The CEO pay slice ☆

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ABSTRACT

We investigate the relation between the CEO Pay Slice (CPS)—the fraction of the aggregate compensation of the top-five executive team captured by the Chief Executive Officer—and the value, performance, and behavior of public firms. The CPS could reflect the relative importance of the CEO as well as the extent to which the CEO is able to extracts rents. We find that, controlling for all standard controls, CPS is negatively associated with firm value as measured by industry-adjusted Tobin's q. CPS also has a rich set of relations with firms' behavior and performance. In particular, CPS is correlated with lower (industry-adjusted) accounting profitability, lower stock returns accompanying acquisitions announced by the firm and higher likelihood of a negative stock return accompanying such announcements, higher odds of the CEO receiving a lucky option grant at the lowest price of the month, lower performance sensitivity of CEO turnover, and lower stock market returns accompanying the filing of proxy statements for periods when CPS increases. Taken together, our results are consistent with the hypothesis that higher CPS is associated with agency problems and indicate that CPS can provide a useful tool for studying the performance and behavior of firms.

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1. Introduction

The inner workings of the top executive team, and their importance for firm performance, are hard to observe or quantify. In this paper, we aim to contribute to the subject by introducing a new measure pertaining to the relationship between the Chief Executive Officer (CEO) and the other members of the top executive team, as well as studying the relation between this measure and the performance and behavior of firms. Our new measure is CEO Pay Slice (CPS), which is defined as the fraction of the aggregate compensation of the firm's top-five executive team captured by the CEO. By basing CPS on compensation information from executives that are all at the same firm, we control for any firm-specific characteristics that affect the average level of compensation in the firm's top executive team.

We find that CPS has a rich set of relations with a wide range of aspects of firms' performance and behavior. In particular, higher CPS is associated with lower firm value as measured by Tobin's q, lower accounting profitability, lower quality of acquisition decisions, higher odds of opportunistically timed option grants to the CEO, lower CEO turnover, and lower stock market returns accompanying the filing of proxy statements for periods when CPS increases. Our findings thus unearth a rich set of systematic relations between CPS and the value and outcomes of firms. Taken as a whole, our results indicate that CPS can provide a useful tool for research on firm performance and behavior, and that its relation with the value and behavior of firms is an important issue for study by financial economists.

Our investigation of the relation between CPS levels and firm outcomes and behavior has two parts. The first part examines the relation between lagged CPS and firm value as measured by industry-adjusted Tobin's q. We find a strong empirical relation between CPS and q. Controlling for the various factors that prior work has used in q regressions, a significant—and economically meaningful—negative correlation exists between CPS and industry-adjusted q. We also find that the association between CPS and q is robust to the inclusion of several factors that might affect both q and CPS, such as the CEO's tenure and status as founder or large owner or chair of the board, the size of the company's aggregate top-five compensation relative to peer companies, the extent to which the CEO's compensation is more incentive-based than the compensation of the other top executives, and the compensation inequality among the executives in the top team other than the CEO.

We find that the identified negative correlation between CPS and Tobin's q is robust to the addition of all of these controls as well as to controlling for lagged q, adding firm fixed effects, and trying to incorporate the

endogenous choice of CPS. The negative association between CPS and q exists both among firms whose aggregate top-five compensation is higher and for those where it is lower than their peers. The negative association between q and CPS is further concentrated among firms whose boards are entrenched (using measures of shareholder rights as in Gompers, Ishii, and Metrick, 2003; Bebchuk, Cohen, and Ferrell, 2009).

In the second part of our analysis, we examine how CPS is associated with other dimensions of company behavior and performance, including ones that are commonly viewed as reflecting governance problems. These tests help to understand why CPS and firm value might be negatively related.

First, CPS is negatively correlated with accounting profitability. Firms with high CPS tend to have a lower industry-adjusted operating income to assets ratio.

Second, high-CPS firms tend to make worse acquisition decisions as judged by the market's reaction to their acquisition announcements, using the data set of Masulis, Wang, and Xie (2007). If the acquiring firm has higher CPS, the stock return accompanying the acquisition announcement is lower and more likely to be negative.

Third, firms with higher CPS are more likely to provide their CEO with opportunistically timed option grants. High CPS is associated with an increased likelihood of the CEO receiving a lucky option grant with an exercise price equal to the lowest price of the grant month.

Fourth, CPS is associated with CEO turnover. The probability of a CEO turnover after bad performance is lower if CPS is higher controlling for the CEO's length of service.

Fifth, stock market returns accompanying the filing of proxy statements tend to be lower for periods when CPS increases.[1]

In interpreting our rich set of results, one should keep in mind that firms might differ in their CPS levels for two reasons. First, firms might differ in their optimal (or appropriate) CPS level, as the optimal CPS level for any given firm might depend on the CEO's relative ability and contribution, as well as on the extent to which it is optimal for the firm to provide tournament incentives to executives. Second, firms might differ in how their CPS levels depart (if at all) from the optimal level for the firm. To the extent that the CEO has power and influence over the company's decision making, the CEO might use this power and influence to raise CPS above its optimal level. In this case, the excess CPS—that is, the excess of the

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[1] Our earlier discussion paper (Bebchuk, Cremers, and Peyer, 2007) provides evidence that high CPS is also associated with greater tendency to reward the CEO for luck due to positive industry-wide shocks.

actual CPS over the optimal CPS—reflects rents captured by the CEO and can be viewed as a product of agency (governance) problems.

This separation of CPS into two components, optimal (or appropriate) CPS and excess CPS, is relevant for interpreting any identified association of CPS with firm characteristics or behavior. A correlation of a given variable with firm differences in observed CPS levels could be due to a correlation of the variable with the optimal level of CPS for a given firm or with excess CPS (or a correlation with both). Whether the second component exists at all depends on whether CPS is optimally selected. Under an optimal selection hypothesis, CPS is generally optimally selected and the second component is thus nonexistent. Under an agency (governance) hypothesis, CPS might not always be optimally chosen and CPS has a component that reflects rent-seeking and agency problems.

The negative correlation we find between CPS and q rules out the joint hypothesis that CPS is chosen optimally to reflect the relative importance of the CEO in the top team and that firm value as measured by q is either uncorrelated or positively correlated with the optimal CPS level. Instead, this finding has two, not mutually exclusive, explanations. One is an optimal selection explanation: The optimal level of CPS or the relative importance of the CEO could be higher for lower value firms, and the identified pattern could be due to the tendency of such firms to choose high CPS levels. This possibility calls for further study, including the development of a formal theoretical framework for studying optimal levels of CPS.

A second explanation for the negative correlation between CPS and firm performance is an agency (governance) problem explanation: High excess CPS could reflect agency and governance problems, which in turn bring about the identified pattern between lower firm value and higher CPS. While the identified correlation between CPS and Tobin's q can theoretically be fully explained by optimal selection alone, some of our other results are supportive or at least consistent with the possibility that the association between CPS and lower q is at least partly driven by CPS reflecting governance problems. In particular, this is the case with respect to our findings that CPS is associated with opportunistic timing of CEO grants, worse acquisition decisions, more CEO luck-based pay, and lower probability of turnover in the event of bad performance, as well as our result that the negative association between q and CPS is concentrated among firms whose boards are entrenched.

We should stress that, even if some firms have excessive CPS levels and actual CPS levels are correlated with excess CPS levels and agency problems, this is a mere correlation and it does not imply that firms with high (observed) CPS levels have governance problems and are made better off by reducing these levels. In some high-CPS firms, an observed high level of CPS might be optimal given the firm's circumstances and a reduction in the CPS level would make the firm worse off.

Our work is related to several bodies of literature. To begin, some recent work has shown that the fraction of the top-five compensation received by CEOs has been trending up over time (Bebchuk and Grinstein, 2005;

Frydman, 2005; Murphy and Zabojnik, 2007; Frydman and Saks, 2010). In contrast, we focus on the relations of this fraction with the performance and behavior of firms at any given time.

Our work also relates to the literature examining how firm value as measured by Tobin's q is associated with governance arrangements. For example, studies show that Tobin's q is negatively correlated with the presence of staggered boards (e.g., Bebchuk and Cohen, 2005), the weakness of shareholder rights more generally (see e.g., Gompers, Ishii, and Metrick, 2003; Bebchuk, Cohen, and Ferrell, 2009; Cremers and Nair, 2005), and the presence of a large board (Yermack, 1996). We contribute to this literature by identifying yet another aspect of the firm's governance arrangements—the CPS level—that is associated with Tobin's q.

In addition, this paper relates to work on stock market reaction to acquisition announcements. Financial economists have paid close attention to buyers' willingness to make acquisitions, which, as measured by the stock market returns accompanying the acquisition announcement, the market views as value-decreasing (see, e.g., Lang, Stulz, and Walkling, 1991; Morck, Shleifer, and Vishny, 1990; Qiu, 2004; Moeller, Schlingemann, and Stulz, 2005). Masulis, Wang, and Xie (2007) show that the magnitude of the announcement returns are related to governance characteristics and, in particular, entrenchment provisions. We extend their work by showing that these returns are also negatively correlated with CPS even after controlling for entrenchment provisions.

Similarly, our work is related to the literature on opportunistic timing of option grants and its relation to firm governance and structure (see, e.g., Yermack, 1997; Lie, 2005; Bebchuk, Grinstein, and Peyer, 2010). We extend this work by showing that, controlling for other governance provisions, firms with higher CPS are more likely to grant opportunistically timed options to the CEO.

Our work is further related to the substantial literature on CEO turnover (see, e.g., Jenter and Kanaan, 2006; Kaplan and Minton, 2006). We extend this literature by showing that high CPS is associated with a lower CEO turnover controlling for performance.[2]

Two earlier studies have used different measures of CEO dominance within the top executive team. Morck, Shleifer, and Vishny (1989), in a study of alternative mechanisms for transfer of corporate control, define CEOs as powerful when no other person holds the title of president or chairman and no other person co-signs the letter to shareholders in the annual report. They find that more powerful CEOs are less likely to be replaced by the board but more likely to be replaced through a hostile takeover. More recently, in investigating whether CEO dominance is correlated with firm-specific variability of stock returns, Adams, Almeida, and Ferreira (2005) assume CEOs to be more powerful when they serve as chair of the board, when they are the only insider on the

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[2] While our analysis focuses on the relation between CPS and CEO turnover, Chang, Dasgupta, and Hilary (2010) examine a complementary question of whether abnormal stock returns around managerial departure announcements are related to CPS.

board, and when they have the status of a founder. In this paper, we put forward CPS as a measure of CEO dominance that captures more than the formal status variables. CPS is positively correlated with such variables, but they explain only a small part of the variability in CPS.

Finally, a growing literature is studying how the type and style of a CEO affects firm outcomes (see, e.g., Malmendier and Tate, 2009; Bertrand and Schoar, 2003). Our work seeks to highlight the importance for firm outcomes of another dimension concerning the CEO: the CPS.

Our analysis is organized as follows. Section 2 describes our data and presents summary statistics. Section 3 analyzes the relation between CPS and Tobin's q. Section 4 examines the relation between CPS and accounting profitability, abnormal acquirer returns, opportunistic timing of CEO grants, the probability of turnover in the event of bad performance, and abnormal returns around announcements of CPS changes. Finally, Section 5 concludes.

2. Data and summary statistics

2.1. The CEO Pay Slice (CPS)

The CEO Pay Slice is defined as the percentage of the total compensation to the top five executives that goes to the CEO. In this section, we discuss our computation of CPS and give summary statistics.

We compute the CPS using data from Compustat's ExecuComp database from 1993 to 2004. Our main measure is based on the total compensation to each executive, including salary, bonus, other annual pay, the total value of restricted stock granted that year, the Black and Scholes value of stock options granted that year, long-term incentive payouts, and all other total compensation (as reported in ExecuComp item TDC1).

While CPS can be computed for every firm-year, we restrict our sample to firm-years in which the CEO was in office for the entire year. This avoids observations with artificially low CPS due to the fact that a CEO has received compensation only for part of the year. Also, for some firm-years more than five executives are listed in Execu-Comp. In such cases, we use only the five executives with the highest compensation.[3]

Because CPS is likely the product of many observable and unobservable dimensions of the firm's top executives and management model, CPS could enable us to capture dimensions of the CEO's role in the top team beyond the ones captured by other, previously examined variables such as whether the CEO also chairs the board. CPS is positively correlated with dummy variables for whether the CEO also chairs the board and whether the CEO is the

only executive of the firm who is a member of the board.[4] However, a regression of CPS on these two variables results in an adjusted R-squared of only 0.9%, which indicates that CPS captures other information not contained in those two variables.[5] In addition, because CPS is calculated using the compensation figures for the top executives at the same firm, it directly controls for any firm-specific characteristics that affect the average level of executive compensation at the firm level.

2.2. Summary statistics

Univariate statistics for the average CPS and the main variables used in this paper are shown in Table 1. The statistics are computed based on a panel data set of 12,011 firm-year observations that represent 2,015 different firms and 3,256 different CEOs between 1993 and 2004. In this time period, the average CPS was 35% and its standard deviation equals 11.4%.

For the pertinent firm characteristics, we use various Compustat, Center for Research in Security Prices (CRSP), IRRC, and ExecuComp variables: Tobin's q is defined as the market value of equity plus the book value of assets minus the sum of book value of common equity and deferred taxes, all divided by the book value of assets. Industry adjustments are made at the four-digit standard industrial classification (SIC) level, by subtracting the industry median Tobin's q. Our definition of Tobin's q is the one used by Kaplan and Zingales (1997) and subsequently also by Gompers, Ishii, and Metrick (2003).[6] Industry-adjusted ROA is the return on assets computed as operating income divided by book value of assets minus the median ROA of the firms in Compustat in a given four-digit SIC industry and year. It is expressed in percentage terms. We report results in which both variables are winsorized at the 1 and 99 percentile, though results are robust to not winsorizing.

The entrenchment index (Eindex) consists of six of the governance/shareholder rights provisions that are identified as those most relevant for shareholder value by Bebchuk, Cohen, and Ferrell (2009). The six provisions in the Eindex are classified boards, poison pills and golden parachutes, and supermajority voting requirements for charters, by-laws, and mergers. Eindex ranges between 0 and 6, where higher values indicate weaker shareholder

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[3] In our sample period, firms were required to report the compensation for anyone holding the office of CEO during the year, plus the four highest paid executive officers not including the CEO. Some firms voluntarily report the compensation for more executives than required. When restricting the sample to firms that report compensation for only five executives, our results continue to hold (not reported). If the firm reports compensation for fewer than five executives (uncommon), we exclude the firm to ensure that CPS remains comparable across firms.

[4] We use information from the Investor Responsibility Research Center (IRRC) to identify the chairman. If the item is missing we use the annual title from ExecuComp to identify whether the CEO is also holding the chairman position.

[5] The rank correlation of CPS with a dummy variable for whether the CEO also chairs the board is 0.062 (significant at the 1% level) and the correlation of CPS with a dummy whether the CEO is the only executive of the firm who is a member of the board is 0.099 (significant at the 1% level). The second variable is related not only to the relative importance of the CEO within the top executive team but also to the relative importance of the executive team on the board (Raheja, 2005).

[6] Tobin's q is equal to the market value of assets divided by the book value of assets (Compustat item 6), where the market value of assets is computed as the book value of assets (item 6) plus the market value of common stock (item 199∗item 25, or if item 199 is missing, then item 24∗item 25) less the sum of book value of common stock (item 60, set to zero if missing) and balance sheet deferred taxes (item 74, set to zero if missing).

Table 1
Descriptive statistics.

CEO Pay Slice (CPS) is the fraction of the total compensation (ExecuComp item TDC1) to the group of top-five executives that is received by the Chief executive officer (CEO). Industry Median CPS is the median CPS in the four-digit standard industrial classification (SIC) group. Tobin's q is defined as the market value of equity plus the book value of assets minus the book value of equity, all divided by the book value of assets. The industry adjustment is made at the four-digit SIC level using all Compustat firms. ROA is the return on assets computed as operating income divided by book value of assets. Eindex is the entrenchment index of Bebchuk, Cohen, and Ferrell (2009). Log Book Value is the log of the book value of assets. Insider Ownership is the fraction of shares held by all insiders as reported by ExecuComp. Capex/Assets is the ratio of capital expenditures to assets. Leverage is the long-term debt to assets ratio. R&D is the ratio of R&D to sales. If R&D is missing, it is set to zero and the dummy variable R&D Missing is set to one. Company Age is computed as the current year minus the year in which the company was first listed on the Center For Research in Security Prices (CRSP). Founder is a dummy equal to one if the CEO was already CEO when the firm first appeared on CRSP. CEO Outsider is a dummy equal to one if the CEO was working at the firm for less than one year before becoming CEO. Log Abnormal Total Compensation is the residual of a regression of total compensation of the top-five executives on Log Book Value with industry and year fixed effects. Relative Equity Compensation is the ratio of the fraction of equity compensation of the CEO to the average fraction of equity compensation of the other four top executives. The fraction of equity compensation is defined as EBC/TDC1, where EBC is the equity-based compensation calculated as the sum of the value of the restricted shares granted plus the Black and Scholes value of options granted and TDC1 is the total compensation from ExecuComp. CEO Ownership $\geq$ 20% is a dummy equal to one if the CEO holds at least 20% of outstanding shares. CEO Tenure is the number of years since becoming CEO. Diversification is a dummy variable equal to one if the firm reports more than one segment on Compustat's segment database. CEO Is Chair is a dummy equal to one if the CEO is also the chairman of the board using Investor Responsibility Research Center (IRRC) and ExecuComp data. CEO Is Only Director is a dummy variable equal to one if the CEO is the only executive officer on the board. Number of VPs is the number of vice presidents among the top-five executives. We present the number of observations, the overall sample mean, and standard deviation, as well as the minimum and maximum values.

Variable	Number of observations	Mean	Standard deviation	Minimum	Maximum
CPS	8,659	0.357	0.114	0	1
Industry Median CPS	8,683	0.336	0.035	0.089	0.587
Industry-adjusted Tobin's q	8,557	0.339	1.095	−1.32	5.77
Eindex	8,683	2.227	1.294	0	6
Log Book Value	8,663	7.689	1.699	0.644	13.9
Insider Ownership	8,683	0.061	0.070	0.000	0.825
Insider Ownership^2	8,683	0.009	0.030	0.000	0.681
ROA	8,662	0.037	0.090	−0.475	0.238
Capex/Assets	8,662	0.183	1.997	−19.9	132
Leverage	8,647	0.196	0.164	0	1.87
R&D	8,683	0.121	4.616	0	0.31
R&D Missing	8,683	0.517	0.500	0	1
Company Age	8,683	25.992	18.805	0	78
Founder	8,683	0.144	0.351	0	1
CEO Outsider	8,680	0.153	0.360	0	1
Abnormal Total Compensation (Log)	8,651	−0.115	0.672	−3.84	5.03
Relative Equity Compensation	8,683	1.106	0.710	0	6
CEO Ownership $\geq$ 20%	8,683	0.045	0.206	0	1
CEO Tenure	8,139	7.736	7.172	0	52
Diversified	8,662	0.580	0.494	0	1
CEO Is Chair	8,683	0.729	0.444	0	1
CEO Is Only Director	8,683	0.507	0.500	0	1
Number of VPs	8,683	2.577	1.273	0	4

rights or more entrenched management. As a robustness test, we have also used the Gompers, Ishii, and Metrick (2003) governance index (Gindex), which is based on a broader set of 24 governance provisions, and the results are qualitatively similar (not shown).

Log Book value is the book value of assets. Insider Ownership is the fraction of shares held by insiders as reported by ExecuComp.[7] Capex/Assets is the ratio of capital expenditures to assets. Leverage is the ratio of long-term debt to assets. R&D is the ratio of research and development to sales. If R&D is missing, it is set to zero and the dummy variable R&D Missing is set to one. Company age is computed as the current year minus the year in which the company was first listed on CRSP.

Next, we include several variables capturing CEO and top team compensation characteristics. Founder CEO is a dummy equal to one if the CEO's tenure reported in ExecuComp started prior to the firm's first listing in CRSP, which is assumed to be the initial public offering (IPO) year. There are 1,661 firm-year observations with a founder CEO, consisting of 284 different founder CEOs in our sample. CEO Is Outsider is a dummy equal to one if the CEO was at the firm less than one year before becoming CEO.[8] Abnormal Total Compensation is the residual of the following industry and year fixed effects regression: log(total compensation to the top five executives combined) on a constant and log(book value of assets). The inclusion of this variable can thus be viewed

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[7] Just using CEO ownership, we find very similar results in the CPS regressions in Table 2. For the q regressions (Tables 3 and 4), CEO ownership and its square are less significant than Insider Ownership (not shown).

[8] We use ExecuComp information on "joined company" and "became CEO." A CEO is classified as an insider if the CEO has joined the company more than a year before becoming CEO and if either one data item is missing.

as controlling for the aggregate quality or outside opportunities of the firm's top executive team. We report results using industry classifications at the four-digit SIC level, but the results are robust to using two- or three-digit levels (not shown).

Relative Equity Compensation captures the difference in pay-performance sensitivity between the CEO and other top executives, measured as the ratio of the fraction of equity compensation of the CEO to the average fraction of equity compensation of the other four top executives. Here, the fraction of equity compensation is defined as EBC/TDC1, where EBC is the equity-based compensation calculated as the sum of the value of the restricted shares granted plus the Black and Scholes value of options granted and TDC1 is the total compensation from Execu-Comp. CEO Ownership $\geq 20\%$ is a dummy equal to one if the CEO owns a stake of at least 20%. CEO Tenure is the number of years since becoming CEO. Diversification is a dummy variable equal to one if the firm reports more than one segment on Compustat's segment database.

The last three variables capture board characteristics. CEO Is Chair is a dummy based on ExecuComp and equal one if the CEO also chairs the board, in which case the CEO is likely to be more powerful. CEO Is Only Director is a dummy variable equal to one if the CEO is the only executive officer on the board. Finally, Number of VPs is the number of vice presidents among the top five executives using ExecuComp data. The latter two variables proxies are related to the firm's organizational structure, e.g., whether or not the firm has more CEO-like executives who could run corporate divisions.

The rank order correlation between contemporaneous and lagged CPS equals 44.2%. Other variables with high correlations with CPS are Industry Median CPS (25%), Relative Equity Compensation (35.3%), and Number of VPs (19.2%) (not reported).

In Table 2, we report CPS regressions using a pooled panel with firm and year fixed effects and standard errors clustered at the firm level. We find that CPS is positively associated with Industry Median CPS, the Number of VPs on the board, the CEO Is Chair dummy, ROA, R&D expenses, Company Age, and Relative Equity Compensation, and that it has a non-linear relation to Insider Ownership.[9] The CEO Is Only Director variable is not significant. The specification in Column 1 later is used as first-stage regressions in a system of equations, in which we try to incorporate the endogenous choice of CPS. The three variables assumed as instruments for CPS, i.e., variables that only affect firm value through CPS but not directly, are Industry Median CPS, Number of VPs, and CEO Is Only Director (the first three variables in Table 2). The first two are clearly the most important in Table 2, while the third has been used by previous literature as a proxy for the relative importance of the CEO (e.g., Adams, Almeida, and Ferreira, 2005).

Abnormal Total Compensation of the top-five executive group has a negative coefficient that is marginally significant. To understand this further, in Column 2 we decompose this variable into cases in which the group is relatively highly paid (positive values) versus poorly paid (negative values). We find that the negative association between CPS and Abnormal Total Compensation is driven by firms with top teams that are relatively poorly paid. Specifically, CPS and Abnormal Total Compensation are negatively related only for firms in which the top executive team as a whole receives relatively low compensation. For firms with relatively high compensation for the top team, we find a significantly positive association. Thus, any deviation from the median total compensation seems to be related to a higher CPS. Finally, being a new CEO (tenure equal to one year) also has a negative association with CPS.

3. CPS and firm performance

3.1. How could CPS and firm performance be expected to correlate?

Before proceeding, we first discuss alternative hypotheses as to how CPS can be expected to correlate with firm value and behavior. In thinking about this question, we distinguish two assumptions under which this question could be analyzed.

3.1.1. Optimal selection hypotheses

Consider a case in which there are no agency problems and firms therefore generally set CPS at the optimal level according to the relative importance of the CEO in the top executive team. Absent agency costs, the compensation of the top executive team is set by the board without any undue influence by the CEO. In this optimal selection scenario, by definition, no firm would be able to increase its value by changing its CPS level. Still, CPS levels could relate to firm value to the extent that the optimal CPS level differs across firms.

Optimal CPS levels can be expected to vary among firms, depending on several considerations. First, the optimal CPS level for any given firm depends on the pool of candidates from which the members of the top executive team are drawn, and the quality and outside opportunities of these candidates clearly differ from firm to firm. Second, the optimal CPS level depends on the extent to which it is desirable to provide tournament incentives to top executives other than the CEO.[10] Third, the optimal CPS level depends on the extent to which it is desirable for the firm to have a dominant player model based on one especially important player rather than a management

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[9] We find that CEO Is Chair duality is related both to higher total CEO compensation and to lower total compensation of the other top four executives (controlling for industry, size, and year effects).

[10] A tournament environment can provide both positive and negative incentives to top executives other than the CEO (Milgrom and Roberts, 1992). On the one hand, a tournament could provide executives other than the CEO with incentives to excel to increase their chances of succeeding the CEO. On the other hand, a tournament could produce deadweight costs by, for example, causing executives vying for the CEO position to cooperate less with, or even seek to undermine, their rivals. These benefits and costs are likely to vary across firms.

Table 2
CEO Pay Slice (CPS) regressions.

Firm fixed effects regressions with *t*-statistics based on robust standard errors clustered at the firm level. Each regression includes year dummy variables (not shown). The dependent variable is CPS. CPS is the ratio of CEO total compensation to the sum of all top executives' total compensation. Total compensation is data item TDC1 from ExecuComp. We limit the sample to firms with five or more executives listed in ExecuComp and use only the top-five executives determined by total compensation to form the denominator. We also require that the CEO is the same as last year and that last year he was in office for a full year. Industry Median CPS is computed as the median CPS of the same four-digit SIC industry in a given year. Number of VPs is determined based on ExecuComp data that identify the main position of the executive listed. See Table 1 for further variable descriptions. *, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

Variables	CPS	
	(1)	(2)
Industry Median CPS	0.492***	0.491***
	(8.246)	(8.270)
Number of VPs	0.0179***	0.0176***
	(10.59)	(10.51)
CEO Is Only Director	0.00442	0.00454
	(1.212)	(1.247)
CEO Is Chair	0.0105**	0.0103**
	(2.031)	(1.984)
Industry-adjusted Tobin's q	0.00389	0.00410
	(1.431)	(1.521)
Eindex	−0.000231	−0.000347
	(−0.0815)	(−0.123)
Log Book Value	−0.000548	4.70e-05
	(−0.0911)	(0.00775)
Insider Ownership	−0.167**	−0.168**
	(−2.228)	(−2.233)
Insider Ownership^2	0.275*	0.276*
	(1.907)	(1.915)
ROA	0.0568**	0.0556**
	(2.498)	(2.436)
Capex/Assets	−0.000343	−0.000320
	(−0.801)	(−0.752)
Leverage	−0.0223	-0.0217
	(−1.344)	(−1.304)
R&D	0.00214***	0.00216***
	(14.27)	(13.95)
R&D Missing	−0.00195	−0.00232
	(−0.126)	(−0.151)
Company Age	0.00267***	0.00261***
	(3.081)	(3.009)
Founder	0.00111	0.00149
	(0.110)	(0.149)
Abnormal Total compensation	−0.00672*	
	(−1.785)	
Abnormal Total Compensation × (dummy=1 if Abnormal Total Compensation < 0)		−0.0125**
		(−2.047)
Abnormal Total Compensation × (dummy=1 if Abnormal Total Compensation ≥ 0)		−0.000204
		(−0.0353)
Relative Equity Compensation	0.0537***	0.0537***
	(19.90)	(19.94)
CEO Ownership ≥ 20%	−0.00455	−0.00516
	(−0.415)	(−0.470)
CEO Tenure=1	−0.00747	−0.00747
	(−1.382)	(−1.381)
CEO Tenure=2	−0.000304	−0.000381
	(−0.0619)	(−0.0777)
CEO Tenure=3 or 4	0.00105	0.000989
	(0.246)	(0.232)
CEO Tenure=5 or 6	0.00476	0.00477
	(1.280)	(1.287)
CEO Tenure Missing	0.00773	0.00776
	(0.617)	(0.619)
Diversified	−0.00688	−0.00688
	(−1.580)	(−1.589)
CEO Outsider	−0.00192	−0.00174
	(−0.215)	(−0.196)
Number of observations	8,129	8,129
R-squared	0.246	0.246
Firm fixed effects	Yes	Yes
Year dummies	Yes	Yes

model based on a team of top executives.[11] Fourth and related, the optimal CPS level reflects whether it is desirable to concentrate dollars spent on incentive generation on the CEO instead on other top executives.

Existing theory does not provide an unambiguous prediction as to how the above considerations relate to firm value, allowing three different optimal selection hypotheses:

Hypothesis O1. Optimal CPS is positively correlated with firm performance. It might be argued that a dominant player model and powerful tournament incentives are especially valuable for high value firms with high growth opportunities that need to be decisively and vigorously pursued. It might also be that high value firms are especially likely to attract star CEOs.

Hypothesis O2. Optimal CPS is negatively correlated with firm performance. A dominant player model and powerful tournament incentives might be especially needed for low value firms in distress that need to be turned around. It might also be that low value firms are unlikely to be able to attract a good executive bench.

Hypothesis O3. Optimal CPS is uncorrelated with firm performance. It might be that the factors making high or low CPS optimal vary in ways that are distributed independently of firm value.

Thus, to the extent that the association between CPS and firm performance is determined by optimal selection, an empirical investigation is necessary to choose among the competing Hypotheses O1–O3.

3.1.2. Agency (governance) hypotheses

The discussion above assumed that all CPS levels are optimally set and that CPS measures the relative importance of the CEO in the top executive team. However, because choices are partly made by agents whose decisions are influenced by private interests and thus involve agency costs, some CPS choices could depart from their optimal level. Under this alternative hypothesis, CPS could reflect the extent to which a CEO's power and influence is used to push for a dominant player model and an increase in CEO compensation, leading to a higher CPS than optimal for the firm. In this case, CPS would (partly) reflect rents that the CEO has been able to extract by influencing the pay-setting process to allocate a larger slice of the aggregate compensation of the top executive to himself or herself.[12]

Assuming that some CPS levels depart from the optimum, let "excess CPS" denote the excess (if any) of a given observed CPS level over the optimal level. As long as excess CPS levels are not perfectly negatively correlated with optimal CPS levels, observed CPS levels can be expected to be positively correlated with excess CPS levels. In this case, a correlation between excess CPS levels and a given variable (e.g., Tobin's q) can produce a correlation between observed CPS levels and this variable.

A high level of excess CPS—that is, a substantial departure from the optimal CPS level—can be viewed as a reflection of significant governance problems. It could reflect a state of affairs in which the CEO is making significant use of the CEO's power. Accordingly, high levels of excess CPS, and the governance problems they reflect, would be correlated with low firm value. Thus, to the extent that observed CPS levels do contain a potentially significant component of excess CPS, such presence can be expected to produce a negative correlation between CPS and firm value, which provides the following agency (governance) hypothesis:

Hypothesis G. Excess CPS levels, and in turn also observed CPS levels, are negatively correlated with firm performance.

3.1.3. Firm performance and endogenously determined CPS

In this section, our primary empirical proxy for firm performance is the industry-adjusted Tobin's q. This follows a substantial literature on the association between firm value and various corporate arrangements, which extensively used Tobin's q as a measure of firm value (e.g., Demsetz and Lehn, 1985; Morck, Shleifer, and Vishny, 1988; Lang and Stulz, 1994; Yermack, 1996; Gompers, Ishii, and Metrick, 2003).

In studying the empirical association between CPS and Tobin's q, it is critical to recognize that CPS is an endogenously determined variable, which itself could be determined by factors that are also related to firm value. We try to account for this in several different ways when relating CPS to Tobin's q. First, we use lagged not contemporaneous CPS.[13] Second, we industry-adjust CPS by deducting the median CPS in each firm's industry at the four-digit SIC level in that year. Third, we control for lagged Tobin's q. Fourth, we add firm fixed effects, effectively considering how changes in CPS are associated with changes in firm value (Table 3).

In addition, in later parts of this paper, we take additional steps. To begin, we add controls that could affect the endogenous choice of CPS (Section 3.2). We also use the CEO changes in our sample to investigate whether we can find evidence for optimal selection, i.e., whether a low level of Tobin's q is associated with an increase in the level of CPS for the new relative to the old CEO

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[11] A dominant player model has both benefits and costs. On the one hand, a dominant player model could provide clarity, steadiness, and reduction in the cost of decision making. On the other hand, a large body of literature, starting with Shaw (1932), extolls the benefits of group instead of individual decision making, and some experimental data show that groups often outperform individuals in decision making (see Bainbridge, 2002, for a survey). Furthermore, a dominant player model and the high CPS coming with it can lead to resentment on the part of the other members of the top team (Brill, 1993; Cook, 1990). All of these benefits and costs are unlikely to be invariant across firms.

[12] In the management literature, there is related work on the psychology of managerial decisions that uses the pay of the CEO relative to other top executives as a measure of CEO self-importance or narcissism. For example, Hayward and Hambrick (1997) and Chatterjee and Hambrick (2007) use the CEO cash compensation divided by the cash

(footnote continued)

compensation of the second-highest-paid officer in a small sample of firms (about one hundred companies) as one among a set of indicators for CEO self-importance, and they find some evidence of a negative association between CEO self-importance and firm performance.

[13] As we use lagged CPS, we require that the CEO remains in place the following year. The results are qualitatively similar without this constraint (not shown).

Table 3
Tobin's q and CEO Pay Slice (CPS).

   This table presents ordinary least squares regressions in Columns 1 and 2 and firm fixed effects regressions in Columns 3 and 4. Regression 4 reports the second-stage results for a system of equations estimation, using a firm fixed effects instrumental variable regression. The first-stage CPS regression equals CPS, $t-1=a+b\,X+c\,Z+u_i+e_{it}$, and corresponds to Column 1 of Table 2. The instruments in the first stage are (all measured at $t-1$): industry median CPS, the number of vice presidents in the top-five executives, and a dummy variable for CEO is the only director. The Hansen J statistic is a test of overidentifying restrictions, where the p-value is reported between parentheses. t-statistics are based on robust standard errors clustered at the firm level. In all regressions, we include year dummies (not shown). The dependent variable is the four-digit SIC industry-adjusted Tobin's q. Tobin's q is defined as the market value of equity plus the book value of assets minus the sum of book value of equity and deferred taxes, all divided by the book value of assets. The industry adjustment is done by subtracting the industry median Tobin's q from the firm Tobin's q. The dependent variable is winsorized at the 1% and 99% level. CPS is the ratio of CEO total compensation to the sum of all top executives' total compensation and is expressed as decimals. Total compensation is data item TDC1 from ExecuComp. See Table 1 for further variable descriptions. The sample size is smaller for data availability reasons related to the board membership of the CEO. *, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

Variables	Industry-adjusted Tobin's q			
	(1)	(2)	(3)	(4)
CPS, $t-1$	−0.475***	−0.177**	−0.229**	
	(−3.226)	(−2.470)	(−2.347)	
CPS, $t-1$ (endogenous)				−0.649**
				(−1.981)
Industry-adjusted Tobin's q, $t-1$		0.767***	0.287***	0.290***
		(48.03)	(11.10)	(31.60)
Eindex	−0.0966***	−0.00377	0.00855	0.00884
	(−5.874)	(−0.738)	(0.459)	(0.542)
Log Book Value	−0.0379**	−0.00901*	−0.399***	−0.397***
	(−2.408)	(−1.686)	(−9.949)	(−15.87)
Insider Ownership	0.413	0.0773	0.564	0.463
	(0.633)	(0.333)	(1.284)	(1.262)
Insider Ownership^2	−2.113*	−0.118	−0.850	−0.693
	(−1.655)	(−0.286)	(−1.535)	(−1.038)
ROA, t	4.089***	0.851***	1.470***	1.468***
	(10.95)	(5.342)	(5.841)	(12.52)
Capex/Assets	0.00584	0.000583	0.00387	0.00427
	(1.374)	(0.163)	(1.412)	(1.231)
Leverage	−0.739***	−0.186*	−0.402***	−0.393***
	(−3.759)	(−2.519)	(−3.070)	(−4.297)
R&D	0.0169***	0.0101*	0.00357	0.00374**
	(2.745)	(1.708)	(0.622)	(2.533)
R&D Missing	−0.192***	−0.00287	0.0193	0.0105
	(−4.396)	(−0.215)	(0.301)	(0.163)
Company Age	−0.00328**	0.000962**	0.0322***	0.0325***
	(−2.358)	(2.342)	(6.672)	(6.305)
Founder		−0.00540	−0.0187	−0.0201
		(−0.249)	(−0.302)	(−0.372)
Abnormal Total Compensation, $t-1$		0.0183	0.0113	0.00207
		(1.417)	(0.611)	(0.131)
Relative Equity Compensation, $t-1$		−0.00211	0.00131	−0.00408
		(−0.232)	(0.126)	(−0.367)
CEO Ownership $\geq 20\%$		−0.0463	−0.0569	−0.0552
		(−1.203)	(−1.140)	(−1.059)
CEO Tenure$=1$		−0.00733	−0.0766**	−0.0848**
		(−0.290)	(−2.216)	(−2.525)
CEO Tenure$=2$		0.00930	−0.0545*	−0.0594**
		(0.414)	(−1.678)	(−2.110)
CEO Tenure$=3$ or 4		−0.00516	−0.0497	−0.0495**
		(−0.250)	(−1.478)	(−2.018)
CEO Tenure$=5$ or 6		−0.0215	−0.0415	−0.0417*
		(−1.119)	(−1.540)	(−1.673)
CEO Tenure Missing		−0.0508**	−0.0578	−0.0493
		(−1.967)	(−0.786)	(−0.726)
Diversified		−0.0623***	−0.0162	−0.0164
		(−4.179)	(−0.521)	(−0.611)
CEO Outsider		0.0140	0.0304	0.0408
		(0.609)	(0.438)	(0.943)
CEO Is Chair		−0.0214	−0.0249	−0.0215
		(−1.218)	(−0.737)	(−0.773)
Constant	1.013***	0.111*		
	(7.227)	(1.820)		
Number of observations	8,661	8,077	8,077	8,077
R-squared	0.192	0.702	0.273	0.270
Firm fixed effects	No	No	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Hansen J statistic				1.31 (25%)

(Section 3.3). In addition, we analyze a system of equations to simultaneously estimate the associations between firm value and CPS, using a two-stage procedure (Section 3.3). Furthermore, we examine whether the association between Tobin's q and lagged CPS is different in subsamples, where optimal selection or agency problems or both could differ (Section 3.5). Finally, to shed light upon the identified association between Tobin's q and CPS, we investigate in Section 4 whether CPS is related to a host of other firm outcomes and behavior. These include accounting profitability as measured by industry-adjusted ROA (Section 4.1), acquirer stock market returns when the firm announces a takeover (Section 4.2), opportunistic timing of CEO stock option grants (Section 4.3), CEO turnover (Section 4.4), and abnormal stock returns around announcements of CPS changes (Section 4.5). In all of these settings, we discuss the extent to which the relation between CPS and firm behavior is consistent with either of the two main hypotheses or interpretations of CPS.

3.2. Association between CPS and Tobin's q

In this subsection, we discuss our empirical results concerning the association between lagged CPS and firm performance as measured by industry-adjusted Tobin's q.[14]

Our regressions include the standard controls used in the literature. In particular, we control for firm size (logs of book value of assets), insider ownership and insider ownership squared (see McConnell and Servaes, 1990), profitability (ROA), the ratio of capital expenditures to assets (Capex/Assets), leverage, the ratio of R&D expenditures to sales (R&D), a dummy for missing R&D data, log of the age of the firm (see Shin and Stulz, 2000), and year dummies. We also include the entrenchment index (Eindex) of Bebchuk, Cohen, and Ferrell (2009).

The pooled panel regression result with year dummies, displayed in Column 1 of Table 3, indicates that higher CPS has a strong association with lower firm value. All standard errors are clustered at the firm level to account for correlations within firm observations. The economic significance is strongest for lagged CPS: A one standard deviation change in the value of CPS (equal to 11.73%) is associated with a reduction in next year's Tobin's q of 5.5% ($=11.73\% \times -0.475$). In further tests (not included to save space, available upon request), we find that the results are

robust to using lagged industry-adjusted CPS (i.e., deducting the median CPS each year of all firms with the same four-digit SIC code).

In subsequent columns, we add lagged Tobin's q as a control, effectively considering changes in firm value. We further add seven other controls that could be related to the choice of CPS under the optimal selection hypothesis. In particular, we examine whether the negative association between q and CPS is driven by factors not included in standard q regressions that are correlated both with CPS and with a lower q.[15]

3.2.1. Founder CEO

Founder CEOs could have relative importance in the top team in ways not expressed by their annual executive compensation. In addition, Amit and Villalonga (2006) find that Fortune 500 firms that are founder-managed have a higher value. If CPS was lower when the CEO is a founder, then the relation between CPS and Tobin's q could be due to the omitted founder effect.

3.2.2. Abnormal Total Compensation

CPS could be related to the level of the firm's aggregate top-five compensation relative to peer companies, and this aggregate top-five compensation could be related to firm value. For example, a firm with a CEO whose compensation is on par with peer companies could have a high CPS to the extent that its other top executives have abnormally low compensation due to low quality and poor outside opportunities. In such a firm, firm value likely is low, and so is the aggregate compensation of the top executives other than the CEO as well as of the top-five team. The inclusion of this variable can thus be viewed as controlling for the aggregate quality or outside opportunities of the firm's top executive team.

3.2.3. Relative Equity Compensation

This captures the difference in pay-performance sensitivity between the CEO and other top executives. Aggarwal and Samwick (2003) show that CEOs capture a substantial fraction of the aggregate incentive pay awarded to the top-five executive team. When an executive is paid an especially large fraction of compensation in equity, the executive's compensation level could increase to compensate the executive for the risk-bearing costs involved. Thus, CPS might be high because the CEO receives a compensation package that is more performance-based relative to that of the other top executives.

3.2.4. CEO Ownership $\geq 20\%$

CPS could be related to whether the CEO has a large ownership, whereas previous literature has identified that CEO ownership and firm value are correlated. There are 525 firm-year observations of 61 different CEOs owning at least a 20% stake in the company.

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[14] Tobin's q is the ratio of market-to-book of the firm. Specifically, we calculate Tobin's q as (data199∗data25+data6−data60−data74)/data6, where data199 is the stock price at the end of the fiscal year, data25 is the number of shares outstanding, data6 is the book value of total assets, data60 is the book value of equity, and data74 is the amount of deferred taxes. If data199 is missing, we use data24 instead. If data74 is missing, it is set to zero. We winsorize q at 1%, but our main results are robust when we do not do so. The results are also robust to using [ln(Tobin's q)−ln(industry median of Tobin's q)] or ln[Tobin's q−(industry median of Tobin's q)], and when we remove the bubble years of 1999 and 2000. An alternative specification of our regressions, with log TQ as the dependent variable and SIC codes as industry fixed effects, yields similar results throughout. Using the Fama and French classification of 48 industry groups, instead of four-digit SIC codes, yields similar results throughout (not shown).

[15] In addition, in untabulated results, we use both lagged Equity-CPS and lagged Non-Equity-CPS in the Tobin's q regressions. We find that there is a negative and significant coefficient for both variables and that the coefficient on Non-Equity-CPS tends to be more negative (or larger in absolute value).

3.2.5. CEO Tenure

CPS could increase with the CEO's tenure, and the CEO's tenure could be related to the firm's value. Therefore, we include dummy variables for different levels of the CEO tenure, with tenure of 7 years and more being the hold-out group.

3.2.6. Diversification

When a firm is diversified, some of the top executives might be heads of divisions. CPS thus could be related to whether the firm has a diversified structure, which has been found to affect firm value (e.g., Lang and Stulz, 1994), and thus our results could be driven by this relation.

3.2.7. CEO Outsider

Parrino (1997) examines the characteristics of new CEOs who enter their job at the firm, finding that firms with insider CEOs could be more heterogeneous in nature, implying that CEO talent from inside the firm is harder to replicate. Further, Murphy and Zabojnik (2007) show that outsider CEOs receive more compensation, which could increase their CPS and could indicate unique skills.

3.2.8. CEO Is Chair

Adams, Almeida, and Ferreira (2005) use this as a proxy for the relative importance of the CEO to the firm.

The result in Column 2 of Table 3 indicates that the negative association between industry-adjusted Tobin's q and lagged CPS is robust to adding these controls. The coefficient of lagged CPS is significant at 5%, albeit with a reduced magnitude. The main effect comes from adding lagged Tobin's q, which greatly increases the R-squared and renders many of the standard controls insignificant or much less significant than before. Most of the additional controls are not statistically significant, with the main exception being the Diversification dummy.

In Column 3, we add firm fixed effects to the specification with the additional controls of Column 2, thus considering how changes in Tobin's q are related to changes in lagged CPS. The association between q and lagged CPS remains robustly negative, though again statistical significance is reduced (the coefficient for lagged CPS has a t-statistic of -2.35).

3.3. Optimal selection and firm value: CEO changes and a system of equations

The negative correlation between CPS and Tobin's q identified in Section 3.2 is inconsistent with two of the optimal selection hypotheses discussed in Section 3.1. In particular, our findings are inconsistent with the hypothesis that firms' optimal CPS levels are positively correlated with firm value (Hypothesis O1) or that firms' optimal CPS levels are uncorrelated with firm value (Hypothesis O3). Thus, to the extent that CPS levels are largely optimally set, our findings are consistent only with the second optimal selection Hypothesis O2. In addition to the optimal selection Hypothesis O2, our findings are consistent with the agency (governance) hypothesis (Hypothesis G) that CPS levels are correlated with excess CPS levels which are in turn negatively correlated with firm value due to agency problems.

It is worth stressing that the two remaining hypotheses are not mutually exclusive. The agency (governance) hypothesis does not assume that all firms depart from optimal CPS levels, only that some do. The negative correlation between CPS and q might thus be due to a negative correlation between optimal CPS levels and q as well as a correlation between actual CPS levels and excess CPS. Therefore, we frame our investigation below as an examination of whether the identified pattern is fully driven by optimal selection or is at least partly due to agency (governance) problems.

To this end, in the firm fixed effects regression in Column 4 of Table 3 we try to instrument for CPS using a two-staged estimation process in which we specify a system of equations to explicitly estimate the association between endogenously determined lagged CPS and Tobin's q. In the first stage (results presented in Column 1 of Table 2), we use CPS as the dependent variable to estimate how it is related to various firm characteristics. Three instruments are used to identify variation in CPS that only affects Tobin's q through CPS: Industry Median CPS, the number of vice presidents on the board, and whether the CEO is the only director. We also add contemporaneous Tobin's q as an explanatory variable, next to the various controls and firm fixed effects. Column 1 in Table 2 shows that only the first two (Industry Median CPS and the Number of VPs) are significantly related to CPS.

We use the Industry Median CPS, as the optimal CPS is likely to be different across industries and the choice of industry is to a large extent exogenous. Murphy (1999), for example, shows that executive compensation has important industry-wide components. The use of the number of VPs is motivated by two observations: First, Kale, Reis, and Venkateswaran (2009) identify this as an important determinant of tournament incentives, i.e., the more executives with an equal job title, the more the tournament incentives. Second, if the number of VPs is higher, the more likely it is that the other four executives are similar, which might allow the CEO to clearly differentiate himself or herself from others and thus justify taking a larger slice of the top-five pie.

The results of the second-stage estimation of Tobin's q on the (estimated) endogenously determined lagged CPS are presented in Column 4 of Table 3. We also include lagged Tobin's q, the standard and additional controls in Columns 2 and 3 of Table 3, and firm fixed effects.[16] The coefficient of lagged CPS is negative and significant at 5% (t-statistic of -1.98), suggesting that the negative association between Tobin's q and CPS is robust to incorporating the endogenous choice of CPS.

We report the results from the Sargan and Hansen test of overidentifying restrictions (see, e.g., Hayashi, 2000, pp. 227–228, 407 and 417), which tests the null hypothesis that the instruments are valid instruments (i.e., uncorrelated with the error term in the second stage) and that the excluded instruments are correctly excluded from the estimation second-stage regression. A rejection would cast

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[16] The regressions are estimated using Stata 9's extra command xtivreg2 written by Schaffer (2007).

doubt on the validity of the instruments. Using robust standard errors, this null hypothesis is not rejected.

Furthermore, we verify that no strong evidence for reverse causality exists, i.e., that firms with low q tend to hire CEOs with high CPS. Specifically, we investigate all 1,326 CEO changes indentified from ExecuComp in the universe of firms in our sample and compare the CPS of CEOs joining low q versus high q firms. If low value firms are more optimally run by CEOs with a high CPS, then we would expect to find that the new CEOs of low value firms have, on average, a significantly higher CPS than new CEOs of high value firms. However, we find neither significant differences in CPS, measured in the first full fiscal year after taking office, nor industry-adjusted CPS between newly hired CEOs in lower valued (with an industry-adjusted Tobin's q that is negative or with a Tobin's q below one) versus higher valued firms (results not included to save space, available upon request).

We note that no significant difference exists between low and high value firms in terms of the increase in CPS that the new CEO receives relative to the predecessor. The p-value of the difference in the change of CPS from the old CEO to the new CEO across firms with Tobin's q above versus below one has a p-value of 11%, and using negative versus positive industry-adjusted Tobin's q the p-value is 82%. Thus, this analysis does not support the hypothesis that the identified negative correlation between CPS and q can be explained by a tendency of low value firms to provide new CEOs with relatively high levels of CPS. In further unreported results, we separately consider CEOs hired from the outside versus inside CEOs. We find that CPS increases significantly if the new CEO is hired from outside the firm, but this is not related to the firm's level of (industry-adjusted or not) q.

The negative correlation between Tobin's q and lagged CPS is thus robust to controlling for lagged Tobin's q and for many other additional factors introduced in this subsection. It is also robust to adding firm fixed effects and incorporating the endogenous choice of CPS. In the most extensive specification with firm fixed effects without instruments, Column 3 in Table 3, the coefficient of lagged CPS equals -0.229 with a t-statistic of 2.3. That means that the economic significance of a one standard deviation increase in the value of CPS is associated with a reduction in next year's Tobin's q of about 2.7% ($=11.73\% \times -0.229$).[17] Meanwhile, the coefficient on the instrumented CPS in Column 4 of Table 3 equals -0.649, such that one standard deviation increase in CPS is associated with a 7.6% lower Tobin's q ($=11.73\% \times -0.649$).

3.4. Firm value and CPS versus Gini Top 5

The recent study of Kale, Reis, and Venkateswaran (2009) finds a positive contemporaneous association between Tobin's q and another measure of compensation inequality in the top executive team, Gini Top 5, which is defined as the Gini coefficient for the top five executives including the CEO. A higher Gini Top 5 is viewed by Kale, Reis, and Venkateswaran (2009) as reflecting greater inequality and thus stronger tournament incentives. Because Gini Top 5 is naturally positively correlated with CPS, it is worth investigating the robustness of our result to including lagged Gini Top 5 and, more generally, to reconcile our respective results.

Gini Top 5 is a product of both (i) the extent to which the CEO's compensation differs from the average compensation of the other members of the top executive team, a factor captured by CPS, and (ii) the extent to which compensation is unequal among these other members of the team. In particular, CPS captures only the pay inequality between the CEO and the average pay of the other top executives, while Gini Top 5 (used by Kale, Reis, and Venkateswaran, 2009) is driven by the inequality between all top five executives and thus by both factors (i) and (ii). To separately capture factor (ii), we use the variable Gini Other 4, which is defined as the Gini coefficient for the four executives in the top team other than the CEO.[18]

Table 4 presents q regressions to which the Gini variables are added (including many controls but not reporting their coefficients to save space). In Column 1, we include only lagged Gini Top 5 to replicate the results for Kale, Reis, and Venkateswaran (2009), and we find a positive and significant coefficient. In Column 2, we use both lagged CPS and lagged Gini Top 5, and find that both are significant with a negative coefficient for CPS and a positive coefficient for Gini Top 5. However, once the additional controls from Table 3 plus firm fixed effects are added in Column 3, lagged Gini Top 5 is significant only at the 10% level with a coefficient that is about half the coefficient in Column 1, while CPS remains significant (t-statistic of -2.10).[19] Thus, the negative correlation between CPS and q is robust to the inclusion of Gini Top 5.

How does one reconcile the negative correlation between q and CPS with the positive correlation between q and Gini Top 5? In Columns 4 and 5 of Table 4, we use lagged Gini Other 4 in conjunction with lagged CPS, with firm fixed effects used in Column 5 but not in Column 4. In both regressions, lagged CPS remains negative and significant, which reinforces the conclusion that, putting aside how compensation is distributed among the other four, CPS, our chief variable of interest, is negatively correlated with q.

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[17] In addition, all results in Table 3 are robust to excluding firm-year observations with a founder CEO or when the CEO holds at least 20% equity ownership.

[18] Gini Top 5 is positively correlated with CPS and Gini Other 4. When compensation among the four top executives other than the CEO is equal, CPS and Gini Top 5 would give an identical rank ordering. Across firms with identical CPS, differences in Gini Top 5 are driven by differences in Gini Other 4. The correlation between CPS and Gini Top 5 (Gini Top 4) is 62% (-10%), between Gini Top 5 and Gini Top 4 equals 54%, and their averages (standard deviations) are 0.32 (0.15) and 0.27 (0.20), respectively, such that the slightly lower Gini Top 4 average indicates that the compensation of the top four non-CEO executives is a bit more similar relative to the top five executives including the CEO.

[19] Kale, Reis, and Venkateswaran (2009) use contemporaneous specifications and find a positive correlation between Gini and firm value. Our finding that lagged Gini is positively (albeit less significantly) related to firm value supports the importance of tournament incentives and suggests that CPS captures a different effect.

Table 4
Tobin's q and CEO Pay Slice (CPS) with additional control variables.

This table presents ordinary least squares (OLS) regressions in Columns 1, 2 and 4, and firm fixed effects regressions in Columns 3 and 5, with $t-$statistics based on robust standard errors clustered at the firm level. The dependent variable is the four-digit SIC industry-adjusted Tobin's q. The dependent variable is winsorized at the 1% and 99% level. Gini Top 5 is the Gini coefficient of the top-five executives, including the CEO, while Gini Other 4 is the gini coefficient of the top team excluding the CEO. See Table 1 for a description of the other variables. Included in the regression, but not displayed for brevity, are the following variables: Constant (in OLS regressions), Eindex, Log Book Value, Insider Ownership, ROA, Capex/Assets, R&D, R&D Missing, Company Age, Diversified, CEO Outsider, CEO is Chair, CEO Tenure missing, CEO Tenure=5 or 6, CEO Tenure=3 or 4, and year dummies. *, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

Variables	Industry-adjusted Tobin's q				
	(1)	(2)	(3)	(4)	(5)
CPS, $t-1$		−0.804***	−0.172**	−0.489***	-0.147**
		(−4.757)	(−2.102)	(−3.434)	(-2.089)
Gini Top 5, $t-1$	0.2075**	0.353**	0.104*		
	(1.986)	(2.182)	(1.744)		
Gini Other 4, $t-1$				0.225**	0.0619
				(2.497)	(1.056)
Tobin's q, $t-1$			0.291***		0.293***
			(10.08)		(11.42)
Number of observations	7,828	7,828	7,300	7,828	7,300
R-squared	0.194	0.198	0.281	0.193	0.273
Firm fixed effects	No	No	Yes	No	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Standard control variables (Column 1 of Table 3)	Yes	Yes	Yes	Yes	Yes
Additional control variables (Columns 2–4 of Table 3)	No	No	Yes	No	Yes

At the same time, Gini Other 4 is positive in both regressions, though it is significant only in the regression without firm fixed effects in Column 4. Thus, the positive correlation between q and Gini Top 5 seems to come from a positive correlation between Gini Other 4 and q. Thus, the results in Kale, Reis, and Venkateswaran (2009) seem to be driven by Gini Other 4, the pay inequality among the group of top executives other than the CEO. Investigating the relation between Gini Other 4 and firm performance and behavior could be a worthwhile subject for future research.

3.5. Interaction of CPS with shareholder rights and compensation levels

This subsection considers whether the negative association between q and CPS is more prevalent in certain subsets of firms. We run firm fixed effects regressions as in Column 3 of Table 3 with additional interaction terms but report only the interaction variables to conserve space.

3.5.1. Shareholder Rights

We first investigate whether firms with high versus low entrenchment levels, as measured by the Eindex (Bebchuk, Cohen, and Ferrell, 2009), display different sensitivities between CPS and firm value. In firms with higher entrenchment levels, the CEO and the board are relatively insulated from market discipline and the threat of removal. For those firms, the potential for agency problems in general, and departures from optimal levels of CPS in particular, could be higher.

The first column of Table 5 displays the results of replacing lagged CPS with two variables to the specifications of Table 3: the interactions of lagged CPS with dummies of high versus low Eindex, where high (low)

Eindex is a dummy equal to one if the firm's Eindex is above (below or equal to) the sample median's Eindex in a given year. The lower value for firms with higher CPS is driven by firms with high entrenchment as measured by the Eindex. This suggests a complementary relation, as it is only firms with both entrenchment and high CPS that have lower firm values.

Thus, the data suggest that the negative correlation between CPS and firm value is more pronounced in firms with high entrenchment levels. In such firms, the potential for departures from optimal CPS levels may well be more significant, and as a result the distribution of actual CPS levels could be influenced to a greater extent by the distribution of excess CPS levels and the governance problems they reflect. Thus, the finding reported in this subsection is consistent with the hypothesis that the negative correlation between CPS and q is at least partly due to CPS levels, including a component that reflects agency problems.

3.5.2. Quality of the pool of executive candidates

We create two more subsets of firms: one in which the abnormal compensation paid to the top five executives (including the CEO) is positive or negative, and another in which the abnormal compensation to the top four executives (excluding the CEO) is positive or negative. Firms with relatively high abnormal compensation of the top-five executives as a group could be in a particularly challenging business environment and need to attract or retain valuable talent. Firms that pay the top executives other than the CEO more than peer companies could face a pool of executive candidates that has a different quality. For example, the negative association between q and CPS could be driven by firms with lower value having trouble attracting enough talent to their top executive team, thus

Table 5
CEO Pay Slice (CPS) and Tobin's *q* in different subsamples.

    The table shows firm fixed-effects regressions with year dummies and *t*-statistics based on robust standard errors clustered at the firm level. The dependent variable is the four-digit SIC industry-adjusted Tobin's *q*. Tobin's *q* is defined as the market value of equity plus the book value of assets minus the sum of the book value of equity and deferred taxes, all divided by the book value of assets. The dependent variable is winsorized at the 1% and 99% level. CPS is the ratio of CEO total compensation to the sum of all top executives' total compensation and is expressed as decimals. Total compensation is data item TDC1 from ExecuComp. The industry adjustment in CPS and Tobin's *q* are made at the four-digit SIC level. Low Eindex is defined as a firm with Eindex=0 or 1. High Eindex are firms with Eindex from 2 to 6. Abnormal Total Compensation is the residual of the following industry and year fixed effects regression: log (total compensation to the top five executives)=constant and log (book value of assets), with year and industry fixed effects. Abnormal compensation other 4 is the residual of the following industry and year fixed effects regression: log (total compensation to the four non-CEO executives)=constant and log (book value of assets), with year and industry fixed effects. Abnormal Total Compensation Pos (Neg) and Abnormal compensation other 4 Pos (Neg) are dummy variables equal to one if Abnormal Total Compensation or Abnormal compensation other 4 is positive (negative). For additional variable definitions, see Table 1. Included in the regression, but not displayed for brevity, are the following variables: lagged Industry-adjusted Tobin's *q*, Eindex, Log Book Value, Insider Ownership, Insider Ownership^2, ROA, Capex/Assets, Leverage, R&D, R&D Missing, Company Age, Founder, CEO Ownership ≥ 20%, CEO Tenure, Diversified, CEO Is Chair, and year dummies. *, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

Variables	Industry-adjusted Tobin's *q*			
	(1)	(2)	(3)	(4)
CPS, *t*−1 × High Eindex	−0.270** (−2.14)			
CPS, *t*−1 × Low Eindex	−0.111 (−1.1)			
High Eindex	0.096 (1.17)			
CPS, *t*−1 × Abnormal Total Compensation Pos		−0.241*** (−2.19)		
CPS, *t*−1 × Abnormal Total Compensation Neg		−0.055 (−0.43)		
Abnormal Total Compensation Pos		0.121 (2.03)***		
CPS, *t*−1 × Abnormal compensation other 4 Pos			−0.168** (−2.01)	
CPS, *t*−1 × Abnormal compensation other 4 Neg			−0.145** (−1.96)	
Abnormal compensation other 4 Pos			0.014 (−0.16)	
CPS, *t*−1 × CEO Outsider				−0.163* (−1.76)
CPS, *t*−1 × CEO Not Outsider				−0.222** (−2.02)
Firm fixed effects	Yes	Yes	Yes	Yes
Additional control variables	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Number of observations	8,100	8,077	8,096	8,100
R-squared	0.27	0.27	0.27	0.27

by necessity focusing on attracting the best possible CEO. In other words, the CPS may be high because the firm's bench has relatively lower quality. The interaction of CPS with whether or not the other four top executives (excluding the CEO) are paid better or worse relative to their peers can directly investigate this possibility.

    Column 2 (3) of Table 5 shows the interactions of lagged CPS with dummy variables indicating whether the abnormal total compensation of the top-five (top-five team other than the CEO) executives is positive or negative. The negative association between lagged CPS and *q* is present among both subsets of firms that pay their top-five executives more than peer companies and firms that pay these executives less than peer companies. However, the coefficient estimate is significant only for those firms whose abnormal total compensation is positive.

    This finding is consistent with the interpretation that high CPS is particularly negatively associated with firm

value if total compensation to the top-five executives is in excess of what comparable firms in the industry and of similar size pay. The findings in Column 3 do not provide support for the hypothesis that the negative association between lagged CPS and *q* is driven by the quality of the pool of executive candidates (poor bench) faced by firms with lower industry-adjusted value because both interaction terms are significant.

    Finally, we investigate whether the negative relation between lagged CPS and firm value is particular to firms with outside versus inside CEOs. Research stressing the difference between firms with inside and outside CEOS include Murphy (2002), Murphy and Zabojnik (2007), and Cremers and Grinstein (2009). Column 4 shows that both types of firms display a negative, and at least marginally significant, association between lagged CPS and *q*. This suggests that it is unlikely that our finding of a negative correlation is driven by firms in which performance is bad

and that have to recruit a CEO from the outside who needs to be compensated more highly.

4. CPS and company decisions and behavior

Thus far we have focused on the relation between CPS and one measure of firm outcomes and performance: Tobin's q. We now turn to examining whether CPS is associated with several other significant aspects of firms' decisions and behavior. This section provides a critical counterpart to Section 3, which focuses on the association between CPS and firm value. In particular, this section can shed light on the reasons that high-CPS firms seem to have lower value. As such, this inquiry can help in assessing whether cross-sectional differences in CPS could be at least partly due to agency (governance) problems instead of just differences in optimal CPS levels. While a low Tobin's q could be due to such problems, an optimally governed firm might also have low Q due to its circumstances. In contrast, some of the aspects of firm outcomes and behavior considered in this section, such as the poor quality of acquisition decisions, are likely to be correlated with suboptimal decision making and thus can help to further test the agency (governance) explanation.

We consider in turn five aspects of firms' decisions and outcomes: accounting profitability (Section 4.1), quality of acquisition decisions as judged by the stock market's reaction to their announcement (Section 4.2), opportunistic timing of CEO option grants (Section 4.3), CEO turnover (Section 4.4), and the stock market returns accompanying the filing of proxy statements for periods with changes in CPS (Section 4.5).

4.1. Accounting profitability and CPS

The first dimension of firm outcomes and performance we consider is that of accounting profitability. Our dependent variable is accounting profitability as proxied by ROA, defined as net income divided by the book value of assets, industry-adjusted using the median profitability of the four-digit SIC industry in a given year using all firms in Compustat, and winsorized at the 1 and 99 percentiles. Table 6 reports pooled panel regressions using robust standard errors that are clustered at the firm level, and all specifications include year dummies.

In Column 1, we use lagged CPS next to lagged Tobin's q and the various standard controls we used in the q regressions (see Table 3). In the second column, we add the additional controls from Table 3 plus firm fixed effects to Column 1. Finally, in Column 3, we use the instrumented lagged CPS from Column 1 of Table 2 together with firm fixed effects.

In the specifications without firm fixed effects, the coefficient on lagged (industry-adjusted) CPS is negative and clearly significant throughout. The effect of CPS is also economically meaningful. Using the estimate in Column 1, a one standard deviation increase in CPS (0.1172) is associated with a decrease of industry-adjusted ROA by 0.48% ($=0.1172*-4.094$). Given the average ROA of 3.7%, the impact of a one standard deviation change in CPS corresponds to a change of about 10% of the mean value. If

we include firm fixed effects in column 2, the coefficient on lagged CPS remains negative but is less significant with a t-statistic of about 1.8, while the coefficient on the instrumented CPS in Column 4 is again significant with a t-statistic of 2.0.

The negative association of CPS with (industry-adjusted) accounting profitability is consistent with and reinforces our earlier finding that high CPS is associated with lower firm value as measured by Tobin's q.

4.2. CPS and acquirer returns

To gain insight into our finding that high-CPS firms display a lower firm value, we ask whether such firms are more likely to make suboptimal acquisition decisions. In studying this issue, we follow the study of Masulis, Wang, and Xie (2007). This study investigates the negative correlation between firm value and shareholder rights, measured by the Gindex [the governance index of Gompers, Ishii, and Metrick (2003), consisting of 24 shareholder rights provisions] or the Eindex, by asking whether weaker shareholder rights are associated with lower levels for the stock returns accompanying bidders' announcements.

The Masulis, Wang, and Xie study finds that announcement returns for acquirers with high entrenchment levels are significantly lower, and it concludes that the low value of high-entrenchment firms could be at least partly due to the bad acquisition decisions they make. Using the same data, we add CPS in the year prior to the acquisition announcement as another explanatory variable. Our test asks whether, controlling for the level of entrenchment, high CPS is associated with lower stock returns upon the announcement of an acquisition as well as with a higher likelihood of a negative stock return upon such an announcement.

We start with the 3,333 events from Masulis, Wang, and Xie (2007).[20] The sample is based on acquisitions recorded by the Securities Data Corporation (SDC) between January 1, 1990 and December 31, 2003. Because we require that CPS is available at the fiscal year-end prior to the takeover bid, our sample is reduced to 1,241 events.[21] For this subsample, we find an average (standard deviation) abnormal announcement return in the 11 days around the announcement date of 0.26% (6.60). These are very similar to the values of 0.22% (6.59) reported by Masulis, Wang, and Xie (2007) for the full sample, and it is thus unlikely that the restrictions imposed by the availability of CPS introduce any particular bias.

Table 7 shows the results for two sets of regressions. Columns 1 and 2 are ordinary least squares (OLS) regressions with the abnormal announcement return of the bidder in the 11 days around the initial announcement as the dependent variable (cumulative abnormal return, CAR$[-5,+5]$). Columns 3 and 4 are logit regressions in

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[20] For a detailed description of the sample and the selection process, see Masulis, Wang, and Xie (2007), pp. 5–6. We thank Ronald Masulis for sharing these data.

[21] We have CPS data from 1993 onward and only use CPS when the CEO is not changing during the year.

Table 6

Return on assets (ROA).

The dependent variable is the industry-adjusted operating income divided by book value of asset ratio. The industry adjustment is made at the four-digit SIC level by year and by subtracting the industry median (using all firms in Compustat) ROA from the firm's ROA. The dependent variable is winsorized at the 1% and 99% level and is expressed in percentage terms. All regressions include year dummies (not shown) and standard errors are clustered at the firm level. Regression 1 is ordinary least squares (OLS). Regressions 2 and 3 are firm fixed effects regressions. Regression 3 reports the second-stage results for a system of equations estimation, using a firm fixed effects instrumental variable regression. The first-stage CEO Pay Slice (CPS) regression equals CPS, $t-1 = a + b\,X + c\,Z + u_i + e_{it}$, and corresponds to Column 1 of Table 2. The instruments in the first stage are (all measured at $t-1$): industry median CPS, the number of vice presidents in the top-five executives, and a dummy variable for CEO is the only director. Included in the regression, but not displayed for brevity, are the following variables: Constant, Diversified, CEO Is Chair, CEO Tenure Missing, CEO Tenure=5 or 6, CEO Tenure=3 or 4, and year dummies. t-statistics are based on robust standard errors clustered at the firm level. *, **, and *** indicate significance at the 10%, 5%, 1% level, respectively.

Variables	Industry-adjusted ROA		
	(1)	(2)	(3)
CPS, $t-1$	−4.094***	−2.388*	
	(−3.174)	(−1.787)	
CPS, $t-1$ (instrumented)			−3.192**
			(1.962)
Industry-adjusted Tobin's q, $t-1$	1.899***	1.490***	1.458***
	(10.73)	(7.640)	(13.56)
Eindex	0.218*	−0.154	−0.156
	(1.728)	(−0.693)	(−0.797)
Log Book Value	0.480***	1.083*	1.056***
	(3.452)	(1.796)	(3.553)
Insider Ownership, $t-1$	7.544**	2.956	3.931
	(1.999)	(0.507)	(0.893)
Insider Ownership^2, $t-1$	−0.760	−0.885	−2.436
	(−0.109)	(−0.116)	(−0.303)
Capex/Assets	0.00947	−0.0231	−0.0271
	(0.162)	(−1.021)	(−0.647)
Leverage	−8.629***	−13.01***	−13.10***
	(−6.383)	(−6.401)	(−12.23)
R&D	−0.184***	−0.0192*	−0.0208
	(−8.485)	(−2.056)	(−1.169)
R&D Missing	−0.673*	0.595	0.681
	(−2.062)	(0.657)	(0.893)
Company Age	0.0205*	−0.0930	−0.0964
	(2.399)	(−1.357)	(−1.567)
Founder		−1.249*	−1.244*
		(−1.724)	(−1.920)
Abnormal Total Compensation, $t-1$		0.0500	0.143
		(0.221)	(0.761)
Relative Equity Compensation, $t-1$		−0.663***	−0.610***
		(−4.464)	(−4.562)
CEO Ownership ≥ 20%		−1.201	−1.218*
		(−1.529)	(−1.960)
CEO Tenure=1		−0.390	−0.306
		(−0.891)	(−0.758)
CEO Tenure=2		−0.447	−0.394
		(−1.088)	(−1.165)
CEO Outsider		1.113	1.012*
		(1.273)	(1.949)
Number of observations	8,672	8,181	8,181
R-squared	0.130	0.081	0.077
Firm fixed effects	No	Yes	Yes

which the dependent variable is equal to one if the CAR was negative and zero otherwise. Both types of regressions use robust standard errors that are clustered at the firm level to account for correlations if firms make multiple acquisitions. The main variable of interest is the CPS of the bidder, computed at the fiscal year-end prior to the takeover bid.

In Columns 1 and 2, we find that the coefficient is negative and significant at the 10% level even after controlling for other determinants found to be significant in Masulis, Wang, and Xie (2007). In particular, CPS has additional explanatory power over and above the entrenchment Eindex (Column 1) or the governance Gindex (Column 2) and over and above additional proxies for power such as the CEO also being the chair and the CEO being the only director among the top-five executives.

Economically, the coefficient on the CPS variable of −0.023 indicates that a one standard deviation increase in CPS (in this sample that is 0.12) is associated with a reduction of the announcement return of 0.276% (0.12 × −2.30). Given the average market value of the bidder in our sample of $6,358 million, a one standard

Table 7
CEO Pay Slice (CPS) and acquirer returns.

The sample consists of 1,241 takeover announcement events from the sample of Masulis, Wang, and Xie (2007). The dependent variable is the cumulative abnormal announcement return (CAR) of the bidder in the 11 days around the announcement (CAR[−5,+5]) in Regressions 1 and 2 and a dummy equal to one if the CAR is negative in Regressions 3 and 4. Regressions 1 and 2 (3 and 4) are OLS (logit) regressions with t-statistics based on robust standard errors and errors clustered at the firm level. Robust t-statistics are in parentheses. CPS is the ratio of CEO to the sum of all top executives' compensation. CPS is based on total compensation as measured by data item TDC1 from ExecuComp containing salary, bonus, other annual compensation, total value of restricted stock granted, Black and Scholes value of stock options granted, long-term incentive payouts, and all other total incentive compensation. Gindex is the governance index of Gompers, Ishii, and Metrick (2003). Eindex is the entrenchment index of Bebchuk, Cohen, and Ferrell (2009). Fraction Blockowners is the fraction of the shares outstanding owned by institutional blockholders. Log Book Value (Bidder) is the book value of the bidder at the end of the fiscal year prior to the takeover. Relative Deal Size is the ratio of the deal value (from SDC) to the market value of equity of the bidder at the fiscal year-end prior to the takeover. Tobin's q is the market-to-book ratio of the bidder at the fiscal year-end prior to the takeover. Leverage is the ratio of book value of long-term debt to assets. Herfindahl is based on sales of firms in the same four-digit SIC industry. Run-up is the cumulative stock return in the year prior to the takeover. High-Tech Dummy is equal to one if the firm operates in an industry with four-digit SIC code of 3570, 3571, 3572, 3576, 3577, 3661, 3674, 4812, 4813, 5045, 5961, 7370, 7371, 7372, or 7373. Cash Used (Stock Only) Dummy is equal to one if the bidder pays at least a part in cash (all in equity). The status of the target is private, public, or subsidiary indicated by the respected dummy variables. CEO Is Chair is a dummy equal to one if the CEO is also the chairman and zero otherwise. Year dummies are included but omitted to save space. The R-squared reported for the logit regression is a pseudo R-square. *, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

Variables	CAR[−5,+5]		Dummy=1 if CAR Negative	
	(1)	(2)	(3)	(4)
CPS (Bidder)	−0.0230*	−0.0227*	0.0113**	0.0111**
	(−1.784)	(−1.769)	(2.177)	(2.146)
Eindex (Bidder)	−0.493***		0.0959**	
	(−4.106)		(2.141)	
Gindex (Bidder)		−0.179***		0.0285
		(−2.755)		(1.270)
Fraction Blockholders (Bidder)	0.0254	0.0285	−0.0131	−0.0138
	(0.978)	(1.090)	(−1.219)	(−1.291)
Log Book Value (Bidder)	−0.251*	−0.217*	0.0614	0.0554
	(−2.153)	(−1.882)	(1.415)	(1.276)
Relative Deal Size	−0.750	−0.764	0.231	0.233
	(−0.598)	(−0.602)	(0.756)	(0.758)
Tobin's q (Bidder)	−0.0229	0.0129	−0.00564	−0.0133
	(−0.146)	(0.0815)	(−0.128)	(−0.303)
Leverage (Bidder)	2.196*	2.150	−0.163	−0.144
	(1.678)	(1.633)	(−0.351)	(−0.308)
Herfindahl (Bidder)	5.306*	5.939*	−2.164	−2.292*
	(1.954)	(2.118)	(−1.630)	(−1.717)
Run-up (Bidder)	−1.368*	−1.380*	0.196	0.195
	(−2.284)	(−2.318)	(1.276)	(1.289)
High-Tech Dummy (Bidder)	−1.084*	−1.020	0.244	0.224
	(−1.724)	(−1.621)	(1.441)	(1.318)
Cash Used Dummy	0.00530	0.00571	−0.000366	−0.000438
	(1.152)	(1.235)	(−0.220)	(−0.264)
Stock Only Dummy	−0.925*	−0.917*	0.523***	0.518***
	(−1.828)	(−1.799)	(2.913)	(2.882)
Private (Target)	1.648	1.182	−0.341	−0.243
	(0.445)	(0.289)	(−0.226)	(−0.152)
Subsidiary (Target)	2.214	1.790	−0.511	−0.420
	(0.599)	(0.439)	(−0.338)	(−0.262)
Public (Target)	0.187	−0.292	0.0207	0.123
	(0.0504)	(−0.0715)	(0.0137)	(0.0770)
CEO Is Chair	−0.290	−0.323	0.187	0.193
	(−0.711)	(−0.792)	(1.323)	(1.372)
Constant	3.248	3.912	−1.067	−1.141
	(0.820)	(0.896)	(−0.675)	(−0.680)
Number of observations	1,241	1,241	1,241	1,241
R-squared	0.098	0.094	0.053	0.051

deviation increase in CPS results in a loss of about $18 million per acquisition announcement. The effect of a one standard deviation change in CPS is thus in the same order of magnitude as the effect from adding one more provision in the Eindex (the coefficient on the Eindex in Column 1 is −0.493) and is more than twice the effect from adding one more provision in the Gindex (the coefficient on the Gindex in Regression 2 is −0.179).

The coefficients on CPS in Columns 3 and 4 are positive and significant at the 5% level, indicating that high-CPS firms are more likely to make acquisitions judged by the market to be value-destroying, i.e., acquisitions in which the bidder announcement return is negative. Economically, the coefficient of 0.0113 implies that a one standard deviation increase in CPS increases the chances of an acquisition being judged to be value-destroying by the

market by 15% ($\exp(0.12 \times 1.13) = 1.15$). This is again of similar magnitude to increasing Eindex by one and of substantially higher magnitude than increasing Gindex by one.

From this analysis, we conclude that one potential reason for the lower valuation of firms with high CPS is that high-CPS firms make acquisitions viewed less favorably by the market and, in particular, are more likely to make acquisitions viewed as value-destroying by the market. These findings are consistent with the hypothesis that cross-sectional differences in CPS levels are at least partly due to and reflective of differences in agency (governance) problems.

4.3. CPS and opportunistic option grant timing

This subsection considers the relation between CPS and the occurrence of opportunistically timed option grants to the CEO. Yermack (1997) shows that option grants are opportunistically timed, being systematically followed by abnormal positive stock returns, and Lie (2005) shows that the abnormal stock returns around CEO option grants are at least partly due to backdating. The literature on opportunistic timing has also shown an association between such timing and the quality of firm governance (see, e.g., Bizjak, Lemmon, and Whitby, 2009; Heron and Lie, 2009; Yermack, 1997). We examine in this subsection whether opportunistic timing is related in any systematic fashion to CPS.

We use the standard data in current work on opportunistic timing—the Thomson Financial's insider trading database, which is available from 1996 onwards We focus on lucky grants, at-the-money grants awarded on a date with a stock price equal to the lowest price of the month. Bebchuk, Grinstein, and Peyer (2010) show that lucky grants occur with a substantially higher frequency than could be explained by pure luck and that they provide a useful proxy for opportunistically timed grants. We start with a sample of 11,712 firm-year observations from Bebchuk, Grinstein, and Peyer (2010), from which we use only those where the CEO did receive an option grant, leaving a sample of 8,823 firm-year observations (though results are robust to using all observations). We also consider a sample in which all five top executives receive an option grant, which further reduces to sample to 7,243 firm-year observations.

We run four logit regressions in which the dependent variable is a dummy variable called Lucky, which is equal to one if the firm granted its CEO a lucky option grant during the year and zero otherwise. The first and fourth regressions are pooled logit regressions with the robust standard errors clustered at the firm level, using the sample in which the CEO receives an option grant in the first logit and the sample in which all top-five executives receive an option grant in the fourth logit. The second and third regressions include firm and CEO fixed effects, respectively, and use the sample in which the CEO receives an option grant. The controls included are Insider Ownership, Size, Industry (High-Tech Dummy), and a proxy for stock return volatility (computed as the standard deviation of daily stock returns over a year) to

account for the fact that opportunistic timing is more profitable when stock return volatility is high. All four regressions include year dummies as well.

The results are displayed in Table 8. In all four specifications, the coefficient of the CPS variable is positive and significant (at 95% confidence), indicating that a higher CPS is positively correlated with opportunistic timing of option grants. In unreported regressions, we replace CPS with industry-adjusted CPS and find that the coefficient is also positive and significant. Overall, our findings indicate that high CPS is correlated with opportunistic timing of option grants, which is consistent with the notion that high CPS is correlated with agency (governance) problems.

Finally, we consider whether the probability of Lucky grants for top executives other than the CEO is related to CPS. To that end, we construct a variable termed Sumlucky, which is the number of lucky grants among the top-five executives (including the CEO). As shown in Regression 5, this is strongly negatively related to CPS, suggesting that high-CPS CEOs are more generous to themselves than to their close colleagues when it comes to opportunistically timed options. This findings is consistent with high CPS being associated with CEOs with more self-importance or narcissism (Hayward and Hambrick, 1997; Chatterjee and Hambrick, 2007).[22]

4.4. CPS and CEO turnover

We have seen that firms with higher CPS have lower firm value and accounting profitability and make acquisition decisions that are viewed less favorably by the market. It could thus be expected that the CEOs of such firms are replaced more often unless the high CPS is at least partly due to agency problems in the first place, which could make CEO replacement more difficult and unlikely. We explore this possibility by testing whether, controlling for performance, CEO turnover is related to CPS.

Table 9 displays the results of logit regressions where the dependent variable is equal to one if there is a CEO turnover in year t. We use the ExecuComp data set to identify CEO turnover, which we define as taking place if the CEO title in this data set has changed from one person to another. We find 1,326 turnovers in our sample of 9,571 firm-years with available data on the prior-year CPS.

The independent variables of interest in Column 1 are the CPS at the end of the preceding year and the interaction between CPS and the stock return. The control variables include the stock return of the company during the year and dummies for the year of the CEO's service (we do not use tenure as a continuous variable because its

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[22] The sample is considerably smaller here, as it relies on matching all top executives by name from Thompson Financial's insider trading database to ExecuComp. A match requires that the last names and initials of the first names are the same and no other such combination existed in the company in the year. However, many names are written differently in the databases that are likely the same (e.g., Robert and Bob), such that our match is of limited quality. However, there is unlikely to be a bias in how names are reported in the various places and CPS or Lucky. Finally, alternative specifications in which we count only the other top four lucky grants as the dependent variable result in very similar results, as does an ordered logit regression.

Table 8

CEO Pay Slice (CPS) and opportunistic timing of option grants.

The sample consists of 8,823 firm-year observations between 1996 and 2004 in which the CEO did receive an option grant during the year (Regressions 1−3) or 7,243 observations in which all top-five executives have received an option grant during the year (Regression 4). The dependent variable, Lucky, is a dummy equal to one if the firm has provided at least one option grant to the CEO during the year in which the grant day was the day with the lowest stock price of the month. Option grant information is from Thompson Financial's insider trading database. For details on the definition of the variable and the sample, see Bebchuk, Grinstein, and Peyer (2010). Regression 5 further restricts the sample to firms in which all five top executives' grants could be identified in Thompson Financial. The dependent variable, Sumlucky, is the number of lucky grants among the top-five executives (including the CEO). The independent variables are CPS, the ratio of CEO to the sum of all top executives' total compensation, is based on total compensation as measured by data item TDC1 from ExecuComp containing salary, bonus, other annual compensation, total value of restricted stock granted, Black and Scholes value of stock options granted, long-term incentive payouts, and all other total incentive compensation; High Tech Dummy is a dummy equal to one if the firm operates in an industry with four-digit SIC code of 3570, 3571, 3572, 3576, 3577, 3661, 3674, 4812, 4813, 5045, 5961, 7370, 7371, 7372, or 7373; Insider Ownership is the fraction of shares held by insiders as reported by ExecuComp; Log Book Value is the log of the book value of assets; Eindex is the entrenchment index of Bebchuk, Cohen, and Ferrell (2009); Stdev Stock Return is the standard deviation of daily stock return over a calendar year. The first and fourth regressions are logit regressions with errors clustered at the firm level with no firm or CEO fixed effects. The second regression is a firm fixed effects logit regression, the third is a CEO fixed effects logit regression, and the fifth is an OLS regression with errors clustered at the firm level. *, **, and *** indicate significance at 10%, 5%, and 1% level, respectively. Year dummies and a constant (in Regressions 1, 4, and 5) are included but omitted to save space.

Variables	Lucky				Sumlucky
	(1)	(2)	(3)	(4)	(5)
CPS	3.706***	7.322***	9.885***	3.873***	−0.755**
	(14.08)	(13.99)	(13.81)	(12.42)	(−2.109)
High-Tech Dummy	0.192			0.227*	0.193
	(1.638)			(1.753)	(1.428)
Insider Ownership	2.127	2.564	−0.623	2.248	−2.225
	(1.548)	(1.132)	(−0.214)	(1.288)	(−1.573)
Insider Ownership^2	−3.047	−2.390	6.429	−4.670	4.427
	(−0.839)	(−0.475)	(0.841)	(−0.844)	(1.440)
Log Book Value	0.0293	0.443***	0.456**	0.040	−0.004
	(1.237)	(3.082)	(2.327)	(1.477)	(−0.183)
Eindex	0.0256	0.132	0.168	0.024	0.003
	(0.944)	(1.440)	(1.424)	(0.773)	(0.0954)
Stdev Stock Return	−0.068*	−0.100	−0.058	−0.086*	0.050
	(−1.797)	(−1.484)	(−0.740)	(−1.890)	(1.300)
Lucky					0.315***
					(3.48)
Number of observations	8,823	8,823	8,823	7,243	1,529
Firm fixed effects	No	Yes	No	No	No
CEO fixed effects	No	No	Yes	No	No
CEO receives option grant	Yes	Yes	Yes	Yes	Yes
All five top executives receive option grant	No	No	No	Yes	Yes

effect on turnover might not be monotonic). The coefficient on CPS is negative and significant, indicating that CEOs with high CPS are less likely to be replaced. The interaction can answer the question whether high-CPS CEOs are less likely to experience turnover even if their stock performance is bad. The coefficient on the interaction variable is positive, and marginally significant, indicating that turnover is less performance-sensitive for high-CPS CEOs.[23]

To assess the economic significance of the result in Column 1, we consider the effect of a 10% increase in CPS on the performance sensitivity of CEO turnover. The coefficient on stock return is −0.350, implying that with a −50% stock return, CEO turnover probability increases by 19% ($\exp(−0.5 \times −0.350)−1$). The coefficient on the interaction term between the stock return and industry-adjusted CPS is 2.201, implying a reduction in the performance sensitivity of 10% ($\exp(−0.5 \times 1.684 \times 0.1)−1$), about a one-third reduction in the performance sensitivity of turnover. Results are robust to adding firm fixed effects in Column 2.

Following Jenter and Kanaan (2006), Column 3 splits the stock return into firm-specific and market returns, where firm specific returns are defined as the difference between the overall stock return and the market return. Consistent with Jenter and Kanaan (2006) we also find that CEO turnover is sensitive to market returns, albeit not significantly so. The main conclusion is that CEO turnover is less sensitive to firm-specific returns for CEOs with a high industry-adjusted CPS. If a lower performance sensitivity is an indication of more agency problems (e.g., Kaplan and Minton, 2006), then our findings here are consistent with the notion that cross-sectional differences in CPS are associated with differences in the magnitude of agency problems. These findings could also help to

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[23] Powers (2005) suggests computing the marginal effect (basically the local derivate at the mean of the variables) to get the correct test statistic. Doing so confirms and strengthens the significance of our results. For example, in Regression 2 we find that the marginal effect is positive (0.144) with a standard error of 0.033, making it significant at the 1% level, with similar results for the other interaction variables.

Table 9

CEO turnover and CEO Pay Slice (CPS).

The sample consists of 9,571 firm-year observations with available data on CEO turnover in year t and independent variables the year prior to the turnover. Regressions 1 and 3 (2 and 4) are logit (firm fixed effects) regressions with t-statistics based on robust standard errors clustered at the firm level. We display the coefficients and t-statistics in brackets underneath. The dependent variable is a dummy equal to one if the CEO for firm i in year $t-1$ is not the same as in year t (there are 1,326 turnovers). CPS is based on total compensation as measured by data item TDC1 from ExecuComp containing salary, bonus, other annual compensation, total value of restricted stock granted, Black and Scholes value of stock options granted, long-term incentive payouts, and all other total incentive compensation. The tenure dummies are equal to one if a CEO has exactly that number of years of tenure. Zero is the hold-out group, i.e., CEOs who in year $t-1$ just joined the company. Stock return, $t-1$ is the return over the calendar year prior to the CEO turnover. Market Return is the value-weighted CRSP return. Firm-Specific Return is the difference between the firm and the market return. CEO Age > 60 Dummy is a dummy equal to one if the CEO's age is above 60 using data from ExeuComp and IRRC. CEO Is Chair is a dummy equal to one if the CEO is also the chairman and zero otherwise. * and *** indicate significance at 10% and 1% level, respectively.

Variables	CEO turnover dummy			
	(1)	(2)	(3)	(4)
CPS, $t-1$	−2.550***	−4.121***	−2.346***	−4.028***
	(−5.613)	(−10.37)	(−4.810)	(−9.60)
Stock Return, $t-1$	−0.350	−0.372		
	(1.141)	(1.442)		
Stock Return, $t-1$ × CPS, $t-1$	2.201*	2.379***		
	(2.348)	(2.947)		
Firm-Specific Return, $t-1$			−0.250	−0.330
			(−0.778)	(−1.228)
Firm-Specific Return, $t-1$ × CPS, $t-1$			1.910*	2.364***
			(1.894)	(2.776)
Market Return, $t-1$			−0.926	−0.598
			(−1.120)	(−0.903)
Market Return, $t-1$ × CPS, $t-1$			2.456	0.828
			(0.991)	(0.427)
CEO Tenure = 1, $t-1$	7.645***		7.644***	
	(7.525)		(7.517)	
CEO Tenure = 2, $t-1$	5.470***		5.468***	
	(5.447)		(5.442)	
CEO Tenure = 3, $t-1$	0.294		0.297	
	(0.254)		(0.256)	
CEO Tenure = 4, $t-1$	−0.648		−0.645	
	(−0.457)		(−0.455)	
CEO Tenure = 5, $t-1$	0.275		0.272	
	(0.224)		(0.222)	
CEO Tenure = 6, $t-1$	0.520		0.515	
	(0.424)		(0.420)	
CEO Tenure > 6, $t-1$	0.985		0.985	
	(0.925)		(0.924)	
CEO Age > 60 Dummy	0.493*	1.174***	0.489*	1.176***
	(1.804)	(7.751)	(1.781)	(7.768)
CEO Is Chair	−0.537***	−2.284***	−0.541***	−2.283***
	(−4.918)	(−18.08)	−0.541***	(−18.08)
Constant	−4.956***		−5.033***	
	(−4.491)		(−4.524)	
Number of observations	9,571	9,571	9,571	9,571
Pseudo R-squared	0.64		0.64	
Firm fixed effects	No	Yes	No	Yes

explain the overall negative association between CPS and firm value. Results are again robust to adding firm fixed effects (see Column 4).

4.5. Stock market reactions to proxy statement releases

Companies' proxy statements disclose the compensation of the firm's top executives during the preceding year, as well as other types of new information. In this subsection we study the relation between these abnormal returns and the changes in CPS levels disclosed in the proxy statements.

Our event study uses the data on proxy filing dates collected by Dlugosz, Fahlenbrach, Gompers, and Metrick (2006). They collect those dates for 1,916 companies for the years 1996–2001. We examine whether the release of information about changes in CPS is associated with abnormal stock returns. New information about the elements necessary for calculating CPS is provided in firms' proxy statements, which are the source of public information about executive compensation.

Using the date of the proxy filing as the event date, we calculate the cumulative abnormal return around each event date using the market model. The event window is −10 to +10 days around the event. We use a 21-day

Table 10

Abnormal returns around announcements of CEO Pay Slice (CPS).

    We use the date of the proxy filing as the event date, in which the proxy dates are from Dlugosz, Fahlenbrach, Gompers, and Metrick (2006), who collect proxy dates in the years $1996-2001$ for 1,916 companies. We find 4,062 firm-years with available data to compute the change in CPS from year $t-1$ to year t and with sufficient data available on CRSP to compute abnormal returns. We calculate the cumulative abnormal return (CAR) around the event using the market model. The event window is -10 to $+10$ days around the event, using a 21-day window because the proxy date and the filing date are not always the same. CPS is based on total compensation and is expressed as a percentage. Panel A presents mean comparisons between samples that increase (top quartile) or decrease (lowest quartile) their CPS from one year to the next. Panel B reports a weighted least squares regression where the dependent variable is CAR. The independent variables are the change in CPS from year $t-1$ to year t, Log Book Value (of assets) and the Book-to-Market ratio. Observations are weighed by the inverse of the variance of the estimate of the cumulative abnormal return. *, **, and *** indicate significance at 10%, 5%, and 1% level, respectively. The regression in panel B also reports t-statistics in parentheses.

Panel A: Mean comparisons

	Average CAR	Number of observations
For Firms increasing CPS	0.699%***	2,062
For Firms decreasing CPS	1.028%***	2,000
Difference (decrease-increase)	0.329%	
Top quartile change in CPS	0.531%	1,015
Lowest quartile change in CPS	1.691%***	1,015
Difference (lowest-top)	1.160%***	

Panel B: Regression analysis

	CAR$[-10,+10]$ in percent	
Variables	(1)	(2)
Change in CPS $(t-1, t)$	−0.0328	−0.0044
	(2.03)**	(0.21)
Change in CPS $\times$ Dum(Eindex > median)		−0.0525
		(1.86)*
Dum(Eindex > median)		−0.3907
		(1.24)
Log Book Value, t	−0.1299	−0.1014
	(1.07)	(0.89)
Book-to-Market, t	0.1448	0.1514
	(1.61)	(2.02)***
Constant	1.610	1.357
	(1.79)*	(1.56)
R-squared	0.002	0.003
Number of observations	4062	3763

window because the filing date often time precedes the distribution of the proxy.[24] We assign events to groups according to the change in CPS in the event year relative to the previous year. We also weigh the observations by the inverse of the variance of the estimate of the cumulative abnormal return to incorporate estimation risk.

Table 10 Panel A presents the comparison of the average CAR for firms with decreasing versus increasing CPS, as well as the average CAR for the 25% of firms with the biggest reduction in CPS versus the 25% of firms with the biggest increase in CPS. Comparing across groups, the 25% of firms with the biggest decreases in CPS had a significantly higher CAR than the 25% of firms with the biggest increases in CPS. The difference in the 21-day event window of 1.2% is statistically and economically significant. Comparing firms with decreasing versus increasing CPS, we again find a positive difference in CAR equal to 0.3%, but it is not statistically significant.

We also find a small but strongly statistically significant correlation of -3.5% between the change in CPS and the CAR. As reported in Panel B of Table 10, this correlation survives after controlling for differences in firm size and book-to-market characteristics. In particular, the second regression of CAR also includes the interaction of the change in CPS with a dummy indicating whether or not the firm has an Eindex above the sample median. The negative relation between news about increases in CPS and abnormal returns is driven by firms with high entrenchment. This is consistent with the previous result that the negative correlation of CPS with q is concentrated in firms with high entrenchment.

One interpretation of our results is that the market reacts negatively to news about increases in CPS. An alternative interpretation, consistent with the view that CPS levels are correlated with worse governance, is that increases in CPS are also correlated with other information released in firms' proxy statements that investors view unfavorably.

5. Conclusion

    In this paper, we conduct an empirical investigation of CPS, the fraction of top-five compensation captured by the

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[24] For example, Dell filed its proxy on October 31, 2007 while the letter says that the proxy statement is distributed on or about November 5, 2007. Similarly, SUN Bankcorp filed on April 30, 2007, but the letter in the proxy statement is dated May 11. Focusing on a shorter event window of $\pm$ one day, the results go in the same direction but become statistically insignificant (not shown).

CEO. We show that CPS has a rich set of relations with the performance, value, and behavior of firms. In particular, cross-sectional differences in CPS are associated with lower Tobin's q, lower accounting profitability, less favorable market reaction to acquisition announcements made by the firm, more opportunistic timing of CEO option grants, more luck-based CEO pay, less CEO turnover controlling for performance and tenure, and lower stock market returns accompanying the filing of proxy statements for periods with increases in CPS. The identified negative correlation between CPS and Tobin's q is especially concentrated among firms with higher entrenchment levels.

To the extent that our results are fully or partly driven by firms' optimal CPS choices, they indicate that high CPS is optimal for low value firms and thus call for developing a theoretical explanation for such an association. Furthermore, some of our findings are consistent with the possibility that CPS levels of some firms are excessive and that cross-sectional differences in CPS levels provide a tool for studying cross-sectional differences in agency problems.

Beyond our particular findings and their interpretation, our general conclusion is that CPS is an aspect of firm governance and management that deserves the attention of researchers. Future research on the effects of governance arrangements and management processes, as well as research on a wide range of aspects of firm behavior and decision making, could consider using CPS as a useful control or a subject of investigation. We hope that our work can provide a framework and a starting point for this line of work.

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