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Executive Pay Disparity and the Cost of Equity Capital

Zhihong Chen, Yuan Huang, and K. C. John Wei*

Abstract

Executive pay disparity, as measured by chief executive officer (CEO) pay slice (CPS), is positively associated with the implied cost of equity, even after controlling for other determinants of the cost of equity. The difference in the cost of equity can explain 43% of the difference in the valuation effect attributable to CPS reported by Bebchuk, Cremers, and Peyer (2011). Further analysis shows that the positive association is stronger when agency problems of free cash flow are more severe and when CEO succession planning is more important. Our evidence suggests that a large CPS is associated with CEO entrenchment and high succession risk.

I. Introduction

After having focused on absolute pay commanded by corporate executives for decades, investors, rating agencies, and regulators have begun to pay more attention to pay disparity in the boardroom. Corporate governance advisor Institutional Shareholder Services (ISS) lists internal pay equity as one of the key considerations in executive pay (Ho and Epstein (2008)). Moody also sees a large pay differential between the chief executive officer (CEO) and other senior executives as a red flag for credit risk (Moody (2006)). The Dodd-Frank Wall Street Reform and Consumer Protection Act requires listed companies to disclose the ratio of a CEO's pay to the median pay of all other employees of the company.

*Chen, chenzhh@cityu.edu.hk, College of Business, City University of Hong Kong, Tat Chee Ave, Kowloon, Hong Kong; Huang, afyhuang@polyu.edu.hk, School of Accounting and Finance, Hong Kong Polytechnic University, Hunghom, Kowloon, Hong Kong; and Wei, johnwei@ust.hk, School of Business and Management, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong. The authors thank Martijn Cremers (the referee) and Paul Malatesta (the editor) for insightful comments and suggestions. The authors also appreciate the helpful comments received from Peter Swan (China International Conference in Finance (CICF) discussant) and the seminar participants at City University of Hong Kong, Hong Kong University of Science and Technology, National Chengchi University, Southwestern University of Finance and Economics, Wuhan University, the 2011 Asian Finance Association Conference in Macau, and the 2011 CICF in Wuhan, China, and Alice Cheung for excellent editorial assistance. Wei acknowledges financial support from Hong Kong University of Science and Technology Business School Research Grant (G4911). Chen acknowledges financial support from the Hong Kong Research Grants Council (Project 141112). All remaining errors are ours.

All of these indicate that executive pay disparity has become a hot issue, especially after the recent bailouts of financial companies, with their risk-taking behavior, to prevent them from collapsing in the face of the subprime mortgage crisis.

In this paper, we investigate the association between executive pay disparity and the cost of equity capital. Understanding the association is important because the cost of capital is one of the key considerations for managers in their capital budgeting and corporate financing decisions. In fact, the cost of capital is a more direct yardstick of corporate investment and financing decisions than is firm valuation. A higher cost of capital means fewer positive net present value (NPV) projects, leading to fewer growth opportunities. In addition, the cost of capital summarizes an investor's risk-return trade-off in his resource allocation decision (Pástor, Sinha, and Swaminathan (2008)).

In general, there are two perspectives on executive pay disparity. The tournament perspective views the large pay gap between the CEO and other executives as the prize for a tournament in which players compete for the CEO position (Lazear and Rosen (1981), Kale, Reis, and Venkateswaran (2009)). A large pay disparity motivates non-CEO senior executives to work hard and to invest in firm-specific human capital. This, in turn, helps build a large pool of skilled internal candidates for the CEO position. The availability of skilled internal candidates not only reduces the entrenchment of the incumbent CEO by increasing the bargaining power of the board, but it also reduces CEO succession risk. Therefore, this perspective predicts a negative association between executive pay disparity and the cost of capital.

On the other hand, the managerial power perspective (Bebchuk and Fried (2003)) suggests that pay reflects the bargaining power of executives, and therefore a large pay disparity between the CEO and other senior executives indicates an entrenched CEO. An entrenched CEO is associated with a more severe agency problem during his tenure (Bebchuk, Cremers, and Peyer (2011)). In addition, an entrenched CEO may obstruct succession planning, especially the grooming of internal successor candidates, to further entrench himself (Rajan and Wulf (2006), Masulis and Mobbs (2011)). This leads to high succession risk. As a result, the managerial power perspective predicts a positive association between executive pay disparity and the cost of capital.

Prior studies on pay disparity focus on the economic consequence of firm value and performance. Kale et al. (2009) find a positive contemporaneous association between executive pay disparity and firm value as well as accounting performance. In contrast, Bebchuk et al. (2011) find that a large executive pay inequity leads to lower future firm value and accounting performance. As a whole, this line of research provides inconclusive evidence. Furthermore, since firm value is determined by both the expected future cash flows and growth rates (the cash flow effect) and the cost of capital (the discount rate effect), it is not clear from the above findings if large executive pay disparity implies a higher cost of equity capital.

A recent study by Cooper, Gulen, and Rau (2009) finds that higher CEO incentive pay is associated with lower future realized returns. They do not examine the relation between executive pay disparity and future stock returns directly.

Moreover, they examine ex post realized returns. As pointed out by a number of researchers (e.g., Elton (1999), Stulz (1999), Gebhardt, Lee, and Swaminathan (2001), and Pástor et al. (2008)), realized returns may not be an appropriate proxy for a firm's cost of equity capital. Realized returns not only capture the variations in a firm's cost of equity, they also reflect the variations in expected cash flows and growth opportunities, the shocks to cash flows and growth opportunities, and the shocks to the discount rates (Campbell (1991)). In this study, we rely on the ex ante cost of equity implied in stock prices and analysts' earnings forecasts. Specifically, the ex ante cost of equity is computed as the internal rate of return that equates the current stock price with the present value of all future cash flows to common shareholders, or as the rate that the market implicitly uses to discount all future cash flows (Gebhardt et al.). One important advantage of the implied cost of equity models is that they explicitly control for cash flow and growth effects in order to separate the discount rate effect from a firm's valuation (Hail and Leuz (2006)). Pástor et al. analytically show that under plausible conditions, the implied cost of equity is perfectly correlated with the conditional expected stock return.

Using 13,454 firm-year observations in the United States from 1993 to 2007, we provide evidence that is consistent with the managerial power perspective, but inconsistent with the tournament perspective. Our main measure of executive pay disparity is the relative CEO pay, or more specifically, the CEO pay slice (CPS) used by Bebchuk et al. (2011), defined as the ratio of the total CEO pay to the sum of the total pay of the top 5 executives. We find that executive pay disparity has a significantly positive association with the implied cost of equity capital even after controlling for firm characteristics that may affect the cost of equity capital. The positive association is statistically robust to various model specifications and alternative measures of the cost of equity and executive pay disparity. We conduct a battery of robustness tests and conclude that the association is not likely to be driven by biases due to the endogeneity of executive pay disparity. The association is also economically significant. Based on the results of our baseline model, an increase in CPS from the 10th percentile to the 90th percentile increases the cost of equity by 13.9 basis points (bp). Under reasonable assumptions, 43% of the valuation effect due to CPS reported by Bebchuk et al. (2011) is attributable to the difference in the cost of equity capital.

We then investigate to what extent the positive association is due to an agency problem during the incumbent CEO's tenure (i.e., the monitoring hypothesis) or a lack of succession planning leading to a high succession risk (i.e., the succession risk hypothesis). The former argument predicts a more pronounced positive association when monitoring is more important. The latter argument predicts a stronger positive association when CEO succession planning is more important. To test these predictions, we partition the sample by our proxies for the importance of monitoring and the importance of succession planning for a firm. We then investigate how the association between CPS and the cost of equity varies with these proxies.

We measure the importance of monitoring the incumbent CEO by the severity of agency problems of free cash flow (Jensen (1986)). A firm with high (low) operating cash flow and low (high) Tobin's Q (a proxy for investment opportunities) is defined as having the most (least) severe agency problem of free cash flow. Since Bebchuk et al. (2011) have shown that CPS is negatively associated with Tobin's Q and future accounting performance, our partitioning variables may suffer from an endogeneity bias. To mitigate this potential bias, we use residual Tobin's Q (or residual operating cash flow) in the analysis, where the residual comes from the regression of Tobin's Q (or operating cash flow) on CPS.

We measure the importance of CEO succession planning by considering the likelihood that the CEO will leave in the near future and the cost of hiring an external CEO successor. CEO succession planning is more important for a firm that expects its incumbent CEO to leave in the near future but sees a relatively high cost of hiring an external successor. We estimate a logit model of CEO turnover to construct an ex ante measure of CEO turnover likelihood. To measure the costliness of hiring an external successor, we rely on industry homogeneity (Parrino (1997)). Industry homogeneity is computed as the industry mean value of the partial correlation between a firm's returns and industry returns, controlling for the market returns. Firms operating in a homogenous industry are likely to adopt similar production technologies and compete in similar product markets. Therefore, the gap in firm-specific skills between the internal and external successors is smaller in a more homogenous industry, resulting in a relatively lower cost of hiring an external successor.

We find supportive evidence for both the monitoring and the succession risk hypotheses. In particular, we find that the positive relation between CPS and the cost of equity capital is more pronounced in firms with more severe agency problems of free cash flow (i.e., firms with high operating cash flow but low investment opportunities). We also find that the positive association is more pronounced when CEO succession planning is more important (i.e., when firms operate in a less homogenous industry and the ex ante likelihood of the CEO's leaving is higher).

Executive pay disparity is correlated with corporate governance (Bebchuk et al. (2011)). In a robustness check, we control for the influence of corporate governance on executive pay disparity by using *residual executive pay disparity* in our analysis, where the residual comes from a regression of executive pay disparity on a series of corporate governance-related variables that potentially affect the cost of equity. We still find a positive relation between *residual executive pay disparity* and the cost of equity, suggesting that executive pay disparity captures additional information beyond the agency problem. Finally, uncertainty associated with a CEO turnover, as measured by the increases in stock return volatility around the time of the CEO turnover, is significantly higher for firms with a larger CPS before the turnover. The result provides further support for the hypothesis that a large executive pay disparity indicates a high succession risk.

The rest of the paper is organized as follows: Section II develops the hypotheses. Section III describes the research design. Section IV investigates the main effect of CPS on the cost of equity and presents the results of our robustness tests. Section V examines the cross-sectional variation in the association between CPS and the cost of equity. Section VI provides further analysis on the effect of CPS after controlling for corporate governance mechanisms. Section VII investigates the association between CPS and the change in volatility around

CEO turnovers. Finally, Section VIII discusses the contributions and concludes the paper.

II. Hypothesis Development

Executive pay disparity can be viewed from two perspectives. The 1st perspective views executive pay disparity as a reflection of the relative power between the CEO and other senior executives. We call this view the *managerial power* perspective. A 2nd perspective, which we call the *tournament* perspective, sees a large CEO pay disparity as a huge incentive for other senior executives to compete for the CEO position (Lazear and Rosen (1981), Kale et al. (2009)). Both hypotheses predict that CEO pay disparity can be related to the cost of equity. While the managerial power hypothesis predicts a positive relation, the tournament hypothesis predicts a negative relation.

A. The Managerial Power Hypothesis

The managerial power hypothesis predicts that a larger CEO pay disparity is related to a higher cost of equity because it is associated with more CEO entrenchment and a greater CEO succession risk. Under this perspective, an excessively large pay disparity between the CEO and other senior executives suggests the entrenchment of the incumbent CEO and a weak board (Bebchuk and Fried (2003)). Consistent with this view, Bebchuk et al. (2011) show that a large CEO pay disparity is associated with low CEO turnover sensitivity to performance. A series of studies in agency theory (Jensen and Meckling (1976)) suggest that investors demand a higher rate of return for an entrenched CEO for reasons such as a higher systematic risk due to overinvestment, inefficient merger and acquisition decisions, higher monitoring cost, more severe information asymmetry, higher estimation risk, and investors' lower willingness to share the idiosyncratic risk.[1]

In addition, in order to remain firmly entrenched, the incumbent CEOs may obstruct effective CEO succession planning. In particular, they may be unwilling to groom high quality internal CEO successor candidates or may even hinder the career development of subordinate managers (Rajan and Wulf (2006)). Poor inside promotion opportunities push talented subordinate managers to seek outside opportunities and reduce the pool of skilled internal candidates. Consistent with this notion, Masulis and Mobbs (2011) find that inside directors with high ability are rare in firms with more entrenched CEOs. The lack of skilled internal

[1] Albuquerque and Wang (2008) and Garmaise and Liu (2005) suggest that entrenched managers increase a firm's systematic risk because they overinvest to gain private benefits. Bebchuk et al. (2011) show that executive pay disparity is associated with inefficient merger and acquisition decisions. According to Lombardo and Pagano (2002), investors need to pay higher monitoring costs to safeguard their payoffs when managers are entrenched, and these must be compensated for with a higher required rate of return. To hide their opportunistic behavior, entrenched CEOs may engage in the manipulation of financial reporting and disclosures (Bowen, Rajgopal, and Venkatachalam (2008)), which increases the cost of equity (Francis, LaFond, Olsson, and Schipper (2004)). Merton's (1987) incomplete market hypothesis suggests that if shareholders are unwilling to hold shares of firms with entrenched CEOs (Ferreira and Matos (2008)), the idiosyncratic risk is shared by fewer investors, who consequently demand a higher expected return.

replacements for incumbent CEOs reduces the bargaining power of the boards and further entrenches the incumbent CEOs. Furthermore, the lack of skilled internal successor candidates increases CEO succession risk.

CEO succession is one of the most important and risky events during the life of a company (Vancil (1987)), and it is not a rare event.[2] CEO succession brings large risks to a firm.[3] Shareholders value effective succession planning that leads to smooth CEO succession (Shen and Cannella (2003), Zhang and Rajagopalan (2004)). Consistent with this notion, there is an increasing demand by investors and also regulators for effective CEO succession planning.[4] Grooming quality internal candidates is one of the most important planning tasks (Bower (2007)). It is through this process that internal candidates obtain the necessary firm-specific knowledge and skills (Vancil (1987), Hermalin and Weisbach (1988)). If subordinate managers do not have enough opportunities to gain the relevant skills and expertise needed for the CEO position, they will face a steep learning curve after succession. Alternatively, the board is forced to conduct a risky and costly outside search. Both lead to great succession risk. The above discussions lead to our 1st hypothesis:

Hypothesis 1. Under the managerial power hypothesis, executive pay disparity is positively associated with the cost of equity capital.

B. The Tournament Hypothesis

The tournament hypothesis argues that a large pay gap between the CEO and other senior executives may represent a huge incentive for those competing for the CEO position (Lazear and Rosen (1981), Kale et al. (2009)). To run a firm, a CEO requires firm-specific skills. However, developing these skills has no benefits for subordinate managers with no intention to stay for the long term because these skills become useless when they leave the firm. Thus, incentives must be provided for subordinate managers to stay and develop these skills. In addition, neither firm-specific skills nor the inputs needed to develop them are observable. Taylor (1995) suggests that contracting cannot induce competitors to make unobservable investments for the purpose of developing unobservable outputs, but a

[2]For example, Vancil (1987) shows that for the entire population of newly appointed CEOs in the United States between 1960 and 1984, only ½ remained in the position after 6 years. A cursory analysis of the ExecuComp data also suggests that on average about 10% of the firms covered by ExecuComp experienced at least one CEO departure each year between 1993 and 2005. This suggests that, in any given year, the unconditional probability of a CEO turnover for a typical firm in the next 5 years is about 60%.

[3]Selecting the wrong CEO can damage the organization as a whole and can cause a depletion of talent at the top of the firm. CEO succession is also likely to be accompanied by significant disruption, instability, and uncertainty for employees and for a firm's business strategies (Coyne and Coyne (2007)). Clayton, Hartzell, and Rosenberg (2005) find a significantly long-lived increase in share price volatility following a CEO turnover.

[4]For example, the Securities and Exchange Commission (SEC) now considers CEO succession a key part of corporate risk management and recommends greater transparency and shareholder disclosure about the management of succession risk (McCool (2009)). Institutional investor LIUNA (Laborers' International Union of North America) filed proposals on CEO succession at more than 70 companies. Moody and Standard & Poor's include succession planning factors in their credit ratings.

tournament wherein competitors compete for the top award can solve the problem. Schwarz and Severinov (2010) also analytically show that a tournament for promotion motivates contenders to invest in firm-specific skills. Consequently, a big tournament prize helps build a large pool of quality internal CEO candidates and reduces the risk associated with CEO succession.

In addition, a large pool of skilled internal candidates represents credible replacements for the incumbent CEO. This increases the bargaining power of the board and reduces the incentives of the incumbent CEO to behave opportunistically (Masulis and Mobbs (2011)). Furthermore, competition for the big prize associated with the CEO position can induce inside successor candidates to reveal their private information, which is necessary for the board to monitor the CEO (Raheja (2005)). The previous discussions lead to our 2nd hypothesis.

Hypothesis 2. Under the tournament hypothesis, executive pay disparity is negatively associated with the cost of equity capital.

C. Cross Variation in the Association between Executive Pay Disparity and the Cost of Equity

The previous two perspectives also lead to different predictions on the conditional association between CEO pay disparity and the cost of equity. The managerial power perspective views a large pay disparity as a symptom of entrenched CEOs, which suggests not only a severe agency problem during tenure but also high succession risk due to poor succession planning. Therefore, this perspective predicts a more pronounced *positive* association between pay disparity and the cost of equity when i) monitoring is more important, and ii) succession is perceived as more urgent and it is more costly to find a suitable external CEO successor.

The 1st prediction follows from Garmaise and Liu (2005), who show that in the presence of information asymmetry, management control over investment decisions increases the cost of equity more when managers are more dishonest. Chen, Chen, and Wei (2011) further show empirical evidence that shareholders demand a higher risk premium for firms with weak shareholder rights, when the agency problem of free cash flow (Jensen (1986), Lang, Stulz, and Walkling (1991)) is more severe (i.e., monitoring is more important). We follow Chen et al. (2011) to use free cash flow to proxy for the demand for monitoring. For the 2nd prediction, the likelihood of CEO succession in the near future matters because identifying and grooming a skilled internal successor is a long process (Bower (2007)). Parrino (1997) argues that the relative cost of having an outside CEO successor is likely to be higher in less homogenous industries (i.e., industries consisting of dissimilar firms). This is because firm-specific skills are important for the successor CEO in running the firm. External successors will find it more difficult to gain firm-specific skills if they are from firms that employ a dissimilar technology and compete in a different product market. In addition, it is more difficult to evaluate an outside candidate's ability in a heterogeneous industry.

The tournament hypothesis, however, suggests that a large pay disparity helps a firm to build a pool of possible internal CEO successors. A large pool of skilled potential CEO replacements disciplines the incumbent CEO during his tenure and also reduces succession risk when he steps down. Therefore, one should observe a more pronounced *negative* association between pay disparity and the cost of equity under the previous two conditions. The above discussions lead to the following hypotheses:

Hypothesis 3 (The monitoring hypothesis). Under the managerial power (the tournament) hypothesis, the positive (negative) association between executive pay disparity and the cost of equity is more pronounced when the level of free cash flow is higher and when fewer investment opportunities are available to the firm.

Hypothesis 4 (The succession risk hypothesis). Under the managerial power (the tournament) hypothesis, the positive (negative) association between executive pay disparity and the cost of equity is more pronounced if the CEO is more likely to leave in the near future and if the firm operates in a more heterogeneous industry.

III. Research Design

A. Sample Selection

We collect all firm-year observations with complete data from the ExecuComp database from 1993 through 2007 to compute CEO pay disparity. We exclude observations for year 1992, since ExecuComp's coverage is incomplete for that year. We delete financial institutions (Standard Industrial Classification (SIC) codes from 6000 to 6999) and remove firm-year observations with no corresponding data on the implied cost of equity, executive pay disparity, and the control variables (defined later). The previous sample selection procedure results in a total of 13,454 firm-year observations for 2,187 firms over 44 industries defined by Fama and French (1997).

B. Model Specification

We estimate the following regression to test our hypotheses.

$$(1)\qquad \begin{aligned} COC_{i,t} = {} & \alpha + bCPS_{i,t-1} + c_1 BETA_{i,t} + c_2 IRISK_{i,t} + c_3 LogMV_{i,t-1} \\ & + c_4 LogBM_{i,t-1} + c_5 LEV_{i,t-1} + c_6 MMT_{i,t} + c_7 FERR_{i,t} \\ & + c_8 FLTG_{i,t} + \textit{Industry Fixed Effects} \\ & + \textit{Year Fixed Effects} + \varepsilon_{i,t}, \end{aligned}$$

where *COC* is the cost of equity, measured as the implied cost of equity minus the risk-free rate. We follow Gebhardt et al. (2001) and Pástor et al. (2008) to compute *COC*. The implied cost of equity is the internal rate of return that equates the current stock price with the present value of all future cash flows to common shareholders (Gebhardt et al.). The estimation procedure is detailed in the Appendix. The risk-free rate is measured as the yield on 10-year Treasury bonds. We follow Bebchuk et al. (2011) to use *CPS*, defined as the total CEO pay (ExecuComp item TDC1) divided by the sum of the total pay of the top 5 executives, as our main measure of executive pay disparity. We require the CEO to have served the company for at least a complete fiscal year. We also require firms to have complete total pay data in ExecuComp for at least 5 top executives. When the total pay of more than 5 top executives is reported, we pick the 5 top executives with the highest total pay.

We include 9 control variables that prior studies have found to affect *COC*. Specifically, we control for market beta (*BETA*), idiosyncratic return volatility (*IRISK*), firm size (*LogMV*), book-to-market ratio (*LogBM*), leverage (*LEV*), price momentum (*MMT*), forecast errors (*FERR*), and long-term growth rates (*FLTG*). We expect positive coefficients on *BETA*, *LogBM* (Fama and French (1992)), *IRISK* (Merton (1987)), and *LEV* (Modigliani and Miller (1958)). We expect negative coefficients on *LogMV* (Fama and French (1992)), *MMT* (Guay, Kothari, and Shu (2011)), and *FERR* (Hail and Leuz (2006)). We do not have predictions on *FLTG* (Gebhardt et al. (2001)). We also control for industry effects by including industry dummy variables based on the industries defined by Fama and French (1997).[5] Finally, we control for year fixed effects, as Bebchuk et al. (2011) have found that *CPS* increases over time. The definitions of these variables are detailed in the Appendix. Equation (1) is estimated using the ordinary least squares (OLS) method and by pooling all firm-year observations.

Since the implied cost of equity is a key variable in our study and its validity is subject to debate (Easton and Monahan (2005)), we conduct a validity test before proceeding. Specifically, we test the validity of our cost of equity estimate using the 2-dimension tests proposed by Lee, So, and Wang (2010). Guay et al. (2011) and Easton and Monahan suggest that after controlling for the cash flow news and the discount rate news, a good estimate of the cost of equity should be positively related to future realized returns. Lee et al. further suggest that under very general assumptions, a good estimate of the cost of equity should predict not only future realized returns but also the future cost of equity.

Panel A of Table 1 presents the results of our validity tests. We first test the association between our *COC* measure and future stock returns, which is measured as the 12-month buy-and-hold returns (*BHR*12) starting from the month after which *COC* is estimated. To do so, we run the OLS regression of *BHR*12 on *COC* using all observations in our sample. Following Lee et al. (2010), we adjust the standard errors by clustering at both the firm and year levels. Column 1 in Panel A shows that the coefficient on *COC* is positive and significant at the 5% level (t-statistic = 2.30). Mohanram and Gode (2011) suggest that removing predictable analysts' forecast biases can significantly improve the quality of the cost of equity estimate. Consistent with their conclusion, column 2 in Panel A shows that the coefficient on *COC* becomes more significant (t-statistic = 4.72) when we control for analyst forecast errors (*FERR*) in the regression. Column 3 shows that the current *COC* can reasonably predict the future *COC*. In particular, the coefficient on *COC* is 0.716, which is significant at the 1% level (t-statistic = 17.43), and the adjusted R^2 is 0.396, which is equivalent to a correlation of 0.63. Thus, our cost of equity estimate seems reasonably valid in our sample period. We repeat our tests using alternative measures of *COC* and obtain qualitatively similar results.

[5] As a robustness test, we also use the lagged industry cost of equity to control for the industry effect (Gebhardt et al. (2001)). The results are similar.

TABLE 1

Validation Tests for the Implied Cost of Equity Measure and the Summary Statistics

Panel A of Table 1 presents the OLS regression results of validity tests of the implied cost of equity. *BHR*12 is the 12-month buy-and-hold returns starting from the month after the implied cost of equity is estimated. COC_{t+1} is the implied cost of equity of the next fiscal year. The *t*-statistics are presented in parentheses and are based on standard errors adjusted for clustering at both firm and year levels. Panel B reports the statistics of the key variables. *COC* is the cost of equity capital, *CPS* is the CEO pay slice, *BETA* is the systematic risk, *IRISK* is the idiosyncratic risk, *LogMV* is the firm size, *LogBM* is the book-to-market ratio, *LEV* is the leverage ratio, *MMT* is the momentum return, *FERR* is the analysts' forecast error, and *FLTG* is the analysts' forecasted long-term growth rate. See the Appendix for detailed variable definitions.

Panel A. The Validation Test for the Implied Cost of Equity Measure

	Dependent Variable		
	$BHR12_{t+1}$		COC_{t+1}
Independent Variable	1	2	3
COC_t	0.021 (2.30)	0.039 (4.72)	0.716 (17.43)
Analyst forecast error (*FERR*)		0.032 (7.59)	
Adj. R^2	0.010	0.065	0.396
No. of firm-year obs.	12,063	12,063	11,956

Panel B. Descriptive Statistics

				Percentile				
Variable	No. of Firm-Year Obs.	Mean	Stdev	10th	25th	50th	75th	90th
COC (%)	13,454	4.288	2.570	1.167	2.608	4.152	5.839	7.541
CPS	13,454	0.374	0.115	0.237	0.308	0.373	0.439	0.511
Market beta (*BETA*)	13,454	1.080	0.705	0.309	0.592	0.960	1.416	2.015
Idiosyncratic volatility (*IRISK*)	13,454	1.360	1.431	0.280	0.487	0.891	1.649	2.987
Firm size (*LogMV*)	13,454	7.505	1.485	5.753	6.436	7.355	8.411	9.517
Book-to-market (*LogBM*)	13,454	−0.851	0.715	−1.751	−1.269	−0.801	−0.367	−0.022
Leverage (*LEV*)	13,454	0.191	0.152	0.000	0.048	0.186	0.297	0.388
Price momentum (*MMT*)	13,454	0.082	0.418	−0.392	−0.122	0.102	0.308	0.527
Analyst forecast error (*FERR*, %)	13,454	−1.006	4.513	−3.389	−1.060	−0.057	0.359	1.109
Long-term growth rate (*FLTG*, %)	13,454	15.576	10.804	7.000	10.000	14.250	19.000	25.000

IV. The Association between CPS and the Cost of Equity

A. Summary Statistics and Univariate Correlations

Panel B of Table 1 presents the summary statistics of our key variables. The mean and median of *COC* are 4.288% and 4.152%, respectively, which are comparable with those reported in prior studies (e.g., Guay et al. (2011)). The mean and median of *CPS* are 0.374 and 0.373, respectively, which are comparable to those reported by Bebchuk et al. (2011). The median of firm size (*MV*) is $1,564 million, suggesting that our sample covers relatively large firms.

Table 2 presents the pairwise Spearman correlation matrix for the key variables in this study. The inference from the pairwise Pearson correlation (unreported) is qualitatively similar. The univariate analysis shows that the result is consistent with the managerial power hypothesis but inconsistent with the tournament hypothesis. In particular, the correlation between *CPS* and *COC* is significantly positive (coefficient = 0.032, *p*-value = 0.000). However, *CPS* is also correlated with other determinants of *COC*. Therefore, the univariate analysis results may be misleading. We conduct formal regression analysis controlling for other determinants of the implied cost of equity in the next section.

TABLE 2

Univariate Correlations

Table 2 reports the Spearman correlation coefficients and the corresponding *p*-values (in parentheses) for the key variables. *COC* is the cost of equity capital, *CPS* is the CEO pay slice, *BETA* is the systematic risk, *IRISK* is the idiosyncratic risk, *LogMV* is the firm size, *LogBM* is the book-to-market ratio, *LEV* is the leverage ratio, *MMT* is the momentum return, *FERR* is the analysts' forecast error, and *FLTG* is the analysts' forecasted long-term growth rate. See the Appendix for detailed variable definitions. The *p*-values in parentheses are used to test the null hypothesis that the correction is 0.

Variable Name	*COC*	*CPS*	*BETA*	*IRISK*	*LogMV*	*LogBM*	*LEV*	*MMT*	*FERR*
CPS	0.032 (0.000)								
Market beta (*BETA*)	0.091 (0.000)	−0.071 (0.000)							
Idiosyncratic volatility (*IRISK*)	0.305 (0.000)	−0.108 (0.000)	0.442 (0.000)						
Firm size (*LogMV*)	−0.286 (0.000)	0.161 (0.000)	−0.113 (0.000)	−0.390 (0.000)					
Book-to-market (*LogBM*)	0.417 (0.000)	−0.018 (0.033)	−0.135 (0.000)	−0.081 (0.000)	−0.350 (0.000)				
Leverage (*LEV*)	0.059 (0.000)	0.084 (0.000)	−0.247 (0.000)	−0.211 (0.000)	0.046 (0.000)	0.306 (0.000)			
Price momentum (*MMT*)	−0.333 (0.000)	0.041 (0.000)	−0.052 (0.000)	−0.003 (0.728)	0.107 (0.000)	−0.248 (0.000)	−0.052 (0.000)		
Analyst forecast error (*FERR*)	−0.222 (0.000)	0.051 (0.000)	−0.046 (0.000)	−0.063 (0.000)	0.132 (0.000)	−0.098 (0.000)	−0.038 (0.000)	0.284 (0.000)	
Long-term growth rate (*FLTG*)	−0.020 (0.019)	−0.134 (0.000)	0.412 (0.000)	0.531 (0.000)	−0.162 (0.000)	−0.410 (0.000)	−0.338 (0.000)	0.078 (0.000)	−0.041 (0.000)

B. Regression Analysis

Table 3 reports the multivariate regressions of *COC* on *CPS*. Column 1 reports the results of the OLS regression, which is our baseline specification. We adjust standard errors by clustering at the firm level.[6] After controlling for market beta (*BETA*), idiosyncratic return volatility (*IRISK*), firm size (*LogMV*), book-to-market (*LogBM*), leverage (*LEV*), price momentum (*MMT*), earnings forecast bias (*FERR*), long-term growth rate (*FLTG*), and industry and year effects, firms with a larger *CPS* are found to have a significantly higher *COC*. The coefficient on *CPS* is 0.509, which is significant at the 1% level (t-statistic = 2.94). The signs of the coefficients for all control variables are consistent with prior literature. For example, *COC* is positively associated with *BETA*, *IRISK*, *LogBM*, *LEV*, and *FLTG*, and negatively associated with *LogMV*, *MMT*, and *FERR*.

We also investigate to what extent the results are driven by within- or cross-firm variations. Column 2 reports the results from the firm fixed effects regression. The firm fixed effects regression also serves as the 1st attempt to address the concern of omitted correlated variables. To the extent that firm heterogeneity, which determines *CPS*, is fixed over time, the firm fixed effects regression can effectively

[6]Petersen (2009) suggests that failing to control for over-time and cross-firm dependence may result in the underestimation of standard errors in a panel data regression. We cluster standard errors at the firm level and include year fixed effects to control for potential common shocks. We re-estimate the OLS regression after clustering the standard errors at both the firm and year levels. The t-statistic of the slope coefficient on *CPS* based on the 2-way clustered standard error is 3.57, so cross-firm correlation should not be a concern in our sample.

TABLE 3

Executive Pay Disparity and the Implied Cost of Capital

Table 3 reports the results of the implied cost of capital (*COC*) regressed on executive pay disparity as measured by *CPS*. *CPS* is the CEO pay slice, *BETA* is the systematic risk, *IRISK* is the idiosyncratic risk, *LogMV* is the firm size, *LogBM* is the book-to-market ratio, *LEV* is the leverage ratio, *MMT* is the momentum return, *FERR* is the analysts' forecast error, and *FLTG* is the analysts' forecasted long-term growth rate. See the Appendix for variable definitions. Column 1 reports the result from the baseline OLS regression, column 2 from the firm fixed effects regression, and column 3 from the Fama-MacBeth (1973) regression. The *t*-statistics are in parentheses. The standard errors are adjusted for heteroskedasticity and clustering at the firm level in columns 1 and 2 and for time-series serial correlation by the Newey and West (1987) method in column 3. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	OLS Regression	Firm Fixed Effects Regression	Fama-MacBeth Regression
Independent Variable	1	2	3
CPS	0.509***	0.308*	0.381***
	(2.94)	(1.67)	(5.11)
Market beta (*BETA*)	−0.012	−0.055	0.044
	(−0.28)	(−0.94)	(0.48)
Idiosyncratic volatility (*IRISK*)	0.077***	0.067*	0.146***
	(3.01)	(1.77)	(3.35)
Firm size (*LogMV*)	−0.225***	−0.018	−0.228***
	(−9.71)	(−0.22)	(−4.57)
Book-to-market (*LogBM*)	1.457***	1.089***	1.418***
	(23.45)	(11.31)	(27.02)
Leverage (*LEV*)	1.355***	0.482	1.351***
	(6.70)	(1.61)	(5.85)
Price momentum (*MMT*)	−0.986***	−1.192***	−1.020***
	(−18.43)	(−21.76)	(−6.25)
Analyst forecast error (*FERR*)	−0.071***	−0.062***	−0.066***
	(−12.47)	(−9.35)	(−7.91)
Long-term growth rate (*FLTG*)	0.010***	0.012***	0.009**
	(3.86)	(3.95)	(2.42)
Year fixed effects	Yes	Yes	No
Industry fixed effects	Yes	No	Yes
Firm fixed effects	No	Yes	No
Adj. R^2	0.562	0.696	0.556
No. of firm-year obs.	13,454	13,454	13,454

eliminate biases due to omitted correlated variables. We find that the coefficient on *CPS* (0.308) remains positive and is still significant at the 10% level (t-statistic = 1.67). Column 3 presents the results from the Fama-MacBeth (1973) regression. We adjust the standard errors for the serial correlation as suggested by Newey and West (1987). The coefficient on *CPS* (0.381) is still positive and significant at the 1% level (t-statistic = 5.11). Thus, the positive association between *CPS* and *COC* is driven by both within- and cross-firm variations. The results regarding the control variables are in general consistent with those reported in column 1 using the OLS regression.

The results in Table 3 are consistent with those of Bebchuk et al. (2011) but inconsistent with those of Kale et al. (2009). That is, our empirical findings support Hypothesis 1 but reject Hypothesis 2. Our evidence suggests that investors view large executive pay disparity as a symptom of CEO entrenchment, but not as a part of a tournament that is used to motivate non-CEO senior executives. Looking at the economic significance, the estimated coefficient of *CPS* suggests that an increase in *CPS* from the 10th percentile (0.237 in Table 1) to the 90th percentile (0.511) is associated with an increase in the cost of equity of 13.9 bp, other things being equal. Under reasonable assumptions, this difference in the cost of equity implies a difference of around 2.79% in firm value.[7] Linking this result to that of Bebchuk et al. (2011), the difference in the cost of equity accounts for 43% of the valuation difference associated with their *CPS*.[8]

C. Robustness Tests

1. The Endogeneity of CPS

The endogeneity of executive compensation has always been a major concern in studies of the economic consequence of executive compensation. We have made an attempt to address this issue in Table 3 by estimating the firm fixed effects regression. In this section we conduct several additional robustness tests to further address this concern.

Our 1st test attempts to check if our results are driven by reverse causality. That is, does a higher cost of equity in the previous period drive a larger *CPS*? To address this concern, we follow Chen et al. (2011) to include the lagged dependent variable in our regression. Reverse causality can be ruled out to some extent if the coefficient on *CPS* remains positive. The results are reported in column 1 of Table 4. The evidence rules out reverse causality in this case, as the slope coefficient on *CPS* remains positive and significant at the 1% level (t-statistic $= 3.97$) even after including lagged *COC* in the regression. In addition, the magnitude of the coefficient (0.484) is very close to that in our baseline OLS regression (0.509). The results (unreported) are similar when we include *COC* lagged by 2 or 3 years.

Second, we estimate a change regression. Specifically, we regress the change in *COC* (ΔCOC) against the change in *CPS* (ΔCPS), controlling for the changes in all control variables, as well as industry and year fixed effects. Column 2 of Table 4 reports the results. The sample size is reduced to 9,779 firm-year observations due to the extra data requirement. The coefficient on ΔCPS (0.315) remains positive and significant at the 10% level (t-statistic $= 1.87$). The magnitude is close to that in the firm fixed effects regression but lower than that in the baseline regression.

Third, we estimate a 2-stage least squares (2SLS) regression treating *CPS* as endogenous. We adopt 2 extra instrumental variables for *CPS*: *CPS* lagged by 2 years and the industry median *CPS*. For each year, we compute the industry median *CPS* as the median *CPS* of all firms in the same 2-digit SIC industry, excluding the firm in question. *Lagged CPS* can be a valid instrument because it is not likely to be affected by the cost of equity 3 years later. When industry fixed

[7]To see this, assume that a constant growth model holds and that the spread between the cost of equity and the permanent earnings growth rate is no greater than 5%, that is, $V = E/(R - g)$, where V is firm value, E is the expected earnings in year 1, R is the cost of capital, and g is the earnings growth rate. Denote V_H (R_H) and V_L (R_L) as the value (the cost of equity) of a firm with a high *CPS* and that of a firm with a low *CPS*, respectively. Assume that both companies have the same E and g. Then $(V_L - V_H)/V_H = (R_H - R_L)/(R_H - g)$, $R_H - R_L = 0.139\%$, and $R_H - g \leq 5\%$ suggest that $(V_L - V_H)/V_H \geq 2.79\%$.

[8]The coefficient on *CPS* in the Q-regression (column 1 of Table 4) in Bebchuk et al. (2011) is –0.475. The mean value of Tobin's Q in our sample is 1.998 (Bebchuk et al. do not report the mean value of unadjusted Tobin's Q). Therefore, an increase in *CPS* from the 10th percentile to the 90th percentile will reduce the firm value by 0.475 × (0.511 – 0.237)/1.998 = 6.51%. This suggests that the effect of the cost of equity accounts for 42.9% (2.79/6.51) of the valuation effect.

TABLE 4

Robustness Tests for the Endogeneity of *CPS*

Table 4 reports regression results from robustness checks for the endogeneity of *CPS*. The dependent variable is the implied cost of capital (*COC*) in columns 1 and 3, and it is the change in *COC* in column 2. *CPS* is the CEO pay slice, *BETA* is the systematic risk, *IRISK* is the idiosyncratic risk, *LogMV* is the firm size, *LogBM* is the book-to-market ratio, *LEV* is the leverage ratio, *MMT* is the momentum return, *FERR* is the analysts' forecast error, *FLTG* is the analysts' forecasted long-term growth rate, and *LagCOC* is a 1-year lagged *COC*. The independent variables in column 2 are the changes in the corresponding variables. See the Appendix for variable definitions. The *t*-statistics are in parentheses and are based on standard errors adjusted for heteroskedasticity and clustering at the firm level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Controlling for the Lagged Dependent Variable	Change Regression	2SLS Regression
Independent Variable	1	2	3
CPS	0.484***	0.315*	1.121**
	(3.97)	(1.87)	(2.21)
Market beta (*BETA*)	0.006	0.081	−0.083
	(0.19)	(1.33)	(−1.63)
Idiosyncratic volatility (*IRISK*)	0.019	−0.129**	0.107***
	(1.06)	(−2.08)	(3.13)
Firm size (*LogMV*)	−0.071***	0.422***	−0.212***
	(−4.93)	(3.98)	(−8.00)
Book-to-market (*LogBM*)	0.652***	0.656***	1.484***
	(13.45)	(5.35)	(20.72)
Leverage (*LEV*)	0.461***	0.026	1.430***
	(3.62)	(0.09)	(6.06)
Price momentum (*MMT*)	−1.737***	−1.518***	−1.011***
	(−32.26)	(−31.61)	(−14.88)
Analyst forecast error (*FERR*)	−0.054***	−0.093***	−0.065***
	(−9.14)	(−13.12)	(−9.20)
Long-term growth rate (*FLTG*)	0.015***	0.023***	0.014***
	(6.30)	(5.97)	(4.82)
Previous year's cost of equity (*LagCOC*)	0.476***		
	(32.03)		
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adj. R^2	0.680	0.422	0.567
No. of firm-year obs.	12,908	9,779	8,854

effects are included in the cost of equity regression, *industry CPS* is not likely to affect the cost of equity either. Due to the additional data requirements, the sample size is further reduced to 8,854 firm-year observations.

Before presenting the 2SLS regression results, we first discuss the validity of the 2 instrumental variables. Unreported results indicate that the 2 instruments are jointly correlated with *CPS*. The Shea's partial R^2 of the 2 instruments in the 1st-stage regression is 0.156 (p-value < 0.0001). Formal tests reject the redundancy of each individual instrument. The Hansen J-statistic for the overidentification test of all instruments is 1.619 (p-value $= 0.203$), which fails to reject the null hypothesis that all instruments are exogenous. Column 3 of Table 4 shows that the estimate of the coefficient on *CPS* in the 2SLS regression is 1.121, and it is significant at the 5% level (t-statistic $= 2.21$). Finally, we conduct a Durbin-Wu-Hausman test to determine the endogeneity of *CPS*. The test technically fails to reject the null hypothesis that *CPS* is exogenous ($\chi^2 = 2.527$, p-value $= 0.112$).

We thus conclude that although *CPS* is a firm choice variable, the evidence from a series of robustness tests suggests that the positive association between *CPS* and the cost of equity is not likely to be driven by endogeneity bias.

2. Alternative Estimates of the Cost of Equity

The estimates of firm-specific implied cost of equity that rely on analysts' earnings forecasts may have two drawbacks. One is that analysts' forecasts with systematic optimistic biases are used to proxy for investors' earnings expectation. The other is that simplified assumptions have to be made for the perpetual growth rate (i.e., the growth rate beyond the explicit forecast horizon). If the variable in question (i.e., *CPS*) is correlated with measurement errors in earnings expectations and perpetual growth rates, the results can be spurious. We have explicitly controlled for analysts' earnings forecast errors (*FERR*) and long-term growth rates (*FLTG*) in regression (2). In this section, we conduct 2 further tests to address this concern.

Before we conduct formal robustness tests, we calculate the correlation between *CPS* and analysts' forecast errors for earnings per share (EPS) in year $t+1$. As shown in Table 2 earlier, the correlation between *CPS* and *FERR* is 0.051, suggesting that analysts' earnings forecasts are *less* optimistic for the firms with a larger *CPS*.[9] We also calculate the correlation between *CPS* and analysts' forecast errors for EPS in year $t+2$ to year $t+5$, and the results (unreported) are the same. If investors are rational in incorporating *CPS* into their earnings expectations but analysts are less so, the above results suggest that the estimates of the cost of equity are *less* upward biased for firms with a larger *CPS*. This implies that the confounding factors due to analysts' forecast biases, if any, bias against our findings. Nevertheless, we conduct another robustness test using the portfolio-level cost of equity estimates suggested by Easton and Sommers (2007). This approach uses realized earnings to proxy for investors' expectations and therefore should not suffer from analysts' forecast biases. In addition, it estimates the cost of equity and the perpetual growth rate simultaneously so that no firm-specific assumptions on the perpetual growth rate need to be made.

Specifically, in each year from 1993 to 2007, we sort all firms into 10 equal-sized portfolios based on *CPS*. We then compute the average cost of equity for each portfolio following Easton and Sommers (2007). We are able to obtain 150 portfolio-year observations. We use both future- and current-year realized earnings to proxy for investors' expectations. We then estimate the regression

$$\begin{aligned}(2)\qquad COC_{p,t} &= \alpha + bCPS_{p,t-1} + c_1BETA_{p,t} + c_2IRISK_{p,t} \\ &\quad + c_3LogMV_{p,t-1} + c_4LogBM_{p,t-1} + c_5LEV_{p,t-1} \\ &\quad + c_6IndCOC_{p,t} + Year\ Fixed\ Effects + \varepsilon_{i,t},\end{aligned}$$

where $COC_{p,t}$ is the cost of equity for *CPS*-sorted portfolio p in year t; and $CPS_{p,t-1}$, $BETA_{p,t}$, $IRISK_{p,t}$, $LogMV_{p,t-1}$, $LogBM_{p,t-1}$, and $LEV_{p,t-1}$ are, respectively, the mean values of *CPS*, *BETA*, *IRISK*, *LogMV*, *LogBM*, and *LEV* of portfolio p in year t or $t-1$. Since the cost of equity is estimated based on portfolios and each portfolio consists of firms from different industries, we are

[9]Note that *FERR* is computed as actual EPS minus forecasted EPS. A high value of *FERR* indicates *low* optimism.

not able to control for industry fixed effects. To control for the industry effect, however, we first compute the Easton and Sommers estimates of the cost of equity each year for each of the 48 industries defined by Fama and French (1997). *IndCOC* is the portfolio's weighted average industry cost of equity, where the weight is the number of firms belonging to an industry. Since the estimated cost of equity does not depend on analysts' forecasts, we do not control for *MMT*, *FERR*, or *FLTG*, the 3 variables that are correlated with forecast properties.

The results are reported in Table 5. Expected earnings are proxied by future realized earnings in column 1 and by current realized earnings in column 2. Consistent with Table 3, the coefficient on *CPS* is positive and significant at the 1% level in both models. Thus, the positive relation between *CPS* and the cost of equity is not likely to be driven by measurement errors in analysts' forecasts and perpetual growth rates. However, in contrast to Table 3, the control variables in both models are mostly insignificant. This might be because firms are grouped

TABLE 5

Regression Results from Using Alternative Cost of Equity Estimates

Table 5 reports the regression results from using alternative cost of equity estimates. The dependent variable is $COC_{ES,F}$ in column 1, $COC_{ES,C}$ in column 2, and COC_{VL} in column 3. *CPS* is the CEO pay slice, *BETA* is the systematic risk, *IRISK* is the idiosyncratic risk, *LogMV* is the firm size, *LogBM* is the book-to-market ratio, *LEV* is the leverage ratio, *MMT* is the momentum return, *FERR* is the analysts' forecast error, *FLTG* is the analysts' forecasted long-term growth rate, and *IndCOC* is the portfolio's weighted average industry cost of equity, where the weight is the number of firms belonging to an industry. See the Appendix for detailed variable definitions. The *t*-statistics are in parentheses and are based on standard errors adjusted for heteroskedasticity in columns 1 and 2, and adjusted for clustering at the firm level in column 3. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Portfolio-Level Cost of Equity Estimates Based on Easton and Sommers (2007)		
	Using *Future* Earnings to Proxy for Investors' Expectations, $COC_{ES,F}$	Using *Current* Earnings to Proxy for Investors' Expectations, $COC_{ES,C}$	Using the Value Line Cost of Equity Estimate, COC_{VL}
Independent Variable	1	2	3
CPS	4.204***	3.647***	1.658**
	(3.79)	(2.86)	(2.08)
Market beta (*BETA*)	−4.019***	−1.860	0.678***
	(−3.03)	(−0.95)	(3.03)
Idiosyncratic volatility (*IRISK*)	107.887	25.538	0.577***
	(1.34)	(0.32)	(4.47)
Firm size (*LogMV*)	−0.189	0.516	−0.139*
	(−0.30)	(0.82)	(−1.65)
Book-to-market (*LogBM*)	−3.756**	−3.453*	0.761***
	(−1.94)	(−1.78)	(4.23)
Leverage (*LEV*)	9.234	6.166	3.925***
	(1.36)	(0.98)	(5.27)
Price momentum (*MMT*)			−5.939***
			(−22.39)
Analyst forecast error (*FERR*)			−0.378***
			(−10.15)
Long-term growth rate (*FLTG*)			0.021*
			(1.84)
Industry cost of equity (*IndCOC*)	0.417**	0.481	
	(1.97)	(1.29)	
Industry fixed effects	No	No	Yes
Year fixed effects	Yes	Yes	Yes
Adj. R^2	0.506	0.626	0.321
No. of firm-year obs.	150	150	7,553

into portfolios based on *CPS* in order to maximize the testing power. As a consequence, variations in the control variables across the portfolios might not be large enough for their effects to be detected. This is one limitation of the portfolio-based cost of equity estimates. The test might be less efficient because firm-level information is lost in the portfolio aggregation process (Dhaliwal, Krull, Li, and Moser (2005)).

We next use the cost of equity estimate provided by Value Line, an investment research company, to repeat our baseline model. Unlike the portfolio-level cost of equity estimates, the Value Line cost of equity estimates enable us to exploit firm-level information. Furthermore, Value Line provides firm-specific estimates of future dividends per share and future target prices so that we do not need to make any assumptions on earnings growth beyond the explicit forecast horizons. Therefore, measurement errors associated with those assumptions can be eliminated. However, Value Line has a much smaller coverage compared with the Institutional Brokers' Estimate System (IBES) database and may have a potentially serious sample selection problem (Ogneva, Subramanyam, and Raghunandan (2007)). The results are reported in column 3 of Table 5. The coefficient on *CPS* is still positive and significant at the 5% level (t-statistic = 2.08). The signs of the control variables are in general consistent with those reported in Table 3.

To summarize, the evidence in Table 5 as a whole suggests that the positive association between *CPS* and the cost of equity is robust to alternative cost of equity estimates.

3. Alternative Estimates of Executive Pay Disparity

Finally, we test whether the inference in Table 3 is sensitive to alternative measures of executive pay disparity used in prior studies. Table 6 reports the results. First, we repeat our baseline model using the logarithm of total pay gap (*PAYGAP*) used by Kale et al. (2009). *PAYGAP* is defined as the logarithm of the difference between the total compensation awarded to the CEO and the median value of the total compensation awarded to the other 4 top executives. The results are reported in column 1 of Table 6. Column 2 uses the coefficient of variation (CV) calculated from the total pay of each of the top 5 executives (*CV_TOP*5). Column 3 uses the Gini coefficient computed from the total pay of each of the top 5 executives (*GINI_TOP*5). All proxies of executive pay disparity show a significant and positive association with the cost of equity. Bebchuk et al. (2011) show that *CPS* and the Gini coefficient based on the other 4 top executives (*GINI_TOP4*) have opposite impacts on firm value and future accounting performance. We then check whether they have different associations with the cost of equity. Column 4 gives the results. We find that after controlling for *GINI_TOP4*, *CPS* is still significantly and positively associated with the cost of equity (coeff. = 0.553, t-statistic = 3.14). *GINI_TOP4* also shows a positive association with the cost of equity and is significant at the 10% level (coeff. = 0.362, t-statistic = 1.83).

To summarize, the positive association between executive pay disparity and the cost of equity is also robust to alternative measures of executive pay disparity.

TABLE 6

Regression Results from Using Alternative Measures of Executive Pay Disparity

Table 6 reports the regression results from using alternative measures of executive pay disparity. The dependent variable is *COC*. *PAYGAP is* the difference between the total pay of the CEO and the median total pay among the other top 4 executives. *CV_TOP5* is the coefficient of variation based on the total pay awarded to each of the top 5 executives. *GINI_TOP4* (*GINI_TOP5*) is the Gini coefficient based on the total pay awarded to each of the top 4 (5) executives, *CPS* is the CEO pay slice, *BETA* is the systematic risk, *IRISK* is the idiosyncratic risk, *LogMV* is the firm size, *LogBM* is the book-to-market ratio, *LEV* is the leverage ratio, *MMT* is the momentum return, *FERR* is the analysts' forecast error, and *FLTG* is the analysts' forecasted long-term growth rate. See the Appendix for detailed variable definitions. The *t*-statistics are in parentheses and are based on standard errors adjusted for heteroskedasticity and clustering at the firm level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Independent Variable	1	2	3	4
PAYGAP	0.097***			
	(4.69)			
CV_TOP5		0.182**		
		(2.46)		
GINI_TOP5			0.489**	
			(2.53)	
CPS				0.553***
				(3.14)
GINI_TOP4				0.362*
				(1.83)
Market beta (*BETA*)	−0.003	−0.013	−0.013	−0.012
	(−0.07)	(−0.32)	(−0.32)	(−0.30)
Idiosyncratic volatility (*IRISK*)	0.072***	0.075***	0.074***	0.075***
	(2.78)	(2.92)	(2.91)	(2.93)
Firm size (*LogMV*)	−0.276***	−0.226***	−0.227***	−0.228***
	(−10.59)	(−9.79)	(−9.83)	(−9.86)
Book-to-market (*LogBM*)	1.449***	1.459***	1.459***	1.458***
	(23.09)	(23.45)	(23.45)	(23.45)
Leverage (*LEV*)	1.309***	1.366***	1.367***	1.352***
	(6.43)	(6.76)	(6.76)	(6.69)
Price momentum (*MMT*)	−1.011***	−0.978***	−0.978***	−0.983***
	(−17.88)	(−18.23)	(−18.22)	(−18.34)
Analyst forecast error (*FERR*)	−0.068***	−0.071***	−0.071***	−0.071***
	(−11.38)	(−12.48)	(−12.48)	(−12.48)
Long-term growth rate (*FLTG*)	0.010***	0.010***	0.010***	0.010***
	(3.70)	(3.79)	(3.78)	(3.82)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	No
Adj. R^2	0.580	0.562	0.562	0.562
No. of firm-year obs.	12,799	13,454	13,454	13,454

V. Cross Variation in the Association between CPS and the Cost of Equity

In this section, we formally test Hypotheses 3 and 4, which predict cross-sectional variations in the association between *CPS* and *COC*. Hypothesis 3 predicts a more pronounced association when the agency problem of free cash flow is more severe (i.e., when monitoring is more important). Hypothesis 4 predicts a stronger association if CEO succession is to occur sooner rather than later and if the comparative advantage of hiring an inside CEO successor is higher. Testing the cross-sectional predictions serves two purposes. First, if we can provide evidence consistent with prior theoretical predictions, the concern of missing correlated variables is further reduced. Second, cross-sectional variations in the association can help us understand the particular mechanisms through which *CPS* is associated with the cost of equity.

A. Agency Problem of Free Cash Flow

To test Hypothesis 3, we follow Chen et al. (2011) and measure the agency problem of free cash flow using operating cash flow and investment opportunities. Operating cash flow (*CF*) is defined as net cash flow from operating activities, and investment opportunities are defined as Tobin's *Q*. Definitions of variables are detailed in the Appendix. As a sensitivity check, we also measure investment opportunities by sales growth (*SGRW*), defined as the ratio of sales in the current year to sales in the prior year. The results (unreported) are similar. To alleviate the concern that the results may be driven by the endogenous relation between *CPS* and the free cash flow problem, we regress *Q* or *CF* on *CPS*, and we use *residual Q* (denoted as *RQ*) or *residual CF* (denoted as *RCF*) to partition our sample (Chen et al. (2011)).

Firms are independently sorted into 2 equal-sized groups (low and high) based on *residual CF* (*RCF*), and another 2 equal-sized groups (again low and high) based on *residual Q* (*RQ*). Firms with high *RCF* and low *RQ* are likely to have the most serious agency problem associated with free cash flow. Firms with low *RCF* and high *RQ* are likely to have the least severe agency problem. The severity of the agency problem associated with free cash flow for firms in the other 2 portfolios falls somewhere in the middle. We use these 2 portfolios as the benchmark.

We then allow *CPS* to interact with the indicator variable for the high and low free cash flows.[10] Column 1 of Panel A in Table 7 gives the regression results. We find that the coefficient on *CPS* (b_0) is 0.592, which is significant at the 1% level (t-statistic $= 2.93$), suggesting a positive association between *CPS* and *COC* for the 2 benchmark portfolios. The coefficient on *CPS* × *High free cash flow* (b_1) is 0.918, which is significant at the 10% level (t-statistic $= 1.85$). The null hypothesis that $b_0 + b_1 = 0$ is rejected at the 1% level (F-statistic $= 10.40$, p-value $= 0.001$), suggesting a highly significant and positive association between *CPS* and *COC* when the agency problem of free cash flow is most severe and monitoring is most important. The magnitude of $b_0 + b_1$ is 1.51, suggesting that an increase in *CPS* from the 10th percentile to the 90th percentile is associated with an increase in the cost of equity of 41.4 bp $((0.592 + 0.918) \times (0.511 - 0.237))$, or a difference of 8.28% (41.4 bp/5.00%) in firm value for the high free cash flow portfolio. On the other hand, the coefficient on *CPS* × *Low free cash flow* (b_2) is -0.205 (t-statistic $= -0.49$), and we cannot reject the null hypothesis that

[10]As a robustness test, we create a 3rd indicator variable for firms with high *residual Q* and also high *residual CF*, and we use firms with low *residual CF* and low *residual Q* as the benchmark. The results (not reported) are essentially the same. Specifically, the coefficient on *CPS* is still significantly higher in the high free cash flow portfolio than in the low free cash flow portfolio. In addition, there is no significant difference between the coefficient on *CPS* in the high *residual Q*, high *residual CF* portfolio and that in the low *residual Q*, low *residual CF* portfolio. We therefore combine the 2 portfolios into one and use it as the benchmark.

$b_0 + b_2 = 0$ at the 10% level (F-statistic = 1.01, p-value = 0.3154). This indicates that investors do not discount firms with a large *CPS* when the agency problem of free cash flow is low. The difference between b_1 and b_2 is significant at the 10% level (F-statistic = 3.38, p-value = 0.066), consistent with the managerial power hypothesis but inconsistent with the tournament hypothesis regarding the monitoring role associated with *CPS* (Hypothesis 3).

TABLE 7

Cross Variation in the Association between *CPS* and the Cost of Equity

Panel A of Table 7 reports the regression results of the cost of equity capital (*COC*) on CEO pay slice (*CPS*) by taking into account the agency problem and CEO succession risk. Panel B reports test statistics. *High free cash flow* (*Low free cash flow*) is a dummy variable for firms with above (below) median residual cash flow and below (above) median residual Tobin's *Q*. *High CEO succession planning importance* (*Low CEO succession planning importance*) is a dummy variable for firms with above (below) median CEO leaving probability (*PrLEAVE*) and below (above) median industry homogeneity (*HOMOG*). *BETA* is the systematic risk, *IRISK* is the idiosyncratic risk, *LogMV* is the firm size, *LogBM* is the book-to-market ratio, *LEV* is the leverage ratio, *MMT* is the momentum return, *FERR* is the analysts' forecast error, and *FLTG* is the analysts' forecasted long-term growth rate. See the Appendix for detailed variable definitions. The *t*-statistics are in parentheses and are based on standard errors adjusted for heteroskedasticity and clustering at the firm level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Regression Results

Independent Variable	Coefficient	1	2	3
High free cash flow		−0.004 (−0.02)		−0.009 (−0.05)
Low free cash flow		−0.536*** (−3.11)		−0.525*** (−3.05)
High CEO succession planning importance			−0.236 (−1.60)	−0.216 (−1.49)
Low CEO succession planning importance			0.216 (1.35)	0.210 (1.32)
CPS	b_0	0.592*** (2.93)	0.494** (2.19)	0.550** (2.24)
CPS × *High free cash flow*	b_1	0.918* (1.85)		0.923* (1.86)
CPS × *Low free cash flow*	b_2	−0.205 (−0.49)		−0.227 (−0.55)
CPS × *High CEO succession planning importance*	b_3		0.412 (1.13)	0.382 (1.07)
CPS × *Low CEO succession planning importance*	b_4		−0.363 (−0.93)	−0.383 (−0.98)
Market beta (*BETA*)		−0.061 (−1.40)	−0.096** (−2.14)	−0.059 (−1.36)
Idiosyncratic volatility (*IRISK*)		0.099*** (3.88)	0.086*** (3.29)	0.100*** (3.92)
Firm size (*LogMV*)		−0.224*** (−9.49)	−0.228*** (−9.32)	−0.219*** (−9.17)
Book-to-market (*LogBM*)		1.347*** (21.77)	1.420*** (22.63)	1.356*** (21.69)
Leverage (*LEV*)		1.651*** (7.97)	1.506*** (7.20)	1.656*** (8.00)
Price momentum (*MMT*)		−1.017*** (−18.42)	−1.061*** (−18.90)	−1.035*** (−18.69)
Analyst forecast error (*FERR*)		−0.072*** (−11.08)	−0.071*** (−10.95)	−0.072*** (−11.08)
Long-term growth rate (*FLTG*)		0.013*** (4.57)	0.010*** (3.63)	0.013*** (4.55)
Year fixed effects		Yes	Yes	Yes
Industry fixed effects		Yes	Yes	Yes
Adj. R^2		0.583	0.555	0.563
No. of firm-year obs.		10,669	10,669	10,669

(continued on next page)

TABLE 7 (continued)

Cross Variation in the Association between *CPS* and the Cost of Equity

Panel B. Hypothesis Testing

	F-Statistic (p-value)		
Null Hypothesis	1	2	3
CPS + *CPS* × *High free cash flow* = 0 ($b_0 + b_1 = 0$)	10.40 (0.001)		9.24 (0.002)
CPS + *CPS* × *Low free cash flow* = 0 ($b_0 + b_2 = 0$)	1.01 (0.315)		0.65 (0.419)
CPS × *Low free cash flow* = *CPS* × *High free cash flow* ($b_1 = b_2$)	3.38 (0.066)		3.54 (0.060)
CPS + *CPS* × *High CEO succession planning importance* = 0 ($b_0 + b_3 = 0$)		7.98 (0.005)	7.75 (0.005)
CPS + *CPS* × *Low CEO succession planning importance* = 0 ($b_0 + b_4 = 0$)		0.14 (0.713)	0.22 (0.638)
CPS × *Low CEO succession planning importance* = *CPS* × *High CEO succession planning importance* ($b_3 = b_4$)		2.70 (0.101)	2.69 (0.101)

The previous finding is consistent with that of Chen et al. (2011) that shareholders charge a higher risk premium for firms with weak shareholder rights when the agency problem of free cash flow is more severe. The evidence is also consistent with that of Bebchuk et al. (2011), that firms with a large *CPS* make less profitable acquisitions. In terms of the economic significance, the magnitude of the difference in the coefficient on *CPS* between the portfolio with high cash flow (b_1) and the portfolio with low free cash flow (b_2) is 1.123. This difference suggests that when the severity of a firm's agency problem of free cash flow increases from among the lowest to among the highest, the difference in the cost of equity associated with the difference in *CPS* between the 10th and 90th percentiles is increased by 30.5 bp ((0.918 + 0.205) × (0.511 – 0.237)). This difference in the cost of equity implies an increase in the valuation effect of 6.1% (30.5 bp/5.00%).

B. The Importance of CEO Succession Planning

To test Hypothesis 4, we need a measure of the CEO turnover likelihood and a measure of the relative cost of hiring an external CEO successor versus an internal CEO successor. We take a 2-step approach to measure the likelihood of a future CEO turnover. In the 1st step, for each year, we estimate a logit regression to predict a CEO turnover in the next 3 years. We choose a 3-year horizon, since grooming a quality internal successor candidate is a long process (Bower (2007)). However, our results are not sensitive to whether a CEO turnover is predicted for the next 1, 2, or 3 years. We include the following predictors based on the prior literature: the level of and the change in return on assets (*ROA*) (Parrino (1997), Huson, Malatesta, and Parrino (2004)), current and lagged market-adjusted stock returns (Warner, Watts, and Wruck (1988)), volatility of *ROA*, systematic volatility and idiosyncratic volatility of stock returns (Bushman, Dai, and Wang (2010)), firm size, a CEO age dummy variable indicating if the age of the incumbent CEO is greater than or equal to 60 (Brickley (2003)),[11] and the change in institutional holding (Parrino, Sias, and Starks (2003)). All of the predictors are measured at the current year.

In the 2nd step, for each year t, we use the predictors measured at year t and the coefficient estimates from the model estimated at year $t-3$ to construct an ex ante measure of the CEO leaving probability (*PrLEAVE*) in year $t+1$ to year $t+3$. This approach ensures that the measure of CEO leaving likelihood is based on information available to investors. In addition, our model incorporates both the determinants of a forced CEO turnover and a voluntary CEO turnover. The predictions are correct 65% of the time when we use the ex ante CEO turnover probability to predict actual CEO turnover in the next 3 years using the holdout sample. When we partition the firms into 2 groups based on the annual median estimated probability, the actual CEO turnover frequency for the high probability group is 0.408, and it is 0.204 for the low probability group. This suggests that the model has reasonable predictive power in the holdout sample.

We then measure the relative cost of hiring an outside CEO successor using industry homogeneity as suggested by Parrino (1997). For each firm-year observation, we estimate the partial correlation between firm returns and industry returns, controlling for the market returns from the past 60 (with a minimum of 36) monthly returns until the end of the current fiscal year. Industry returns are the mean monthly returns of all firms in the same industry as defined by Fama and French (1997). Then, for each industry year, we compute the industry homogeneity (*HOMOG*) as the mean partial correlation coefficient of all firms in the industry. Excluding firms not covered by ExecuComp does not qualitatively affect the results. The central rationale behind this measure is that if firms in an industry employ similar production technologies and compete in similar product markets, news concerning technological innovations or changes in the economic environment will tend to affect their stock prices in a similar manner (Parrino).[12]

We first partition firm-year observations into 2 groups based on whether the estimated CEO leaving probability (*PrLEAVE*) is above the within-year median value. Firms are also independently sorted into 2 groups based on the within-year median value of industry homogeneity (*HOMOG*). Thus, the 2-way sorts classify firms into 4 portfolios. The benefit of having skilled inside CEO candidates is

[11] Murphy (1999) finds that the likelihood of a CEO leaving office during a given year is about 30% higher when the CEO is over the age of 64. Since our model is used to predict whether the CEO will leave office within the next 3 years, we set the age cutoff at 60. Our results are not sensitive to whether we use 60 or 64 as the cutoff.

[12] Industry homogeneity may capture just one dimension of the cost of hiring an external CEO successor. To the extent that there are other important dimensions, this ex ante measure may result in low testing power. Alternatively, one could measure the costs by observing the outcome of CEO succession. In particular, industries with high external hiring costs should have more internal CEO successors. The outcome-based approach has the advantage of capturing all dimensions of external hiring costs. However, this measure may also capture CEO succession determinants other than external hiring costs. Thus, which variable provides higher testing power is an empirical question. We repeat our analyses in Tables 7 and 8 by replacing industry homogeneity (HOMOG) with the industry percentage of internal CEO successors (see Table 3 in Cremers and Grinstein (2011)). We obtain results that are qualitatively similar but less significant compared with those in Table 7 but do not find results similar to those in Table 8.

likely to be higher for firms with a higher CEO leaving likelihood and operating in less homogenous industries. CEO succession for these firms is more likely, so that less time remains for them to nurture skilled inside successor candidates from scratch. In addition, the risk of hiring an incompetent outside CEO is higher because of higher information asymmetry and his inevitable lack of firm-specific knowledge. To summarize, CEO succession planning is most important for these firms. On the other hand, the benefit of having a good inside CEO candidate pool is likely to be lower for firms with a low CEO leaving probability and operating in a more homogenous industry. In other words, CEO succession planning is relatively less important. The importance of CEO succession planning is somewhere in the middle for firms in the other 2 portfolios.

We then allow *CPS* to interact with the indicator variable for high *CEO succession planning importance* and that for low *CEO succession planning importance*, using the other 2 portfolios combined as the benchmark. Column 2 in Table 7 reports the results. The coefficient on *CPS* (b_0) is positive and significant at the 5% level (t-statistic = 2.19). The coefficient on *CPS* × *High CEO succession planning importance* (b_3) is positive. A formal test rejects the null hypothesis that $b_0+b_3=0$ at the 1% level (F-statistic = 7.98, p-value = 0.005). The result suggests a highly significant and positive association between *CPS* and *COC* in firms in which CEO succession planning is highly important. In terms of the economic significance, the results suggest that an increase in *CPS* from the 10th percentile to the 90th percentile is associated with an increase in the cost of equity of 21.6 bp $((0.494 + 0.412) \times (0.511 - 0.237))$, which is equivalent to a difference of 4.32% (21.6 bp/5.00%) in firm value for firms with high *CEO succession planning importance*. In contrast, the coefficient on *CPS* × *Low CEO succession planning importance* (b_4) is negative, and the null hypothesis that $b_0 + b_4 = 0$ cannot be rejected at the 10% level (F-statistic = 0.14, p-value = 0.713). The result suggests that investors do not demand a higher risk premium for firms with a larger *CPS* when CEO succession planning is of little importance to the firms.

The difference in the coefficient on *CPS* between the group of firms with high (b_3) and the group of firms with low *CEO succession planning importance* (b_4) is marginally significant (F-statistic = 2.70, p-value = 0.10). Turning to the economic significance, when a firm increases its emphasis on *CEO succession planning importance* from the low group to the high group, the increase in the cost of equity associated with an increase in *CPS* from the 10th percentile to the 90th percentile is 18.45 bp $((0.412 + 0.363) \times (0.511 - 0.237))$, which is equivalent to a difference of 3.69% (18.45 bp/5.00%) in firm value. To summarize, the evidence is again consistent with the managerial power hypothesis but inconsistent with the tournament hypothesis regarding the succession risk associated with *CPS* (Hypothesis 4).

C. Additional Analysis

A question that follows naturally from the above two findings is whether they capture the same effects. For example, perhaps a firm with higher free cash flow is more likely to become an acquisition target and the incumbent CEO is expected to be fired after takeover. To answer this question, we first investigate whether the partitions based on *Residual CF* and *Residual Q* and those based on *PrLEAVE* and *HOMOG* overlap. The results suggest that they do not overlap much.[13] Column 3 in Table 7 formally investigates this issue by allowing *CPS* to interact with all 4 indicator variables. We find that the results are similar to those obtained in columns 1 and 2 of Table 7. The difference between the coefficient on *CPS* × *High free cash flow* (b_1) and that on *CPS* × *Low free cash flow* (b_2) continues to be significant at the 10% level (F-statistic = 3.54, p-value = 0.060). The coefficient on *CPS* × *High CEO succession planning importance* (b_3) is also marginally higher than the coefficient on *CPS* × *Low CEO succession planning importance* (b_4) (F-statistic = 2.69, p-value = 0.101). As a further test, we repeat the above but drop the observations falling in the intersection of the *High free cash flow* portfolio and the *High CEO succession planning importance* portfolio (303 observations) and the intersection of the *Low free cash flow* portfolio and the *Low CEO succession planning importance* portfolio (257 observations). The results (unreported) are qualitatively similar.

To summarize, the results in Table 7 further support the hypothesis that shareholders view a large executive pay disparity as a symptom of CEO entrenchment. In particular, the results suggest that shareholders demand compensation for opportunistic behavior such as overinvestment and empire building during the incumbent CEO's tenure (Hypothesis 3), and for poor CEO succession planning, which results in high succession risk (Hypothesis 4). In addition, the findings documented in Table 7 further alleviate the concern of correlated omitted variables.

VI. CPS, Corporate Governance, and the Cost of Equity

Prior studies find that poor corporate governance increases the cost of equity (Ashbaugh-Skaife, Collins, and LaFond (2006), Hail and Leuz (2006), (2009), and Chen et al. (2011)) and that executive pay disparity is associated with characteristics that are indicative of poor corporate governance (Bebchuk et al. (2011)). A natural question that arises is whether executive pay disparity conveys incremental information about CEO entrenchment or CEO succession risk after controlling for other corporate governance mechanisms. We address this question through a 2-step approach. In the 1st step, we regress executive pay disparity against a series of corporate governance variables. We then decompose executive pay disparity into the predicted and the residual components. By construction, the residual component is more likely to capture information about CEO entrenchment or poor succession planning not captured by those governance variables

[13]Specifically, 21.2% of the observations in the portfolio associated with the most severe agency problem of free cash flow are also grouped into the portfolio associated with high *succession planning importance*, and 18.6% of the observations in the portfolio associated with the least severe agency problem of free cash flow are also grouped into the portfolio associated with low *succession planning importance*. Only 9.8% of the observations in the portfolio associated with low *succession planning importance* are grouped into the portfolio associated with the least severe agency problem of free cash flow, and only 11.9% of the observations in the portfolio associated with high *succession planning importance* are grouped into the portfolio associated with the most severe agency problem of free cash flow.

used in the 1st-stage regression. In particular, we employ the following 14 governance variables: the E-index (Bebchuk and Cohen (2005), Bebchuk, Cohen, and Ferrell (2009)),[14] accounting information quality (Francis et al. (2004)),[15] a dummy variable to indicate whether the chairman is also the CEO, board size (Yermack (1996)), board independence, existence of a compensation committee, size of the compensation committee, independence of the compensation committee, existence of an audit committee, size of the audit committee, independence of the audit committee (Klein (2002)), institutional ownership (Gillan and Starks (2000)), CEO ownership, and ownership by directors other than the CEO (Morck, Shleifer, and Vishny (1988)). In the 2nd stage, we regress the cost of equity against the *predicted* pay disparity and the *residual* pay disparity.[16]

A. The Main Effect of the Residual *CPS*

The results are reported in Table 8. Panel A of Table 8 repeats our analysis in Table 4 using *residual CPS* and *predicted CPS*. Due to additional data requirement, the sample size is reduced to 5,832 firm-year observations. Column 1 in Panel A includes only *predicted CPS*. Consistent with prior literature (Ashbaugh-Skaife et al. (2006), Hail and Leuz (2006), (2009), and Chen et al. (2011)), the predicted pay disparity is positively associated with the cost of equity and is significant at the 1% level (t-statistic = 3.03). Column 2 in Panel A includes only *residual CPS*. The coefficient on *residual CPS* is 0.451, which is significant at the 5% level (t-statistic = 1.98). Finally, column 3 in Panel A includes both *predicted CPS* and *residual CPS* in the regression. As expected, since the 2 components of *CPS* are orthogonal to each other, the coefficients of *predicted CPS* and *residual CPS* are very close to those in the first 2 models.[17] In terms of economic significance, based on the results in column 3, an increase in *predicted CPS* of

[14]We also use the G-index constructed by Gompers, Ishii, and Metrick (2003) in a robustness test and find similar results.

[15]We use the Dechow and Dichev (2002) model to measure accounting information quality. Specifically, for each year and each industry defined by Fama and French (1997), we estimate a cross-sectional regression of working capital accrual on operating cash flow in the prior, current, and subsequent years. Accounting information quality is measured as the absolute value of the residual from the regression, multiplied by −1. We use the absolute value of the residual to maximize sample size. We also use the standard deviation of the residuals over the previous 4 years to measure accounting information quality. The results are similar.

[16]An alternative way to examine whether *CPS* is subsumed by governance or whether *CPS* substitutes for or complements a governance measure in influencing the cost of capital is to include both *CPS* and the governance measure plus their interaction term in a regression. Based on this approach, Bebchuk et al. (2011) find a significantly negative association between firm value and *CPS* when shareholder rights (proxied by the E-index (Bebchuk et al. (2009)) are weak but not when they are strong. Consistent with their findings, we also find that the association between *CPS* and the cost of equity is significantly positive only when the E-index is above the sample median (i.e., when shareholder rights are weak) but not when it is below. In addition, we find a similar result when board independence is used to proxy for corporate governance. These findings suggest that *CPS* is complementary to both external (i.e., the E-index) and internal (i.e., board independence) governance mechanisms in influencing the cost of equity. The results are available from the authors.

[17]We also estimate regression (1) using the reduced sample. The coefficient on *CPS* is 0.631 with a t-statistic of 2.81 (unreported).

1 standard deviation (0.036, unreported) is associated with an increase in the cost of equity of 9.9 (2.749 × 0.036) bp. An increase in *residual CPS* of 1 standard deviation (0.114, unreported) is associated with an increase in the cost of equity of 5.4 (0.473 × 0.114) bp. Thus, while the 14 governance-related variables mentioned above have captured a significant portion of the variation in *CPS* associated with the cost of equity, the results are also consistent with the notion that *CPS* captures incremental information about CEO entrenchment and CEO succession risk.

B. The Conditioning Effects of the Residual *CPS*

Panel B of Table 8 repeats the analysis in Table 7 by replacing *CPS* with *residual CPS*. Column 1 of Panel B interacts *residual CPS* with the 2 indicators of the severity of the agency problem of free cash flow, and column 2 interacts

TABLE 8

Residual CPS and the Cost of Equity

Table 8 reports the results of regression of the cost of capital (*COC*) on *predicted* and *residual CPS*. *Predicted* and *residual CPS* are the predicted and the residual values of *CPS* regressed on a set of governance variables: the E-index, accounting information quality, a dummy variable indicating whether the chairman is also the CEO, board size, board independence, the existence of a compensation committee, size of the compensation committee, the independence of the compensation committee, the existence of an audit committee, size of the audit committee, the independence of the audit committee, institutional ownership, CEO ownership, and ownership by directors other than the CEO. *BETA* is the systematic risk, *IRISK* is the idiosyncratic risk, *LogMV* is the firm size, *LogBM* is the book-to-market ratio, *LEV* is the leverage ratio, *MMT* is the momentum return, *FERR* is the analysts' forecast error, and *FLTG* is the analysts' forecasted long-term growth rate. *High free cash flow* (*Low free cash flow*) is a dummy variable for firms with above (below) median residual cash flow and below (above) median residual Tobin's *Q*. *High CEO succession planning importance* (*Low CEO succession planning importance*) is a dummy variable for firms with above (below) median CEO leaving probability (*PrLEAVE*) and below (above) median industry homogeneity (*HOMOG*). See the Appendix for detailed variable definitions. The *t*-statistics are in parentheses and are based on standard errors adjusted for heteroskedasticity and clustering at the firm level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. The Main Effect of the Residual CPS

Independent Variable	1	2	3
Predicted CPS	2.699***		2.749***
	(3.03)		(3.08)
Residual CPS		0.451**	0.473**
		(1.98)	(2.08)
Market beta (*BETA*)	−0.127**	−0.134**	−0.127**
	(−2.17)	(−2.30)	(−2.16)
Idiosyncratic volatility (*IRISK*)	0.032	0.031	0.033
	(0.91)	(0.89)	(0.94)
Firm size (*LogMV*)	−0.284***	−0.272***	−0.286***
	(−9.49)	(−9.34)	(−9.53)
Book-to-market (*LogBM*)	1.491***	1.496***	1.492***
	(17.94)	(17.96)	(18.00)
Leverage (*LEV*)	1.501***	1.575***	1.495***
	(6.14)	(6.47)	(6.12)
Price momentum (*MMT*)	−1.008***	−1.010***	−1.010***
	(−13.89)	(−13.88)	(−13.91)
Analyst forecast error (*FERR*)	−0.109***	−0.109***	−0.109***
	(−12.19)	(−12.12)	(−12.20)
Long-term growth rate (*FLTG*)	0.009**	0.008**	0.009***
	(2.55)	(2.40)	(2.62)
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adj. R^2	0.583	0.583	0.584
No. of firm-year obs.	5,832	5,832	5,832

(continued on next page)

TABLE 8 (continued)

Residual CPS and the Cost of Equity

Panel B. The Cross-Sectional Variation in the Effect of the Residual CPS on the COC

Independent Variable	Coefficient	1	2	3
High free cash flow		0.274*** (3.79)		0.270*** (3.74)
Low free cash flow		−0.623*** (−7.83)		−0.619*** (−7.79)
High CEO succession planning importance			−0.063 (−1.05)	−0.063 (−1.06)
Low CEO succession planning importance			0.104* (1.67)	0.088 (1.44)
Residual CPS	b_0	0.575** (2.19)	0.283 (0.91)	0.411 (1.20)
Residual CPS × *High free cash flow*	b_1	0.978 (1.44)		1.014 (1.51)
Residual CPS × *Low free cash flow*	b_2	−0.379 (−0.70)		−0.408 (−0.75)
Residual CPS × *High CEO succession planning importance*	b_3		0.823* (1.67)	0.721 (1.49)
Residual CPS × *Low CEO succession planning importance*	b_4		−0.183 (−0.34)	−0.282 (−0.53)
Market beta (*BETA*)		−0.098* (−1.73)	−0.137** (−2.39)	−0.095* (−1.67)
Idiosyncratic volatility (*IRISK*)		0.066** (1.96)	0.049 (1.40)	0.068** (2.01)
Firm size (*LogMV*)		−0.251*** (−8.93)	−0.255*** (−8.67)	−0.245*** (−8.53)
Book-to-market (*LogBM*)		1.470*** (19.39)	1.533*** (19.57)	1.481*** (19.20)
Leverage (*LEV*)		1.657*** (6.82)	1.536*** (6.22)	1.666*** (6.85)
Price momentum (*MMT*)		−1.003*** (−13.96)	−1.054*** (−14.63)	−1.025*** (−14.32)
Analyst forecast error (*FERR*)		−0.107*** (−11.84)	−0.105*** (−11.53)	−0.106*** (−11.82)
Long-term growth rate (*FLTG*)		0.011*** (3.11)	0.009*** (2.53)	0.011*** (3.09)
Year fixed effects		Yes	Yes	Yes
Industry fixed effects		Yes	Yes	Yes
Adj. R^2		0.596	0.589	0.596
No. of firm-year obs.		5,639	5,639	5,639

Hypothesis Testing: Null Hypothesis	*F*-Statistic (*p*-value) 1	2	3
Residual CPS + *Residual CPS* × *High free cash flow* = 0 ($b_0 + b_1 = 0$)	5.95 (0.015)		4.75 (0.030)
Residual CPS + *Residual CPS* × *Low free cash flow* = 0 ($b_0 + b_2 = 0$)	0.15 (0.698)		0.00 (0.995)
Residual CPS × *Low free cash flow* = *Residual CPS* × *High free cash flow* ($b_1 = b_2$)	2.71 (0.100)		3.03 (0.082)
Residual CPS + *Residual CPS* × *High CEO succession planning importance* = 0 ($b_0 + b_3 = 0$)		7.89 (0.005)	7.79 (0.005)
Residual CPS + *Residual CPS* × *Low CEO succession planning importance* = 0 ($b_0 + b_4 = 0$)		0.04 (0.835)	0.07 (0.786)
Residual CPS × *Low CEO succession planning importance* = *Residual CPS* × *High CEO succession planning importance* ($b_3 = b_4$)		2.66 (0.103)	2.74 (0.098)

residual CPS with the 2 indicators of the importance of CEO succession planning. In column 3, *residual CPS* is interacted with all 4 indicators. Since the results from columns 1 and 2 are consistent with those from column 3, we focus our discussions on the results from column 3 only. The coefficient on *residual CPS* (b_0) is positive but insignificant (t-statistic = 1.20). The results from column 3 also show a positive coefficient on *residual CPS* × *High free cash flow* (b_1) and a negative coefficient on *residual CPS* × *Low free cash flow* (b_2). Formal tests reject the null hypothesis that $b_0 + b_1 = 0$ at the 5% level (F-statistic = 4.75, p-value = 0.030) but cannot reject the null hypothesis that $b_0 + b_2 = 0$ at the 10% level (F-statistic = 0.00, p-value = 0.995). In addition, the difference between b_1 and b_2 is significant at the 10% level (F-statistic = 3.03, p-value = 0.082), which is in line with the results in Table 7. Also consistent with the results in Table 7, the coefficient on *residual CPS* × *High CEO succession planning importance* (b_3) is positive and the coefficient on *residual CPS* × *Low CEO succession planning importance* (b_4) is negative. The null hypothesis that $b_0 + b_3 = 0$ is rejected at the 1% level (F-statistic = 7.79, p-value = 0.005). But the null hypothesis that $b_0 + b_4 = 0$ cannot be rejected at the 10% level (F-statistic = 0.07, p-value = 0.786). The difference between b_3 and b_4 is significant at the 10% level (F-statistic = 2.74, p-value = 0.098). The evidence provides further support for the hypothesis that *CPS* captures additional information about CEO entrenchment and CEO succession planning.

VII. CPS and the Change in Stock Return Volatility around a CEO Turnover

To further substantiate the succession risk hypothesis, we examine the association between the uncertainty surrounding a CEO turnover event and *CPS* before the turnover. We measure the uncertainty driven by the CEO turnover as the change in stock return volatility around the CEO turnover event. If a large *CPS* indicates poor CEO succession planning and high succession risk, we would expect the increase in stock return volatility around CEO turnover to be positively associated with CEO pay disparity before the CEO turnover. A small internal CEO candidate pool may force the board of directors to look elsewhere for a CEO successor. Since there is more uncertainty in the strategies and the ability of an external CEO successor, the change in volatility would be higher. Furthermore, even if the board chooses an internal candidate, if this candidate has low ability or little experience in handling the work of a CEO, he will face a steep learning curve. These 2 forces will both lead to higher uncertainty around a CEO turnover event.

We identify CEO turnovers based on information in ExecuComp. In particular, we first identify all fiscal years in which the CEO in the current year is different from the CEO in the previous year for a firm. When there is insufficient information in ExecuComp to identify the CEO in the current or previous year, we search 10-K forms and proxy statements in the EDGAR database and exclude those observations involving no CEO turnover. We then estimate the following regression to investigate the effect of pay disparity on the change in return volatility around a CEO turnover:

$$(3) \quad \Delta VOL_{i,t+N} = \alpha + b_1 CPS_{i,t-1} + b_2 \Delta VOL_{MKT,t+N} + b_3 \Delta VOL_{M1,t+N} + b_4 \Delta VOL_{M2,t+N} + b_5 IndQ_{i,t-1} + b_6 ROA_{i,t-1} + b_7 \Delta ROA_{i,t+N} + \mathit{Year\ Fixed\ Effects} + \varepsilon_{i,t}.$$

The dependent variable, $\Delta VOL_{i,t+N}$, is the change in stock return volatility from year $t-1$ to year $t+N$ (for $N = 1$, 2, or 3), where year t is the fiscal year in which the incumbent CEO stepped down. We also use year $t-2$ as a benchmark and obtain similar results (unreported). We estimate stock return volatility as the standard deviation of daily stock returns over the fiscal year. We require the incumbent CEO to have served the firm for the complete year $t-2$ and year $t-1$. We also require the successor CEO to have been in the CEO position from year t to year $t+N$. Pay disparity is measured at year $t-1$. Following Clayton et al. (2005), we control for the change in market return volatility ($\Delta VOL_{MKT,t+N}$), the change in volatility of 2 sets of matched firms ($\Delta VOL_{M1,t+N}$ and $\Delta VOL_{M2,t+N}$), industry Tobin's Q (*IndQ*), and accounting performance (*ROA*) before the CEO turnover in the regression. Bebchuk et al. (2011) find that *CPS* is negatively associated with future performance, and performance is negatively associated with return volatility (Hanlon, Rajgopal, and Shevlin (2004)). Therefore, we further control for the change in performance, $\Delta ROA_{i,t+N}$, in the regression. Finally, we further control for the year fixed effects as it tends to increase with *CPS*. Here, $\Delta VOL_{MKT,t+N}$ is the change in volatility of value-weighted NYSE/AMEX/NASDAQ daily returns over the same period.

The 2 sets of matched firms are constructed as follows: The 1st set of matched firms (*M*1) is constructed based on firm size and the change in return volatility from year $t-2$ to year $t-1$. The 2nd set of matched firms (*M*2) is based on firm size and the stock returns in year $t-2$ and year $t-1$. In particular, for each firm with a CEO turnover, we first identify all firms whose total assets fall between 90% and 110% of the total assets of the firm with a CEO turnover in year $t-1$ and eliminate the firms with a CEO turnover in any year between t and $t+N$. Next, for each firm with a CEO turnover, we select the firm with the closest change in return volatility from year $t-2$ to year $t-1$ to construct the 1st matched sample and the firm with the closest compound return from year $t-2$ to year $t-1$ to construct the 2nd matched sample.

Table 9 gives the regression results. We find that in general the evidence is consistent with our hypothesis that a larger *CPS* is associated with greater uncertainty around a CEO turnover. The association between the change in return volatility in year $t+1$ and *CPS* in year $t-1$ is positive and significant at the 5% level (t-statistic = 2.36). The change in return volatility in year $t+2$ is also positively and significantly associated with *CPS* in year $t-1$ (t-statistic = 1.98). The increase in volatility in year $t+3$ is again positively associated with *CPS* (t-statistic = 2.09), and the magnitude of the coefficient (0.009) is very close to those in columns 1 and 2. The signs of the control variables are in general consistent with those of Clayton et al. (2005). As a whole, the evidence suggests that a large *CPS* is associated with an increase in uncertainty around a CEO turnover event, consistent with the notion that a large *CPS* is associated with poor CEO succession planning and thus high CEO succession risk. Our finding appears to be consistent with the evidence given by Bebchuk et al. (2011) that a larger *CPS* is associated with lower sensitivity of a CEO turnover to performance.

TABLE 9

CPS and the Change in Volatility around CEO Turnovers

Table 9 reports the results of the change in return volatility ($\Delta VOL_{i,t+N}$) around a CEO turnover regressed on executive pay slice (*CPS*). Here, $\Delta VOL_{i,t+N}$ is the change in stock return volatility of firm *i* from year $t-1$ to year $t+N$, where year *t* is the fiscal year of the CEO turnover, and return volatility is measured as the standard deviation of daily returns over the fiscal year; $\Delta VOL_{MKT,t+N}$ is the change in volatility of market returns from year $t-1$ to year $t+N$; $\Delta VOL_{M1,t+N}$ is the change in return volatility from year $t-1$ to year $t+N$ of the firm matched with a CEO turnover firm with similar size and a similar change in return volatility in the pre-turnover period; $\Delta VOL_{M2,t+N}$ is the change in volatility from year $t-1$ to year $t+N$ of the firm matched with a CEO turnover firm with similar size and similar stock returns in the pre-turnover period; *IndQ* is the median Tobin's *Q* of all firms in the same industry as defined by Fama and French (1997); *ROA* is the return on assets, defined as income before extraordinary items scaled by total assets; and $\Delta ROA_{i,t+N}$ is the change in *ROA* between year $t+N$ and year $t-1$. The *t*-statistics are in parentheses and are based on standard errors adjusted for clustering at the firm level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable = $\Delta VOL_{i,t+N}$		
Independent Variable	$N=1$	$N=2$	$N=3$
$CPS_{i,t-1}$	0.007**	0.007**	0.009**
	(2.36)	(1.98)	(2.09)
Change in market return volatility ($\Delta VOL_{MKT,t+N}$)	1.255***	0.939***	1.387***
	(5.04)	(5.32)	(7.76)
Change in volatility of firms matched on size and pre-turnover volatility ($\Delta VOL_{M1,t+N}$)	0.110**	0.099**	0.035
	(2.35)	(2.33)	(0.60)
Change in volatility of firms matched on size and pre-turnover returns ($\Delta VOL_{M2,t+N}$)	0.069	0.018	0.035
	(1.31)	(0.47)	(0.56)
Industry Tobin's Q ($IndQ_{t-1}$)	−0.002	−0.002*	−0.006***
	(−1.62)	(−1.74)	(−4.13)
Return on asset ($ROA_{i,t-1}$)	−0.017***	−0.004	−0.009
	(−3.37)	(−0.96)	(−1.52)
Change in return on assets ($\Delta ROA_{i,t+N}$)	−0.012***	−0.011***	−0.021***
	(−3.11)	(−3.74)	(−3.52)
Year fixed effects	Yes	Yes	Yes
Adj. R^2	0.301	0.488	0.603
No. of firm-year obs.	1,089	846	638

VIII. Conclusions

We find a significant and positive association between executive pay disparity and the ex ante cost of equity capital implied in stock prices and analysts' earnings forecasts. The association is robust to alternative model specifications, estimates of cost of equity, and proxies for executive pay disparity. A series of robustness tests suggest that the positive association is not likely due to biases associated with the endogeneity of executive pay disparity. Furthermore, the positive association is more pronounced the higher the level of severity of the agency problem of free cash flow faced by the firm. The positive association is also more pronounced the more likely the incumbent CEO is to leave in the near future and the more difficult it is to find a suitable successor. These findings also hold even when *residual executive pay disparity* is used in the analysis, where the residual comes from a regression of pay disparity on

14 corporate governance-related variables that potentially affect the cost of equity. Finally, a larger change in stock return volatility around CEO turnover events is also associated with a larger executive pay disparity before CEO turnovers. In sum, the evidence is consistent with the hypothesis that shareholders view a large pay disparity as a symptom of CEO entrenchment, which implies not only more opportunistic behavior during his tenure but also higher succession risk when he leaves.

We make several contributions to the emerging literature on executive pay disparity. First, to the best of our knowledge, we are the first to provide large sample evidence on the association between executive pay disparity and the cost of equity. Our results are consistent with those of Bebchuk et al. (2011), but are inconsistent with those of Kale et al. (2009). In particular, Bebchuk et al. (2011) find that executive pay disparity is associated with lower firm value and lower future cash flows. We complement their study by showing that investors also charge a higher discount rate for firms with a large pay disparity and that a significant portion of the firm valuation effect attributable to executive pay disparity as documented by them is in fact due to the cost of equity effect. Our study is also related to that of Cooper et al. (2009), who find a negative relation between executive pay and future realized returns. Their study suggests that investors do not fully incorporate the information implied in executive pay into stock prices. We show that investors do realize that excessive CEO pay relative to the pay of other senior executives can be a symptom of CEO entrenchment and an indication of succession risk. In other words, investors do incorporate this information into their resource allocation decisions.

Second, our study enhances our understanding of the implications of executive pay disparity. Bebchuk et al. (2011) provide evidence that a large executive pay disparity is associated with various opportunistic behavior of the CEO during his tenure. Consistent with their findings, our study indicates that shareholders discount the cash flow of firms with a large executive pay disparity more when the agency problem of free cash flow is more severe. Furthermore, our results suggest that a large executive pay disparity is associated with poor CEO succession planning and high succession risk, which is also incorporated into shareholders' resource allocation decisions. Our evidence suggests that poor CEO succession planning and high succession risk can explain the findings of Bebchuk et al. (2011) that the incumbent CEO is less likely to be replaced for poor performance.

Finally, our paper also contributes to our understanding of the determinants of the cost of equity, a key variable in a firm's financing and capital budgeting decisions. Our paper is related to recent studies on the effect of corporate governance on the cost of equity in general (Ashbaugh-Skaife et al. (2006), Hail and Leuz (2006), (2009), and Chen et al. (2009), (2011)). In particular, we find that executive pay disparity is positively associated with the cost of equity even after controlling for the influence of governance-related variables on CEO pay disparity. This evidence is also in line with the notion that executive pay disparity captures additional information beyond the agency problem (Bebchuk et al. (2011)).

Appendix. Variable Definitions

COC. The cost of equity capital estimated following Gebhardt et al. (2001) and Pástor et al. (2008) minus the risk-free rate measured as the yield on the 10-year Treasury bonds. Specifically, the implied cost of equity capital is the internal rate of return (R) in the following equation:

$$\text{(A-1)} \qquad P_t^* = B_t + \sum_{i=1}^{T-1} \frac{(FROE_{t+i} - R) \times B_{t+i-1}}{(1+R)^i} + \frac{(FROE_{t+T} - R) \times B_{t+T-1}}{(1+R)^{T-1}R}.$$

We use IBES analysts' earnings per share forecasts (*FEPS*) to proxy for the market expectations of a firm's earnings for the next 3 years. We measure *FEPS* by assuming that the future return on equity (*FROE*) declines linearly until it reaches an equilibrium *ROE,* which carries on from the 4th year to the T-th year. This equilibrium *ROE* is measured by a historical, 10-year, industry-specific median return on equity. The *ROE* is calculated as the income available to common shareholders (#*IBCOM*)[18] scaled by the lagged total book value of equity (#*CEQ*). We classify all firms into the 48 industries defined by Fama and French (1997). Following Gebhardt et al. (2001), firm-year observations with a negative *ROE* are excluded from our sample. The future book value of equity (B) is estimated by assuming a clean surplus relation. We follow Gebhardt et al. and assume $T = 12$. To make sure that the cost of equity estimate is based on information available to the investors, we estimate the cost of capital at month +4 after the fiscal year-end. To account for partial year discounting, we adjust the stock price at month +4 (P_t) by $(1+R)^{4/12}$, that is, $P_t^* = P_t/(1+R)^{4/12}$(Hail and Leuz (2006)).

$COC_{ES,F}$ ($COC_{ES,C}$). Cost of equity estimated following Easton and Sommers (2007). In each year, firms are sorted into 10 equal-sized portfolios based on *CPS* defined below. The Easton and Sommers cost of equity estimate is based on future realized earnings. $R_{ES,F}$, is based on the regression

$$\text{(A-2)} \qquad \frac{EPS_{t+1}}{B_t} = \gamma_0 + \gamma_1 \frac{P_t}{B_t} + \mu_t, \quad \text{and} \quad R_{ES,F} = \gamma_0 + \gamma_1,$$

where EPS_{t+1} is earnings per share (#IB divided by #CSHO, adjusted for stock splits) of year $t+1$, B_t is the book value of equity per share (#CEQ divided by #CSHO, adjusted for stock splits) at the end of year t, and P_t is the stock price (#PRCC_F, adjusted for stock splits) at the end of year t. The Easton and Sommers cost of equity estimate based on current realized earnings, $R_{ES,C}$, is based on the regression

$$\text{(A-3)} \qquad \frac{EPS_t}{B_{t-1}} = \delta_0 + \delta_1 \frac{P_t - B_t}{B_{t-1}} + \varepsilon_t, \quad \text{and} \quad R_{ES,C} = \delta_0,$$

where EPS_t is realized earnings per share of year t; B_{t-1} is the book value of equity per share of year $t-1$; B_t is the adjusted book value per share at the end of year t, defined as #CEQ of year t minus #NI of year t, plus #IB of year t, and scaled by #CSHO of year t (adjusted for split); and P_t is the stock price at the end of year t. $COC_{ES,F}$ ($COC_{ES,C}$) is defined as $R_{ES,F}$ ($R_{ES,C}$) minus the risk-free rate.

COC_{VL}. The Value Line cost of equity (COC_{VL}), estimated following Brav, Lehavy, and Michaely (2005), is defined as R minus the risk-free rate. R solves the equation

$$\text{(A-4)} \qquad (1+R)^4 = \frac{TP_{t+5}}{P_t} + \frac{DIV_{t+1}\left[\frac{(1+R)^4-(1+g)^4}{R-g}\right]}{P_t},$$

[18]Here, # refers to the Compustat annual data item.

where DIV_t is dividends per share for the next 12 months, g is the forecasted dividends growth rate, and TP_{t+5} is the average forecasted target price.

CPS. CEO pay slice, measured as a CEO's total pay (ExecuComp item TDC1) divided by the sum of the total pay of the top 5 executives. The observation is deleted when a CEO has not served for a complete fiscal year, or if ExecuComp does not have total pay data for at least 5 executives.

Residual CPS. Residual from the annual regression of *CPS* against the following variables: the E-index, accounting information quality, a dummy variable to indicate whether the chairman is also the CEO, board size, board independence, existence of a compensation committee, size of the compensation committee, independence of the compensation committee, existence of an audit committee, size of the audit committee, independence of the audit committee, institutional ownership, CEO ownership, and ownership by directors other than the CEO.

PAYGAP. Natural logarithm of the difference between the total pay of the CEO and the median total pay among the other top 4 executives.

*GINI_TOP*4 (*GINI_TOP*5). Gini coefficient based on the total pay among the top 4 (5) executives, defined as

$$1 + \frac{1}{n} - \frac{2}{n^2 \bar{z}} \sum_{i=1}^{n} (i \cdot z_i),$$

where $n = 4$ (5) is the number of executives excluding (including) the CEO for *GINI_TOP*4 (*GINI_TOP*5); z_1, z_2, z_3, z_4, and z_5 are the total pay awarded to each of the n executives in descending order; and $\bar{z}$ is the mean total compensation awarded to the n executives.

*CV_TOP*5. Coefficient of variation based on the total pay among the top 5 executives. Measured as the standard deviation of the total pay awarded to each of the top 5 executives divided by the mean of the total pay awarded to each of the top 5 executives.

BETA. Beta, estimated for each firm-year observation by regressing monthly returns on the value-weighted market returns of NYSE/AMEX/NASDAQ. Sixty (with a minimum of 24) monthly observations before the month at which the cost of capital is computed are used in the regression.

IRISK. Idiosyncratic risk, measured as the standard deviation of the residuals from the above regression used to estimate *BETA*.

LogMV. Natural logarithm of the market value of equity (#PRCC_F × #CSHO), measured at the most recent fiscal year-end.

LogBM. Natural logarithm of the ratio of the book value of equity (#CEQ) to the market value of equity (#PRCC_F × #CSHO), both measured at the most recent fiscal year-end.

LEV. Book leverage, measured as the book value of total long-term debt (#DLTT) divided by the book value of total assets (#AT), both measured at the most recent fiscal year-end.

MMT. Natural logarithm of the compounded returns over the 12 months before the month at which the cost of equity is computed.

FERR. Analysts' forecast error of the forthcoming annual earnings, defined as *actual EPS* from IBES minus the analysts' forecasted *EPS* used to compute the cost of equity, scaled by the price in the month at which the cost of equity is computed. When the IBES *actual EPS* is missing, *actual EPS* from Compustat is used instead.

FLTG. Analysts' forecast of the long-term growth rate. If missing, it is defined as FY3/FY2, where FY3 and FY2 are analysts' forecasts of earnings in years $t + 3$ and $t + 2$. The value of FY2 is required to be positive in the calculation.

RQ. Residual value of the regression of Tobin's Q against *CPS*. Tobin's Q is defined as the market value of equity (#PRCC_F × #CSHO) minus the book value of equity (#CEQ) plus the book value of total assets (#AT), scaled by the book value of total assets (#AT). All variables are measured at the most recent fiscal year-end.

RCF. Residual value of the regression of operating cash flow against *CPS*. Operating cash flow is defined as income before extraordinary items (#IB) plus depreciation (#DP), scaled by the book value of total assets (#AT). All variables are measured at the most recent fiscal year-end.

PrLEAVE. Probability of the CEO leaving in the next 3 years, estimated as follows: First, for each year t, we estimate a logit model to predict CEO turnover in the next 3 years. We include the following variables as the predictors: the level of and change in *ROA*, current and lagged market-adjusted stock returns, volatility of *ROA*, systematic volatility and idiosyncratic volatility of stock returns, firm size, a CEO age dummy variable indicating if the age of the incumbent CEO is greater than or equal to 60, and the change in institutional holdings. All of the predictors are measured at year t. Second, for each year t, we use the predictors measured at year t and the coefficient estimates from the model estimated in year $t-3$ to construct an ex ante measure of the CEO leaving probability (*PrLEAVE*) in years $t+1$ to $t+3$.

HOMOG. Industry homogeneity. In each year, a partial correlation between a firm's returns and the industry returns, controlling for the market returns, is computed for each firm using monthly returns over the previous 60 months (with a minimum of 24 months) until the fiscal year-end. Industry homogeneity is defined as the mean partial correlation of all firms in the same industry. The industries are defined by Fama and French (1997).

$\Delta VOL_{i,t+N}$. Change in stock return volatility of firm i from year $t-1$ to year $t+N$, where year t is the fiscal year of the CEO turnover. Return volatility is measured as the standard deviation of daily returns over the fiscal year.

$\Delta VOL_{MKT,t+N}$. Change in volatility of market returns from year $t-1$ to year $t+N$.

$\Delta VOL_{M1,t+N}$. Change in return volatility from year $t-1$ to year $t+N$ of the firm matched with a CEO turnover firm of similar size and a similar change in return volatility in the pre-turnover period.

$\Delta VOL_{M2,t+N}$. Change in return volatility from year $t-1$ to year $t+N$ of the firm matched with a CEO turnover firm of similar size and similar stock returns in the pre-turnover period.

IndQ. Median Tobin's Q of all firms in the same industry as defined by Fama and French (1997).

ROA. Return on assets, defined as income before extraordinary items scaled by total assets.

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