CEO PAY SLICE AND THE SUNK-COST EFFECT

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ABSTRACT

The sunk-cost effect refers to obsessive attachment to prior investments, possibly impairing corporate-value sustainability. This paper explores whether CEOs become susceptible to the sunk-cost effect as their pay slice (a pay gap among a CEO and the other top managers) increases. In situations where information is insufficient to determine an option because of lower collaboration with other top executives (caused by a sense of unfairness), high CEO pay slice induces the CEO to feel burdened and not confess her/his investment failures. This may more likely lead to the justification of previous decisions and continuous reinvestment despite negative consequences. Supporting this conjecture, we find that a CEO's susceptibility to the sunk-cost effect increases with CEO pay slice. Our evidence, which adds to the understanding of the sunk-cost effect in the corporate environment, suggests a vital clue for the mechanisms of how a relatively overpaid CEO affects corporate-value sustainability.

Keywords: CEO Pay Slice (CPS), Compensation System, Sunk-Cost Effect, Investment Decision-Making, Corporate Sustainability.

INTRODUCTION

The literature notes that firm value decreases as the pay difference between a CEO and the other top managers (CEO pay slice) increases (Bebchuck et al., 2011; Bugeja et al., 2017), suggesting that the pay difference reflects the CEO's rent seeking behavior rather than the labor market's evaluation of the CEO's ability or the incentive effects in a tournament compensation system (Mande & Son, 2012; Withisuphakorn & Jiraporn, 2017). This negative consequence of CEO pay slice (hereafter, CPS) has been explained in terms of agency theory (attributed to CEO entrenchment), but specific mechanisms are not well known. This study grew out of conversations concerning this matter, especially in view of distorted investment decision-making derived from a biased attachment to a prior investment.

The sunk-cost effect is a well-documented bias regarding the continued investment of resources to options where previous investments in effort or money have been made (Arkes & Blumer, 1985; Sofis et al., 2015). Specifically, escalation refers to a tendency to go on investing resources irrespective of negative consequences (Staw, 1976; Sofis et al., 2015)[1]. When a person encounters a situation in which his/her behavior is inconsistent with his/her beliefs, to alleviate the unpleasant feelings associated with cognitive dissonance (Zhang & Baumeister, 2006; Friedman et al., 2007), the person tends to avoid any negative feedback related to the behaviour and continue pursuing it (Judge et al., 1998; Bragger et al., 2003)[2]. In particular, when a CEO makes an obsessive-compulsive decision to continue to invest in initial projects, it may severely hurt corporate-value sustainability.

If a large gap of pay exists among a CEO and other top managers, the other top managers may believe that the large gap reflects the CEO's entrenchment or a sense of unfairness in pay

determination, which in turn frequently leads to non-cooperative behaviours (Hambrick, 1995; Carpenter & Sanders 2002; Wade et al., 2006). Accordingly, the overpaid CEO may face a paucity of information on alternatives derived from receiving less collaboration from the other top executives (Carpenter & Sanders, 2002; Wade et al., 2006).

Worse still, the overpaid CEO bears considerable responsibility and avoids confessing their decision failures. Thus, the CEO can be easily exposed to self-justification associated with the failure of investment decision-making (Carpenter & Sanders, 2002; Chang et al., 2010). The cognitive dissonance between the CEO's beliefs and situations may induce her/him to discount negative feedback, and thereby continue to invest in a prior option through the sunk-cost mechanism.

This study investigates whether a CPS induces the CEO's bias towards the sunk-cost effect. We first construct a monetary proxy of the sunk-cost effect by using regression to estimate a coefficient that captures sunk costs. The coefficient is estimated after current capital expenditure is regressed by lagged capital expenditures, assuming perfect foresight of future sales information serves as a crucial control for rational investment decisions. Then, we find that the sunk-cost effect increases with CEO pay slice. This result remains robust throughout a variety of estimation methods and alternative measures of CEO pay slice. Our finding suggests that even assuming the relative CEO overpayment or high CEO pay slice is based on economic considerations,[3] it may backfire when used without careful consideration.

This study contributes to the related literature in several ways. First, we add to the literature on compensation schemes. The negative consequences of CEO pay slice on firm value has been explained in terms of agency aspects (as a CEO's rent-extractions), but specific mechanisms are still unknown. We take a first step toward filling this void by suggesting the sunk-cost mechanism. Second, in the context of corporate-value sustainability, we enhance the understanding of defective investment decision-making arising from the sunk-cost effect. An investment decision is more likely to be wrong when it is made based on a prior investment, rather than on information about the expected consequences of the decision taken and its alternative options. As such, if CEOs are exposed to the sunk-cost effect, this may be an important source of agency costs. To address agency costs associated with the sunk-cost effect, a better understanding is needed of the factors that trigger the sunk-cost effect in the corporate environment. Finally, in the literature, the issue of how sunk-costs influence investment decisions is largely addressed using experimental or survey data. Although the findings in the literature provide important insights into this issue, they may not be readily generalized to corporate behaviour, because they are based on a small sample and are only applicable to cases with similar experimental conditions. We complement the literature by using empirical data that reflect the actual investment behaviours of CEOs.

LITERURE REVIEW AND REARCH QUESTION

Researchers have documented that individuals have a tendency to escalate commitment to a series of prior actions. Investment that is affected by previous investment, not by the available information at that time (i.e., the expected consequences of engaging in that course of action), is economically undesirable, although it sometimes brings a turnaround of investment results. This phenomenon is named by social psychologists as the sunk-cost effect (Arkes & Blumer, 1985; Garland, 1990), by economists as hysteresis (Dixit, 1992), and by organizational psychologists as escalation (Staw, 1976; Ross & Staw, 1993). Although the research has been separately developed, the conceptualization of the phenomenon is similar[4].

The literature on psychology describes that the escalation behaviour may be derived from a decision-maker's desire to reduce *cognitive dissonance* between his/her beliefs and current situations (Zhang & Baumeister, 2006; Friedman et al., 2007). When a decision-maker is subject to self-justification pressures for her/his own earlier decision, she/he tends to deny any negative feedback and repudiate a claim that it is no longer profitable to continue the project. Eventually, she/he continues to invest (Judge et al., 1998; Bragger et al., 2003).

Some scholars argue that escalation of commitment to past investments may be adaptive in conditions of equivocality. Escalation may occur when individuals face decision dilemmas due to uncertainty surrounding decisions. Ambiguity and uncertainty are key prerequisites for escalation, where individuals cannot forecast the consequences of these actions (Staw, 1997). When facing a decision dilemma on whether to continue a failing project, an individual seeks to understand the confusing information around him/her by gathering information about the investment situation. They may delay exit decisions, hoping that profitability conditions change in the future, and continue the project until uncertainty decreases (Dixit, 1992; Bragger et al., 1998; Macaskill & Hackenberg, 2012).

Based on the above discussion, we connect escalation behavior to CPS. CPS refers to the extent to which a CEO is overpaid compared with the other top executives. It may essentially embody the comparative importance of a CEO's role in the top management team (TMT) or the labor market's assessment of a CEO's ability (Chang et al., 2010). However, to the extent that CEOs have influence over their own pay setting process and the other executives' pay, CEO pay slice has been recognized as a consequence of CEO power or entrenchment associated with agency problems (Bebchuk et al., 2011; Mande & Son, 2012; Withisuphakorn & Jiraporn, 2017; Bugeja et al., 2017)[5].

Hence, the relative CEO overpayment may reduce behavioural integration within the TMT and thereby reduce information sharing (Carpenter & Sanders, 2002; Wade et al., 2006). The other members in TMT may believe that their pay level should not be greatly different from the CEO's pay level (Carpenter & Sanders, 2002). If a large gap of pay exists among the CEO and the other top managers, then the other members may believe that this pay gap reflects CEO entrenchment or a lack of fairness in pay determination, which in turn frequently leads to selfish (rather than cooperative) behavior on the part of the other executives (Hambrick, 1995; Carpenter & Sanders, 2002; Wade et a,l. 2006). The complexity and difficulty of managing today's large firms require the CEO to delegate a considerable part of the job's responsibilities to the other top executives, or to otherwise rely on the contributions of other top executives (Hambrick, 1995; Carpenter & Sanders, 2002)). The large social distance between the CEO and the other members of the team is likely to constrain the exchange/dissemination of information within the team and impair the quality (e.g., richness, currency, or accuracy) of the information processed[6]. As a result, the overpaid CEO may confront a paucity of information.

Moreover, the relative CEO overpayment may create strong incentives for her/him to avoid the appearance of failure connected with considerable responsibility. To the extent that stakeholders believe that a CEO should be paid depending on their contribution, a highly compensated CEO may be motivated to demonstrate competence to the stakeholders and thus be discouraged from confessing their decision failures, leading to motivation to justify previous decisions and to reinvest. This escalation behaviour may be more pronounced when there is relative CEO overpayment. In today's environment where top executives function as part of an interdependent team, a CEO and the other top executive's pay levels are expected to show close similarities based on firms' respective pay practices (Hambrick, 1995; Carpenter & Sanders,

2002). Nevertheless, if a large pay gap exists between CEOs and the other top managers, it is more likely to come under scrutiny or arouse the indignation of those who believe that the entire executive team shapes a firm's performance rather than CEOs alone (Carpenter & Sanders, 2002). In this situation, a highly compensated CEO relative to their peers may feel more pressure not to disappoint others and therefore be more vulnerable to escalation error.

Given that escalation tends to occur in situations where information is insufficient to determine when to escape (Dixit, 1992; Bragger et al., 1998; Macaskill & Hackenberg, 2012), the discussion suggests that relative CEO overpayment (high CEO pay slice) contributes to escalation behavior (the sunk-cost effect). In this context, we develop the research question about whether the sunk-cost effect increases with CEO pay slice.

MATERIALS AND METHODS

Estimation of CEO Pay Slice

Following Bebchuk et al. (2011), we estimate CPS, which is defined as the fraction of the total compensation (TDC1) for the five top managers. This measure is based on the total pay to each managers, comprising salary, bonus, other annual pay, the total amount of stock and stock options granted that year and all other total compensation (as disclosed in ExecuComp item as TDC1). We restrict the sample to firm-years in which a CEO was working in office for the entire year to avoid underestimating CPS for a CEO who has received pay only for part-time works of the year. When more than five executives are listed in ExecuComp, we use only the five top managers with the highest pay. An advantage of this measure is that it is based on pay information from managers who are all at the same firm, and thus firm-specific attributes that influence the average pay in the company's TMT (e.g., firm risk and complexity) are relatively controlled (Bebchuk et al., 2011).

Econometric Model

The empirical model for testing the association between the sunk-cost effect and CPS is specified in Equation (1). The empirically observable phenomenon of the sunk-cost effect is current investment expenditures closely associated with previous investment expenditures (the coefficient on LCapx (β_1) is expected to be positive). If the sunk-cost effect increases with CEO pay slice, the coefficient of the interaction between CPS and LCapx (β_3) is anticipated to be positive. We include future sales information (FInfo) to control for investment decisions based on relevant information. Assuming perfect foresight, the inclusion of FInfo is likely to control for current investments based on information about expected future benefits and, in this case, current investments associated with previous investments represent decisions based on sunk costs.

To reduce any potential endogeneity bias or omitted variable bias, we include an extensive number of control variables. First, we control for CEO power variables. Compensation levels are an important indicator that provides information on executive power (Hambrick & D'Aveni, 1992; Core et al., 1999; Bebchuk & Fried, 2003). As such, although our focus is only on the pay gap effect on the sunk-cost effect, CPS (CEO pay slice) may, to some extent, capture the comparative power of the CEO within the TMT, and the documented association between CPS and the sunk-cost effect may reflect general agency problems rather than the pay gap effect per se. To investigate this possibility, we include CEO power variables such as CEOChair and OnlyDirector (see below for definitions) in our regression model. We also control for the effects of CEO

characteristics and corporate governance by including Founder, Male, GIndex, CEOtenure, and CEOage (see below for definitions).

In addition, we include the following variables in the model. Cash holdings as measured by operating cash flows deflated by total assets (Cash) are included to consider a firm's financial ability to implement investment projects. Industry capital expenditure growth (IndCapxGr) is included to control for industry-level factors that may affect a firm's investment level. Firm size (Size) is included, because it is a surrogate for unobservable variables that influence a firm's investment level. Finally, we include firm fixed effects (Firm Dummy) to absorb any variation caused by unobserved firm characteristics and year fixed effects (Year Dummy) to control for any unobserved time-varying effects.

$$\begin{aligned} \mathrm{Capx}_{i,t} \;=\; & \beta_0 + \beta_1 \mathrm{LCapx}_{i,t} + \beta_2 \mathrm{CPS}_{i,t} + \beta_3 \mathrm{CPS}_{i,t} * \mathrm{LCapx}_{i,t} + \beta_4 \mathrm{FInfo}_{i,t} + \sum_{p=5}^{11} \beta_P \ \mathrm{CEO\ Var} \\ & + \sum_{q=12}^{18} \beta_q \mathrm{CEO\ Var} * \mathrm{LCapx}_{i,t} + \beta_{19} \mathrm{Cash}_{i,t} + \beta_{20} \mathrm{IndCapxGr}_{i,t} + \beta_{21} \mathrm{Size}_{i,t} \\ & + \mathrm{Firm\ Dummy} \;+\; \mathrm{Year\ Dummy} \\ & + \varepsilon_{i,t}, \end{aligned} \tag{1}$$

where Capx is current capital expenditure deflated by total assets. LCapx is lagged capital expenditure deflated by total assets. CPS is the fraction of the total compensation (TDC1) offered to the five top managers that go to the CEO. FInfo is one-year ahead sales deflated by total assets. CEO Var represents a vector including CEO power, characteristic, and governance variables. CEOChair is a dummy variable equal to one if the CEO is the chairman; OnlyDirector is a dummy variable equal to one if the CEO is the only top managers on the board; Founder is a dummy equal to one if the CEO was initial CEO when the company appeared on CRSP; Male is a dummy variable equal to one if the CEO is male; GIndex is the governance index of (Gompers et al., 2003), which is based on a series of 24 governance provisions, where lower values indicate stronger shareholder's rights or less entrenched management; CEOtenure is the number of years since becoming CEO; and CEOage is CEO age. Cash is operating cash flows deflated by total assets; IndCapxGr is industry capital expenditure growth (the industry classification is based on a two-digit Standard Industrial Classification (SIC) Code); Size is the log of the book value of assets; and Firm (Year) Dummy is firm (year) fixed effects.

Data and Descriptive Statistics

We obtain top managers' pay data from ExecuComp and financial statement data from Compustat. Firms with SIC codes 6000-6999 are financial institutions and are excluded from the study. Our final sample comprises 22,823 firm-year observations between 1993 and 2013. The sample distribution shows that the industry composition follows that of Compustat. In untabulated results, we find that our sample represents 84.04 % of ExecuComp's total value of equity and 47.13 % of that of Compustat firms for the same sample period, suggesting that although a fairly large number of firms are excluded from the sample due to data unavailability, the sample is economically substantial[7]. We winsorize the dependent and independent variables used for the regressions at the 1% and 99% levels[8].

Descriptive statistics for the variables used in this paper are shown in Table 1. Table 1 shows that the average firm in the sample has total assets of about $5,672 million. The dependent variable

Capx has a mean (median) of 0.058 (0.043). The average CPS is 39%, and its standard deviation is 11.7%.

Table 1
DESCRIPTIVE STATISTICS AND PEARSON CORRELATION

Panel A: Descriptive Statistics

Variables	N	mean	sd	p25	p50	p75
Capx	22.823	0.058	0.052	0.023	0.043	0.074
LCapx	22.823	0.054	0.048	0.022	0.04	0.069
CPS	22.823	0.39	0.117	0.32	0.388	0.455
FInfo	22.823	1.183	0.782	0.628	1.006	1.511
Cash	22.823	0.1	0.084	0.057	0.098	0.145
IndCapxGr	22.823	0.092	0.173	-0.009	0.092	0.184
Size	22.823	7.386	1.573	6.248	7.273	8.442
(Assets)	22.823	5.672	12.149	517	1.441	4.638
CEOChair	16.246	0.466	0.499	0	0	1
OnlyDirector	16.246	0.53	0.499	0	1	1
Founder	16.246	0.206	0.405	0	0	0
Male	16.246	0.979	0.145	1	1	1
GIndex	16.246	8.323	2.529	6	8	10
CEOtenure	16.246	9.107	7.135	4	7	12
CEOage	16.246	56.17	7.027	51	56	61

RESULTS

Table 2 reports the regression results from estimating Equation (1) before controlling for CEO power, characteristic, and governance variables. Column (1) presents the baseline regression results for comparison purposes. The evidence shows that the coefficient on LCapx is 0.411 (t-stat. 63.19), which supports the existence of the sunk-cost effect. To the extent that the inclusion of FInfo (future sales information), assuming perfect foresight, controls for current investment decisions based on relevant information (expected future benefits), the portion of current investment expenditures explained by previous investment expenditures may be regarded as reflecting the sunk-cost effect (i.e., continued investment associated with self-justification needs or continued investment under equivocal conditions). Column (2) shows that the interaction coefficient between CPS and LCapx is 0.262 (t-stat. 6.02) and that, after considering the effect of CPS, the magnitude of the coefficient on LCapx decreases as compared with Column (1) (from 0.411 to 0.317). These findings collectively suggest that CPS is an important driver of the sunk-cost effect. In Column (3), a three-year average of sales is used as future sales information, leaving the results unchanged.

Table 2
REGRESSION ANALYSES OF CEO PAY SLICE AND SUNK-COST EFFECTS

Dependent Variable is Capx			
	Column (1)	Column (2)	Column (3)
Constant	0.035***	0.041***	0.039***
	(8.76)	(9.7)	(7.95)
LCapx	0.411***	0.317***	0.331***
	(63.19)	(18.78)	(18.06)
CPS		-0.012***	-0.009***
		(-4.16)	(-2.87)
CPS*LCapx		0.262***	0.213***
		(6.02)	(4.52)
FInfo	0.005***	0.005***	0.004***
	(8.03)	(7.91)	(6.85)
Cash	0.050***	0.049***	0.051***
	(15.3)	(15.1)	(14.14)
IndCapx	0.026***	0.026***	0.027***
	(19.15)	(19.15)	(18.69)
Size	-0.001	-0.001	0
	(-1.02)	(-1.23)	(-0.80)
Firm Dummy	Included		
Year Dummy	Included		
R-squared	0.732	0.732	0.73
N	22.823	22.823	19.596

The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

The results with controls for CEO power, characteristic, and governance variables appear in Table 3. CEO power variables (CEOChair and OnlyDirector) are negatively associated with the sunk-cost effect, as indicated by the negative coefficients on the interaction terms between CEOChair (OnlyDirector) and LCapx, whereas Founder (founder), Male (male CEOs), and GIndex (weak corporate governance) are positively associated with the sunk-cost effect, as indicated by the positive coefficients on the interaction terms between Founder (Male or GIndex) and LCapx. The evidence also exhibits that CPS is more strongly related to the sunk-cost effect as compared with when CEO power variables are not controlled (Table 3): the magnitude of the interaction coefficient between CPS and LCapx increases from 0.262 (Table 2, Column 2) to 0.432 (Table 3). Taken together, the evidence may be interpreted as follows: although CPS represents a gap of pay among the CEO and the other top managers, it also reflects various factors, including board characteristics, corporate governance, CEO power, and CEO characteristics. As such, if CPS to some extent reflects the positive aspects of CEO power effects that prevent unnecessary

conflict and communication and allow effective management, some of its effects may be negatively associated with the sunk-cost effect; in this case, the observed interaction coefficient between CPS and LCapx is less positive when compared with the case of CPS only capturing the per se effect of the pay gap. Accordingly, when other CEO power variables are considered in the analysis, CPS is more likely to capture the per se effect of the pay gap with its coefficient increasing[9].

Table 3
COMPARISON OF CEO PAY SLICE (CPS) AND MEASURES OF CEO CHARACTERISTICS

Dependent Variable is Capx	
Constant	0.058*** (7.68)
LCapx	0.130* (1.75)
CPS	-0.017***(-4.64)
CPS*LCapx	0.432***(7.92)
FInfo	0.006***(7.93)
CEOChair	0.005***(5.77)
OnlyDirector	0.001(0.99)
Founder	-0.000(-0.04)
Male	-0.004(-1.21)
GIndex	-0.001***(-3.44)
CEOtenure	0.000**(1.96)
CEOage	-0.000***(-4.18)
CEOChair*LCapx	-0.043***(-3.68)
OnlyDirector*LCapx	-0.038***(-3.25)
Founder*LCapx	0.036**(2.24)
Male*LCapx	0.091*(1.72)
GIndex*LCapx	0.008***(3.03)
CEOtenure*LCapx	-0.001(-1.24)

CEOage*LCapx	0.000(0.21)
Cash	0.049***(12.60)
IndCapx	0.024***(16.13)
Size	0.001(0.92)
Firm Dummy	Included
Year Dummy	Included
R-squared	0.754
N	16,246
The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.	

In Table 4, we employ investment changes instead of investment levels in an attempt to mitigate the omitted correlated variable problem. Column (1) shows that LΔCapx is negatively associated with ΔCapx, which is consistent with the mean-reversion property of investments. In Column (2) where the investment level (LCapx) is included to control for the mean-reversion effect, LΔCapx is positively associated with ΔCapx, suggesting the existence of the sunk-cost effect. In Column (3), we investigate the effect of CEO pay slice on the sunk-cost effect. The results show that the interaction coefficient between CPS and LΔCapx is 0.204 (t-stat. 3.01) and that the coefficient on LΔCapx decreases as compared to Column (2) (from 0.122 to 0.049). This evidence is consistent with that in Table 2 and corroborates that the sunk-cost effect are greater with CEO pay slice. In Column (4), where CEO power, characteristic, and governance variables are controlled, the results also mirror those in Table 3 and show that the impact of CPS on the sunk-cost effect is not subsumed by that of CEO power variables.

Table 4
REGRESSION ANALYSES USING INVESTMENT CHANGES

Dependent Variable is ΔCapx				
	Column (1)	Column (2)	Column (3)	Column (4)
Constant	-0.022***	0.030***	0.030***	0.039***
	(-4.28)	(6.61)	(6.46)	(5.24)
LΔCapx	-0.180***	0.122***	0.049*	-0.044
	(-22.31)	(15.00)	(1.92)	(-0.49)
LCapx		-0.595***	-0.595***	-0.595***
		(-72.75)	(-72.66)	(-62.19)
CPS			0.001	0.005*
			(0.46)	(1.95)

CPS * LΔCapx			0.204***	0.409***
			(3.01)	(4.95)
FInfo	0.005***	0.006***	0.006***	0.006***
	(5.48)	(7.63)	(7.6)	(6.96)
CEOChair				0.003***
				(3.79)
OnlyDirector				-0.001*
				(-1.93)
Founder				0.001
				(0.98)
Male				0
				0
GIndex				-0.000**
				(-2.22)
CEOtenure				0
				(0.51)
CEOage				-0.000***
				(-3.33)
CEOChair * LΔCapx				-0.037**
				(-2.29)
OnlyDirector * LΔCapx				-0.041**
				(-2.51)
Founder * LΔCapx				0.047**
				(2.55)
Male * LΔCapx				-0.004
				(-0.07)
GIndex * LΔCapx				0.009***

				(2.62)
CEOtenure * LΔCapx				-0.004***
				(-3.07)
CEOage * LΔCapx				0
				-0.09
Cash	0.043***	0.048***	0.048***	0.047***
	(10.51)	(13.65)	(13.58)	(11.52)
IndCapx	0.039***	0.026***	0.026***	0.024***
	(23.81)	(17.75)	(17.67)	(15.09)
Size	0.002***	0	0	0.001
	(3.47)	(-0.01)	(-0.02)	(1.26)
Firm Dummy	Included			
Year Dummy	Included			
R-squared	0.106	0.333	0.333	0.342
N	17,970	17,970	17,970	13,462
The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.				

CONCLUSION

The sunk-cost effect refers to the preference for continuing previously-chosen actions despite evidence to the contrary. In this study, we suggested CEO pay slice, which captures a gap of pay among a CEO and the other top managers, as a critical driver of the sunk-cost effect, which likely impairs shareholder value.

Specifically, we focused on and hypothesized that a CEO's sunk-cost effect increases with the pay gap. The results suggest that when there is a relative CEO overpayment, a CEO is more likely to be motivated to justify previous decisions or, because of reduced behavioral integration within the TMT, to experience deficiencies in information needed to determine when to stop an ongoing project. These implications are consistent with the findings of (Bebchuk et al., 2011; Bugeja et al., 2017) that firm value decreases as the gap of pay among the CEO and other top managers increases. This paradoxical finding, which implies that the higher the compensation a firm pays to its CEO, the lower the firm value, has been explained only using agency theory, but specific

mechanisms are not well understood. We propose the impact of CPS on the sunk-cost effect as one of the mechanisms.

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ENDNOTES

1. Some researchers define the sunk-cost effect as a subset of escalation, and others use the terms interchangeably (Sofis et al., 2015).
2. This tendency is known to be more pronounced when people cannot find external justification for their decision.
3. For example, tournament theory (e.g., Brian et al. 2013) may prescribe a large pay gap between the CEO and the other top executives as a way to increase efforts of both CEOs and executives who compete for the CEO position (i.e., a better-paid job position).
4. Sunk-cost effects refer to a phenomenon that a past investment raises the likelihood of future investment, while escalation behavior is the preference to continue investment irrespective of forecasted negative consequences. In defining escalation behavior, "expected negative consequences" are especially emphasized.
5. CEO pay slice is endogenous, reflecting CEO ability or entrenchment. Because the object of this study is to investigate the per se effect of the pay gap on the sunk-cost effect, CEO ability or entrenchment is a factor that should be controlled for. We discuss this later in detail.
6. These information processing deficiencies may cause strategic errors: failure to identify problems, failure to gauge serious problems, and failure to timely identify opportunities (Thomas and McDaniel 1990; Hambrick & D'Aveni 1992).
7. Our sample may be biased toward larger firms. Resultantly, our results would not necessarily be generalizable to all firms, although there is no ex-ante effect that this potential selection bias drives our results.
8. The results are robust to not winsorizing the data.
9. CEO pay slice may capture CEOs' inherent ability or future potential. To the extent that competent CEOs are skillful in attending to feedback, the ability effect on the sunk-cost effect may be negative. As such, the ability effect is less likely to drive our results; rather, it works against finding results that corroborate our hypothesis. Accordingly, we believe that it is not a serious concern that we cannot estimate CEOs' inherent ability and control for it.

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