CEO Expertise and the Design of Compensation Contracts: Evidence from Generalist versus Specialist CEOs[☆]

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ABSTRACT

Generalist CEOs receive higher pay than specialist CEOs. We examine the implications of CEO expertise for the *structure* of executive compensation. We follow contract theory and predict that information asymmetry induces generalist CEOs to overstate their ability to a larger extent when contracting with shareholders. Boards of directors take this into account by designing compensation contracts that link their pay more closely to firm performance. Our empirical results support this prediction, and the link is more pronounced when generalist CEOs are less known in the executive labor market or are hired externally. The results hold after we control for a battery of factors that potentially affect incentive pay, including firm characteristics and CEO ability. Overall, our results support the optimal contracting perspective of executive compensation and highlight the importance of CEO expertise generality in resolving adverse selection during the contracting process.

Keywords: Compensation contract; CEO expertise; Generalist; Information asymmetry; Adverse selection

JEL Classification: G34; J24; J33

I. INTRODUCTION

In designing compensation contracts for CEOs, the level and structure of pay are equally important. As a significant element in the structure of CEO compensation, incentive pay serves as a tool for firms seeking to mitigate the agency problem, which manifests itself as either adverse selection (Arya and Mittendorf 2005; Dutta 2008; Goldmanis and Ray 2014) or moral hazard (Gayle and Miller 2009). While there is ample evidence supporting the role of incentive pay in mitigating the moral hazard problem (e.g., Murphy 1999), there is scant empirical evidence regarding its role in resolving adverse selection, even though asymmetric information is prevalent in the contracting process (e.g., Arya and Mittendorf 2005; Dutta 2008). As Murphy (1999) points out, "*CEOs have superior skills or information. Unobservable actions cannot be the driving force underlying executive contracts*…." Hence, to better understand executive compensation contracts, it is important to investigate the role of incentive pay in alleviating adverse selection. However, the literature on resolving adverse selection in compensation contracting focuses on issues other than incentive pay (e.g., past performance in Banker, Darrough, Huang, and Plehn-Dujowich 2013). This paper intends to fill that gap.

Although empirical research on this topic is limited, certain predictions can be made with the help of theoretical work, such as the models of Dutta (2008) and Goldmanis and Ray (2014). In the presence of asymmetric information regarding CEO ability, CEOs tend to overstate their ability when negotiating with shareholders for higher pay. The incentive to overstate ability is stronger for CEOs with more outside job opportunities. As the counterparty in the contracting process, the firm rationally anticipates this tendency and responds by designing the compensation contract in a way that closely links CEO pay to firm performance. This would lead to a performance-based contract even in the absence of a moral hazard problem, especially for

generalist CEOs, who have more employment opportunities outside the firm (hereafter, outside options) than specialist CEOs.[1] We therefore hypothesize that generalist CEOs, whose skills are more likely to be applicable elsewhere, receive compensation contracts with higher pay-performance sensitivity than those received by their specialist counterparts.

Measuring the generality of skills is empirically challenging. In this paper, we follow the literature and measure CEO skill generality using work-experience-based indicators (Custódio, Ferreira, and Matos 2013).[2] We construct an updated general ability index (*GA-index*) based on a CEO's past work experience obtained from BoardEx. Data on CEO compensation of S&P 1,500 firms are retrieved from ExecuComp. Our final sample consists of 34,344 CEO-year observations, including 5,650 unique CEOs and 2,861 unique firms from the period 1992-2016. Consistent with our main prediction, our findings reveal that generalist CEOs' pay is more sensitive to performance than that of their specialist counterparts, even after controlling for the level of total compensation.

Cross-sectional analysis indicates that the relation between pay-performance sensitivity and CEO skill generality is stronger when the CEO is less known in the executive labor market. In addition, firms are more likely to offer incentive contracts to generalist CEOs who are hired externally. Our findings suggest that the resolution of information asymmetry is one channel through which CEO expertise determines the design of compensation contracts. The results hold after we control for various factors that potentially affect incentive pay. In particular, inferences

[1] Dutta (2008) models a decrease in CEO outside options with the specificity of their expertise. That is, the more general their skills are, the more outside options they have, which increases their bargaining power and overstatement of their ability. In our setting, outside options can be interpreted as the value of managerial expertise if used by other firms. Specialists are likely to have fewer outside options, either because their skills are specialized *per se* or because there are few firms which weigh their skillset in a similar way to their current (or past) employers. Moreover, the key to the prediction is the specificity (rather than the level) of CEO expertise.

[2] Arguably, boards of directors may infer CEO ability from such experience. However, boards of directors cannot make unbiased inferences to achieve full unravelling. Otherwise, there would be no adverse selection problem. We use work experience as the basis of our measure to shed light on the implications of CEO skill generality for contracting.

remain unchanged when we account for the confounding effect of managerial ability by either (i) explicitly controlling for the managerial ability score, or (ii) matching generalist versus specialist CEOs based on their ability. The evidence thus demonstrates the incremental effect of skill generality on incentive pay above and beyond the effect of managerial ability. Overall, the results support our hypotheses and shed light on the role of adverse selection in the design of an optimal compensation contract given differences in CEO expertise.

To rule out potential bias arising from endogenous matching between firms and CEOs, we construct a propensity score matched sample. We select pairs of similar firms that differ in one key characteristic: one hires a generalist CEO, while the other hires a specialist CEO. Applying the main specification to the matched sample, we continue to find that the compensation packages awarded to generalist (vs. specialist) CEOs have significantly higher pay-performance sensitivity.

We use instrumental variable (IV) estimation to further correct the potential bias arising from omitted variables, such as ability. Specifically, we use the non-compete agreement enforcement index constructed by Garmaise (2009) as the instrument for the *GA-index*. A non-compete clause prevents employees from joining their current employers' competitors after they quit, are laid off, or are fired. CEOs who used to work in states where non-compete clauses are enforced more stringently tend to accumulate more general skills to maximize their outside employment opportunities. The enforcement of such clauses differs across states and can also change over time within the same state. The variation in non-compete agreement enforcement across states where CEOs used to work is unlikely to affect their current compensation structure directly. The finding of our IV estimation further confirms the positive association between CEO skill generality and pay-performance sensitivity.

As a robustness check, we explore another dimension of CEO skill generality, namely potential users of managerial skills. We construct an outside options index by extracting the first factor from principal component analysis of four outside option proxies: (i) the number of firms operating in the same two-digit SIC industry, (ii) the industry beta, (iii) the number of firms located within a radius of 100 km of the focal firm's headquarters, and (iv) total product similarity which is constructed by Hoberg and Phillips (2016). Again, we find that CEOs whose expertise can more easily be applied elsewhere receive contracts with higher pay-performance sensitivity. Moreover, we explore the joint effect of outside options and information asymmetry on pay-performance sensitivity using the outside options index. The result confirms the prediction that information asymmetry, combined with CEO's outside options, leads the board of directors to award more incentive pay to generalist CEOs to mitigate ability overstatement.

Custódio et al. (2013), whose study is the closest to ours, show that generalist CEOs receive higher pay than specialist CEOs. However, they do not examine the relation between CEO skill generality and pay-performance sensitivity. To examine the possibility that our results are driven by generalist CEOs receiving higher pay. We include the interaction between the *GA-index* and the level of CEO pay and find that our main results remain qualitatively similar. Moreover, the coefficient on the interaction term is insignificant, indicating that the relation between pay-performance sensitivity and CEO expertise does not depend on the size of compensation packages. Taken together, our findings are not a manifestation of the evidence found in Custódio et al. (2013).[3]

[3] Our paper is also related to Arya and Mittendorf (2005) and Bettis, Bizjak, Coles, and Kalpathy (2010). Arya and Mittendorf (2005) model the use of options to identify and attract more capable managers. Bettis et al. (2010) document that more performance-vest options are granted to new CEOs due to the need to learn about CEO ability. Our study is related to theirs because they share the same context—i.e., compensation contract design in the presence of information asymmetry regarding CEO ability. The main difference is that we emphasize the tendency to overstate ability in the presence of information asymmetry regarding CEO ability and the specificity of CEO

Our paper makes several contributions. First, we show that pay-performance sensitivity reflects CEO expertise. Typical principal-agent models are built on the trade-off between incentivizing managerial effort and limiting managers' risk exposure. These models predict that the optimal strength of incentives depends on the quality of performance signals, the cost of managerial effort, and managers' risk aversion.[4] Less attention is paid to the role of incentive pay in resolving information asymmetry between the boards and CEOs, especially adverse selection by CEOs. Our findings enrich understanding of the factors affecting executive incentive contracts and indirectly echo the debate on whether executive pay reflects performance or results from managerial rent-seeking (e.g., Bebchuk and Fried 2003; Goldman and Slezak 2006).

Second, we add to the literature on CEO skills by revealing the implications of such skills for the design of compensation contracts. Previous studies document that managerial skill generality has both positive and negative aspects and thus affects firm policies in different ways. For example, generalists are paid more than specialists because general skills are more appreciated by the labor market (Custódio et al. 2013). We uncover an important new policy shaped by CEO skill generality: incentive contracts. Understanding this relationship is instrumental for interpreting recent trends related to the importance of human capital and increases in incentive pay.

Third, we shed light on the interaction between the labor market and the design of managerial contracts. While Oyer (2004) relies on outside opportunities to explain why firms use non-indexed options to retain executives, we show that outside opportunities associated with skills accumulated during past work experience affect optimal incentive pay. We complement

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expertise. In addition, as is discussed later (in the subsection "*General Skills versus Managerial Ability*"), managerial ability and skill generality are two related yet distinct constructs, both conceptually and empirically.

[4] See Garen (1994), Haubrich (1994), Aggarwal and Samwick (1999), Himmelberg, Hubbard, and Palia (1999), and Becker (2006).

Lustig, Syverson, and Van Nieuwerburgh (2011), who show that increases in pay-performance sensitivity can be explained by growth in outside options resulting from increases in the portability of managers' organizational capital. We also confirm the claim of Arya and Mittendorf (2005) that one complementary benefit of option-based compensation is to provide efficient matching between firms and CEOs.

The remainder of the paper is organized as follows. We review the literature and develop the hypotheses in Section II. The research design is presented in Section III. Section IV reports the empirical results and Section V describes additional tests. Section VI concludes the paper.

II. RELATED LITERATURE AND HYPOTHESES DEVELOPMENT

This study is related to several streams of literature, including studies of managerial expertise, pay-performance sensitivity, and the revelation of CEO ability over time. This section discusses the related literature and develops the hypotheses.

General managerial skills

The CEO is the most important employee of any firm and probably has the most influence on firm performance. The literature identifies the effects of firm-specific and general CEO skills on executive compensation, firm innovation, and the cost of capital. For example, Murphy and Zabojnik (2004; 2007) demonstrate that a shift in the relative importance of general and firm-specific skills has contributed to the observed increases in CEO pay over the last few decades. In a related study, Custódio et al. (2013) find that generalist CEOs earn 17 percent more than specialist CEOs do, indicating that firms pay a premium for general skills. Custódio, Ferreira, and Matos (2019) further show that generalist CEOs spur more innovation. However, firms with generalist CEOs at the helm may suffer from more severe agency problems. Investors demand higher returns when operations are more complex and when more anti-takeover provisions are in

place (Mishra 2014). Overall, managerial skill generality has both positive and negative aspects; consequently, and its effects on firm policies and performance are mixed. Moreover, it remains ambiguous ex ante whether and how CEO skill generality affects the design of compensation contracts. We therefore refer to analytical models to make predictions for our subsequent analyses.

Pay-Performance Sensitivity

In the presence of information asymmetry, the separation of ownership and control in modern organizations leads to agency problems (Berle and Means 1932; Shleifer and Vishny 1997; Murphy 1999; Laffont and Martimort 2002; Jensen, Murphy, and Wruck 2004). Agency problems can take the form of adverse selection, or moral hazard (Laffont and Martimort 2002). To better align the interests of shareholders and managers, firms implement both internal and external corporate governance mechanisms (Shleifer and Vishny 1997). One notable internal governance mechanism is compensation contracts (Murphy 1999; Jensen et al. 2004), especially the structure of compensation packages (Jensen and Murphy 1990).

Incentive contracts are typically assumed to serve one of the following functions: incentivizing, retention, and sorting (Ittner, Larcker, and Rajan 1997; Core and Guay 2001; Kedia and Mozumdar 2002; Lazear 2003; Oyer and Schaefer 2005). Firms grant incentive pay to employees to stimulate their effort and retain key personnel. Differences in preference for incentive versus fixed pay can help to sort employers and employees.

Given the importance of incentive pay in incentivizing, retaining, and sorting employees, exploring its determinants can shed light on why variation in pay-performance sensitivity exists. One such determinant is the generality of CEO skills. However, whether and how CEO skill generality influences pay-performance sensitivity remain largely unexplored questions. Although

the empirical evidence is scant, theoretical models can help guide certain predictions on how skill generality may affect pay-performance sensitivity. Dutta's (2008) analytical model shows that pay-performance sensitivity is higher when managerial skills are more general, suggesting a positive relation between pay-performance sensitivity and the generality of CEO skills.

The rationale behind Dutta's (2008) prediction is based on the presence of asymmetric information. When asymmetric information exists, both generalist and specialist CEOs have a tendency to overstate their abilities; this results in performance-based contracts for both, even in the absence of moral hazard. One deviation of Dutta (2008) from the previous analytical models is its treatment of the outside options. Most previous models assume away the importance of skill generality to CEO's reservation wage. The dependence of outside options on CEO type is what distinguishes Dutta's (2008) model from others. In particular, the likelihood and magnitude of ability overstatement depend on a CEO's outside options. A CEO with more general skills has more outside options and is thus more likely to overstate his/her abilities to negotiate for higher pay. Rationally anticipating this tendency, the firm designs the compensation contract in a way that more closely links CEO pay to firm performance.[5] Note that outside options in this model arise from skill generality, which is related to but different from CEO ability. Two equally able CEOs might have different outside options due to the composition of their knowledge and experience. Similarly, Goldmanis and Ray (2014) model the sorting effect of performance pay and predict that under asymmetric information, pay-performance sensitivity increases with the manager's outside options. Given that generalist CEOs have more outside options, their compensation is more closely linked to firm performance. This leads to our main hypothesis:

[5] In the presence of information asymmetry regarding the ability of candidates for future CEOs, corporate boards are also likely to "filter" CEO candidates by using high-powered compensation packages to mitigate adverse selection. If CEOs with general skills happen to be abler ones, we would observe higher pay-performance sensitivity for generalist CEOs, which is not due to these CEOs enjoying more outside options and thus higher bargaining power. We try to exclude this alternative hypothesis in the empirical section of this paper.

H1: Ceteris paribus, pay-performance sensitivity in compensation contracts is more pronounced for generalist CEOs than for specialist CEOs.

However, specialist CEOs might be more risk-averse than their generalist counterparts due to their lack of outside options, and such an attitude toward risk may be detrimental to firm performance (John, Litov, and Yeung 2008). Therefore, boards of directors may design contracts featuring higher pay-performance sensitivity for specialist CEOs. In addition, if specialist CEOs possess scarce skills that are of significant value to their employers, boards may seek to capitalize on those skills by linking pay closely to firm performance. This potential counterargument makes the relation between general skills and pay-performance sensitivity an empirical question.[6]

We now turn to the cross-sectional variation derived from hypothesis H1, which stems from the fact that the board of directors learns about the CEO's ability over time. The implicit assumption behind the theoretical predictions of Dutta (2008) and Goldmanis and Ray (2014) is that information regarding the CEO's true ability is less accessible. Over time, however, the CEO's ability is revealed through either in-process interaction or ex post realized performance (Harris and Hölmstrom 1982; Murphy 1986; Pan, Wang, and Weisbach 2015), reducing the board's concerns about adverse selection. When such information is available, the compensation contract does not need to be designed in a way that counteracts generalist CEOs' tendency to overstate their ability. Similarly, there is greater information asymmetry regarding the true ability of managers who become CEOs later than their peers (i.e., those who are older when they assume the position of CEO); for such CEOs, firms will design compensation contracts in a way

[6] If other top managers have generic skill sets that overlap with those of generalist CEOs, there may be competition from these subordinate executives. Such a conjecture, while plausible, adds further tension to our hypothesis. The conjecture indicates either a lower tendency for CEOs to overstate (as their ability is in lower demand) or a lower importance of CEOs. In either situation, we would observe a lower pay-performance sensitivity for generalist CEOs, which goes against finding our results.

that mitigates the potential adverse selection problem. The above discussion leads to our second hypothesis.

H2: The positive relation between general skills and pay-performance sensitivity is more pronounced for generalist CEOs who are less known to the employer.

III. RESEARCH DESIGN

Sample Selection

We retrieve CEO compensation data from ExecuComp. CEOs' past work experience is obtained from BoardEx and is used to construct the general ability index (*GA-index*), following Custódio et al. (2013). The *GA-index* intends to capture how widely managers' expertise can be applied. The firm financials and stock return data come from Compustat and the Center for Research in Security Prices (CRSP), respectively. Our initial sample consists of 47,122 CEO-year observations in ExecuComp from 1992 to 2016 with non-missing total compensation. We drop observations for which data on CEO pay-performance sensitivity is not available (2,770) and observations with missing firm characteristics (4,351). Restricting the sample to CEOs for whom data on the *GA-index* are available reduces the sample size by a further 5,657. Our final sample consists of 34,344 CEO-year observations, covering 5,650 unique CEOs and 2,861 unique firms from 1992 to 2016.

Measures of CEO Skill Generality

We follow Custódio et al. (2013) and construct the *GA-index* based on CEOs' past work experience in publicly traded firms to measure the generality of their expertise. The *GA-index* captures CEO skills that are transferable across firms using five indicators: (1) *the number of positions* a CEO has held during his or her career(*X1*), (2) *the number of firms* a CEO has worked for (*X2*), (3) *the number of industries* (measured at the four-digit SIC level) a CEO has

worked in (*X3*), (4) *the CEO experience indicator*, equal to 1 if a CEO has previously held another CEO position (*X4*), and (5) *the conglomerate indicator*, equal to 1 if a CEO has worked in a conglomerate (*X5*).

CEOs who have higher scores in these dimensions are considered to have more general human capital. To mitigate concerns regarding multi-collinearity and measurement error, we follow Custódio et al. (2013) and combine all five variables into one composite index by conducting principal component analysis and extracting the first common component. Specifically, the *GA-index* of CEO *i* in year *t* is calculated by applying the scores of each component to the standardized general ability component as follows:

$$GA\text{-}index_{i,t} = 0.284X1_{it} + 0.367X2_{it} + 0.376X3_{it} + 0.129X4_{it} + 0.233X5_{it}.$$

To aid the interpretation of the results, the *GA-index* is standardized to have a mean of zero and a standard deviation of one. To bring the measure to life, we include two examples of CEOs in Panel A of the Appendix to illustrate what the *GA-index* intends to capture. Specifically, we select two same-age CEOs with similar career lengths but quite distinct working experiences. As expected, the CEO with more general expertise (Case 1) has broader working experience, while the CEO with less general expertise (Case 2) has narrower working experience.

Apart from using the updated *GA-index* to measure the generality of CEO skills, we also construct a dummy variable to categorize a CEO as either a *generalist* or a *specialist* each year. Specifically, we categorize a CEO as a generalist if her *GA-index* is above the annual median; all remaining CEOs are classified as specialists.[7]

Measures of Pay-Performance Sensitivity

We rely on *Delta* to measure pay-performance sensitivity, which is derived from options and stock compensation. *Delta*, which gauges the change in CEO pay (in thousands of dollars) for a

[7] In untabulated analysis, we find that generalist CEOs switch jobs more frequently than specialist CEOs do.

one-percentage-point change in stock price, has been adopted extensively as a pay-performance sensitivity measure in prior studies, such as Core and Guay (2002) and Coles, Daniel, and Naveen (2006). Following Coles, Daniel, and Naveen (2013), we calculate *Delta* under different reporting formats (pre-2006 versus post-2006) and take into account all shares and options in the CEO's portfolio when calculating *Delta*. [8]

Empirical Model

We run the following empirical model to test our hypotheses:[9]

$$PPS_{i,t} = \alpha + \beta GA\text{-}index_{i,t} + \gamma Controls_{i,t} + y_t + e_i + \varepsilon_{i,t}, \quad (1)$$

where $PPS_{i,t}$ equals $Ln(Delta)_{i,t}$ and is used to measure the pay-performance sensitivity for CEO *i* in year *t*. Given that *Delta* is highly skewed to the right, we use its natural logarithm as the dependent variable. The *GA-index* captures how general the CEO's skills are, following Custódio et al. (2013). As indicated above, we use two versions of this measure: continuous and categorical.

Controls refer to a battery of control variables designed to account for any omitted correlated factors. We first control for firm size as measured by *Ln*(*Sales*), as CEOs working in larger firms are paid more than their counterparts in smaller firms. Following Jayaraman and Milbourn (2012), we control for market-to-book ratio (*Market to book*), as growth opportunities can affect how firms design compensation contracts (Gopalan, Milbourn, Song, and Thakor 2014). A firm's capital structure can also affect executive incentives, given the role that debt plays in aligning incentives (Douglas 2006). We therefore control for the book leverage ratio

[8] The calculation takes into account the CEO portfolio, including unvested and vested shares and options. Thus, the *Delta* measure in our paper is the sum of (1) the delta of current year options, (2) the delta of the portfolio of previously-granted options (both vested and unvested), and (3) the delta from the shareholding by CEOs. The detailed calculation of each component is elaborated on pages 6-7 of Coles et al. (2013).

[9] We also try an alternative model specification from Ittner, Lambert, and Larcker (2003) and our inference remains unchanged. The results are available in the Internet Appendix.

(*Leverage*). We also consider the effects of firms' accounting performance and stock price performance, as both are correlated with executive incentives (Hochberg and Lindsey 2010). Specifically, we control for both accounting performance, measured by return on assets (*ROA*) and operating cash flows (*CFO*), and stock performance (*Stock return*). Risk can affect executive incentives and pay-performance sensitivity (Aggarwal and Samwick 1999; Prendergast 2002). We control for risk using the volatility of return on assets (*Sd. ROA*), stock return volatility (*Sd. Return*), and the volatility of operating cash flow (*Sd. CFO*). We also control for firm age (Pástor and Veronesi 2003), CEO age (Yim 2013), and CEO tenure (Cremers and Palia 2010) in the main analysis, given their potential impact on the design of compensation contracts. Panel B of the Appendix defines all of these variables in more detail. Finally, pay-performance sensitivity may vary systematically over time and across industries. Thus, we also control for year (y_t) and industry (e_i) fixed effects in our main analysis. Heteroscedasticity-robust standard errors are adjusted for clustering at the firm level.

IV. RESULTS

Summary Statistics

Table 1 presents the summary statistics for the key variables. The average CEO in our sample is paid US$5,191,593 annually (*Total compensation*).[10] *Delta*, our measure of pay-performance sensitivity, has a mean of 1,090,983, which corresponds to a change of US$1,090,983 in CEO pay given a one-percentage-point change in stock price. The median of *Delta*, US$192,200, is much smaller than the mean, suggesting that *Delta* is highly positively skewed. These figures are similar to those reported in previous studies (e.g., Jayaraman and

[10] We use *tdc1* as provided in ExecuComp to measure total pay to executives. This measure differs from *tdc2*, mainly in the equity component of compensation. Specifically, *tdc1* captures how much has been granted, rather than realized. The distribution of CEO pay is highly positively skewed.

Milbourn 2012). By construction, the mean of the CEO skill generality measure (i.e., the *GA-index*) is zero and the standard deviation equals one.

Regarding the control variables, the average market-to-book ratio is 2.003 and firms finance about 23 percent of their assets with debt (*Leverage* = 0.23) on average. The average return on assets (*ROA*) is 13.0 percent, indicating that firms in the sample are profitable. The mean annual stock return is 15.8 percent. Cash flow from operating activities has a volatility of 4.8 percent.

Table 2 reports the Pearson correlations among the variables in the regression. The *GA-index* is positively and significantly correlated with both total compensation and *Ln(Delta)*, with correlations equal to 0.346 and 0.101, respectively. Table 3 reports the results of a univariate comparison between firms led by specialist CEOs and firms led by generalist CEOs. Firm characteristics differ significantly between the two groups. For instance, firms run by generalists tend to be larger in size and more levered. They also have less volatile cash flows and stock returns. This underscores the importance of including various firm characteristics in the regression analysis.

Generalist CEOs' compensation packages also differ from those of their specialist counterparts. Consistent with Custódio et al. (2013), the total compensation of generalists is significantly higher than that of specialists. More relevantly, a generalist CEO's pay is significantly more sensitive to firm performance than a specialist CEO's pay is. A comparison of *Delta* reveals that generalists (relative to specialists) on average receive approximately US$412,951 more for each one-percentage-point increase in their firms' stock price.

Main Findings

Table 4 presents the estimation results of our main specification in Equation (1). The natural logarithm of *Delta* (*Ln(Delta)*) is used as a proxy for pay-performance sensitivity. For our main

independent variable of interest, Columns (1) – (2) use the continuous measure (*GA-index*), while Columns (3) – (4) use the indicator measure (*Generalist*). As our baseline specifications, Columns (1) and (3) control for industry and year fixed effects. The coefficient on the *GA-index* in Column (1) is positive and significant at the 5% level (coeff. = 0.031; *t*-stat. = 2.16) and the coefficient on *Generalist* in Column (3) is positive and significant at the 10% level (coeff. = 0.047; *t*-stat. = 1.74). The results suggest that generalist CEOs expect a larger increase in their wealth than specialist CEOs for every one-percentage-point increase in firm value.

Columns (2) and (4) control for CEO and year fixed effects to account for CEO-specific attributes that do not change over time, such as gender and talent. Again, we find that CEOs with more general skills are granted compensation packages that are more sensitive to firm performance. The results are also economically meaningful. The estimated coefficient of the *GA-index* in Column (2) implies that a one-standard-deviation increase in the *GA-index* is associated with an increase of 7.2% in *Delta* when evaluated at the mean. As shown in Column (4), the pay-performance sensitivity of compensation contracts awarded to CEOs whose skill generality lies above the annual median is 7.0% higher than that for all other CEOs. In general, these results confirm our prediction in hypothesis H1 that generalist CEOs' pay is more sensitive to firm performance.[11]

We also find that firms with more growth opportunities, lower leverage, higher ROA, and/or lower stock return volatility offer significantly higher pay for performance. The negative association between stock return volatility and pay-performance sensitivity is consistent with the literature on trade-offs between risks and incentives (e.g., Aggarwal and Samwick 1999).

[11] We also follow the approach proposed by Bergstresser and Phillippon (2006) and scale *Delta* by the summation of cash pay and *Delta* value. We find that the *GA-index* continues to be significantly and positively related to the scaled *Delta*. We thank an anonymous referee for providing this suggestion.

Comparing the regression results in Columns (1) and (2) of Table 4, we find that the coefficient magnitude of the *GA-index* becomes substantially larger if we control for CEO fixed effects. Exploiting within-CEO variation helps to correct the bias from important omitted variables, such as CEO ability. However, given that a great majority of the variation in the *GA-index* stems from between-CEO heterogeneity, controlling for CEO fixed effects makes capturing cross-sectional variation impossible. Moreover, the implications Dutta's (2008) theoretical model apply to the cross section. Therefore, in the remaining tests, we control for year and industry fixed effects unless otherwise stated.[12]

Cross-Sectional Analysis

Learning about the CEO's Skills

We now investigate whether the relation between CEO skill generality and pay-performance sensitivity is heterogeneous across different types of CEOs. If generalist CEOs are indeed awarded incentive pay to mitigate information asymmetry regarding their true ability, we should observe a more significant effect in a setting where information asymmetry between the firm and the CEO is more severe (i.e., hypothesis H2).[13]

We use two measures to capture the information asymmetry between the firm and the CEO regarding the CEO's true ability: (i) executive career length and (ii) an external hire dummy variable. To calculate the career length, we count the number of years elapsed since the CEO

[12] The trade-off here is to balance the correlated omitted variable bias versus the variation we intend to capture. Certain time-invariant unobservable CEO-specific characteristics, such as managerial ability and managerial style, might contaminate the relation between CEO skill generality and incentive pay. Inclusion of CEO fixed effects help mitigate the impact of such confounding factors. The downside is that we can only interpret the results as within-CEO variation rather than cross-sectional variation. As the latter variation is more interesting in the current setting, we now use industry/year fixed effects as the main specification. All of our main results are qualitatively the same when we control for CEO fixed effects along with industry (two-digit SIC) and year fixed effects.

[13] The information asymmetry here is from the *ex ante* perspective, which results in adverse selection. We also investigate if moral hazard plays any role in the impact of skill generality on equity incentive, yet fail to find supporting evidence for this. The result is available in the Internet Appendix.

first appears in ExecuComp.[14] The external hire dummy equals one if the CEO is either an "industry insider and company outsider" or an "industry outsider" (Eisfeldt and Kuhnen 2013). These two measures capture two different dimensions of information asymmetry regarding CEO ability: the length of a CEO's executive career is related to the labor market's knowledge of the CEO, while the external hire dummy is specific to the current employment contract (i.e., current employer-employee relationship). Arguably, shareholders are exposed to more asymmetric information regarding the true ability of CEOs who have shorter working histories or are new to their employers.

Table 5 presents results of regressions in which the *GA-index* interacts with the length of the CEO's executive career or the external hire indicator. In Column (1), we modify Equation (1) by including an interaction term between CEO career length and the *GA-index*. Presumably, CEOs who started their careers earlier are better known in the executive labor market. Adverse selection is therefore less of a concern for these CEOs, making it less necessary to use performance pay to reduce information rents. This is exactly what we find. The coefficient on the interaction term (*GA-index* × *CEO career length*) is significantly negative at the 5% level (coeff. = -0.006; *t*-stat. = -2.36). The effect is also economically significant, as the effect of the *GA-index* on *Ln(Delta)* declines by about 0.027 for a one-standard-deviation (i.e., 4.44 years) increase in CEO career length.

Column (2) examines whether the relation between the *GA-index* and pay-performance sensitivity differs between internally promoted CEOs and those hired from outside the firm. The sample size declines substantially to 10,288 because of the availability of data on the source of

[14] We use the year when the current CEO first appears in ExecuComp as the starting year of her executive career. Because ExecuComp started to collect compensation information only in 1992, a fraction of the CEOs in our sample start their careers in 1992 by construction. We do not exclude these CEOs from our sample. However, the results are similar if we correct for this truncation bias.

new CEOs. The coefficient estimate of the interaction term is positive and statistically significant at the 10% level (coeff. = 0.081; *t*-stat. = 1.68). The economic magnitude is also sizable, suggesting that the propensity to offer incentive contracts to generalist CEOs is significantly higher if the CEO is hired externally. Again, this supports the information asymmetry channel.

Taken together, the evidence in Table 5 is consistent with hypothesis H2.[15] More specifically, because boards of directors lack knowledge of generalists' true ability, they design compensation contracts in a way that links CEO pay more closely to firm performance to prevent generalists from overstating their abilities.[16]

V. ADDITIONAL TESTS

Propensity Score Matching

One empirical concern is the endogenous matching between firms and CEOs. To address such a concern, we follow Custódio et al. (2013) and use the propensity score matching method. Specifically, for each firm that hires a new generalist CEO, we find a matched control firm that hires a new specialist CEO in the same year and thus has a similar *ex ante* likelihood of hiring a generalist CEO. We match these hiring firms using the propensity score generated from a Probit model in which the dependent variable is a dummy indicating the hiring of a generalist.

Following Custódio et al. (2013) and Mishra (2014), we select a battery of firm-level variables as determinants of the choice between generalist and specialist CEOs. These variables include firm size (larger firms are more likely to hire a generalist CEO), leverage (more levered firms are more likely to hire generalists), R&D expenses (scaled by sales; more R&D-intensive

[15] The results are qualitatively similar if we use the scaled *Delta* proposed by Edmans, Gabaix, and Landier (2009) to measure pay-performance sensitivity. These results are available upon request.

[16] There are two alternative explanations for our findings: risk-taking and price efficiency. Empirical evidence does not seem to support either explanation. The results are tabulated in Tables A2-A3 in the Internet Appendix.

firms prefer generalist CEOs), a conglomerate dummy (conglomerates are found to be more likely to hire generalists), and firms' two-digit SIC industry membership. We also consider several measures of firm performance as suggested by Custódio et al. (2013). These include Tobin's Q, ROA, and stock returns. To alleviate the concern that generalist CEOs, who might have different risk preferences, are endogenously matched to firms with certain risk profiles, we also match firms with respect to riskiness, as captured by two volatility-based proxies: ROA volatility and stock return volatility. All of the variables used for matching are defined one year prior to the hiring year.

Panel A of Table 6 presents the coefficient estimates of the Probit model that predicts the likelihood of hiring generalist CEOs. Consistent with Custódio et al. (2013) and Mishra (2014), we find that bigger firms, more innovative firms, firms with more volatile cash flows, and worse performance are more likely to hire generalist CEOs. Using the nearest neighborhood matching technique, we successfully select 755 control hiring firms (without replacement) for an equal number of treated hiring firms during our sample period. The Probit model predicts quite similar *ex-ante* probabilities of hiring a generalist CEO for the two groups of firms: the probability is equal to 49.5% for the control group and 50.2% for the treated group. Panel B of Table 6 compares the firm characteristics of these two groups. We find that the treated and control groups look very similar in all dimensions after matching. We then use all of the tenure years of CEOs newly hired by these firms to construct the matched sample; this results in 7,691 firm-year observations. Using the matched sample, we estimate the treatment effect of hiring a generalist CEO on the pay-performance sensitivity of the compensation contract. We control for the same set of variables used in Table 4 and the results are reported in Panel C of Table 6.

The results in Columns (1) – (3) indicate that the pay-performance sensitivity of compensation contracts offered by firms that hire generalist CEOs is significantly higher than that of contracts offered by otherwise similar firms within the same industry that choose to hire specialists in the same year. The magnitude of this difference is 7.8% when not including any control variables in the regression, 15.0% when controlling for a full set of control variables as well as industry and year fixed effects, and 16.8% when including only control variables (without industry/year fixed effects). Overall, the findings from the matched sample indicate that firms offer generalist CEOs compensation contracts with higher pay-performance sensitivity relative to the contracts they would have offered to specialist CEOs.

Instrumental Variable Estimation

Our coefficient estimates might suffer from omitted variable bias, particularly due to unobservable confounding factors. For example, one of the most important determinants of compensation contract design is unobserved CEO ability, which can also affect the accumulation of general skills along a CEO's career path. Moreover, some omitted variables, such as CEO risk aversion, are almost impossible to measure. Another empirical concern is related to potential measurement errors of CEO skill generality. If measurement errors are related to unobserved determinants of pay-performance sensitivity, the coefficient of the *GA-index* can be a biased estimate of skill generality's effect on pay-performance sensitivity.[17]

To address such aforementioned endogeneity concerns about the relation between CEO skill generality and pay-performance sensitivity, we instrument the *GA-index* with one variable that is plausibly exogenous to the pay-performance sensitivity of CEO compensation packages.

[17] Reverse causality could be another endogeneity concern. For example, firms that offer higher incentive pay might attract CEOs with certain expertise. However, to the extent that the *GA-index* is based on CEOs' past working experience (which is measured prior to entering the compensation contract in the current firm, or the year we measure incentive pay), such a concern is unlikely to hold in our setting.

Specifically, we use the degree of enforcement of non-compete agreements at the state level as an instrument for the *GA-index*.[18] Non-compete agreements aim to prevent CEOs (or employees in general) from working for their current employers' competitors after they leave their jobs.[19]

We average the state-level non-compete agreement enforcement indexes in all states where a CEO has held an executive position in the *past*. Our instrument is relevant to the accumulation of skills by CEOs during their careers. When enforceable, a non-compete agreement can substantially reduce a CEO's job opportunities.[20] Given that such agreements limit job opportunities in the same industry, it is reasonable to assume that CEOs located in states where non-compete agreements are strictly enforced would be incentivized to accumulate more general skills to maximize outside opportunities.

An important feature of our instrument is that it *excludes* from the calculation the non-compete clause enforceability of the jurisdiction in which the CEO currently works. This has the advantage of mitigating the violation of exclusion restrictions. For instance, it is possible that the compensation contract is actually shaped by non-compete clauses in the jurisdiction in which the CEO currently works.[21] The enforceability of the non-compete clause in the states where CEOs used to work, however, would not directly affect the pay-performance sensitivity of a CEO's

[18] Note that the sample period shrinks to 1993-2004 because the non-compete agreement enforcement index offered by Garmaise (2009) stops at 2004.

[19] These agreements are widely used in the employment contracts of CEOs. According to recent research by Bishara, Martin, and Thomas (2015), during the period of 1993-2010, around 79% of CEOs signed non-compete agreements, which restricted their post-employment job opportunities. Covering an earlier sample period, Garmaise (2009) also finds that 70% of CEOs had non-compete clauses in their employment contracts.

[20] Garmaise (2009) finds that as non-compete agreements become more enforceable in a state, the intensity of within-industry job transfers for CEOs declines by 47%, while between-industry transfer intensity increases substantially.

[21] More specifically, as the stringent enforcement of non-compete clauses could lead to fewer outside options for managers and thus make their human capital largely firm-specific, the board may give managers fewer stocks and more cash to lower their exposure to firm idiosyncratic risk.

current compensation package. We therefore contend that the *past* enforceability of non-compete clauses satisfies the exclusion restriction criteria and can serve as a valid instrument[22]

We run a two-stage least squares (2SLS) regression, with the historical state-level average of the enforcement index as the instrument for the *GA-index* in the first stage. The results are reported in Table 7. Column (1) of Table 7 shows that, after controlling for firm-level characteristics and year and industry fixed effects, the *historical average* of the state-level non-compete clause enforcement index is significantly and positively associated with CEO skill generality. Thus, the variable can indeed serve as a valid instrument for the generality of CEOs' skills.[23] Column (2) of Table 7 reports the second-stage regression results. We find that the instrumented *GA-index* is positively associated with the level of pay-performance sensitivity and the estimate is significant at the 5% level (coeff. = 0.200; *t*-stat. = 2.02). Overall, the results in Table 7 lend further support to our main prediction that more general skills lead to higher pay-performance sensitivity.[24]

Outside Options

The key hypothesis tested in this study is that, to induce truth telling, firms offer contracts that have higher pay-performance sensitivity to managers whose skills can be applied more

[22] A recent paper by Kini, Williams, and Yin (2020) documents a *concurrent* relationship between non-compete agreements and incentive pay. We believe that our IV is unlikely to directly affect the current incentive pay awarded to CEOs, as we use the historical average of non-compete agreement enforceability across the states where the CEO has worked. This echoes an argument made by Custódio et al. (2019): "Going further back in time makes it more plausible that the exclusion restriction is not violated." As a robustness check, we also try an alternative IV. We follow Yonker (2017) by using the average percentage of clear days in the headquarters cities of firms where the CEO has worked during his/her career. The intuition is that a higher percentage of clear days will motivate CEOs to stay in the current firm and therefore make him/her less likely to accumulate cross-industry (or, more broadly speaking, general) skills. It is also likely to satisfy the exclusion restriction criteria, as weather itself may not affect incentive pay beyond its direct effect on skill generality. Our results continue to hold using this alternative IV.

[23] According to the "rule of thumb" suggested by Stock, Wright, and Yogo (2002) regarding the reliability of the inference based on the two-stage least squares estimator, the F-statistics of the first-stage regression should exceed 10. The F-statistic reported at the bottom of Table 7 indicates that the non-compete enforcement index and the industry-average *GA-index* serve as strong instrumental variables.

[24] As a placebo test, we randomly assign CEOs to different firms and run 5,000 simulations. Results are largely insignificant, providing further support to our prediction.

broadly. In our main analysis, we use a proxy (i.e., the *GA-index*) based on managers' past work experience to measure the generality of skills. In this section, we explore another dimension of CEO skill generality, namely the potential users of managerial skills. The main idea is that CEO skills can be used elsewhere more easily if there are more potential users. Specifically, we measure CEO skill generality by relying on the following four indicators related to CEOs' outside options. (1) *The number of firms in the industry (U1)* refers to the natural logarithm of the number of firms operating in the same two-digit SIC industry as the firm each year. A larger number of firms in the same industry indicates more potential employment opportunities for the CEO. (2) *The industry beta (U2)* is an industry homogeneity measure, defined as the median of industry beta for all firms operating in the same industry following Parrino (1997). Skills required as a CEO tend to be similar in industries with high levels of homogeneity, as measured by industry beta. (3) *The number of firms within the 100-km radius (U3)* is calculated as the natural logarithm of the number of firms headquartered within a 100-km radius of the focal firm's headquarter. Prior research, such as Yonker (2017) and Zhao (2018), documents that the labor market for CEOs is geographically segmented, with firms showing a strong preference of hiring locally. (4) *Product similarity (U4)* refers to the similarity score (TNIC3TSIMM) constructed by Hoberg and Phillips (2016). It measures the total similarity of a firm's products to those of other firms. CEOs working in firms with higher product similarity tend to have more outside options.

Similar to the construction of the *GA-index*, we construct an outside options index (*OO-index*) by extracting the first principal component of these four indicators.[25] The index is also

[25] The first principal component is able to explain about 50% of the total variation. In addition, it has positive loadings on all of the four indicators for CEOs' outside options. Total product similarity has the highest loading. The outside options index is therefore calculated by applying the scores of each component to the standardized outside options component: $Outside\ options\ index = 0.682U1 + 0.151U2 + 0.117U3 + 0.705U4$.

standardized to have a mean of zero and standard deviation of one. Consistent with our main analysis, we also construct a dummy variable that equals one if the CEO's *OO-index* is above the annual median, and zero otherwise.

Panel A of Table 8 presents the results of regressions of *Ln(Delta)* on the *OO-index*. The coefficient estimate in Column (1) indicates that CEOs whose expertise can more easily be applied elsewhere receive contracts with higher pay-performance sensitivity. A one-standard-deviation increase in outside options is associated with a 33.8% increase in $Delta$ if we control for year and industry fixed effects. We find similar results in Column (2), where we compare the *Delta* of CEOs with higher-than-median outside options with that of the other half of CEOs. Overall, the findings support the role of outside options in driving the design of compensation contracts.[26]

Note that there are several important differences between the *GA-index* and our *OO-index*. First, the *GA-index* is CEO specific and thus captures outside options at the CEO level. Our *OO-index*, however, captures outside options available to all CEOs/executives in the same industry/location. Second, the *GA-index*, by definition, captures the work experience of CEO and thus captures the *supply* side of the skill set. However, the *OO-index* mainly captures the *demand* side for CEOs (although it might sometimes also be used to capture the supply side). Dutta (2008) argues that firms grant generalist CEOs compensation packages with higher pay-performance sensitivity (i) when there exists asymmetric information between the CEO and the firm and (ii) when the CEO has more outside options. We use the *OO-index* to proxy for the outside job

[26] If there is plausibly exogenous variation in job opportunities, the transferability of skills will be affected and the relation between the *GA-index* and incentive pay will change accordingly. As the job market for CEOs generally contracts during an economic downturn, we examine the relation between the *GA-index* and incentive pay by comparing recession versus non-recession periods. Following the definition from NBER, the time periods between March 2001 and November 2001, and between December 2007 and June 2009 are defined as recession periods. We find a weakened relation between the *GA-index* and incentive pay during economic recession. The evidence lends further support to our argument that it is outside options that drive the relation between the *GA-index* and incentive pay. We thank one referee for suggesting this test.

opportunities available to CEOs and repeat the same analysis as in Table 5. Panel B of Table 8 reports the results. We continue to find that the impact of outside options is more pronounced when information asymmetry regarding CEO ability is higher (i.e., shorter career length and external hiring). Therefore, we confirm our prediction that information asymmetry, combined with the presence of outside options available to CEOs, leads boards of directors to award more incentive pay to generalist CEOs in anticipation of ability overstatement.

General Skills versus Managerial Ability

CEOs who accumulate more general skills may exhibit higher levels of managerial ability, as they are able to move up across different positions and industries. In other words, the impact of general skills on incentive pay may simply capture the effect of managerial ability. We alleviate this concern at both the conceptual and empirical levels.

Conceptually, CEO skill generality and ability are two related yet distinct constructs. CEO skill generality, which we are interested in, gauges the extent to which CEO skills can easily be transferred across firms or industries. Such transportability of skill sets represents the outside options available to CEOs. It is these outside options that determine CEO reservation wages, as in Dutta (2008). Ability, according to the Cambridge Dictionary, refers to "*the physical or mental power or skill needed to do something*". Managerial ability mainly quantifies the extent to which managers transform resources into revenues (e.g., Demerjian, Lev, and McVay 2012). Given the differences in business models across firms and industries, an able CEO in one firm or industry may be less able in other firms or industries. However, the skill sets of generalist (relative to specialist) CEOs are probably more widely applicable across firms or industries. In other words, two CEOs may be equally able in terms of their capacity to transform resources into revenues, but they may have different outside options due to their differing experience (and,

hence, skill generality). Empirically, as shown in Custódio et al. (2013), the two constructs are also distinct. Nevertheless, to further delineate their differences, we perform the following analysis (shown in Table 9).

First, we include in the regression analysis the proxy for managerial ability (*MA_score*) from Demerjian et al. (2012) and tabulate the results in Column (1) of Table 9. Consistent with theoretical work by Arya and Mittendorf (2005) that highlights the importance of incentive pay in revealing CEO ability, we find a significantly positive association between CEO ability and incentive pay. More importantly, we continue to find a significantly positive association between the *GA-index* and incentive pay (coeff. = 0.032; *t*-stat. = 1.97) even after controlling for managerial ability.

Second, we match generalist CEOs with specialist CEOs based on managerial ability. We find that after matching, managerial ability does not differ significantly between the two groups of CEOs, suggesting a successful matching. We then run the analysis for the matched sample in Column (2) of Table 9 and find that generalist CEOs are awarded higher incentive pay (coeff. = 0.066; *t*-stat. = 1.99). While any one of the above tests in isolation may not mitigate the concern, they collectively lend support to the notion that managerial ability alone cannot account for our findings.[27]

Reconciliation with Custódio et al. (2013)

Custódio et al. (2013) show that generalist CEOs earn more than specialist CEOs. Given this finding, one may question whether the higher incentive pay awarded to generalist CEOs follows mechanically from their higher level of total compensation. To address this concern, we

[27] In untabulated analysis, we examine whether the *GA-index* as of 2016 predicts CEO incentive pay in the 2000s (i.e., 2000-2008). If the *GA-index* captures CEO ability, we would expect the *GA-index* as of 2016 to positively predict CEO incentive pay in 2000-2008. However, we do not find supporting evidence. The test thus helps us to attribute the findings to accumulated skills rather than innate ability.

control for the amount of total compensation in all of our main regressions. We also control for the interaction between the *GA-index* and total compensation. Untabulated results show that our main results continue to hold. Moreover, the interaction term is insignificant, indicating that the relation between CEO expertise and pay-performance sensitivity does not vary with the level of CEO pay. All of these results strongly indicate that our findings are not a manifestation of those of Custódio et al. (2013).

VI. CONCLUSION

Building on theoretical predictions, we test the link between CEO skill generality and executive incentive pay. We document robust evidence supporting the idea that generalist CEOs' pay is more sensitive to performance. In addition, consistent with theoretical predictions (e.g., Dutta 2008), we find that the positive relation between CEO skill generality and pay-performance sensitivity is stronger when information asymmetry about the CEO's ability is more severe.

This study contributes to the literature in several ways. First, it highlights the implications of CEO skill generality for the design of compensation contracts in the presence of information asymmetry regarding CEO ability. Second, it fills a gap in the literature by examining *how* the pay awarded to generalist CEOs is structured. In this sense, our findings are incremental to those of Custódio et al. (2013) on generalist CEOs' level of pay. Finally, our evidence also sheds light on how the labor market interacts with the design of managerial compensation contracts.

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APPENDIX

Panel A. Examples of Generalist versus Specialist CEOs

This panel reports two cases of CEO experiences and CEO compensation. The first case is for a generalist CEO and the second case is for a specialist CEO.

Case 1: Generalist CEO

Executive name: William K. Heiden Age: 59
GA-index = 1.553
Delta = $242,596

Career History

Starting date	Ending date	Company & Positions	Industry (SIC)
		AMAG Pharmaceuticals Inc.	2834
01/04/2015	30/04/2017	*CEO*	
14/05/2012	31/03/2015	*President/CEO*	
		Atara Biotherapeutics Inc.	2836
23/11/2015	present	*Independent director*	
		GTC Biotherapeutics Inc.	2836
01/10/2009	19/05/2010	*Director*	
		Conjuchem Biotechnologies Inc.	2835
28/05/2008	06/04/2010	*Director*	
		Praecis Pharmaceuticals Inc.	2834
09/05/2002	07/09/2004	*President/Chief Operating Officer*	
		Merck & Co Inc.	2834
01/04/1998	01/07/1999	*Division VP of Marketing*	
01/04/1996	31/03/1998	*Director*	
01/01/1988	31/03/1996	*Division Manager*	

Compensation as of fiscal year 2016

Item	Amount ($)
Cash compensation	632,107
Salary	632,107
Bonus	0
Non-cash compensation	2,389,717
Non-Equity Incentive Plan	543,500
Grant-Date Fair Value of Option Awards	931,787
Grant-Date Fair Value of Stock Awards	906,480
Deferred Compensation Earnings	0
Other Compensation	7,950
Total	**$3,021,824**

Case 2: Specialist CEO

Executive name: David Hatfield Age: 59
GA-index = -0.582
Delta = $79,267

Career History

Starting date	Ending date	Company & Positions	Industry (SIC)
		Edgewell Personal Care Co.	3420
01/07/2015	06/07/2016	*President/CEO*	
01/14/2007	30/06/2015	*Division President/CEO*	
01/03/2004	31/03/2007	*Division Executive VP/Chief Marketing Officer*	
01/01/1999	01/01/2004	*Regional VP*	
01/01/1997	31/12/1998	*Regional VP of Marketing*	

Compensation as of fiscal year 2016

Item	Amount ($)
Cash compensation	900,000
Salary	900,000
Bonus	0
Non-cash compensation	1,496,693
Non-Equity Incentive Plan	1,360,557
Grant-Date Fair Value of Option Awards	0
Grant-Date Fair Value of Stock Awards	0
Deferred Compensation Earnings	58,593
Other Compensation	77,543
Total	**$2,396,693**

Panel B. Variable Definition

Variable	Definition	Source
Total compensation	Total compensation (in thousands) comprises of the following: salary, bonus, other annual, total value of restricted stocks granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts and all other compensation (*tdc1*).	ExecuComp
Delta	The dollar change (in thousands) of executives' pay for a one-percentage-point change in stock price (measured in thousands), defined by Core and Guay (2002). We take natural logarithm in the regression (i.e. *Ln(Delta)*)	ExecuComp
GA-index	General ability index, is the first factor from principal component analysis of five proxies of general management ability: (1) number of past positions (*X1*), (2) number of past firms (*X2*), (3) number of industries (*X3*), (4) dummy for CEO experience (*X4*), (5) dummy for conglomerate experience (*X5*). The general ability index (*GA-index*) is calculated by applying the scores of each component to the standardized general ability component. $GA\text{-}index = 0.284X1 + 0.367X2 + 0.376X3 + 0.129X4 + 0.233X5.$	BoardEx
Generalist	An indicator variable that equals one if the CEO has a *GA-index* that is above the annual median, and zero otherwise.	BoardEx
CEO tenure	The number of years as CEO of the current firm. We take natural logarithm in the regression (i.e. *Ln(CEO tenure)*)	ExecuComp
CEO age	The current age of CEOs. We take natural logarithm in the regression (i.e. *Ln(CEO age)*)	ExecuComp
CEO career length	The number of years that elapsed since the current CEO first appears in ExecuComp as CEO in S&P 1500 firms.	ExecuComp
Dummy(External hire)	An indicator variable that equals one if the CEO is either an "industry insider and company outsider" or an "industry outsider", and zero otherwise	Eisfeldt and Kuhnen (2013)
Non-compete agreement enforcement index	The average of the state-level non-compete agreement enforcement indexes in the states where the CEO used to hold an executive position during his/her career. The original non-compete agreement enforcement index on the state-year level is extracted from Garmaise (2009).	Garmaise (2009)
Ln(Sales)	The natural logarithm of net sales (in millions) i.e., *Ln*(*sale*).	Compustat
Firm age	The number of years preceding the year that the firm has a non-missing stock price on Compustat. We take natural logarithm in the regression (i.e. *Ln(Firm age)*)	Compustat
Market to book	The market value of assets divided by book value of assets, calculated as (*at*-(*at-lt+txditc)+*(*prcc_f*×*csho*))/*at*.	Compustat
Stock return	Annual stock return, calculated as monthly compound return starting from the fourth month after fiscal year end of *t*-1 to the third month after fiscal year end of *t*.	CRSP
Leverage	Leverage ratio, defined as total liabilities divided by total assets, i.e., (*dlc* + *dltt*)/*at.*	Compustat
ROA	Return on assets, defined as EBITDA divided by total assets, i.e., *oibdp/at.*	Compustat
CFO	Operating cash flows divided by total assets, i.e., *oancf/at.*	Compustat
Sd. ROA	The standard deviation of return on assets in the past five years.	Compustat
Sd. CFO	The standard deviation of operating cash flows (scaled by total assets) in the past five years.	Compustat
Sd. Return	The standard deviation of daily stock returns in the previous 36 months.	CRSP
OO-index	The first factor from principal component analysis of four proxies of CEO outside options: (1) the natural log of the number of firms operating in the same two-digit SIC industry as the focal firm (*U1*), (2) the median of industry beta for firms operating in the same industry (*U2*), (3) the natural log of the number of firms within the 100-km radius (*U3*), (4) total product similarity (*U4*) from Hoberg and Phillips (2016). The outside options index is therefore calculated by applying the scores of each component to the standardized outside options component: $OO\text{-}index = 0.682U1 + 0.151U2 + 0.117U3 + 0.705U4.$	CRSP-Compustat, Hoberg and Phillips (2016)
Dummy(More outside options)	An indicator variable that equals to one if the CEO's outside options index is higher than the annual median.	same as above
R&D	R&D expenses (*xrd*) scaled by total sales (*sale*).	Compustat
Conglomerate	An indicator variable that equals to one if the firm operates in at least two two-digit SIC industries. Industries in which firms operate their business are obtained from Compustat Historical Segments file.	Compustat

TABLE 1. Summary Statistics

Variable	N	Mean	Std. Dev.	25th Pctl	Median	75th Pctl
Total compensation	34,344	5,191.593	9,578.778	1,365.706	2,937.932	6,125.434
Delta	34,344	1,090.983	10,372.080	69.653	192.200	545.661
GA-index	34,344	0.000	1.000	-0.748	-0.157	0.620
CEO tenure	34,344	7.908	7.057	3.000	6.000	10.000
CEO age	34,344	55.503	7.318	51.000	56.000	60.000
Ln(Sales)	34,344	7.251	1.637	6.165	7.190	8.322
Market to book	34,344	2.003	1.872	1.126	1.516	2.238
Leverage	34,344	0.230	0.206	0.059	0.210	0.344
ROA	34,344	0.130	0.117	0.082	0.129	0.183
CFO	34,344	0.095	0.102	0.051	0.094	0.142
Stock return	34,344	0.158	0.551	-0.137	0.073	0.335
Sd. ROA	34,344	0.042	0.063	0.014	0.027	0.049
Sd. CFO	34,344	0.048	0.056	0.020	0.035	0.058
Sd. Return	34,344	0.117	0.065	0.074	0.102	0.143
Firm age	34,344	25.497	17.385	11.000	21.000	40.000

Notes: Table 1 presents the summary statistics for key variables used in the analysis. The sample consists of 34,344 CEO-year observations from fiscal years 1992 to 2016, for which compensation information is available from ExecuComp and CEO expertise can be measured from their past work experience.. Variables related to compensation is in thousands of dollars. Detailed variable definitions are described in Panel B of the Appendix.

TABLE 2. Correlation Matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	***GA-index***											
(2)	***Ln(Total compensation)***	0.346[a]										
(3)	***Ln(Delta)***	0.101[a]	0.418[a]									
(4)	***Ln(Sales)***	0.278[a]	0.597[a]	0.371[a]								
(5)	***Market to book***	-0.035[a]	0.014[a]	0.217[a]	-0.174[a]							
(6)	***Leverage***	0.121[a]	0.133[a]	-0.040[a]	0.213[a]	-0.120[a]						
(7)	***ROA***	-0.071[a]	0.089[a]	0.106[a]	0.203[a]	0.175[a]	-0.080[a]					
(8)	***CFO***	-0.054[a]	0.097[a]	0.100[a]	0.162[a]	0.161[a]	-0.157[a]	0.785[a]				
(9)	***Stock return***	-0.022[a]	-0.013[b]	0.019[a]	-0.050[a]	0.047[a]	-0.032[a]	0.022[a]	0.027[a]			
(10)	***Sd. ROA***	-0.034[a]	-0.117[a]	-0.034[a]	-0.321[a]	0.241[a]	-0.039[a]	-0.298[a]	-0.208[a]	0.023[a]		
(11)	***Sd. CFO***	-0.053[a]	-0.149[a]	-0.046[a]	-0.342[a]	0.249[a]	-0.055[a]	-0.244[a]	-0.247[a]	0.029[a]	0.767[a]	
(12)	***Sd. Return***	-0.077[a]	-0.179[a]	-0.064[a]	-0.380[a]	0.137[a]	-0.041[a]	-0.221[a]	-0.180[a]	0.060[a]	0.394[a]	0.382[a]

Notes: Table 2 presents the Pearson correlation among variables in the regression analysis in the period of 1992-2016. [a], [b] and [c] denote significance at the 1%, 5% and 10% levels, respectively. Variable definitions are described in Panel B of the Appendix.

TABLE 3. CEO Skill Generality, Executive Compensation and Firm Characteristics

Variables	Specialist	Generalist	Diff. = (2) – (1)
	(1)	(2)	(3)
Ln(Sales)	6.825	7.683	0.858***
Market to book	2.039	1.967	-0.071***
Leverage	0.211	0.249	0.038***
ROA	0.129	0.131	0.002**
CFO	0.095	0.094	0.000
Stock return	0.169	0.148	-0.021***
Sd. ROA	0.044	0.041	-0.004***
Sd. CFO	0.050	0.046	-0.004***
Sd. Return	0.122	0.113	-0.008***
Firm age	21.761	29.280	7.519***
CEO age	54.820	56.195	1.376***
CEO tenure	8.348	7.463	-0.885***
Total compensation	4,103.076	6,293.761	2,190.685***
Delta	885.794	1,298.745	412.951***

Notes: Table 3 presents the means of CEO and firm characteristics for generalist versus specialist CEOs. Generalist CEOs (*Generalist*) are defined as CEOs whose general ability index (*GA-index*) is above the annual median and the remaining CEOs are categorized as specialists (*Specialist*). Column (3) displays the difference in the means between generalist and specialist CEOs. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

TABLE 4. CEO Skill Generality and Pay-Performance Sensitivity

Dependent variable		***Ln(Delta)***			
	Prediction	**(1)**	**(2)**	**(3)**	**(4)**
GA-index	+	**0.031****	**0.072*****		
		(2.16)	**(3.01)**		
Generalist	+			**0.047***	**0.070****
				(1.74)	**(2.40)**
Ln(Sales)	+	0.455***	0.387***	0.458***	0.389***
		(39.11)	(15.59)	(39.74)	(15.65)
Market to book	+	0.195***	0.139***	0.195***	0.139***
		(11.10)	(8.58)	(11.11)	(8.53)
Leverage	-	-0.450***	-0.739***	-0.447***	-0.733***
		(-6.24)	(-9.91)	(-6.20)	(-9.81)
ROA	+	0.644***	1.019***	0.635***	1.019***
		(3.72)	(7.00)	(3.66)	(6.99)
CFO	+	0.082	0.051	0.086	0.052
		(0.58)	(0.43)	(0.61)	(0.44)
Stock return	+	0.061***	0.003	0.061***	0.003
		(5.53)	(0.32)	(5.52)	(0.32)
Sd. ROA	-	0.395	0.006	0.400	0.005
		(1.41)	(0.02)	(1.43)	(0.02)
Sd. CFO	-	-0.205	0.399	-0.202	0.398
		(-0.56)	(1.21)	(-0.55)	(1.21)
Sd. Return	-	-0.778***	-0.831***	-0.763***	-0.820***
		(-3.80)	(-4.22)	(-3.73)	(-4.16)
Ln(Firm age)	?	-0.149***	0.042	-0.148***	0.034
		(-6.77)	(0.88)	(-6.71)	(0.71)
Ln(CEO age)	+	0.099	1.336***	0.112	1.572***
		(0.81)	(4.19)	(0.91)	(5.31)
Ln(CEO tenure)	+	0.666***	0.510***	0.664***	0.511***
		(32.44)	(16.38)	(32.43)	(16.41)
Constant		0.466	-4.411***	0.374	-5.393***
		(0.82)	(-3.76)	(0.67)	(-5.00)
Industry FE		Yes	No	Yes	No
Year FE		Yes	Yes	Yes	Yes
CEO FE		No	Yes	No	Yes
N		34,344	34,344	34,344	34,344
Adj. R-squared		0.424	0.783	0.424	0.783

Notes: Table 4 reports regression results of CEO pay-performance sensitivity on the generality of CEO skills. The sample contains all CEOs in ExecuComp from 1992 to 2016 with non-missing information on compensation and skill generality. The dependent variable is the natural logarithm of pay-performance sensitivity (*Ln(Delta)*).The two measures used to capture the generality of CEO skills are: a continuous variable *GA-index* and a dummy variable *Generalist* which equals one if the *GA-index* of the CEO is above the annual median and zero otherwise. Columns (1) and (2) report results based on the *GA-index*, while Columns (3) and (4) are based on *Generalist*. Columns (1) and (3) control for industry and year fixed effects, while Columns (2) and (4) control for CEO and year fixed effects. Heteroscedasticity-robust standard errors are adjusted for clustering at the firm level. The *t*-statistics are shown in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

TABLE 5. Skill Generality and Pay-Performance Sensitivity: Learning about the CEO's Ability

Dependent variable		***Ln(Delta)***	
	Prediction	**(1)**	**(2)**
GA-index	+	0.015	0.002
		(0.74)	(0.05)
GA-index × CEO career length	-	**-0.006****	
		(-2.36)	
CEO career length	+	0.095***	
		(30.21)	
GA-index × Dummy(External hire)	+		**0.081***
			(1.68)
Dummy(External hire)	?		-0.187***
			(-3.69)
Constant		1.568***	-1.589
		(7.34)	(-1.37)
Controls		Yes	Yes
Industry FE		Yes	Yes
Year FE		Yes	Yes
N		34,344	10,288
Adj. R-squared		0.387	0.533

Notes: Table 5 reports the effect of information asymmetry regarding CEOs' ability on the association between pay-performance sensitivity and CEO skill generality (*GA-index*). The dependent variable is the natural logarithm of pay-performance sensitivity (*Ln(Delta)*). *CEO career length* is the time that elapsed since the CEO first appeared in ExecuComp. *Dummy*(*External hire*) is an indicator variable that equals one if the CEO is an outsider of her current employer and zero otherwise. Each regression controls for year and industry fixed effects. Control variables, whose coefficient estimates are not shown in the table for brevity, are the same as those in Table 4. Heteroscedasticity-robust standard errors are adjusted for clustering at the firm level. The *t*-statistics are shown in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

TABLE 6. CEO Skill Generality and Pay-Performance Sensitivity: Propensity Score Matching

Panel A: The Likelihood of Hiring Generalist CEOs

Dependent variable		***Generalist***	
	Prediction	**(1)**	**(2)**
		Before-matching	**After-matching**
Ln(Sales)	+	0.276***	-0.034
		(9.74)	(-0.82)
Tobin Q	?	-0.013	-0.012
		(-0.76)	(-0.37)
ROA	-	-0.627*	0.378
		(-1.95)	(0.70)
Stock return	-	-0.127*	-0.072
		(-1.92)	(-0.73)
Leverage	+	0.061	0.082
		(0.31)	(0.24)
R&D	+	1.481**	0.176
		(2.01)	(0.17)
Sd. ROA	?	2.672***	1.009
		(4.11)	(0.68)
Sd. Return	?	-1.180	-0.789
		(-1.46)	(-0.80)
Conglomerate	+	0.108	0.021
		(1.36)	(0.18)
Constant		-2.153**	1.692
		(-2.57)	(1.25)
Industry FE		Yes	Yes
N		3,892	1,510
Adj. R-squared		0.060	0.005

Panel B: Descriptive Statistics for the Propensity Score Matched Sample

	(1)	**(2)**	**(1) – (2)**	
Firm characteristics	**Specialist**	**Generalist**	**Difference**	***p*-value**
Ln(Sales)	7.414	7.395	0.019	0.818
Tobin Q	1.974	1.941	0.033	0.719
ROA	0.111	0.119	-0.008	0.320
Stock return	0.154	0.133	0.021	0.447
Leverage	0.227	0.228	-0.001	0.932
R&D	0.041	0.039	0.002	0.698
Sd. ROA	0.045	0.043	0.002	0.392
Sd. Return	0.121	0.120	0.001	0.797
Conglomerate	0.449	0.451	-0.002	0.920

Panel C: Regression Analysis

Dependent variable		***Ln(Delta)***		
	Prediction	**(1)**	**(2)**	**(3)**
Generalist	+	**0.078****	**0.168*****	**0.150*****
		(2.15)	**(2.75)**	**(2.69)**
Constant		5.126***	0.128	-0.454
		(80.62)	(0.10)	(-0.38)
Controls		No	Yes	Yes
Industry FE		No	No	Yes
Year FE		No	No	Yes
N		7,691	7,691	7,691
Adj. R-squared		0.0011	0.4637	0.5280

Notes: Table 6 presents estimates of the difference in CEO pay-performance sensitivity between generalist CEOs and matched specialists. A CEO is defined as a generalist (*Generalist*) if his/her general ability index (*GA-index*) is above the median of the annual *GA-index* distribution and the remaining CEOs are categorized as specialists. Panel A reports the procedure of constructing the matched sample using propensity score matching in which a Probit model is estimated each year to predict the likelihood of firms' hiring a new generalist CEO. Net sales, book leverage, R&D/sales ratio, the conglomerate dummy, Tobin's Q, ROA, stock return, ROA volatility, stock return volatility as well as firm's two-digit SIC industry membership in the previous year are used to predict firms' decision to hire generalists. Each newly-hired generalist CEO is matched to one specialist CEO who is hired in the same year, using nearest-neighbor matching. Panel B compares the firm characteristics between the generalist CEO sample and the matched specialist CEO sample, with the *p*-value reported in the last column. Panel C examines whether pay-performance sensitivity differs between generalists and the matched specialists. The dependent variable is the natural logarithm of *Delta* (*Ln(Delta)*). Control variables, whose coefficient estimates are not shown in the table for brevity, are the same as those in Table 4. Heteroskedasticity-robust standard errors are adjusted for clustering at the firm level. The *t*-statistics are shown in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

TABLE 7. Instrumental Variable Regressions

	Prediction	(1) First stage	(2) Second stage
Dependent variables		***GA-index***	***Ln(Delta)***
GA-index	+		**0.200****
			(2.02)
Non-compete agreement enforcement index	+	**0.008****	
		(2.00)	
Constant		-6.716***	-0.835
		(-22.77)	(-1.02)
Controls		Yes	Yes
Industry FE		Yes	Yes
Year FE		Yes	Yes
N		15,709	15,709
Adj. R-squared		0.196	0.359
Durbin endogeneity χ^2 test		16.123	
1st-stage regression F-statistic		44.81	

Notes: Table 7 presents results from two-stage least squares regressions in which the non-compete clause enforcement index is used as the instrumental variable for the *GA-index*. Column (1) reports the result from the first-stage regression and Column (2) shows the second-stage estimates. In the second-stage regression, the natural logarithm of *Delta* (*Ln(Delta)*) is regressed on the instrumented *GA-index* estimated from the first stage. The non-compete agreement enforcement index is defined as the average of the state-level non-compete agreement enforcement indexes in the states where the CEO used to hold an executive position during his/her career. The original non-compete agreement enforcement index on the state-year level is extracted from Garmaise (2009). All specifications control for year and industry fixed effects. Control variables, whose coefficient estimates are not shown in the table for brevity, are the same as those in Table 4. The Durbin test statistic is provided to test if the *GA-index* is endogenous or not, with the null hypothesis as the *GA-index* being exogenous. Heteroscedasticity-robust standard errors are adjusted for clustering at the firm level. The *t*-statistics are shown in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

TABLE 8. The Effect of Outside Options

Panel A: Outside Options and Pay-Performance Sensitivity

Dependent variable		***Ln(Delta)***	
	Prediction	**(1)**	**(2)**
OO-index	+	**0.338*** **	
		(9.07)	
Dummy(More outside options)	+		**0.207*** **
			(4.87)
Constant		-1.091*	-1.083*
		(-1.79)	(-1.75)
Controls		Yes	Yes
Industry FE		Yes	Yes
Year FE		Yes	Yes
N		27,938	27,938
Adj. R-squared		0.426	0.420

Panel B: Interacting Outside Options Index with Information Asymmetry Measures

Dependent variable		***Ln(Delta)***	
	Prediction	**(1)**	**(2)**
OO-index	+	0.408***	0.211***
		(7.23)	(3.17)
CEO career length	+	0.278***	
		(7.65)	
OO-index × CEO career length	**-**	**-0.044***	
		(-1.79)	
Dummy(External hire)	?		-0.014
			(-0.24)
OO-index × Dummy(External hire)	**+**		**0.191*** **
			(2.67)
Constant		-0.755	-1.067
		(-1.24)	(-0.99)
Controls		Yes	Yes
Industry FE		Yes	Yes
Year FE		Yes	Yes
N		27,938	8,500
Adj. R-squared		0.433	0.543

Notes: Table 8 presents regression results related to the effect of outside options on CEO pay-performance sensitivity (*Ln(Delta)*). We construct an outside options index (*OO-index*) by extracting the principal component of four indicators that intend to measure CEOs' outside options. We regress CEO pay-performance sensitivity on both the *OO-index* and a dummy variable (*Dummy(More outside options)*) that equals one if the CEO's outside options index is above the annual median. Panel B reports results of regressions that examine the effect of information asymmetry regarding CEOs' ability on the association between pay-performance sensitivity and the outside options index. *CEO career length* is the time elapsed since the CEO first appeared in ExecuComp. *Dummy*(*External hire*) is an indicator variable that equals one if the CEO is an outsider of her current employer and zero otherwise. Each specification controls for year and industry fixed effects. Heteroscedasticity-robust standard errors are adjusted for clustering at the firm level. The *t*-statistics are shown in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

TABLE 9. General Skill versus Managerial Ability

Dependent variable		***Ln(Delta)***	
	Prediction	**(1)**	**(2)**
GA-index	+	**0.032****	
		(1.97)	
MA_score	+	0.371***	
		(3.39)	
Generalist	+		**0.066****
			(1.99)
Constant		1.307**	0.826
		(2.14)	(1.08)
Sample		Full	Matched
Controls		Yes	Yes
Industry FE		Yes	Yes
Year FE		Yes	Yes
N		30,140	17,408
Adj. R-squared		0.424	0.433

Notes: Table 9 reports the results of regressions controlling for managerial ability. In Column (1), we take into account the effect of CEO ability on pay-performance sensitivity by controlling for managerial ability score. The managerial ability score (*MA_score*), constructed by Demerjian, et al. (2012), is defined as the part of firm efficiency that could not be explained by firm-specific characteristics. Column (2) reports regression results using a sample in which generalist CEOs are matched with specialist CEOs based on managerial ability. Specifically, we run a Probit model in which the managerial ability score (*MA_score*) as well as firm's two-digit SIC industry membership are included to predict firms' decision to hire generalists. Each generalist CEO is matched to a specialist CEO in the same year, using nearest-neighbor matching. All the specifications control for industry and year fixed effects. Control variables are the same as those in Table 4. Heteroscedasticity-robust standard errors are adjusted for clustering at the firm level. The t-statistics are shown in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.