2002 and the accompanying changes in listing standards on the New York Stock Exchange (NYSE) and Nasdaq, while changing the composition and the structure of corporate boards, also significantly increased the costs and risks to directors serving on the boards of public companies. The new rules increased the disclosure requirements and the scrutiny on directors, imposed new responsibilities on directors to justify their decisions, and increased director personal liability and penalties if directors are found in violation of U.S. securities laws.<sup>1</sup>

Yet, financial researchers are still trying to develop a clear picture of whether and how directors have changed their behavior in response to the higher costs and risks after SOX.<sup>2</sup> In this study, we use a novel approach to examine the determinants of CEO pay and present evidence consistent with directors attempting to avoid the increased costs and risks following SOX by awarding CEO pay that they can more easily justify through direct experiences on other boards.

Several considerations motivate our interest in CEO pay. First, CEO pay was at the center of the 2001-2002 corporate governance scandals that lead to SOX. In most of the scandals CEOs and other executives had received substantial compensation prior to the collapses of their firms.<sup>3</sup> The apparent discrepancy between the fortunes of executives and other stakeholders pointed to a link between executive pay and fraud and focused the attention of regulators, commentators, and academic researchers on executive pay. For instance, in October 2002 NYSE and Nasdaq proposed rules requiring shareholder

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<sup>1</sup> See, for example, Linck, Netter, and Yang (2008), Barger, Lehn, and Zutter (2010), and the references therein. Consistent with an increase in director liability and penalties, Linck, Netter, and Yang (2008) find that Director and Officer (D&O) insurance premiums have doubled after SOX.

<sup>2</sup> Consistent with numerous prior studies, we will use SOX to encompass the Sarbanes-Oxley Act of 2002, SEC rules that implement SOX, and changes in NYSE and Nasdaq listing standards associated with SOX.

<sup>3</sup> The most notorious of these scandals was the collapse of Enron. In 2000, Enron's then chairman and CEO received a total pay valued at around \$30 million and additionally exercised options in excess of \$124 million. In contrast, in the ensuing bankruptcy, ordinary shareholders lost the bulk of their Enron investments and thousands of Enron workers lost their jobs and much of their retirement savings.

approval of most equity-based compensation plans.<sup>4</sup> Executive pay, especially CEO pay, is thus a highly visible aspect of corporate governance that is likely to be heavily scrutinized after SOX. Moreover, scrutiny on how directors award CEO pay could be accompanied by additional scrutiny of other director duties. Under these circumstances, directors would be especially sensitive to CEO pay and may change how they award CEO pay after SOX. Second, the board of directors is the key decision-maker when it comes to awarding CEO pay. For other aspects of corporate behavior (e.g., investment and financial policies), decisions may be in the hands of managers as well as directors. Examining CEO pay, therefore, allows us to reach direct conclusions about changes in the behavior of directors. And third, because CEO actions could significantly affect firm value, understanding the determinants of CEO incentives in general and CEO pay in particular is important and is the subject of an active area of research.

Using a sample of 12,188 firm-years between 1996 and 2011, we find that following the enactment of SOX there is a statistically and economically significant director-specific component in CEO pay; that is, after controlling for firm, CEO, and board characteristics known to affect CEO pay, directors who award relatively higher (lower) CEO pay in one firm also award relatively higher (lower) CEO pay in the other firms of whose boards they are members during the year. Based on our estimates, after 2002 around  $\pm 3.5\%$  of total CEO pay, or around  $\pm \$230,000$  per CEO-year on average, is awarded as a consequence of this director-specific component. Moreover, the director-specific component in CEO pay is also significant in the year-over-year changes in a CEO's pay as well as in the proportion of a CEO's equity-based pay. To the extent that pay changes and equity-based pay provide CEOs with incentives for performance (e.g., Jensen and Murphy, 1990 and Core and Guay, 1999), the director-specific component in CEO pay significantly influences CEO performance incentives.

In order to better understand the source of the documented director-specific component in CEO pay after SOX, we perform additional analysis. For the sake of tractability, we group the potential

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<sup>4</sup> SEC approved these rules on June 30, 2003.

explanations for our findings into two categories: explanations based on changes in board composition and explanations based on changes in director behavior after SOX.

Our findings do not support the explanation that the director-specific component in CEO pay is a consequence of the changes in board composition following SOX. Specifically, we examine whether a director-specific component in CEO pay exists prior to SOX for a sub-sample of firms that even prior to 2002 satisfied the board independence requirements imposed by the new exchange listing standards. We do not find evidence of a director-specific component in CEO pay before SOX in the sub-sample of firms that already satisfied the new standards or, for that matter, in the sub-sample of firms that did not satisfy these standards. In similar tests, we examine whether the director-specific component in CEO pay exists prior to SOX for firms with larger boards, non-dual CEOs, low proportion of current executives, and high proportion of lawyers—i.e., boards that are similar in composition to post-SOX boards.<sup>5</sup> We do not find evidence of a director-specific component in CEO pay in any of these sub-samples prior to SOX.

To determine whether the director-specific component in CEO pay is related to increased director costs and risks after SOX, we examine whether the effect varies with director risk-taking incentives, as measured by excess director option-based pay, expected director turnover, and director reputation concerns in the market for directors. All else equal, if director option-based pay is low relative to expectations then directors are less likely to take on additional risks, including risks stemming from SOX. Because director option-based pay is endogenous, we first estimate a model that explains director option-based pay. Using the residuals from this model, we form two sub-samples based on whether director option-based pay is below-expectations or above-expectations. We find that the director-specific

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<sup>5</sup> After SOX, board composition itself may have changed as a response to the increased costs and risks after SOX. For instance, as discussed by Linck, Netter, and Yang, (2008), the increase in lawyers and the reduction in current executives may be one such response. Consistent with this reasoning, we find that the director-specific component in CEO pay is mostly evident for firms that have followed the general trend and have increased the proportion of lawyers and/or reduced the proportion of current executives in their boards. In contrast, firms that have kept a high proportion of current executives and a low proportion of lawyers in their boards do not exhibit a significant director-specific component in CEO pay. For the sake of brevity we do not tabulate the results from these tests. Results are available upon request.

component in CEO pay is more pronounced when director option-based pay is low relative to expectations. In similar tests we find that the director-specific component in CEO pay is mostly evident when expected director turnover (as measured by the firm's historic turnover) is relatively high and when directors have high reputation concerns (as measured by the number of boards a director serves). Overall, our findings are consistent with the idea that, after SOX, directors with relatively low risk-taking incentives try to avoid taking risks by awarding similar CEO pay across the different boards they serve.

Our study provides several notable contributions to the literature. First, our study contributes to the standing question of whether CEO pay is mostly determined in the labor market for CEO talent (e.g., Rosen, 1990; Himmelberg and Hubbard, 2000; Hubbard, 2005; Gabaix and Landier, 2008; Terviö, 2008) or whether agency problems within the board may lead to CEO pay that reflects the preferences of directors (e.g., Fama, 1980; Fama and Jensen, 1983; Jensen, 1993; Hall and Murphy, 2003; Bebchuk and Fried, 2003). Existing empirical research on the relevance of the board for CEO pay examines mainly the importance of board structure and composition.<sup>6</sup> However, director costs and risks, while more difficult to observe, also play a central role in agency theory. The exogenous shock to director costs and risks after SOX, therefore, provides a unique opportunity to examine whether and how CEO pay depends on the board of directors.<sup>7</sup> Our findings are consistent with the predictions of agency theory where directors' decisions on CEO pay are, at least in part, driven by directors' own preferences.

Second, our study contributes to the literature examining the effects of SOX and the accompanying changes in exchange listing requirements on corporate behavior. For example, Chhaochharia and Grinstein (2009) find a significant decrease in CEO pay in firms that are most affected by the new exchange requirements while Barger, Lehn, and Zutter (2010) find that U.S. firms, when compared to

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<sup>6</sup> See, among others, Yermack (1996), Hallock (1997), Core, Holthausen, and Larcker (1999), Bertrand and Mullainathan (2001), Grinstein and Hribar (2004), and Chhaochharia and Grinstein (2009).

<sup>7</sup> Other studies also use SOX as an exogenous event to examine the effect of outside directors on firm performance (Duchin, Matsusaka, and Ozbas, 2010) and on CEO pay (Chhaochharia and Grinstein, 2009).

non-U.S. firms, experience a decline in risk-taking after SOX as evidenced by a decline in capital and R&D expenditures, an increase in corporate cash holdings, and an overall decline in stock volatility.<sup>8</sup> We present evidence of another, likely unintended, consequence of SOX that is consistent with the view that SOX discourages risk taking by directors.

Third, the findings have more general implications about regulating the internal governance of firms. Because regulation is usually intended to change the incentives of those being regulated, it is important to better understand what incentives exactly are being changed. The substantive corporate governance regulations imposed by SOX are unprecedented in the history of federal securities regulation, which provides a unique opportunity to examine the effects of such regulations of corporate behavior. The lessons learned from SOX indicate that increasing the costs and risks of internal governance, instead of resolving agency problems, may in fact exacerbate them.<sup>9</sup>

Finally, our study also contributes to the literature on the existence of “styles” in corporate decisions. Most notably, Bertrand and Schoar (2003) track top managers over time as they manage different firms and provide evidence for manager fixed effects for a wide range of corporate decisions. Bertrand and Schoar (2003) contribute these findings to heterogeneity in manager “styles”. Fee, Hadlock, and Pierce (2013) propose two distinct hypotheses for the findings of Bertrand and Schoar (2003): (i) the idiosyncratic style hypothesis, according to which unanticipated managerial-style effects cause firm policies and (ii) the selected style hypothesis, according to which directors deliberately select a manager “style” to induce the firm to move in a certain direction. Fee, Hadlock, and Pierce (2013) present evidence consistent with the selected style hypothesis but inconsistent with the idiosyncratic style

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<sup>8</sup> Guthrie, Sokolowsky, and Wan (2012) re-examine the results of Chhaochharia and Grinstein (2009) and find that the majority of the decline in CEO pay after SOX is attributable to two outlier CEOs--Steve Jobs at Apple and Kosta Kartotis at Fossil. Dey (2010) questions the interpretation of Barger, Lehn, and Zutter (2010) that the decline in risk-taking of U.S. firms is due to SOX and instead suggests that general market trends may be behind their findings.

<sup>9</sup> The objective of this study is not to provide a complete cost-benefit analysis of SOX. Zhang (2007), for example, studies the overall economic consequence of SOX and finds that U.S. firms experienced a statistically significant negative cumulative abnormal return around key SOX events.

hypothesis. Our findings raise another possibility: the evidence of “styles” may be contextual and may not reflect the existence of actual “styles”. Specifically, directors may not have their own “styles” in awarding CEO pay, yet in an attempt to reduce the risk of being scrutinized, directors may tend to award similar CEO pay across all boards they serve. In this case the heterogeneity across directors is due to directors serving on different boards and not due to differences in actual “styles”.

Our paper is somewhat related to studies that examine the effect of peer groups on CEO pay (e.g., Bizjak, Lemmon, and Naveen, 2008; Albuquerque, 2009) and studies that examine network effects in corporate governance (e.g., Bouwman, 2011). While existing studies on peer group effects use mainly industry- and size-based peer groups, our study explicitly accounts for industry and size effects and focuses on the importance of specific directors in determining CEO pay.<sup>10</sup> In addition, we demonstrate that our findings are not driven by a wider network of directors sharing information about optimal CEO pay but instead are isolated to the one director who serves on several boards.

The remainder of the paper is organized as follows. Section 2 proposes and motivates two explanations for the director-specific component in CEO pay after SOX. Section 3 describes our sample and variables. Section 4 presents our main findings for a director-specific component in CEO pay. Section 5 examines whether our findings are due to a wider network effect while Section 6 examines whether our findings are due to changes in board composition. Section 7 examines how director risks affect the director-specific component in CEO pay. Section 8 concludes the paper.

## **2. What could explain a director-specific component in CEO pay?**

Existing theoretical and empirical research on the determinants of executive compensation has ignored the possibility that a director-specific component may affect CEO pay. Under optimal

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<sup>10</sup> Moreover, most directors who serve on multiple boards serve on boards across different industries. This fact also makes it highly unlikely that our findings are a result of industry peer effects. Our findings may indicate that post-SOX directors choose peer groups from the set of firms on whose boards they sit. This interpretation of the results relies on endogenously chosen peer groups and is still consistent with our overall conclusion of a director-specific component in CEO pay after SOX.

contracting, CEO pay is determined by the characteristics of the firm, the information environment, the competition for human capital among firms, the competition for jobs among CEOs, and the abilities and risk-preferences of the CEO so that equilibrium CEO pay does not depend on who awards the pay. Even in settings where CEO compensation depends on the governance of the firm, and thus on the board of directors, board and director characteristics are considered to be confined within each firm so that a director-specific component would not manifest itself across different firms.<sup>11</sup> In this section we propose and motivate two possible explanations for a director-specific component in CEO pay after SOX.

### *2.1. Changes in board composition*

Different directors may have different bargaining skills, different assessments of what constitutes optimal CEO pay or simply different “styles” when awarding CEO pay. Such differences across directors may lead to a director-specific component in CEO pay but only if directors are the ones who set the pay of the CEO. Existing studies conducted prior to SOX, however, present evidence that CEO pay may effectively be set by the CEO and not by the board (see Bebchuk, Fried, and Walker, 2002, and Bertrand and Mullainathan, 2001 for the “managerial power” and “skimming” hypotheses).

After the enactment of SOX, there is an increase in board size, board independence, and the proportion of lawyers in the board and a decrease in CEO duality and the proportion of current executives on the board (Linck, Netter, and Yang, 2008).<sup>12</sup> All of these changes provide a strong indication that, after SOX, boards have become more independent from the CEO of the firm. It is, therefore, possible that our findings of a director-specific component in CEO pay after SOX are due to the changes in board composition following SOX and are simply an indication that before SOX directors had less influence on CEO pay than after SOX.

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<sup>11</sup> A comprehensive review of the literature on executive compensation is beyond the scope of this study. For a review of the literature, the reader is referred to Murphy (1999) and Aggarwal (2008) and the references therein.

<sup>12</sup> The increase in board size seems to be a consequence of firms hiring new outside directors to satisfy the new requirements while not letting go of insiders (see, Linck, Netter, and Yang, 2008).

## *2.2. Changes in board behavior*

Director behavior also may have changed in response to changes in director costs and risks after SOX. Linck, Netter, and Yang (2008) find that boards meet more often after SOX and that Director and Officer (D&O) insurance premiums have doubled, findings that are consistent with an increase in director costs and risks. In addition, Linck, Netter, and Yang (2008) find that director turnover has increased after SOX. Because relatively higher turnover means relatively lower job security and because director dismissal would likely have an adverse effect on director reputational capital, an increase in director turnover also points to an increase in director risks after SOX.

Overall, when considering CEO pay after SOX, directors concerned with their own welfare would prefer CEO pay that minimizes these additional costs and risks. Such concerns may lead to a director-specific component in CEO pay in at least two ways. First, to reduce exposure to the higher risks after SOX, directors may award CEO pay that they find relatively easy to justify through direct experiences on other boards. Second, if different directors have different assessments of or sensitivities to the additional costs and risks stemming from SOX, then a director-specific component in CEO pay may emerge, i.e., directors less (more) sensitive to these costs and risk would tend to award higher (lower) CEO pay.

## **3. Sample description**

In this section we describe the data, define the main variables, and provide summary statistics for the sample of firms used in the study. Of special interest is the construction of the variable that we use to measure the director-specific component in CEO pay.

### *3.1. Data*

The main sample for this study is an intersection of Compustat's Execucomp database and RiskMetrics Director and Governance data. Starting from 1992, Execucomp provides detailed executive compensation data mainly for firms in the S&P 1500 index. The CEO compensation data is matched with

RiskMetrics Director and Governance data which provides director data for firms in the S&P 1500 index beginning in 1996. As a result, our base sample consists of firms publicly traded between 1996 and 2011.

To form the final dataset used in our analysis, we obtain additional firm data from the Compustat annual files, the CRSP monthly files, and Thomson Reuters' CDA/Spectrum Institutional Holdings files. The sample is restricted to firm-years with CEOs for whom we have a complete set of components comprising the total compensation variable in Execucomp (*tdc1*).<sup>13</sup> If the net value of the sum of all components is not within \$1,000 of the reported total compensation, then the observation is dropped from our sample. To eliminate spurious effects that CEO turnover may have on observed CEO pay, we also remove from our sample any firm-years where the CEO left office during the fiscal year. Furthermore, when examining changes in CEO pay, we ensure that the year  $t-1$  CEO and the year  $t$  CEO is the same person. CEO compensation as well as all other dollar figures are adjusted for inflation with Consumer Price Index data from the United States Bureau of Labor Statistics, with 2012 as the base year.

Our starting sample consists of 17,395 firm-year observations with available data in both the Riskmetrics and the Execucomp databases. Additional data requirements from CRSP and Compustat reduce the sample size to 14,987 firm-years. For 2,799 of these observations, firms do not share directors with other firms within the same year and so we are unable to calculate our measure of director-specific CEO pay. The final sample thus consists of 12,188 firm-year observations (2,056 unique firms) between 1996 and 2011 with an average of around 762 firms per year. The sample is fairly balanced over time, with a minimum of 607 firms in 1996 and a maximum of 937 firms in 2011.

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<sup>13</sup> Prior to December 2006, *tdc1* was defined as the sum of salary, bonus, *rstkgmnt*, *ltip*, *option\_awards\_blk\_value*, *othann*, and *allothtot*. After December 2006, *tdc1* is defined as the sum of salary, bonus, *noneq\_incent*, *stock\_awards\_fv*, *option\_awards\_fv*, and *othcomp*. These changes came as a result of the 2004 revision of FASB FAS 123.

### 3.2. *Measuring director-specific CEO pay*

To test for a director-specific component in CEO pay, we examine how the pay that directors award to the CEO of one firm is related to the CEO pay of other firms on whose boards these same directors serve.<sup>14</sup> Our general approach is similar to the approach employed by Bertrand and Schoar (2003) and in Fee, Hadlock, and Pierce (2013) to examine how a CEO's style at the new employer relates to the style of the same CEO at her previous employer. Our analysis is not based on director fixed effects (another approach used in Bertrand and Schoar, 2003) for two critical reasons. First, Fee, Hadlock, and Pierce (2013) present significant evidence of serious underlying methodological difficulties in using dummy variables to identify CEO-specific effects, difficulties that would also be present when examining director-specific effects. And second, by construct director-fixed effects are constant over time and forward-looking from the standpoint of a given year. However, when trying to justify CEO pay in a given year directors would be most interested in the pay of other CEOs during the same year since such pay is directly observed and most likely to be used as a comparison. Conceptually, whereas director-fixed effects may help capture heterogeneity in unobserved (or latent) director-specific styles in awarding CEO pay, our focus is on CEO pay that directors can more easily justify and in that sense using observed contemporaneous CEO pay dominates using unobserved director-fixed effects.

Specifically, for each firm-year observation, we form a sample of director-linked firms consisting of all other firms in our dataset that share board members with the base firm during the fiscal year. The sample of director-linked firms contains one observation for each board member link, so a firm may be represented multiple times in the case of interlocking boards (i.e., more than one shared board member with the base firm). Taking an average of the CEOs' total pay within this director-linked sample of firms

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<sup>14</sup> As a source of information, directors may also want to use CEO pay in firms on whose boards they do not serve. However, fiduciary duties, boardroom confidentiality policies, insider trading laws, and verification frictions may prevent directors from sharing and learning about contemporaneous CEO pay in these firms before CEO pay is publicly disclosed.

gives us a measure of director-linked CEO pay for each firm-year. Figure 1 presents a simple example for the identification of director-linked firms.

[Insert Figure 1 about here]

The measure of director-linked CEO pay is in effect the average level of compensation a board pays to other CEOs when its members serve on other boards during the fiscal year. For a mathematical representation, consider a market with  $I$  firms and  $J$  directors who may be shared by any of the firms. We define director-linked CEO compensation for any firm  $i$  in year  $t$ ,  $C_{i,t}^{dl}$ , as equal to:

$$C_{i,t}^{dl} = \frac{\sum_{i'=1}^I \sum_{j=1}^J C_{i',t} D_{j \in i \cap i',t}}{\sum_{i'=1}^I \sum_{j=1}^J D_{j \in i \cap i',t}} \Big| \forall i' \neq i. \quad (1)$$

In this specification,  $C_{i',t}$  is the log total CEO compensation for firm  $i'$  in year  $t$ ,  $D_{j \in i \cap i',t} = 1$  if firm  $i$  and firm  $i'$  share director  $j$  in year  $t$ , and  $D_{j \in i \cap i',t} = 0$  otherwise.<sup>15</sup>

The pay of the CEO in each firm depends on many factors, such as firm size and other firm characteristics as well as CEO and board characteristics. To construct a measure of director-specific CEO pay, we decompose director-linked CEO pay into two components. The first component is the director-linked CEO pay that is predicted by the firm, CEO, and board characteristics of linked firms. The second component is the director-linked CEO pay not predicted by these variables (i.e., the residual), which we use to measure director-specific CEO pay. For this purpose, we estimate the following ordinary least squares (OLS) regression model:

$$C_{i,t} = \beta X_{i,t} + 3\text{-digit SIC code} \times \text{year fixed effects}_{i,t} + v_{i,t}. \quad (2)$$

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<sup>15</sup> As we discuss in more detail in Section 3.4, our final variable of director-linked CEO pay is standardized within each sub-sample where sub-samples are based on the number of director-linked observations used to calculate the average director-linked CEO pay. This adjustment does not affect our findings yet it is necessary since our measure of director-linked CEO pay is an average and thus its variance is directly affected by the number of director-linked firms used to calculate that average.

In Equation (2),  $C_{i,t}$  is the log total compensation of the CEO of firm  $i$  for year  $t$ . As explanatory variables ( $X_{i,t}$ ), we include all firm, CEO, and board characteristics used in the previous analysis.

The model in Equation (2) is estimated using all 14,987 firm-year observations in our base sample, even firm-year observations where no director is a member of other boards. The estimates from the model based on the larger sample are indistinguishable from the estimates presented in Table 2, discussed later in the paper. Based on the estimates, for each firm-year we compute the residual component of CEO compensation ( $v_{i,t}$ ) and the component predicted by all regressors ( $\hat{C}_{i,t} = C_{i,t} - v_{i,t}$ ). Note that by construction the two components are independent from each other. By applying Equation (1) separately to  $\hat{C}_{i,t}$  and to  $v_{i,t}$ , we effectively decompose director-linked CEO pay into its predicted and residual components ( $\hat{C}_{i,t}^{dl}$  and  $v_{i,t}^{dl}$ ). Due to the linearity of all relevant calculations, the two components add up to the director-linked CEO pay variable ( $C_{i,t}^{dl} = \hat{C}_{i,t}^{dl} + v_{i,t}^{dl}$ ). While in the subsequent analysis we examine whether and how CEO pay is related to both components of director-linked CEO pay ( $\hat{C}_{i,t}^{dl}$  and  $v_{i,t}^{dl}$ ), our primary focus is on the measure of director-specific CEO pay ( $v_{i,t}^{dl}$ ).

### 3.3. Control variables

In the analysis that follows, we use a range of control variables that measure various firm, CEO, and board characteristics. Numerous studies on executive compensation find that CEO compensation is positively related to firm size (see, for example, Gabaix and Landier, 2008; Terviö, 2008; Frydman and Saks, 2010; and the references therein). We follow Gabaix and Landier (2008) and measure firm size as the sum of the book value of debt and market value of equity at the end of the prior fiscal year.<sup>16</sup>

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<sup>16</sup> See Appendix for a detailed description of all variables used in the paper.

Studies of executive compensation and its sensitivity to performance traditionally use annual stock returns to capture firm performance (e.g., Jensen and Murphy, 1990; Aggarwal and Samwick, 1999), where stock returns directly affect the value of CEO stock and option holdings as well as the likelihood of receiving bonuses. Annual returns for each firm are calculated for the prior fiscal year using data from the CRSP monthly files. To calculate annual returns we require at least nine monthly return observations, so that firm-years with fewer than nine return observations are dropped from the sample. In consideration of the effect that accounting performance may have on executive compensation (Murphy, 2001), we further calculate and include in our analysis the return on assets (ROA) for each firm-year.

Because firm risk may affect a CEO's compensation contract and value (Agrawal and Mandelker, 1987; Coles, Daniel, and Naveen, 2006), we also include a measure of firm risk that is calculated as the variance of monthly stock returns for the five-year window ending before the start of the fiscal year. When calculating the variance of stock returns, we restrict the sample to only those firm-years with at least 48 monthly stock return observations during the previous five years.

Guay (1999) and Core and Guay (1999) find that CEO compensation contracts may be influenced by the opportunity set of the firm as well as by other factors related to firm uncertainty. To further control for growth opportunities and firm uncertainty, in our regressions we include the book-to-market ratio of the firm (total assets divided by firm market value), leverage (long-term debt divided by total assets), and firm age (years since a firm's first record on CRSP).

Weak corporate governance structures may allow a CEO to extract higher levels of compensation from the firm. A large body of literature is dedicated to the study of corporate governance and its effects on compensation (see, for example, Bebchuk, Fried, and Walker, 2002; and Bertrand and Mullainathan 2001 for the "managerial power" and "skimming" hypotheses). We include the entrenchment index of Bebchuk, Cohen, and Ferrell (2009) for each firm to account for CEO power over the board. In addition, institutional investors may provide some governance through monitoring and activism (Gillan and Starks,

2000; Hartzell and Starks, 2003), therefore, we include the percentage of stock held by institutional investors as a control variable in our empirical estimations.

CEO-specific characteristics may also play a role in determining the CEO's compensation contract. In assignment models, such as the ones developed by Gabaix and Landier (2008) and by Terviö (2008), the most skilled managers are matched to the largest firms and earn the highest pay, in part due to their better skills. We include several variables that measure CEO characteristics, specifically the CEO's age, the CEO's tenure within the firm, and the CEO's total record as a manager. The age of the CEO is provided in Execucomp. Firm-specific tenure is calculated as the distance in years between the fiscal year end date and the hire date for the CEO at that firm. The CEO's record is the number of years Execucomp reports compensation for the CEO, independent of firm or position. The CEO record variable is intended to measure the amount of information available to the market about the CEO's skill level. If availability of information about CEO skill influences CEO pay, past executive experience at other levels and with other firms may also influence compensation level and structure.<sup>17</sup> We also include a measure of CEO firm ownership, because higher ownership results in better incentive alignment of the CEO with the owners of the firm and thus may affect the level and composition of CEO compensation.

As additional variables relevant for the compensation of the CEO we include several board characteristics. Shivdasani (1993) finds that board ownership of the firm decreases the likelihood that a firm is the target of a hostile takeover and concludes that higher levels of board ownership serve as a positive governance mechanism. Core, Holthausen, and Larcker (1999) find that CEO compensation is increasing in board size. They also find that board busyness (directors serving on multiple boards) leads to higher levels of CEO compensation, although other studies have yielded mixed results on the effects of board busyness on CEO pay (e.g., Ferris, Jagannathan, and Pritchard, 2003; Fich and Shivdasani, 2006;

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<sup>17</sup> The CEO record variable may also measure the prior experience of the CEO. If there is a higher demand for prior experience, that would lead to a higher CEO pay.

Perry and Peyer, 2005). In addition to board ownership and board busyness, we account for the industry focus of each board. Board industry focus represents the proportion of director-linked firms that are in the same industry as the base firm, where industries are defined at the level of three-digit SIC codes.

All of our empirical tests adjust for year-industry effects by subtracting the year-industry mean of each variable, where industries are defined at the level of three-digit SIC codes. We note that our analysis thus accounts for industry fixed effects that are allowed to vary every year, an approach that is more conservative than the traditional approach of two separate additive effects, one for the year and the other for the industry, where industry effects are not allowed to vary over time. If directors tend to participate in boards in the same industry, this more conservative approach may bias our tests against finding evidence of a director-specific component in CEO compensation even if such an effect may in fact exist. However, the more conservative approach allows us to more rigorously control for the effects that industry peers have on CEO compensation, as documented by Bizjak, Lemmon, and Naveen (2008) and Albuquerque (2009).

#### *3.4. Summary statistics*

Panel A of Table 1 reports summary statistics for all variables used in the analysis. As shown in Table 1, our final sample consists of 12,188 firm-year observations and spans the period from 1996 to 2011. The median firm in our sample has a market value of \$4.77 billion in 2012 dollars with a median annual stock return of 11.97%. The median CEO earns a total pay of \$4.09 million, is 56 years old, and has been a CEO at the current firm for six years. The median director-linked CEO pay in our sample is \$5.06 million.

[Insert Table 1 about here]

Boards have a median of ten members, and directors hold 1.4 board seats on average. The number of board seats does not show a strong tendency to be held within the same industry. For directors with

multiple board appointments, the median firm has no directors that serve on other boards in the same industry, and on average only 5% of directors serve on multiple boards in the same industry, where industries are defined at the level of three-digit SIC codes. The low industry focus of directors is notable as it suggests that any potential director-specific component in CEO pay is unlikely to be related to a possible industry peer effect in CEO compensation.

Panel B of Table 1 presents the number of firm-year observations and the mean and standard deviation of director-linked CEO pay conditional on the number of other firms to which directors are linked. The table also presents the mean and standard deviation of the predicted and the residual director-linked CEO pay. From a total of 12,188 firm-year observations, 2,610 (or around 20%) have exactly one director who is a member of another board in our sample. The occurrence of linked directors declines by around 20% per additional director-linked firm. Yet, for around 37% of the firm-years director-linked CEO pay is based on at least five linked firms.

The mean director-linked CEO pay increases mostly monotonically with the number of linked firms used to calculate director-linked CEO pay. This feature of the variable is tied to firm size, as larger firms are more likely to have larger boards as well as more likely to have directors who serve on external boards. Director-linked CEO pay is an average and so its standard deviation decreases, also mostly monotonically, with the number of linked firms. This is true for the actual, predicted, and residual CEO pay. To adjust for these trends in the data, we standardize all measures of director-linked CEO pay within each group defined by the number of director-linked firms. Firms with 20 or more director-linked firms are grouped together.<sup>18</sup> For example, for boards with eight linked firms, from the actual director-linked CEO pay we subtract the mean of 1.830 and divide by the standard deviation of 0.444. This adjustment ensures that the distribution of director-linked CEO pay is not driven by the number of linked firms used

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<sup>18</sup> Moving this upper grouping cut off to 25 director-linked firms does not change our findings.

in the calculation of the variable. While this adjustment leads to more accurate interpretation of the estimates (especially for interaction effects), our findings are not sensitive to the adjustment.

#### **4. The director-specific component in CEO pay**

##### *4.1. The level of CEO pay*

This section focuses on the main objective of the paper and examine whether there is a director-specific component in CEO pay before and after SOX. For that purpose, we estimate regression models where the dependent variable is total CEO pay and as the main explanatory variable of interest we use the residual component of director-linked CEO pay. In the following section we further estimate models in which the dependent variable is the change in CEO pay. All models include additional controls for firm, CEO, and board characteristics. Furthermore, to account for year-industry effects, all dependent and independent variables are demeaned at the year-industry level, where industries are defined at the level of three-digit SIC codes.<sup>19</sup>

Panel A of Table 2 reports the estimates from these regressions. We estimate the regression models separately for the period before Sarbanes-Oxley (1996-2001) and for the period after Sarbanes-Oxley (2003-2011) while excluding 2002, the year in which Sarbanes-Oxley was passed. There is no significant relation between residual director-linked CEO pay and CEO pay prior to 2002. However, after 2002, we find a highly significant and positive relation between residual director-linked CEO pay and CEO pay. The estimated coefficient on the residual director-linked CEO pay is equal to 0.049 and has a p-value of 0.001. For further interpretation of the coefficient estimates, Table 2 also reports the scaled coefficients for each explanatory variable, where scaled coefficients are calculated by multiplying the coefficient by the standard deviation of the respective explanatory variable. We should note that while the director-

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<sup>19</sup> Our findings are not substantially affected by the definition of industries. We find similar results when we define industries at the level of two-digit SIC codes and when we define industries based on the 48 industries of Fama and French (1997).

linked CEO pay variables are standardized conditional on the number of director-linked firms, their standard deviations are not necessarily equal to 1.0 for sub-samples based on, for instance, different time periods. Based on the scaled coefficient, we find that a one standard deviation increase (decrease) in residual director-linked CEO pay leads to an approximately 4.6% increase (decrease) in total CEO pay.<sup>20</sup>

The above findings show that there is a statistically and economically significant director-specific component in CEO pay after SOX. But how much of a CEO's pay is awarded as a direct consequence of the director-specific component? To answer this question we compare the actual pay of each CEO in our post-SOX sample to the pay the same CEO would have received if there were no director-specific component in CEO pay. We calculate the pay that a CEO would have received without a director-specific component ( $CEO\ pay_{i,t}^*$ ) as follows:

$$CEO\ pay_{i,t}^* = Actual\ CEO\ pay_{i,t} \times e^{-0.049 \times Residual\ director-linked\ CEO\ pay_{i,t}} \quad (3)$$

This calculation is based on the assumption that without a director-specific component in CEO pay the coefficient on the residual director-linked CEO pay would equal zero while all other coefficients and the residual term would remain unchanged. For each firm-year after SOX we then compute the absolute value of the difference between a CEO's actual pay and a CEO's pay without the director-specific component, i.e.,  $|Actual\ CEO\ pay_{i,t} - CEO\ pay_{i,t}^*|$ . We find that on average around  $\pm\$230,000$  of a CEO's pay is awarded as a consequence of the director-specific component in CEO pay. Scaling the dollar amount by total CEO pay, we find that on average around  $\pm 3.5\%$  of CEO pay is director-specific.<sup>21</sup> Given that our post-SOX sample contains 7,278 firms, we find that, between 2003 and 2011, around

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<sup>20</sup> To examine the sensitivity of our findings to influential observations, in additional tests we re-estimate our model while excluding 538 firm-year observations with a Cook's D statistic greater than  $4/N$  where  $N$  is the total number of observations. We obtain a similar estimate (around 0.04) that is significant at the 0.01 level.

<sup>21</sup> Due to the skewness of CEO pay, the medians are somewhat lower with the median firm awarding around  $\pm\$110,000$  or  $\pm 2.3\%$  of CEO pay as a consequence of the director-specific component in pay.

±\$1.7 billion has been awarded as a consequence of the tendency of directors to award similar CEO pay across the different firms they serve.

[Insert Table 2 about here]

The component of director-linked CEO pay predicted by firm, CEO, and director characteristics also has a significantly positive effect on CEO pay. Moreover, the positive effect is similar over time so that the scaled coefficient is around 0.022 (p-value of 0.046) before 2002 and is around 0.026 (p-value of 0.008) after 2002. The positive coefficient on the predicted director-linked CEO pay may be a result of several factors. For example, it is possible that CEO pay in one firm directly affects CEO pay in other firms because of competition for the CEO's human capital. Current CEOs could potentially be hired as CEOs in other firms and, when directors know the CEO directly, they may be more inclined to hire the CEO due to lower asymmetric information.<sup>22</sup> It is also possible that the characteristics of other firms sharing directors provide a better measure of optimal CEO pay simply because they also provide information about the firm above and beyond the firm's own characteristics.

In an attempt to distinguish between these two possibilities we test whether CEO compensation in one firm directly affects CEO compensation in other firms using an approach similar to the one employed by Leary and Roberts (2014). In their paper, Leary and Roberts (2014) examine whether firms' capital structures are influenced by the capital structure of industry peer firms. As an exogenous shock to peer firm capital structure, Leary and Roberts (2014) use the stock returns of peer firms. Following a similar approach, as an instrumental variable of director-linked CEO pay in our setting we use the stock return of director-linked firms for year  $t-1$ . Based on our previous tests, year  $t-1$  stock returns are significantly

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<sup>22</sup> In the dual scaling model of Gabaix and Landier (2008), the size of the reference firm also affects total CEO pay. Existing research provides evidence that CEO talent has a significant effect on firm performance (Kaplan, Klebanov, and Sorensen, 2012) and that firms compete for CEOs with general CEO talent (Rosen 1981; Murphy and Zabochnik, 2004; Gabaix and Landier, 2008; Terviö, 2008). Existing research indicates that this consideration may be even more relevant in more recent years. For example, Murphy and Zabochnik (2007) find that CEO hires with prior CEO experience in a publicly traded company have increased from less than 20% of all external hires in the 1970s to nearly 50% of external hires in the 1990s.

positively related to CEO pay in year  $t$ . Using this instrumental variable approach, we do not find a significant relation between the returns of director-linked firms and CEO pay.<sup>23</sup> Based on these findings, we do not find evidence that the positive relation between CEO pay and the predicted portion of director-linked CEO pay is a consequence of the compensation of one CEO directly affecting the compensation of another director-linked CEO.

When examining the rest of the explanatory variables we find that, consistent with the numerous previous studies on CEO compensation, market value is the most relevant predictor of CEO compensation. Furthermore, higher annual returns on the firm's stock predict higher CEO compensation levels, as do higher levels of institutional ownership and higher levels of CEO entrenchment (but only after 2002). We also find that board size has a large positive effect on CEO pay, although this result becomes statistically insignificant during the latter period of the sample, possibly as a consequence of SOX. Other board characteristics such as busyness and industry focus also show significant positive influence on compensation after 2002. The only variable in our regression with a significantly negative effect on CEO compensation is CEO ownership, a finding consistent with the idea that CEO pay is used to provide CEOs with incentives for performance and that, when CEO ownership is already relatively high, the need for additional incentives is lower.

To further examine the robustness of our findings, we re-estimate the model of Table 2 separately for each year. Figure 2 plots the annual coefficient estimates on director-linked CEO pay (Panel A) and on the residual portion of director-linked CEO pay (Panel B). The figure further plots the 90<sup>th</sup> (bars) and the 95<sup>th</sup> (whiskers) of the estimated coefficients.

[Insert Figure 2 about here]

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<sup>23</sup> For the sake of brevity, we do not tabulate all the estimates from the tests performed in this section. However, all results are available upon request from the authors.

As Panel A of Figure 2 shows, director-linked CEO pay is positively and significantly related to CEO pay mainly after 2002. In contrast, for the six years prior to 2002, the coefficient on total director-linked CEO pay is mostly insignificant. Examining the coefficient on the residual component of director-linked CEO pay (Panel B of Figure 2) we find similar results. Overall, in all but one (2007) of the nine years after 2002, we find evidence of a significant director-specific component in CEO pay.<sup>24</sup> For the six years prior to 2002, the coefficient on the residual component of director-linked CEO pay is positive and significant in two years (1997 and 1998), negative and significant in one year (1999), and insignificant in the other three years.

This section presents significant and robust evidence that after adoption of SOX, directors tend to award similar CEO compensation across all firms of whose boards they are members, leading to a director-specific component in CEO pay. With the exception of 2007, the director-specific component in CEO pay is present in every year after SOX. Our estimates indicate that there is approximately a 4.6% increase (decrease) in CEO pay for every one standard deviation increase (decrease) in CEO pay that directors award in other firms they serve.

#### *4.2. Changes in CEO pay*

In this section we further test the relation between director-linked CEO pay and total CEO pay by examining the changes in CEO pay. Panel B of Table 2 reports the results of a regression of the annual change in total CEO pay on covariates containing the year-over-year changes in the independent variables as well as the one year lags of those variables. We make sure that the change in CEO pay is measured for the same CEO. When we examine changes in CEO pay, the sample size is reduced to 8,442 firm-years, as annual changes of CEO pay are not available for all firm-years.

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<sup>24</sup> However, in Section 7 we present some evidence that even in 2007 the director-specific component in CEO pay is similar to the effect in the rest of the years after SOX but only for a sub-sample of firms with relatively low director option-based pay.

We find a positive and significant (at the 0.05 level) relation between the change in total CEO pay and the change in the residual component of director-linked CEO pay for the 2003-2011 period of our sample. Examining the scaled coefficients, a one standard deviation increase in the change in residual director-linked CEO pay leads to around 2.7% increase in CEO pay. As a comparison, the scaled coefficient for firm size implies that a one standard deviation increase in the change in firm size leads to an increase in CEO pay of around 4.8% (p-value of 0.061). Therefore, the director-specific component in CEO pay has a relatively high economic significance. In contrast, the change in the predicted portion of director-linked CEO pay is not significantly related to the change in CEO pay, with a scaled coefficient equal to  $-0.002$  (p-value of 0.869). This lack of significance suggests that the positive relation between the predicted portion of director-linked CEO pay and the level of CEO pay (discussed in Panel A of Table 2 in the previous section) may be due to an omitted firm-specific variable that affects CEO pay for firms sharing directors, a possibility that we further investigate in subsequent tests.

The relations between the change in CEO pay and the two components of lagged director-linked CEO pay are consistent with our previous conclusions. The past level of the residual portion of director-linked CEO pay positively affects the change in CEO pay for the 2004-2011 period and is highly significant (p-value of 0.01) while the predicted portion of lagged director-linked CEO pay is not significantly related to CEO pay. These findings confirm our previous conclusions that, after the enactment of SOX, directors tend to award similar CEO pay across the different boards they serve.

In additional analysis, we perform similar tests to examine the composition of CEO pay packages granted by the board, specifically the proportion of CEO equity-based pay. For each firm-year, we calculate CEO stock-based pay as the proportion of the dollar values of restricted stock and option grants relative to total CEO compensation. We then form a director-linked average of CEO stock-based pay using the same methodology as for the measure of director-linked total CEO pay. Because the proportion of stock-based pay to total pay is inherently bounded between zero and one, to obtain an unbounded

measure of CEO stock-based pay we use a logit transform of the average director-linked CEO stock-based pay.<sup>25</sup> We again find significant evidence for a director-specific component in CEO equity based pay after SOX. The director-specific component in CEO equity-based pay does not appear to be distinct from the director-specific component in total CEO pay, which may not be surprising given that the main variation in CEO pay comes from the variation in stock-based and option-based pay.<sup>26</sup> Regardless of whether the two effects have the same source, a director-specific component in CEO stock-based pay would significantly affect CEO incentives.

#### 4.3. *Alternative specifications*

Our findings so far suggest the existence of a linkage between CEO pay of firms that share directors, a linkage that appears due to a director-specific component in CEO pay. In effect, a director-specific component in CEO pay means that, even after accounting for firm, CEO and overall board characteristics, some directors tend to award relatively lower CEO pay while other directors tend to award relatively higher CEO pay. It is also possible that firms sharing a director also share a common factor that is unobserved yet affects the firms' CEO pay. If the explanatory variables do not fully control for that unobserved factor, then CEO pay in one firm may contain information about the unobserved factor and thus be correlated with CEO pay in all other firms sharing directors.

To investigate the possibility that a common factor may be at the root of our findings, Table 3 presents results from two additional tests—the first test further accounts for geographic location fixed effects while the second test accounts for firm fixed effects.<sup>27</sup> For ease of comparison, Table 3 again reports the scaled coefficient estimates from the base model. All models control for all variables as in

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<sup>25</sup> The logit transform is  $\text{logit}(x) = \ln(x/(1-x))$ . Palia (2001) uses a similar approach to transform CEO pay-performance sensitivity.

<sup>26</sup> For this reason, and for the sake of brevity, we do not tabulate the results for CEO stock-based pay. However, all estimates are available upon request.

<sup>27</sup> Graham, Li, and Qiu (2012), for example, present evidence of a significant firm-fixed effect in CEO pay.

Table 2, including year-industry effects; however, to preserve space the table does not report the estimated coefficients of these variables.

One common factor across director-linked firms could be the geographic location of firms. If directors tend to serve on boards of firms that are relatively close to each other geographically, then variations in CEO compensation across different locations may be reflected in the director-specific component. Knyazeva, Knyazeva, and Masulis (2013), for example, find that a larger pool of local director talent has a significant effect on firm governance. To examine whether firm location subsumes the director-specific component in CEO pay, we estimate a model that accounts for Core Based Statistical Area (CBSA) fixed effects, where CBSAs are defined by the Office of Management and Budget and are retrieved from the ZIP code of the firm's headquarters as reported in Compustat. In our data there are 188 distinct CBSA codes and we find that there is a significant variation in CEO pay that is explained by the different CBSA codes (the F-stat of the area code fixed effect is significant at the 0.01 level).

As discussed earlier, in our base model we find that the scaled coefficient on the residual component of director-linked CEO pay is equal to 0.046. Controlling for CBSA code fixed effects, we find that the coefficient declines to 0.040 and remains highly statistically significant (at the 0.01 level).

[Insert Table 3 about here]

The last model takes a most conservative approach and uses firm fixed effects to account for unobserved firm characteristics that may affect CEO pay. Accounting for firm fixed effects, however, may also subsume relevant information such as a director-specific component in CEO pay, and hence may bias our tests against finding significance.

Even after accounting for firm fixed effects, however, we find a significant (at the 0.01 level) and positive relation between CEO pay and the residual portion of director-linked CEO pay. The scaled coefficient is equal to 0.024 which means that a one standard deviation increase in the residual component of director-linked CEO pay is associated with a 2.4% increase in total CEO pay. While the economic

significance of the director-specific component in CEO pay is lower if we control for firm fixed effects than if we do not, the economic significance with firm fixed effects is similar in magnitude to the significance we report in our tests based on changes in CEO pay, where the scaled coefficient is equal to 0.027. The similarity of the two estimates and their significance supports the conclusion that unobserved firm effects are unlikely to drive our main findings.

Similar to our findings based on the changes in CEO pay, in the firm fixed effects model, the predicted portion of director-linked CEO pay is not significantly related to CEO pay. Overall, our findings are consistent with the idea that a positive relation between the pay of director-linked CEOs is due to a director-specific component in CEO pay.

## **5. Test for a wider network effect**

The findings presented in the previous sections provide a strong support for the idea that after SOX, directors tend to award similar CEO pay across the different firms they serve. One potential source of our findings is that directors serving on the same board share information about optimal CEO compensation so that overlapping boards tend to award similar pay. Bouwman (2011) provides such evidence albeit in the context of general firm governance practices.

In this section we test whether our findings are specific to each director rather to a wider network of connected directors. To that end, we start with our main sample of firms and the sample of director-linked firms. We then identify all firms that share a director with any director-linked firm but do not share a director with the base firm. In effect, we identify firms that are indirectly linked to the base firm within a wider network. We term the average CEO pay of these firms “indirectly-linked CEO pay” and examine how the indirectly-linked CEO pay is related to CEO pay. If our main findings are due to directors sharing information about optimal CEO pay among each other within a wider network, we expect to find that indirectly-linked CEO pay is also positively related to CEO pay.

We re-estimate the previous regression models but now we examine how CEO pay is related to the measure of indirectly-linked CEO pay. To be conservative in our conclusions, the models do not include the director-linked CEO pay as an explanatory variable. The results are presented in Table 4. In all models, indirectly-linked CEO pay is insignificantly related to CEO pay, with p-values of 0.331 and higher. Furthermore, the residual component of director-linked pay has p-values of 0.705 and higher. These findings are consistent with the conclusion that the identified director-specific component in CEO pay is not due to a wider network effect.

[Insert Table 4 about here]

## **6. Board composition**

One of the sources of our findings could be the significant change in board composition brought about by SOX. The enactment of SOX and the accompanying changes in exchange listing requirements lead to a significant increase in board independence (e.g., Linck, Netter, and Yang, 2008). One possible interpretation of our findings is that, as long as it is the board that determines CEO pay, a director-specific component would always be present in CEO pay. If CEOs prior to SOX had more power and had the ability to set their own pay, there would be no director-specific component in CEO pay. But if CEOs lost some of their power after SOX due to an increase in director independence, for example, CEO pay would be determined by the board of directors and a director-specific component in CEO pay would emerge.

To examine this possibility, we re-estimate the pre-2002 regression models for sub-samples based on several board composition variables: board independence, CEO duality, board size, and the proportion of directors that are lawyers or current executives at other firms. The results are presented in Table 5.

In Panel A of Table 5, we create two sub-samples based on whether or not more than 50% of the directors are classified as independent. If the change in board independence is behind our findings then we expect the director-specific component in CEO pay to be present, even prior to SOX, for firms with

relatively high board independence. However, our evidence is not consistent with this argument. Prior to 2002, we find that the residual portion of director-linked CEO pay is insignificantly related to CEO pay for both more independent and less independent boards and that the estimates between the two sub-samples are insignificantly different from each other.

[Insert Table 5 about here]

In Panel B of Table 5, we use a different approach to classify boards into more and less independent. Because after SOX, boards are required to have 100% independent audit, nomination, and compensation committees, we estimate our model before SOX separately for firm-years that satisfy the post-Sox requirements and firm-years that do not satisfy these requirements. We again find no evidence of a significant director-specific component in CEO pay in either sub-sample prior to 2002.

Linck, Netter, and Yang (2008) find that after SOX board composition has changed in several other dimensions. They find that CEO duality has declined, board size has increased, and the proportion of current executives in the board has declined while the proportion of lawyers has increased. To examine whether these additional changes may be at the roots of our findings, we split our sample based on whether or not (i) the firm has a dual CEO (Panel C), (ii) board size is above expected (Panel D), (iii) the proportion of current executives in the board is below the median of 52.63% (Panel E), and (iv) there are lawyers in the board (Panel F). Prior to SOX, we do not find significant evidence of a director-specific component in CEO pay in any of these sub-samples.

Overall, the findings in this section show that there is no director-specific component in CEO prior to SOX even for boards that have a composition that is similar to post-SOX boards. We conclude that the documented director-specific component in CEO pay is likely not due to changes in board composition.

## **7. Director risks and incentives**

It is possible that after the adoption of SOX corporate directors have changed their behavior when awarding CEO pay. For example, an increase in board scrutiny and an increase in liability risk to individual directors may provide directors with incentives to award CEO pay that can be easily justified through direct experiences. To examine whether director risks play a role in our findings, in this section we examine whether and how the director-specific component in CEO pay is related to the risk-taking incentives of directors. Existing literature provides significant evidence that option-based pay and the resulting sensitivity to risk affects the corporate decisions of CEOs, such as investment policy and debt policy (see Coles, Daniel, and Naveen, 2006 and the references therein). Motivated by these findings, we use director option-based pay as a proportion of total director pay to measure director risk-taking incentives. Data on director pay are available starting with 2006 and so the subsequent analysis is based on the period of 2006 to 2011 and covers a total of 4,715 firm-years.

Director option-based pay is not awarded randomly, but instead is awarded conditional on the characteristics of the firm, the CEO, and the board. We, however, are interested in director risk-taking incentives that are go beyond firm, CEO, and board characteristics. To adjust for the effects that firm, CEO, and board characteristics have on director option-based pay, we first estimate a model where the dependent variable is the proportion of director option-based pay and as explanatory variables we use year-industry effects and all additional firm, CEO, and board characteristics. We then use the residuals from these regression models to measure excess director option-based pay. In effect, the residuals measures director option-based pay that is in not predicted by firm, CEO, and board characteristics.

We then bifurcate the sample conditional on excess director option-based pay. Firm-years with a positive residual are classified as having a relatively high excess director option-based pay while firm-years with a negative residual are classified as having a relatively low excess director option-based pay. Firm-years with a residual of zero are excluded from the tests.

The findings in Panel A of Table 6 show that, during the period of 2006 to 2011, the residual portion of director-linked CEO pay is significantly related to CEO pay only for firm-years with a relatively low excess director option-based pay. Furthermore, the relation is significantly different (at the 0.05 level) between the two sub-samples. In other words, the director-specific component in CEO pay is only evident when director risk-taking incentives are relatively low.

[Insert Table 6 about here]

In the previous sections of the paper we found that in 2007 residual director-linked CEO pay is not significantly related to CEO pay. In light of the findings in this section, we examine 2007 separately. For the sub-sample of firms with relatively low excess director option-based pay, we find that the estimated coefficient on residual director-linked CEO pay is equal to 0.022, which is indistinguishable in magnitude to the overall estimate of 0.024, from the last model of Table 3. For the sub-sample of firms with relatively high director option-based pay, the coefficient is negative and equal to -0.037. The lack of an overall director-specific component in CEO pay in 2007, therefore, appears to be driven by the sub-sample of firms with directors with relatively high risk-taking incentives; directors with relatively low risk-taking incentives still exhibit a tendency to award similar CEO pay across the different boards.

In Panels B and C of Table 6 we also examine the director-specific component in CEO pay for sub-samples based on expected director turnover (a median of 7.5%) and director busyness in the board of directors market (a median of 1.5 boards). We measure expected director turnover using the historic director turnover of each firm. When firms have relatively high director turnover, directors have a higher risk of leaving the firm and thus lower incentives to take additional risks. In these cases, we expect the director-specific component in CEO pay to be relatively more pronounced. Additionally, if directors serve on more boards they may have higher reputation and employment concerns if their reputation is negatively affected in one firm as a consequence of SOX.

When we examine the different sub-samples, we find that the director-specific component in CEO pay is mostly evident for firm-years with relatively high expected director turnover and relatively high director busyness. Both of these findings are consistent with the conclusion that directors with relatively lower risk-taking incentives and directors with relatively higher sensitivity to risk tend to award CEO pay that is similar across the different boards they serve.

Overall, in this section we find evidence consistent with the idea that, after the enactment of SOX, risk-averse directors became less willing to take risks when awarding CEO pay, leading to a director-specific component in CEO pay, so that directors tend to award similar CEO pay across the different boards they serve. Relatively higher option-based pay, lower risk of leaving the firm's board, and lower reputation concerns in the market for directors appear to counterbalance this effect.

## **8. Conclusions**

Corporate board and governance failures at the turn of the century cast doubt on the ability of corporate boards to effectively monitor and compensate CEOs. With the goal of improving the internal governance of U.S. firms, Congress enacted the Sarbanes-Oxley act of 2002 and NYSE and Nasdaq implemented new governance-related listing standards. While the new rules increased the costs and risks to directors and the scrutiny on director decisions, it is unclear whether the new rules made it easier to answer one of the oldest questions in corporate finance: What constitutes optimal CEO pay?

How would directors of the board behave in this environment, where optimal CEO pay is still elusive yet they may have to justify awarded CEO pay to outside stakeholders and regulators? In this paper we present significant evidence that, following the enactment of SOX, directors tend to award similar CEO pay across the different boards they serve—a finding we term “a director-specific component in CEO pay”. We find that the director-specific component in CEO pay affects the level and the year-over-year

changes in CEO pay and the proportion of equity-based CEO pay. These findings indicate that CEO incentives are significantly affected by the director-specific component present in CEO pay after SOX.

We do not find evidence that our results are a manifestation of a wider network effect or a consequence of changing board composition after SOX. Instead, we find some evidence that the director-specific component in CEO pay is related to director costs and risks after SOX. In particular, we find that the director-specific component in CEO pay is most pronounced when director option-based pay is relatively low, expected turnover is relatively high, and when directors serve on relatively more boards, i.e., when have low incentives to take on additional risks.

According to our estimates, after 2002 around  $\pm 3.5\%$  of total CEO pay, or around  $\pm \$230,000$  per CEO-year on average is awarded as a consequence of this director-specific component. For our post-SOX sample of 7,278 firm-years (i.e., firm-years between 2003 and 2011), approximately  $\pm \$1.7$  billion in aggregate CEO pay has been affected as a consequence of the tendency of directors to award similar CEO pay across the different boards they serve. The resulting inefficiencies in the allocation of capital are most likely an unintended consequence of SOX.

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## Appendix: Variable definitions

Variable	Description
CEO compensation variable, measured as of fiscal year $t$	
Total CEO compensation	The sum of salary, bonus, restricted stock, options, and other compensation from Execucomp; (SALARY) + (BONUS prior to December 2006 and BONUS plus NONEQ_INCENT thereafter) + (RSTKGRNT prior to December 2006 and STOCK_AWARDS_FV thereafter) + (OPTION_AWARDS_BLK_VALUE prior to December 2006 and OPTION_AWARDS_FV thereafter) + (OTHANN + ALLOTHTOT + LTIP prior to December 2006 and OTHCOMP thereafter)
Firm characteristics, measured at end of fiscal year $t-1$	
Market value of the firm	Market value of common stock (Compustat items PRCC_F times CSHO) plus total assets (AT) minus book value of equity (CEQ+TXDB)
12 month return	Return for the fiscal year using CRSP monthly returns and firm-years with 9 or more monthly returns during the year
Return on assets	Net income divided by total assets (Compustat items NI divided by AT)
Book-to-market	Total assets (Compustat item AT) divided by the market value of the firm
Std. dev. of returns	Standard deviation of monthly returns during the 60-month window (with at least 48 observations) preceding the fiscal year
Leverage	Long-term debt divided by total assets (Compustat items LT divided by AT)
Firm age	Years since the firm has data in the CRSP files (year $t$ minus the year of BEGDAT)
E-index	Sum of Riskmetrics items CBOARD, LABYLW, LACHTR, PPILL, GPARACHUTE, and SUPERMAJOR (set to 1 if more than 50% of votes required by board and 0 otherwise); items are set to 0 when missing
Institutional ownership	The sum of all shares reported by institutions in CDA/Spectrum (for last quarter of year $t-1$ ) divided by the total shares outstanding (Compustat item CSHO)
CEO characteristics, measured as of fiscal year $t$	
CEO age	Age of CEO in years, Execucomp item AGE
CEO tenure	Years since the executive became a CEO (Execucomp item BECAMECEO)
CEO record	The number of years prior to year $t$ , for which the CEO has total compensation reported on Execucomp, regardless of position and company of employment
CEO ownership	Shares owned by CEO (Execucomp item SHROWN_EXCL_OPTS) divided by total shares outstanding (Compustat item CSHO)
CEO duality dummy	Equal to 1 if the CEO also serves as the chairman of the board for the given year
Board characteristics, measured as of fiscal year $t$	
Board ownership	Total shares owned by board members (Riskmetrics item NUM_OF_SHARES) divided by total shares outstanding (Compustat item CSHO)
Board size	The number of directors for each firm, using data from Riskmetrics
Board busyness	Average number of directorships held by a firm's board, not including base firm, using the sample in Riskmetrics
Board industry focus	The number of board memberships in the industry of firm $i$ divided by the total number of board memberships, excluding firm $i$ , using data from Riskmetrics
Board independence	The percent of directors that are classified as "I" (independent) in Riskmetrics
Director age	Age of directors in the board, using data from Riskmetrics
Director options pay	The proportion of director option-based pay relative to total pay from Execucomp

Figure 1

An example of director-linked firms

The figure shows a simple example of director-linked firms. The Base Firm A has three directors—1, 2, and 3. Director 1 further serves on the board of Firm B while Director 2 serves on the boards of Firm B and Firm C. The director-linked CEO pay for the Base Firm A is the average CEO pay across all director-linked firms. In this example the CEO pay of Firm B enters twice in the average calculation.

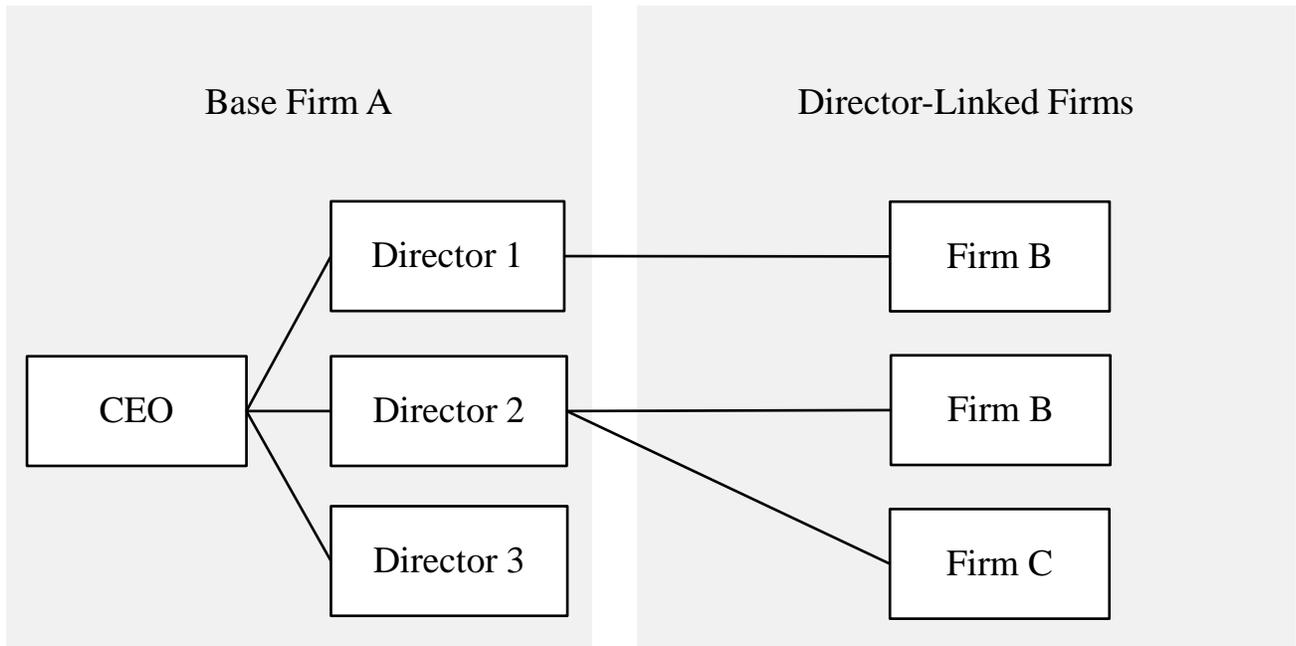
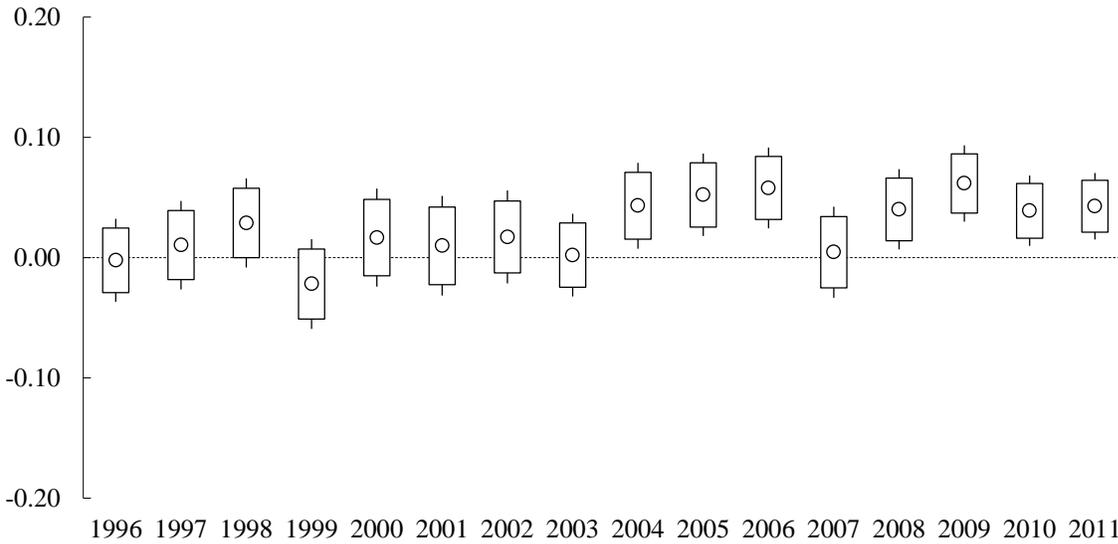


Figure 2

The director-specific component in CEO pay

The figure plots the coefficient estimates on director-linked CEO pay (Panel A) and residual director-linked CEO pay (Panel B) from annual regressions where the dependent variable is total CEO pay. As additional explanatory variables the regression models include firm, CEO, and board characteristics. To calculate residual director-linked CEO pay, we first estimate annual regression models to explain total CEO pay as a function of all firm, CEO, and board characteristics, including year-industry effects. We then use the residuals from this model to construct a measure of residual director-linked CEO pay. The circles mark the estimated coefficients, while the bars and the whiskers define the 90 percent and the 95 percent confidence intervals.

Panel A: Coefficient on director-linked CEO pay



Panel B: Coefficient on residual director-linked CEO pay

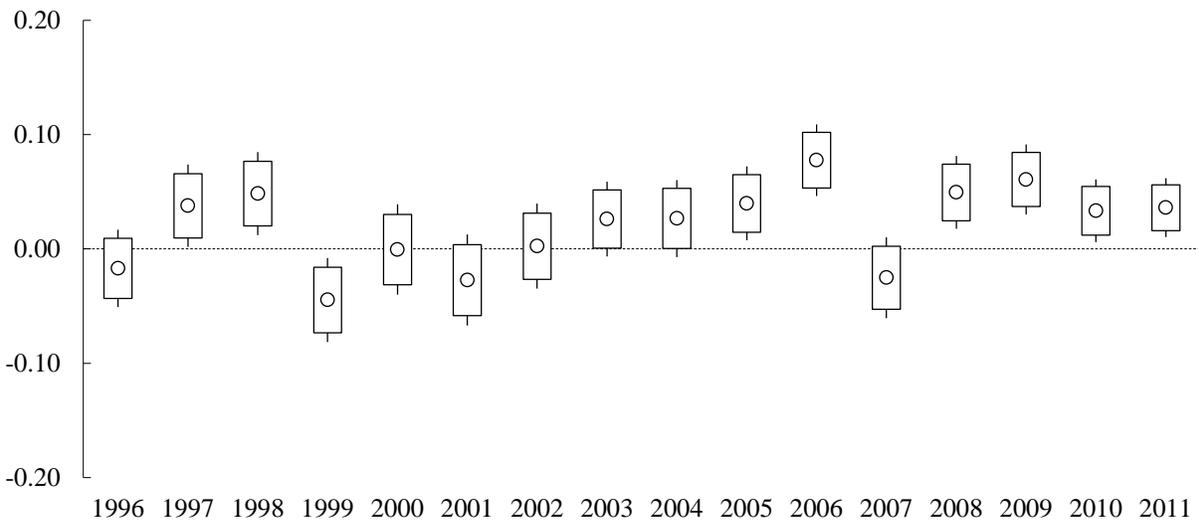


Table 1

## Summary of variables

The main sample consists of the intersection of Riskmetrics and Execucomp. We require additional data from the CRSP monthly files, the Compustat annual files, and CDA/Spectrum. The base sample consists of 17,395 firm-years with data on Riskmetrics and Execucomp. Requiring additional CRSP and Compustat data reduces the sample to 14,987 firm-years. For 2,799 of the firm-years, no director holds a seat on other boards and so requiring that at least one director participates on at least one other board during the year further reduces our sample to 12,188 firm-years. Panel A reports the mean, median, standard deviation, and the 5<sup>th</sup> and 95<sup>th</sup> percentiles of variables measuring firm, CEO, and board characteristics. Panel B reports the number of firm-years and the mean, median, and standard deviation of director-linked CEO pay, conditional on the number of linked firm observations used to calculate director-linked CEO pay. All dollar amounts are in millions of 2012 U.S. dollars. All variables are winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles.

## Panel A: Summary statistics of variables

Variable	Mean	5 <sup>th</sup> pctl	Median	95 <sup>th</sup> pctl	Std. dev.
Compensation variables					
Total CEO pay (mill.)	6.581	0.875	4.086	21.023	7.626
Total CEO pay (mill., log)	1.419	-0.133	1.408	3.046	0.962
Director-linked CEO pay (mill.)	6.135	1.446	5.064	14.085	4.709
Director-linked CEO pay (mill., log)	1.583	0.369	1.622	2.645	0.695
Firm characteristics					
Market value (bill.)	23.025	0.535	4.771	105.345	59.125
Market value (mill., log)	8.629	6.283	8.470	11.565	1.598
12-month return (%)	16.110	-46.990	11.968	93.586	46.993
Return on assets (%)	4.483	-7.021	4.633	15.560	8.056
Book-to-market (log)	-0.485	-1.441	-0.375	0.080	0.479
Standard deviation of returns (%)	11.074	5.183	9.975	21.106	4.974
Leverage (log)	-0.662	-1.645	-0.563	-0.084	0.467
Firm age (log)	3.092	1.792	3.178	4.290	0.721
E-index	2.010	0.000	2.000	5.000	1.373
Institutional ownership (%)	69.690	35.427	71.458	99.547	18.882
CEO characteristics					
CEO age (log)	4.019	3.807	4.025	4.205	0.118
CEO tenure (log)	1.770	0.406	1.791	3.091	0.803
CEO record (log)	1.542	0.693	1.609	2.485	0.637
CEO duality dummy	0.633				
CEO ownership (%)	1.546	0.007	0.281	9.024	3.853
Board characteristics					
Board ownership (%)	5.751	0.000	1.849	26.844	10.383
Board size (log)	2.254	1.792	2.303	2.708	0.259
Board busyness (log)	0.375	0.105	0.336	0.799	0.219
Board industry focus (%)	5.191	0.000	0.000	50.000	17.803
Board independence (%)	71.944	42.857	75.000	90.910	15.521
Director age (log)	4.100	3.991	4.104	4.193	0.061

Table 1 – continued

Panel B: Summary statistics of director-linked CEO pay by number of linked firms

Number of linked firms	Firm-years	Actual		Predicted		Residual	
		Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
1	2,610	1.346	0.940	1.363	0.764	-0.016	0.548
2	2,098	1.458	0.710	1.466	0.578	-0.008	0.405
3	1,663	1.529	0.612	1.525	0.523	0.004	0.321
4	1,324	1.607	0.553	1.604	0.477	0.003	0.274
5	999	1.653	0.545	1.661	0.466	-0.008	0.269
6	780	1.729	0.525	1.714	0.466	0.015	0.228
7	570	1.778	0.490	1.762	0.438	0.016	0.224
8	440	1.830	0.444	1.826	0.413	0.005	0.202
9	359	1.841	0.447	1.839	0.422	0.002	0.196
10	306	1.907	0.491	1.898	0.452	0.009	0.176
11	235	1.845	0.451	1.851	0.431	-0.006	0.166
12	160	1.896	0.448	1.892	0.414	0.003	0.181
13	151	1.952	0.417	1.935	0.404	0.017	0.142
14	115	1.880	0.440	1.887	0.407	-0.007	0.168
15	106	1.983	0.455	1.982	0.393	0.002	0.145
16	71	1.992	0.426	1.986	0.382	0.006	0.145
17	50	1.845	0.432	1.883	0.425	-0.038	0.122
18	31	2.053	0.392	2.078	0.383	-0.025	0.150
19	31	1.968	0.357	1.959	0.346	0.009	0.144
≥ 20	89	1.911	0.361	1.923	0.368	-0.012	0.115

Table 2

## The director-specific component in CEO pay

The main sample consists of firm-years with available data on Riksmetrics, Execucomp, the CRSP monthly files, and the Compustat annual files where there is no change in the CEO. Panel A reports estimates from regression models explaining total CEO pay while Panel B reports estimates from regression models explaining the year-over-year change in total CEO pay. As explanatory variables in Panel A we use the predicted and residual director-linked CEO pay as well as additional firm, CEO, and board characteristics. As explanatory variables in Panel B we use the change and lagged level of director-linked CEO pay as well as changes and lagged levels of additional firm, CEO, and board characteristics. In Panel B we omit changes in variables that measure firm age and CEO age, tenure, and record because the year-over-year increments of these variables are fixed at one. The construction of each variable is described in the Appendix. To measure the economic effect that each variable has on CEO pay, the last column of the table reports the coefficient estimate times the standard deviation of each variable. All models adjust for year-industry effects. Industries are defined based on three-digit SIC codes. The reported p-values (in parenthesis) are based on standard errors that adjust for firm-level and year-level clustering (Petersen, 2009). The last row reports the adjusted R-squared of each model.

Panel A: Dependent variable is total CEO pay (millions of 2012 U.S. dollars, log)

	1996-2001			2003-2011		
	Coeff.	p-value	Scaled coeff.	Coeff.	p-value	Scaled coeff.
Director-linked CEO pay, predicted	0.020	(0.046)	0.022	0.028	(0.008)	0.026
Director-linked CEO pay, residual	0.002	(0.927)	0.002	0.049	(0.001)	0.046
Market value (mill., log)	0.429	(0.001)	0.701	0.383	(0.001)	0.601
12-month return (%)	0.001	(0.094)	0.018	0.002	(0.001)	0.078
Return on assets (%)	0.001	(0.997)	0.001	-0.001	(0.731)	-0.005
Book-to-market (log)	0.025	(0.652)	0.013	0.073	(0.051)	0.032
Standard deviation of returns (%)	0.026	(0.001)	0.131	-0.001	(0.874)	-0.006
Leverage (log)	-0.016	(0.831)	-0.007	0.065	(0.017)	0.031
Firm age (log)	-0.030	(0.339)	-0.022	-0.028	(0.130)	-0.020
E-index	-0.002	(0.863)	-0.002	0.037	(0.001)	0.053
Institutional ownership (%)	0.005	(0.001)	0.088	0.006	(0.001)	0.102
CEO age (log)	0.132	(0.502)	0.016	0.146	(0.270)	0.017
CEO tenure (log)	-0.001	(0.984)	0.001	0.052	(0.078)	0.041
CEO record (log)	0.119	(0.005)	0.067	0.005	(0.892)	0.003
CEO ownership (%)	-0.035	(0.001)	-0.153	-0.028	(0.001)	-0.095
CEO duality dummy	0.138	(0.001)	0.062	0.085	(0.002)	0.042
Board ownership (%)	-0.003	(0.157)	-0.037	0.001	(0.518)	0.013
Board size (log)	0.761	(0.095)	0.221	0.402	(0.573)	0.094
Board busyness (log)	0.093	(0.221)	0.023	0.325	(0.001)	0.063
Board industry focus (%)	0.002	(0.123)	0.032	0.002	(0.001)	0.041
Board independence (%)	0.001	(0.691)	0.008	0.004	(0.001)	0.057
Number of observations	4,133			7,278		
Adjusted R-squared	55.69%			55.87%		

Panel B: Dependent variable is the change in total CEO pay (mill 2012 U.S. dollars, log)

	1996-2001			2003-2011		
	Coeff.	p-value	Scaled coeff.	Coeff.	p-value	Scaled coeff.
Changes in variables						
Director-linked CEO pay, predicted	0.002	(0.920)	0.001	-0.002	(0.869)	-0.002
Director-linked CEO pay, residual	-0.001	(0.928)	-0.001	0.025	(0.043)	0.027
Market value (mill., log)	0.327	(0.051)	0.101	0.173	(0.061)	0.048
12-month return (%)	-0.001	(0.297)	-0.106	0.002	(0.028)	0.104
Return on assets (%)	-0.002	(0.624)	-0.012	-0.002	(0.371)	-0.014
Book-to-market (log)	-0.108	(0.624)	-0.029	0.045	(0.684)	0.010
Standard deviation of returns (%)	0.026	(0.112)	0.033	-0.015	(0.197)	-0.026
Leverage (log)	-0.223	(0.013)	-0.036	0.035	(0.613)	0.006
E-index	0.075	(0.297)	0.030	0.025	(0.195)	0.028
Institutional ownership (%)	0.006	(0.079)	0.047	0.003	(0.002)	0.023
CEO ownership (%)	-0.005	(0.825)	-0.006	0.010	(0.421)	0.013
CEO duality dummy	0.104	(0.001)	0.028	-0.011	(0.775)	-0.003
Board ownership (%)	-0.006	(0.024)	-0.044	-0.002	(0.475)	-0.009
Board size (log)	0.156	(0.886)	0.017	-0.547	(0.353)	-0.058
Board busyness (log)	0.050	(0.574)	0.006	0.057	(0.210)	0.007
Board industry focus (%)	0.001	(0.892)	0.001	0.001	(0.193)	0.010
Board independence (%)	0.001	(0.879)	-0.004	0.001	(0.101)	0.010

Panel B (continued): Dependent variable is the change in total CEO pay (mill 2012 U.S. dollars, log)

	1996-2001			2003-2011		
	Coeff.	p-value	Scaled coeff.	Coeff.	p-value	Scaled coeff.
Lagged variables						
Total CEO pay (mill., log)	-0.571	(0.001)	-0.562	-0.479	(0.001)	-0.434
Director-linked CEO pay, predicted	0.024	(0.037)	0.026	0.014	(0.219)	0.013
Director-linked CEO pay, residual	0.011	(0.564)	0.011	0.036	(0.001)	0.036
Market value (mill., log)	0.235	(0.001)	0.376	0.172	(0.001)	0.270
12-month return (%)	-0.001	(0.255)	-0.069	0.002	(0.081)	0.067
Return on assets (%)	0.003	(0.157)	0.018	0.001	(0.715)	0.007
Book-to-market (log)	0.031	(0.501)	0.016	0.054	(0.037)	0.024
Standard deviation of returns (%)	0.016	(0.032)	0.066	-0.004	(0.279)	-0.017
Leverage (log)	-0.039	(0.267)	-0.016	0.068	(0.001)	0.033
Firm age (log)	0.004	(0.809)	0.003	-0.026	(0.129)	-0.018
E-index	-0.001	(0.943)	-0.001	0.008	(0.456)	0.012
Institutional ownership (%)	0.002	(0.022)	0.035	0.004	(0.001)	0.064
CEO age (log)	-0.045	(0.698)	-0.005	0.181	(0.033)	0.021
CEO tenure (log)	-0.020	(0.565)	-0.016	0.001	(0.986)	0.001
CEO record (log)	0.087	(0.042)	0.047	-0.005	(0.830)	-0.003
CEO ownership (%)	-0.021	(0.017)	-0.091	-0.011	(0.015)	-0.039
CEO duality dummy	0.068	(0.001)	0.030	0.040	(0.049)	0.019
Board ownership (%)	-0.002	(0.511)	-0.019	0.001	(0.549)	0.009
Board size (log)	0.380	(0.066)	0.110	-0.039	(0.934)	-0.009
Board busyness (log)	0.181	(0.218)	0.044	0.190	(0.007)	0.039
Board industry focus (%)	0.001	(0.526)	0.013	0.002	(0.014)	0.027
Board independence (%)	0.001	(0.684)	0.007	0.002	(0.001)	0.032
Number of observations	2,530			5,329		
Adjusted R-squared	27.75%			28.40%		

Table 3

The director-specific component for different specifications

The main sample consists of 7,278 firm-years between 2003 and 2011 with available data on Riksmetrics, Execucomp, the CRSP monthly files, and the Compustat annual files. The table reports scaled coefficient estimates (coefficient estimates times the standard deviation of each variable) for models examining the relation between CEO pay and director-linked CEO pay. All models adjust for year-industry effects, where industries are defined based on three-digit SIC codes. Furthermore, all models control for additional firm, CEO, and board characteristics as in Table 2, Panel A. The construction of each variable is described in the Appendix. Apart from reporting the estimates from the base model, we also estimate models that control for area code fixed effects and models that control for firm fixed effects. The p-values (in parenthesis) are based on standard errors that adjust for firm-level and year-level clustering.

	Base model		With CBSA code fixed effects		With firm fixed effects	
Director-linked CEO pay	0.049 (0.001)		0.041 (0.001)		0.027 (0.003)	
Director-linked CEO pay, predicted		0.026 (0.008)		0.023 (0.061)		0.012 (0.324)
Director-linked CEO pay, residual		0.046 (0.001)		0.036 (0.001)		0.024 (0.010)
All other control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year-industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	7,278	7,278	7,278	7,278	7,278	7,278
p-value of CBSA code fixed effects			0.001	0.001		
p-value of firm fixed effects					0.001	0.001
Adjusted R-squared	55.81%	55.87%	57.79%	57.81%	75.39%	75.40%

Table 4

## Tests for a wider network effect

The starting sample consists of 7,278 firm-years between 2003 and 2011 with available data on Riksmetrics, Execucomp, the CRSP monthly files, and the Compustat annual files. The table reports scaled coefficient estimates (coefficient estimates times the standard deviation of each variable) for models examining the relation between CEO pay of firm  $i$  and the pay of CEOs that do not share directors with firm  $i$  but share directors with firm  $i$ 's director-linked firms. We term this variable non-linked CEO pay, and we are able to calculate it for 6,909 firm-years. All models adjust for year-industry effects, where industries are defined based on three-digit SIC codes. Furthermore, all models control for additional firm, CEO, and board characteristics as in Table 2, Panel A. The construction of each variable is described in the Appendix. Apart from reporting the estimates from the base model, we also estimate models that control for CBSA code fixed effects and models that control for firm fixed effects. The p-values (in parenthesis) are based on standard errors that adjust for firm-level and year-level clustering.

	Base model		With CBSA code fixed effects		With firm fixed effects	
Non-linked CEO pay	0.010		0.008		0.004	
	(0.331)		(0.433)		(0.663)	
Non-linked CEO pay, predicted		0.010		0.009		0.006
		(0.345)		(0.384)		(0.568)
Non-linked CEO pay, residual		0.003		0.001		-0.003
		(0.828)		(0.975)		(0.705)
All other control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year-industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	6,909	6,909	6,909	6,909	6,909	6,909
p-value of CBSA code fixed effects			0.001	0.001		
p-value of firm fixed effects					0.001	0.001
Adjusted R-squared	55.27%	55.25%	57.32%	57.32%	75.70%	75.70%

Table 5

## Pre-SOX tests conditional on board composition

The main sample consists of 4,133 firm-years between 1996 and 2001 with available data on Riksmetrics, Execucomp, the CRSP monthly files, and the Compustat annual files. The table reports scaled coefficient estimates (coefficient estimates times the standard deviation of each variable) for models examining the relation between CEO pay and director-linked CEO pay for two sub-samples based on board independence and CEO duality. All models adjust for year-industry effects, where industries are defined based on three-digit SIC codes, and firm fixed effects. Furthermore, all models control for additional firm, CEO, and board characteristics as in Table 2, Panel A. The construction of each variable is described in the Appendix. In Panel A, the sub-samples of low and high board independence are formed based on whether or not the proportion of independent directors is less than 1/2. In Panel B, boards with high independence are those with a majority of independent directors and 100% independent audit, compensation, and nomination/governance committees. The remaining boards are classified as having low board independence. Since data on board independence by committee is not available for the full sample, in Panel B there are fewer observations than in Panel A. In Panel C we split the sample based on whether or not the CEO is also the chairman of the board (COB). In Panel D we split the sample based on board size, where we first estimate a regression model with board size as the dependent variable and firm and CEO characteristics as the independent variables. If the residual of this regression is negative we classify firms as having relatively low board size, and if the residual is positive we classify the firm as having relatively high board size. In Panel E we split the sample based on whether the proportion of current executives in the board is less than the median of 52.63%, and in Panel F we split the sample based on whether the proportion of lawyers in the board is 0% (the median) or above 0%. The p-values (in parenthesis) are based on standard errors that adjust for firm-level and year-level clustering. The last column reports the difference (p-values in parenthesis) between the estimates for the two sub-samples.

## Panel A: Board independence based on whether or not 50% of all directors are independent

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Dependent variable is total CEO pay (millions of 2012 U.S. dollars, log)

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	Low board independence	High board independence	Diff. in scaled coefficients
Director-linked CEO pay, predicted	- 0.012 (0.529)	0.005 (0.623)	0.017 (0.457)
Director-linked CEO pay, residual	- 0.021 (0.452)	- 0.007 (0.605)	0.014 (0.677)
Number of observations	678	3,455	

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Panel B: Board independence based on whether or not 50% of all directors and 100% of the audit, compensation, and nomination committees are independent

Dependent variable is total CEO pay (millions of 2012 U.S. dollars, log)			
	Low board independence	High board independence	Diff. in scaled coefficients
Director-linked CEO pay, predicted	0.013 (0.100)	- 0.002 (0.709)	- 0.015 (0.008)
Director-linked CEO pay, residual	- 0.012 (0.233)	0.009 (0.590)	0.021 (0.059)
Number of observations	2,076	644	

Panel C: CEO duality

Dependent variable is total CEO pay (millions of 2012 U.S. dollars, log)			
	CEO is chairman of the board	CEO is not chairman of the board	Diff. in scaled coefficients
Director-linked CEO pay, predicted	0.001 (0.958)	0.009 (0.566)	0.008 (0.658)
Director-linked CEO pay, residual	- 0.002 (0.905)	- 0.022 (0.237)	- 0.020 (0.411)
Number of observations	2,757	1,376	

Panel D: Board size

Dependent variable is total CEO pay (millions of 2012 U.S. dollars, log)			
	Lower than expected board size	Higher than expected board size	Diff. in scaled coefficients
Director-linked CEO pay, predicted	- 0.005 (0.677)	0.007 (0.587)	0.012 (0.532)
Director-linked CEO pay, residual	- 0.025 (0.244)	0.005 (0.664)	0.030 (0.261)
Number of observations	1,967	1,689	

Panel E: Percent directors that are current executives (median is 52.63%)

Dependent variable is total CEO pay (millions of 2012 U.S. dollars, log)

	Lower than median current executives	Higher than median current executives	Diff. in scaled coefficients
Director-linked CEO pay, predicted	0.011 (0.325)	0.002 (0.810)	- 0.009 (0.205)
Director-linked CEO pay, residual	0.006 (0.790)	- 0.038 (0.003)	- 0.044 (0.060)
Number of observations	1,426	1,428	

Panel F: Percent directors that are lawyers (median is 0%)

Dependent variable is total CEO pay (millions of 2012 U.S. dollars, log)

	0% lawyers	Higher than 0% lawyers	Diff. in scaled coefficients
Director-linked CEO pay, predicted	0.004 (0.818)	0.012 (0.346)	0.009 (0.697)
Director-linked CEO pay, residual	- 0.032 (0.109)	0.009 (0.499)	0.041 (0.116)
Number of observations	1,832	1,022	

Table 6

## Post\_SOX tests conditional on director incentives

The main sample consists of 7,278 firm-years between 2003 and 2011 with available data on Riksmetrics, Execucomp, the CRSP monthly files, and the Compustat annual files. The table reports scaled coefficient estimates (coefficient estimates times the standard deviation of each variable) for models examining the relation between CEO pay and director-linked CEO pay for two sub-samples based on excess director option-based compensation (Panel A), year  $t-1$  to year  $t$  director turnover (Panel B), and director busyness (Panel C). We have director compensation data starting with 2006 and thus Panel A uses 4,715 firm-years between 2006 and 2011. Availability of the sorting variables dictates the sample size for the other panels. We adjust for year-industry effects, where industries are defined based on three-digit SIC codes, and for firm fixed effects. Furthermore, all models control for additional firm, CEO, and board characteristics as in Table 2, Panel A. The construction of each variable is described in the Appendix. In Panel A, to construct the two sub-samples, we first estimate a regression model where the dependent variable is the option-based compensation of all directors relative to their total compensation. As explanatory variables we use year-industry effects as well as all other firm, CEO, and director characteristics. Firm-years with a negative residual are classified as having low excess director option-based compensation while firm-years with a positive residual are classified as having high excess director option-based compensation. We exclude 934 firm-years with a residual equal to 0. In Panel B, firms with year  $t-1$  to year  $t$  director turnover less than or equal to (greater than) 7.5% are classified as low (high) director turnover firm-years. In Panel C, boards with directors that on average serve on fewer than 1.5 boards are classified as having less busy directors. The p-values (in parenthesis) are based on standard errors that adjust for firm-level and year-level clustering. The last column reports the difference (p-values in parenthesis) between the estimates for the two sub-samples.

## Panel A: Director option-based pay

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Dependent variable is total CEO pay (millions of 2012 U.S. dollars, log)

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	Lower than expected director option-based pay	Higher than expected director option-based pay	Diff. in scaled coefficients
Director-linked CEO pay, predicted	0.009 (0.134)	0.008 (0.493)	- 0.001 (0.897)
Director-linked CEO pay, residual	0.021 (0.003)	- 0.008 (0.581)	- 0.029 (0.025)
Number of observations	2,192	1,589	

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Panel B: Director turnover (median is 7.5%)

Dependent variable is total CEO pay (millions of 2012 U.S. dollars, log)

	Lower than median director turnover	Higher than median director turnover	Diff. in scaled coefficients
Director-linked CEO pay, predicted	0.001 (0.842)	0.009 (0.373)	0.008 (0.424)
Director-linked CEO pay, residual	0.008 (0.287)	0.020 (0.001)	0.012 (0.040)
Number of observations	3,425	3,286	

Panel C: Director busyness (median 1.5 boards)

Dependent variable is total CEO pay (millions of 2012 U.S. dollars, log)

	Lower than median director busyness	Higher than median director busyness	Diff. in scaled coefficients
Director-linked CEO pay, predicted	0.001 (0.892)	0.010 (0.199)	0.009 (0.513)
Director-linked CEO pay, residual	0.010 (0.306)	0.022 (0.013)	0.012 (0.325)
Number of observations	3,605	3,617	