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Are more able CEOs getting more compensated? Evidence from the pay-for-performance sensitivity of equity-based incentives

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ABSTRACT

This study investigates whether the managerial ability of a chief executive officer (CEO) is associated with the CEO's pay-for-performance sensitivity (PPS) of the equity-based compensation. We predict that more talented CEOs receive a higher PPS of equity incentives. Using the managerial ability score (Demerjian, Lev, & McVay, 2012) and PPS measures of options and stocks (Core & Guay, 1999), we find that a CEO's PPS of the equity-based compensation is significantly increasing in the CEO's ability. We also find that the association between managerial ability and the PPS of stock incentives is more evident for small firms. Furthermore, our results show that high ability CEOs are associated with a steeper PPS of option incentives, especially when they are not near retirement. Together, our findings suggest that firms generally incorporate the relative efficiency factor of CEO's ability in designing the CEO's equity-based compensation contracts, and thus the cross-sectional variation in the CEO's PPS is positively influenced by the CEO's ability.

Data availability: Data used in this study are available from public sources identified in the study.

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1. Introduction

In this study, we examine the association between managerial ability and the CEO pay-for-performance sensitivity (PPS, hereafter) of equity-based compensation. Recently, Demerjian, Lev, and McVay (2012) develop a measure of managerial ability, based on managers' efficiency in generating revenues, which captures an economically significant manager-specific aspect of ability. Research also indicates that incentive compensation plans play an important role in screening managers or inducing them to self-select the reward types that can reveal their ability (Arya & Mittendorf, 2005; Banker, Darrrough, Huang, & Plehn-Dujowich, 2013; Darrrough & Melumad, 1995; Lazear, 2000). Thus, how a CEO's ability, based on the manager-specific aspect of ability, is associated with the CEO's PPS of equity-based compensation is an empirical research question.

Extant theoretical literature (e.g., Darrrough & Melumad, 1995; Milbourn, 2003) suggests that, to maximize firm value, the principal of the firm gives higher incentives to the high-ability manager to induce him/her to exert more effort. For instance, Darrrough and Melumad (1995) show that firms use PPS in compensation contracts to attract better managers and to compensate them according to their ability. Milbourn (2003) also proposes a theory that a CEO's stock-based PPS increases in the CEO's reputation at the time of the compensation contract

(Theorem 1). This suggests that, with greater confidence in their ability to better anticipate future prospects and to more efficiently operate their firms, superior managers are likely to receive a steeper PPS in their equity-based incentive compensation. Recently, Demerjian et al. (2012) show that more able CEOs are perceived to have higher productivity and thus are expected to deliver a higher marginal outcome for the same level of effort, i.e., they are more efficient in creating value for the firm. Moreover, exerting effort may become more costly for more talented managers, because they could be already wealthy enough and prefer more leisure time (Edmans & Gabaix, 2011). Together, prior evidence suggests that stronger incentives will be needed to induce greater efforts from such high ability CEOs. Therefore, we predict that if a CEO receives stock and options as compensation, the CEO's managerial ability is positively associated with the PPS of his/her equity-based incentive provision.

In this study, we utilize the direct measures of managerial ability, ability scores, and ability rankings developed by Demerjian et al. (2012).¹ With respect to the measures of PPS, Core and Guay (1999, 2002) estimate the PPS measures of equity incentives, stocks, and options, based on six inputs (stock price, exercise price, time-to-maturity, expected stock return volatility, expected dividend yield, and the risk-free rate), to calculate the Black–Scholes value. They then multiply the partial derivative of the Black–Scholes value with respect

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to stock price and the 1% change in stock price representing the sensitivity of the stock option value to a 1% change in stock price. Following [Core and Guay \(1999, 2002\)](#), we measure the PPS of stocks and options and use three measures – the PPS of options, the PPS of stocks, and the PPS of the sum of options and stocks – as our dependent variables.

Consistent with our prediction, we find that the PPS of equity-based compensation is steeper for firms that hire more talented CEOs, indicating that option and/or stock components of compensation for more talented CEOs are more sensitive to a 1% change in stock price. In terms of the economic significance of the estimated coefficients, our results suggest that one standard deviation of 0.132 increase in the managerial ability score is associated with a 4.1%, 6.9%, and 5.1% increase in the raw values of the PPS of options, stocks, and overall equity incentives, respectively.² We also find evidence that the association between managerial ability and the PPS of stock incentives is more evident for small firms. The results further show that higher ability CEOs are associated with a steeper PPS of option incentives, especially when they are not near retirement. Finally, we find that firms provide high ability CEOs with a higher PPS of option and stock & option incentives when the CEOs are internally promoted.

Our study makes the following contributions. First, unlike prior studies, we use direct and more precise measures of managerial ability, which capture manager-specific aspects of managerial ability. Prior studies ([Banker et al., 2013](#); [Falato, Li, & Milbourn, 2015](#); [Graham, Li, & Qiu, 2012](#); [Milbourn, 2003](#); [Nguyen & Nielsen, 2014](#)) generally rely on several measures (e.g., reputation, firm size, past abnormal performance, media exposures, education, credential, or manager-fixed effects) as surrogates for managerial ability. As indirect proxies, these measures are broader, potentially less precise, and more difficult to attribute solely to the manager versus the firm, because they reflect significant aspects of the firm that are outside of management's control ([Demerjian et al., 2012](#)). Media exposures (e.g., number of Dow Jones article counts, as in [Milbourn \(2003\)](#)), for example, are more prevalent for large firms, and abnormal stock performance is affected by many factors other than merely managerial ability.³ In contrast, the ability measures proposed by [Demerjian et al. \(2012\)](#) contain less noise and better capture a manager-specific component of ability. In fact, [Demerjian et al. \(2012\)](#) show that their proposed measures outperform the existing ability measures, including past abnormal performance, CEO tenure, and media mentions.⁴

Second, our study contributes to the literature on optimal compensation contracts, especially PPS and strategy (e.g., [Darrough & Melumad, 1995](#)), by showing that the relative efficiency measure in generating revenue (i.e., creating more outputs from equal inputs) as a proxy for managerial ability plays an important role in designing executive incentive contracts. For instance, more able CEOs are likely to generate higher revenue for a given level of resources while maximizing the efficiency of the resources used. It is intuitively appealing to assess managers based on the efficiency with which they generate revenues,

because such an approach is consistent with the firms' goal of profit maximization. Thus, our findings have an implication for shareholders, in that they will be able to take advantage of the higher marginal value created by the more able CEOs who are offered stronger equity incentives.

The remainder of this paper is organized as follows. In the next section, we discuss previous literature and develop our hypothesis. We discuss the research design in [Section 3](#) and empirical results in [Section 4](#). [Section 5](#) discusses additional analyses. We conclude the paper in [Section 6](#).

2. Literature review and hypothesis development

2.1. Related literature on managerial ability and PPS

[Darrough and Melumad \(1995\)](#) propose a theory that the PPS relation is motivated by the desire to attract better managers and to compensate them according to their type.⁵ Assuming that there are two types of managers—good and bad (good managers are more productive than bad managers), they argue that when talent is transferable, hiring better managers requires compensation that is more performance sensitive. In a related study, [Milbourn \(2003\)](#) proposes a theory that the optimal PPS of the compensation contract is increasing in the reputational assessment of the CEO at the time of contract ([Theorem 1](#)). According to his theory, as the incumbent CEO's ability increases, the relative weight that the stock price places on the CEO's contribution increases, and thus the optimal contract is made more sensitive to the firm's stock price. Alternatively, “as the incumbent CEO's reputation decreases, the stock price more heavily weights the value of a potential replacement, thereby minimizing its sensitivity to the incumbent CEO's effort choices” ([Milbourn 2003, p. 235](#)). [Milbourn \(2003\)](#) utilizes four indirect measures, including CEO tenure, external or internal appointment, the number of business-related articles in which the CEO's name appears, and industry-adjusted returns, as proxies for CEO reputation. He finds empirical evidence that CEOs with a high reputation have higher PPS.

Our study extends but differs from [Milbourn \(2003\)](#) in several ways. First, unlike [Milbourn \(2003\)](#), we use a direct measure of managerial ability: the managerial score proposed by [Demerjian et al. \(2012\)](#). [Demerjian et al. \(2012\)](#) argue that their measures better capture the manager-specific component of ability. Most measures used in prior studies ([Banker et al., 2013](#); [Graham et al., 2012](#); [Milbourn, 2003](#)) contain noise, and thus it is difficult to attribute them solely to the manager ([Demerjian et al., 2012](#)). That is, existing measures reflect significant aspects of the firm that are outside of management's control. In contrast, the ability measures proposed by [Demerjian et al. \(2012\)](#) are more precise than existing measures and capture an economically significant, manager-specific component of ability. Second, we focus on measures of a manager's relative efficiency to generate revenue as a surrogate for managerial ability, where efficient managers are those who generate more revenue from a given set of inputs. It may be more intuitive for firms to evaluate their managers' ability based on the relative efficiency with which they generate revenue, because this approach is in line with profit maximization. Finally, we control for firm-fixed effects, thereby better capturing manager-specific aspects. The assumption of constant firm effects may not fully remove the dependence between observations and therefore might produce biased standard errors if the firm effects are indeed not fixed ([Gow, Ormazabal, & Taylor, 2010](#); [Petersen, 2009](#)). That is, there might be unobservable effects that vary across firms but are constant over time (e.g., CEO PPS that is firm specific but cannot be fully proxied by size or other variables). In this sense, including firm-fixed effects would better control for these unobservable effects.

² To gauge the economic significance of the estimates, we calculate the effect of one standard deviation increase in ability score on the PPS of each equity-based incentive measure. Since we use the log specification for our incentive measures, we transform these logarithmic measures to raw values (i.e., $\exp(\text{sd} \times \text{coeff.}) - 1$) when we calculate the economic significance of the coefficients. Details are discussed in the empirical results section.

³ Similarly, manager-fixed effects are difficult to implement as a measure of managerial ability, because the firm may experience at least one manager turnover during the sample period examined to differentiate manager-fixed effects from firm-fixed effects.

⁴ As discussed in [Demerjian et al. \(2012\)](#), however, the managerial ability measures have some limitations for the following reasons: 1) there are measurement errors in some accounting variables that are used to estimate firms efficiency scores and managerial efficiency scores; 2) the regression processes may omit some factors that affect firm efficiency and managerial ability due to unavailable data; and 3) using residuals as the measure of managerial ability may contain some factors that are not attributable to managerial ability. Moreover, the ability measure in [Demerjian et al. \(2012\)](#) should be interpreted more as a measure of managerial efficiency in generating revenues and thus is correlated with firm performance. This measure may thus create a potential reverse causality problem. We address and discuss this issue in our additional analyses section. We thank an anonymous reviewer for this insight.

⁵ They also show that the optimal PPS relation does not need to be large, which is consistent with [Jensen and Murphy \(1990\)](#).

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