경영학박사학위논문

# Essays on Management Control System

## 조직 관리통제시스템에 관한 연구

2022년 1월

서울대학교 대학원

경영학과 경영학 전공

정 선 문

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이 논문을 경영학 박사학위논문으로 제출함

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# Abstract

# Essays on Management Control System

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This dissertation consists of two essays on management control system. The first essay, entitled "Benchmarking Peer Pay-performance Sensitivity for CEO Equity Incentives," examines whether firms benchmark the peer firms' pay-performance sensitivity for CEO equity incentives. Drawing from CEO equity Delta over the years 2006–2018, I find that firms benchmark the pay–performance sensitivity of industry-size matched firms' CEO equity incentives and that inferring the appropriate level of incentives is their motive for doing so. In particular, firms benchmark the pay–performance sensitivity of peers to determine new equity grants to their CEOs, but they benchmark only against the peers with high degree of similarity in production functions and exogenous shock. Furthermore, the benchmarking against similar peers is pronounced when the firms face a high uncertainty about the underlying factors that determine the optimal pay-performance sensitivity. Collectively, my findings support that peer firms' pay-performance sensitivity information conveys useful information to improve sharing rule decisions when firms have less internal information.

The second essay, entitled "Public Integrity, Monitoring, and Budget Ratcheting in Government Organizations," examines the effect of public integrity and monitoring on asymmetric budget ratcheting in government organizations. I find that asymmetric budget ratcheting is more pronounced when agencies have higher level of public service integrity. This finding is consistent with the existence of separating contracts, where superiors allocate more (less) budgets to agents with high (low) public integrity. However, the degree of asymmetric budget ratcheting increases with integrity level only when the superiors have the stronger monitoring capability, supporting the notion that more informed superiors better distinguish

between the high- and low-type agents. I further find that asymmetric budget ratcheting is associated with higher subsequent achievement of performance goals and less slack-building behavior. Overall, my findings support that integrity, by facilitating mutually beneficial agreements between the parties, can improve the resource allocation efficiency and organizational performance.

**Keywords:** Equity Incentives; Pay–performance Sensitivity; Peer Benchmarking; Industry-size Matched Peers; Budget ratcheting; Asymmetric ratcheting; Government; Public integrity; Monitoring

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# Essay 1

# Benchmarking Peer Pay–Performance Sensitivity for CEO Equity Incentives

## 1. INTRODUCTION

The incentive contract design consists of two stages: (1) the choice of managerial performance evaluation measures and (2) the design of a sharing rule based on the chosen performance measures (Gjesdal 1982; Banker and Datar 1989). Studies on relative performance evaluation (RPE) focus on the peer effect in the former, suggesting that performance evaluation can be improved by incorporating the performance of firms exposed to similar business risk (Mookherjee 1984; Gibbons and Murphy 1990; Antle and Smith 1986; Gong, Li, Shin 2011). Recent studies on compensation peers also follow this line of literature and focus on peer firms that are particularly relevant in relative performance evaluation (Albuquerque 2009; Gong, Li and Shin 2011; Nam 2020; Jarayaman, Milbourn, Peters and Seo 2020).

The compensation literature, however, has been surprisingly silent on the latter, the relevance of peer information in sharing rule decisions between the principal and the agent. In this paper, I discuss how firms can improve their risk sharing contract by benchmarking similar peers' pay-performance sensitivity. I empirically examine whether firms benchmark similar peers' pay-performance sensitivity for their executive incentives, using CEO equity Delta of S&P 1500 firms during 2006-2018. My findings support the benchmarking against peers with high similarity in production functions and exogenous shocks—industry-size matched firms. Furthermore, my findings support the theoretical prediction that peer incentive benchmarking is driven by the motives of inferring optimal risk sharing. It is evidenced by the magnitude of benchmarking that increases when the firm characteristics approximate to those of peer firms and when the firms face a high uncertainty about the underlying factors determining sharing rule.[1]

[1] Throughout the paper, I use 'optimal sharing rule', 'incentive pay', and 'pay-performance sensitivity' interchangeably. In practice, the sharing rule between the shareholders and the managers shapes up as the incentive rewards, which are pay-for-performance. The higher the pay-performance sensitivity, the larger stake of payoffs the managers get.

I argue that peer firms provide relevant information about optimal risk sharing, because they share common underlying factors that determine the sharing rule. It is because similar peer firms are matched in their precision and sensitivity of performance measures (Baker 2002; Banker and Datar 1989). In addition, due to their similarity in input-output production functions, marginal product of managerial efforts (and thus the marginal value of monetary incentives) are similar across the peer firms (Edmands, Gabaix and Landier 2008). Moreover, managers in the same industry are likely to attract managers with similar talents and risk preferences, which leads to the matched level of optimal risk sharing (Arya and Mittendorf 2005; Hales, Wang and Williams 2015).

Still, for a firm to have incentives to benchmark peers, the peer pay-performance sensitivity should convey incremental information that the firm does not have internally. Firms rely on multiple sources of information when designing compensation contracts (Murphy 2000; Aranda et al. 2014; Kim and Shin 2017), and peers provide especially useful information when a firm's internal information is less reliable in figuring out underlying parameters of sharing contract. For instance, when a firm is experiencing fundamental changes of market structure or technological innovation, it faces a great uncertainty about the underlying factors of risk sharing rules (e.g., future performance distribution, effort-performance relation). Such a turmoil shifts the precision and the sensitivity of performance measures, as well as the marginal product of managerial efforts, because the exogenous shocks alter the firm's production functions. With the advent of smartphones, for example, a firm's performance measure such as stock price became no longer sensitive to the managerial efforts on PDA (personal digital assistant) production. In addition, PDA manufacturers longer found it valuable to induce managerial efforts on developing PDA devices.

Peer firms' decision on their pay-performance sensitivity provides valuable and incremental information about the changing factors of sharing rule. Several PDA manufacturers could have private information about market changes in the near future, while others do not. Those firms *with*

forward-looking information would have updated their executive incentives in advance. Then, the very fact that some of industry peers updated their incentives actually delivers some valuable signal to those *without* private information. By looking at the peer firms' action on pay-performance sensitivity decision, firms without information can arrive at necessary inference on the optimal sharing rule. Importantly, firms can improve their pay-performance sensitivity decision (by simply benchmarking the observable pay-performance sensitivity) even without knowing the peer firms' private information *per se*. Based on this discussion, I predict that firms benchmark the peer firms' average pay-performance sensitivity when they revise the incentive level for their managers (pay-performance sensitivity benchmarking).

I examine the pay-performance sensitivity benchmarking using the sample of S&P 1500 firms during 2006-2018. I measure pay–performance sensitivity by equity Delta, which is the sensitivity of the dollar value of CEOs' equity holdings to the percent change of the firm's stock price. I define the peer firms as the firms from the same industry and of the similar size, because those firms are known to share a common production functions and exogenous shocks (Albuquerque 2009).[2] The results support the benchmarking of peer firms' equity Delta. I find that the equity Delta of industry-size matched peers is significantly and positively associated with the Delta of a CEO's subsequent equity grants. These findings are consistent with the theoretical prediction that the peers sharing common inputs that are used to design the pay–performance sensitivity. On the other hand, I find no evidence in additional analysis that compensation benchmarking peers' equity Delta significantly influences a CEO's equity grants, which implies that firms display sophistication in selecting peer groups that suit their purposes (meeting participation constraint vs. inferring optimal incentives).

[2] In additional analyses, I use an alternative definition of similar peers, product market peers (Hoberg and Phillips 2016; Jarayaman, Milbourn, Peters and Seo 2020). The firms belonging to the same product market are likely to have similar production functions and to be exposed to common productivity and demand shocks.

I further examine the settings in which the peer firms' equity Delta is likely to be *less* informative in drawing the optimal pay–performance sensitivity. When the focal firm has *less* in common with peer firms in terms of production functions, the peer firms' equity Delta is likely to be less relevant about the focal firm's appropriate level of incentives (Edmans, Gabaix, and Landier 2009; Cremer and Grinstein 2013). Furthermore, when firms have more idiosyncratic risk than systematic risk, the peer pay-performance sensitivity information would be less relevant to predict the firms' future stock returns (Campbell, Lettau, Malkiel and Xu 2001). I expect that, under those conditions, the board gives less weight on the peer pay-performance sensitivity information when granting subsequent equity incentives. Consistent with my expectations, I find that a firm is less likely to match industry-size matched peers' equity Delta when its operational scale and productivity (measured by the firm's market cap and ROA, respectively) deviates from those of peers and when its idiosyncratic risk increases relative to the systematic risk.

I then examine the settings in which the peer firms' equity Delta is *more* informative. The benchmarking against peers is expected to be pronounced when firms face greater uncertainty about future, because their lack of credible information encourages them to induce other firms' private information. With technologies and demand shifts, firms have difficulties in predicting the future performance distributions and managerial input-output relations, which are the factors underlying the optimal sharing rule. By referencing peer firms' pay-performance sensitivity, the firms can infer the peer firms' private information about the future changes in those factors. Supporting this idea, I find that a firm is more likely to match industry-size matched peers' equity Delta when it is experiencing the changes in business models (measured by M&A and restructuring costs) or industry-wide changes in production functions (measured by the change in industry-level total factor productivity).

In additional analyses, I find that my findings are robust to an alternative definition of similar peers—product market peers based on

product descriptions in 10-Ks (Hoberg and Phillips 2016). I also provide some insights about the channel through which the board acquires and processes the relevant information from similar peers: the board is able to obtain the peers' pay-performance sensitivity information even before it is publicly disclosed in the proxy statement; interlocking compensation consultants between the firm and the peers are a probable channel for information acquisition. Finally, my finding supports the efficient contracting view, as evidenced by the positive (insignificant) correlation between pay-performance sensitivity similarity and economically explained (unexplained) components of total compensation.

My study makes several contributions to the literature. I provide novel large-sample evidence that firms benchmark their equity incentives' pay–performance sensitivity to that of their peers. My findings expand the understanding of peer firms' role in compensation design in three important ways. First, while studies on relative performance evaluation mainly focus on the importance of peer information in performance evaluation, my study highlights the peer firms' relevance in optimal incentive decisions. Relatedly, my study also extends the optimal incentive models (suggested by Core and Guay (1999)) by incorporating alternative sources of information (e.g., peer firms' pay-performance sensitivity information) into the model.

Second, I also add to the studies on compensation benchmarking. My evidence suggests that, in addition to benchmarking the peers' compensation levels, firms also benchmark peers' pay–performance sensitivity of incentive pay. Third, I also offer insight into the broader debate on rent extraction versus efficient contracting motives in executive compensation decisions. In particular, I provide evidence consistent with the theoretical prediction that peers' incentive practices give boards information that is valuable in gauging appropriate incentive levels. While prior studies suggest that both opportunistic and efficiency motives influence peer selection (Faulkender and Yang 2010; Albuquerque et al. 2013; Cadman et al. 2020), my findings are consistent with efficient contracting also being an

explanation, as the benchmarking is more pronounced when peer equity Delta is more informative to the board.

Collectively, my paper's insight is of particular importance in light of the recent regulations and policies designed to restrain executive compensation. My paper suggests that heightened benchmarking practices may not be entirely driven by managers' opportunistic desire to inflate their compensation, and may instead be partly driven by firms' economic motives.

The remainder of the study proceeds as follows. In Section II, I review the related literature and develop my hypotheses. In Section III, I describe the sample selection, data sources, variable measurement and empirical models. Section IV reports empirical results, and Section V reports the results of additional analyses. Section VI concludes the paper.

## 2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Peer groups' compensation practices have become increasingly important in compensation decisions in recent years. In 2006, the SEC's amended compensation disclosure rules facilitated more transparent disclosure of competitive data, including the extent to which firms' compensation-structuring practices and compensation decisions reflect peer group data. The expanded disclosure on compensation peers, coupled with a significant growth in CEO compensation, has brought heighted public and academic attention to compensation benchmarking practices (Faulkender and Yang 2010). How peer firms compensate their executives is useful and relevant to boards in their compensation contract design. For instance, the executive performance evaluation can be improved by incorporating the performance of firms exposed to similar business risk (Mookherjee 1984; Gibbons and Murphy 1990; Antle and Smith 1986; Gong, Li, Shin 2011). Recent studies on compensation peers follow this line of literature, by focusing on certain groups of peers that are particularly relevant in relative

performance evaluation (Gong, Li and Shin 2011; Nam 2020; Jarayaman, Milbourn, Peters and Seo 2020).

The literature on compensation peers has been surprisingly silent on how the peer firms' relevance about the design of optimal sharing rule. While the incentive contract design consists of the two important stages of (1) the choice of performance measures and (2) the design of a sharing rule (Gjesdal 1982; Banker and Datar 1989), the previous studies on compensation peers mainly focus on the former. Meanwhile, the literature has been relatively silent on how firms can improve their risk sharing design by benchmarking similar peers. This absence is surprising because executive incentives, especially equity incentives, have become an increasingly important component of executive compensation, with more than 90% of S&P 1500 firms now granting equity to their CEOs. The equity incentives have risen as a proportion of total CEO compensation and they account for about 60% of total executive pay (Cadman et al. 2020). Given that incentive pays play a critical role to align the CEO's incentives with shareholders' preferences, we need to pay attention to useful informational sources that can improve the equity incentive design, including the peer information. My study fills this void by suggesting that peer firms' incentive design provides valuable information that improves the equity incentive design.

In this paper, I focus on the industry-size matched peers, because those firms are particularly relevant in risk sharing design. Industry-size matched peers share the underlying factors of pay-performance sensitivity, such as the performance distribution and effort-performance relation of managers (Holmstrom 1979). (See Appendix A for further discussion about the underlying factors that determine the sharing rule.) They share the underlying factors because they have similar production functions and are exposed to common shocks (Aigner and Chu 1968; Albuquerque 2009).[3] Firm production for a given industry is embodied in certain technical

[3] The underlying factors of the sharing rule are the firm's performance distributions and the manager's effort-performance relation; those factors are mostly determined by production functions and exogenous shocks.

parameters in an industry production function (Aigner and Chu 1968). Furthermore, firms of similar size exhibit similar responses to the exogenous shocks (Albuquerque 2009). For instance, Food and Drug Administration (FDA) regulation requiring increased pre-market testing benefited the larger firms with sufficient research productivity, while it negatively impacted small firms with less research inputs (Albuquerque 2009). Collectively, industry- and size-matched firms are most likely to share the underlying contract parameters in common, which validates the focus on the benchmarking against those peers.[4]

Peer benchmarking of pay-performance sensitivity information is subject to two reservations: (1) peer firms should have a similar level of optimal incentives with the focal firm; (2) peer firms' pay-performance sensitivity information should convey incremental information that the focal firm does not have internally.

Peer firms share the similar level of optimal pay-performance sensitivity, first because the strength of incentives in organizations depends on the availability and the precision of performance measures (Baker 2002; Banker and Datar 1989). The executives in the same industry are likely to be evaluated on a common set of performance measures (e.g., net interest margin and cost of funds for banking industry, average daily rate and revenue per room for hotel industry). Furthermore, firms in the same

[4] Another most frequently studied peers are compensation benchmarking peers (Faulkender and Yang 2010; Bizjak, Lemmon, Nguyen 2011). Unlike industry-size matched peers, compensation benchmarking peers might not be relevant when boards gauge the optimal pay–performance sensitivity. Using firms' disclosures of the peer firms they selected for relative performance evaluation, Gong et al. (2011) find that benchmarking peers (peers not used for RPE) are more likely to be superior in firm performance and less likely to co-move with the focal firm. Faulkender and Yang (2010) and Bizjak, Lemmon, and Nguyen (2011) show that, after controlling for similarities between a firm and its chosen peers, firms are more likely to select, as their benchmarking peers, companies with high-paid CEOs. Cadman et al. (2020) suggest that benchmarking peers are used for gauging and matching the CEOs' labor market value and reservation wage. Collectively, their works suggest that compensation benchmarking peers are less likely to share common production functions and performance distributions, despite their importance in the compensation *level* decision. Therefore, I do not expect to observe pay–performance sensitivity benchmarking practices among compensation benchmarking peers.

industry likely share the extent to which each performance measure translates to stock performance (e.g., investors of phone carriers react more sensitively to market share than ROA). Hence, peer firms in the same industry share the precision and sensitivity of certain performance measures such as stock returns, which lead to a similar level of optimal incentives. Second, the marginal product of managerial efforts, and thus the value of monetary incentives, are similar across the peer firms. Assuming a multiplicative production function, managerial efforts have a percentage effect on firm value (Edmands, Gabaix and Landier 2008), and the dollar value of working should be similar across firms with common production functions. Furthermore, managers with similar talents and risk preferences are likely to select into the same industry (Arya and Mittendorf 2005; Hales, Wang and Williams 2015), leading to homogeneous managerial effort-output relations among industry peers.

Secondly, peer firms' pay-performance sensitivity decision reveals their private information about the future performance distributions. When other firms in the same industry update their own pay-performance sensitivity, the focal firm could infer that the underlying factors of the pay-performance sensitivity are shifting. For example, productivity shocks alter the performance measures that are informative about managerial efforts. Return on assets (sales volume) may be more informative in the maturity (introductory) stage of the product life cycle. In addition, the marginal value of managerial efforts changes over time as the market conditions change over time. With the advent of smartphones, it is no longer valuable to induce managerial efforts on developing PDA devices. Several PDA manufacturing firms possessing private information about market changes would have reduced their CEOs' incentive levels in advance. Firms *without* such information could infer the necessary and sufficient information to update their pay-performance sensitivity, simply by benchmarking their peers' pay-performance sensitivity. Notably, the firms do not need to induce detailed information that peer firms have about the market changes and production parameters. Rather, firms only need to know the peer pay-performance

sensitivity per se, which is sufficient to gauge the optimal level of pay-performance sensitivity. Hence, I predict that firms benchmark the peer firms' average pay-performance sensitivity when they revise the incentive level for their managers (pay-performance sensitivity benchmarking).

***H1*** *Pay–performance sensitivity of new equity grants for CEOs is positively associated with industry-size matched peers' average pay–performance sensitivity ("pay–performance sensitivity benchmarking").*

To further investigate whether inferring the appropriate incentive level is a motive of pay–performance sensitivity benchmarking, I examine the settings in which pay–performance sensitivity benchmarking against peers is likely to be either reduced or pronounced. As noted earlier, similar peers are especially relevant in gauging the appropriate pay–performance sensitivity because they share similar performance distributions and productivity. The performance distribution of firms with a largely idiosyncratic performance depend on agent-specific efforts (Holmstrom 1982), which reduces the benefits of benchmarking peer pay-performance sensitivity. On the other hand, firms with performance that covaries with their peer performance, would benefit more from peer benchmarking.

Edmans, Gabaix, and Landier (2009) suggest that firms that are similar in production functions earn a similar amount of value from managerial efforts. It is because, with a multiplicative production function, managerial efforts have a percentage effect on firm value, and the dollar value of working should have similar consequences on the output across firms sharing similar input-output relations. Hence, firms would have greater incentives to benchmark peer pay-performance sensitivity when their peers look more like themselves in terms of production functions. Firms that are in similar size share the similar input-output relation due to the economies of scale, and thus share the similar level of marginal product of managerial inputs (Baker and Hall 2004; Edmans et al. 2009). In addition, firms in the same industry have common production parameters, which

leads to similar cost efficiency and profitability (Aigner and Chu 1968). Firms from the same industry and of similar size, hence, not only share the common production functions and productivity, but also respond similarly to the exogenous shocks (Albuquerque 2009).

Based on this discussion, I expect that a firm's pay–performance sensitivity benchmarking against peers is reduced (1) when their peers deviate more from themselves in terms of size and profitability and (2) when the firm's stock performance is more idiosyncratic.

***H2a*** *Pay–performance sensitivity benchmarking against peers decreases in size difference between the firm and peers.*

***H2b*** *Pay–performance sensitivity benchmarking against peers decreases in profitability difference between the firm and peers.*

***H2c*** *Pay–performance sensitivity benchmarking against peers decreases in idiosyncratic risk of a firm's stock returns*.

Now I turn to the settings where I expect peer firms' pay–performance sensitivity information to be more relevant, such that benchmarking is likely to be amplified. Firms rely on multiple sources of information when designing compensation contracts (Kim and Shin 2017), and the relative precision and strength of signals from each source determine the firms' reliance on it. Peer information is relatively more informative when a firm's own past performance provides less relevant information about its future performance or the manager's effort–performance relation. The optimal level of incentives changes from time to time, partly because a firm's fundamental characteristics and production function that drive optimal incentive levels change with time.

Especially when a firm's industry is experiencing technological innovations and productivity shocks, the board of directors face a great deal of uncertainty in gauging the optimal level of incentives. It is because the board has difficulty in estimating the marginal value of managerial efforts, because they hardly rely on the past performance information during a time

of turmoil. For instance, with the advent of smartphones, PDA (personal digital assistant device) manufacturers faced a lot of uncertainty about whether their products will survive or not. Likewise, when the 3.5-inch floppy disks were vanishing from the market, several disk manufacturers already predicted the new generation of disk formats, while others did not. With great uncertainty, the peer firms' pay-performance sensitivity could deliver valuable information to the firms without forward-looking information. For instance, several PDA manufacturing firms with private information about market changes would have reduced their CEOs' incentive levels in advance. Other firms can infer such private information through the fast mover's pay-performance decisions. Hence, I predict that a firm's benchmarking against peer pay-performance sensitivity increases when it undergoes changes in production functions and technological innovations. I capture three different dimensions of changes: firm-level business restructuring; industry-level productivity innovations; and product market maturity.

***H3a*** *Pay–performance sensitivity benchmarking against peers increases during business restructuring.*

***H3b*** *Pay–performance sensitivity benchmarking against peers increases when a firm's industry experiences productivity innovation.*

***H3c*** *Pay–performance sensitivity benchmarking against peers increases when a firm's product market is less mature.*

## 3. METHODS

### 3.1. Data Sources

I test my predictions using a sample of firms from Execucomp with compensation peer data available over the period 2006–2018. Consistent with prior studies that examine equity incentives, I focus on CEO incentives. I obtain compensation data from ExecuComp, stock prices from CRSP, and financial data from Compustat. I identify industry-size matched peers from

Compustat. For additional analyses using alternative peer definitions, I identify compensation benchmarking peers from ISS Incentive Lab database, and product market peers from Hoberg and Phillips database.

### 3.2. Sample Selection

Sample selection is reported in Panel A of Table 1. I begin with 18,296 firm-years during 2005-2018 with the data needed to calculate the equity Delta of CEOs' equity portfolio and stock options. After excluding observations without necessary data of control variables in the new equity grants model, the sample reduces to 15,202 during 2006-2018. After further excluding observations without peer firms' average equity portfolio Delta, the sample is reduced to 14,230 firm-years with industry-sized matched peers' Delta available (sample for H1 testing). As shown in Panel B, the sample observations are evenly distributed across the sample period. When I exclude observations that are missing the data to measure cross-sectional variables to test H2, the sample is reduced to 10,934 firm-years.

**<Insert Table 1 here>**

### 3.3. Variable Measurement and Model Specification

***Pay–Performance Sensitivity Benchmarking***

To examine the pay–performance sensitivity benchmarking against peer firms, I follow the Core and Guay (1999) model explaining annual equity grant Delta. In particular, I test whether CEO new grant Delta positively relates to peer average portfolio Delta in the previous year, with the following model:

$$Log(New\ Grant\ Delta+1)_{i,t} = \beta_0 + \beta_1\ Log(Peer\_Delta)_{i,t-1} + Controls_{i,t-1} + e_{i,t-1} \qquad (1)$$

I use equity Delta as the empirical proxy of sharing contracts between the shareholders and the manager. The equity Delta is the partial derivative of the dollar amount of CEOs' equity holdings with respect to stock return, and captures how sensitively equity incentives change with

firm value. It is one of the most frequently used measures of pay–performance sensitivity in the accounting and finance literature (Coles, Daniel, and Naveen 2006; Guay, Kepler, and Tsui 2019). Delta is especially useful to capture the sharing rule between the shareholder and the manager in our sample firms. Equity has become an increasingly important component of executive compensation, with more than 90% of S&P 1500 firms now granting equity to their CEOs. In addition, equity pay has risen as a proportion of total CEO compensation such that it accounts for about 60% of total pay (Cadman et al. 2020). Since equity Delta measures the dollar wealth given to a manager as the price performance improves, it captures the share of a firm's wealth (strictly speaking, the increase of a firm's wealth during the period) that goes to the manager. Delta corresponds to the risk sharing rule discussed in the incentive theory (Holmstrom 1979).[5]

I calculate equity Delta of equity portfolio and annual grants in firms with ExecuComp data, where equity portfolio refers to the equity and stock options that a CEO holds, and annual grants refer to newly granted stocks and options during the year. Delta of restricted stocks are calculated by the stocks' fair value multiplied by 1% of the firm's stock price at year end. I estimate the stock options' fair value using the Black-Scholes (1973) model, and follow Core and Guay (1999) to calculate the Delta by the option value's partial derivatives with respect to the percentage change of stock price, multiplied by 1% of the stock price. The dependent variable $Log(New\ Grant\ Delta+1)_{i,t}$ is the natural logarithm of new grant Delta for firm *i*'s CEO in year *t*. The main explanatory variable is $Log(Peer\_Delta)_{i,t-1}$, which is the natural logarithm of industry-size matched firms' average portfolio Delta in the previous year. I use one-year lagged peers' stock portfolio, assuming that the board of directors incorporates the peers' compensation information in the year after the information is publicly

[5] Holmstrom (1979) articulates the sharing rule s(x) as the amount that goes to the agent as the share of a firm's outcome x. "Thus, sharing rules have to be functions of x alone. Let s(x) denote the share of x that goes to the agent and r(x) = x - s(x) denote the share that goes to the principal." Hence, the sharing rule s(x) denotes the (dollar) amount of firm outcome x that the managers take. This corresponds to the definition of Delta.

disclosed.[6] In line with H1, I expect that $Log(Peer\_Delta)_{i,t-1}$ of industry-size matched peers is positively associated with $Log(New\ Grant\ Delta+1)_{i,t}$ ($\beta_1$>0).[7] In equation (1), I control for factors that can be correlated with new grant incentives, such as incentive residuals from the regression of portfolio Delta in the previous year ($Rebalance_{i,t-1}$), firm size ($Log(Sales)_{i,t-1}$), growth option ($MTB_{i,t-1}$), net operating loss ($NOL_{i,t-1}$), cash flow shortfall ($CF\ Shortfall_{i,t-1}$) dividend constraint ($DIV\ Constraint_{i,t-1}$) and the year's and previous year's stock returns ($Return_{i,t}$, $Return_{i,t-1}$) (Core and Guay 1999). To assuage the concern that the positive association between peer Delta and new grants are driven by the motives of matching the CEOs' total compensation with their labor market value, I control for the peer firms' new grants fair value ($Log(New\ Grants\ FV)_{i,t}$) (Cadman et al. 2021). I further control for year and industry fixed effects. The variable definitions are in Appendix B.

To examine the settings in which pay–performance sensitivity benchmarking is more or less pronounced, I estimate equations (2).

$$
\begin{aligned}
Log(New\ Grant\ Delta+1)_{i,t} = {} & \beta_0 + \beta_1 Log(Peer\_Delta)_{i,t-1} \\
& + \beta_2\, Log(Peer\_Delta)_{i,t-1} \times High\_|Peer\ ROA - My\ ROA|_{i,t-1} \\
& + \beta_3\, Log(Peer\_Delta)_{i,t-1} \times High\_|Peer\ MVE - My\ MVE|_{i,t-1} \\
& + \beta_4\, Log(Peer\_Delta)_{i,t-1} \times Idiosyncratic\ Risk\ Ratio_{i,t-1} \\
& + \beta_5\, Log(Peer\_Delta)_{i,t-1} \times Restructuring_{i,t-1} \\
& + \beta_6\, Log(Peer\_Delta)_{i,t-1} \times High\_TFP\ Change_{i,t-1} \\
& + \beta_7\, Log(Peer\_Delta)_{i,t-1} \times Peer\ HHI_{i,t-1} \\
& + \beta_8 High\_|Peer\ ROA - My\ ROA|_{i,t-1} \\
& + \beta_9 High\_|Peer\ MVE - My\ MVE|_{i,t-1} \\
& + \beta_{10} Idiosyncratic\ Risk\ Ratio_{i,t-1}
\end{aligned}
$$

[6] In the robustness checks, I use concurrent peer Delta instead of 1-year lagged one, and find consistent results.

[7] In additional analyses, I re-estimate the equation (1) using alternative peer definitions. I find that firms benchmark the product market peers (Hoberg and Phillips 2016) to decide new grants Delta. On the other hand, I find no evidence that compensation benchmarking peers' Delta is associated with new grants. These findings further support my prediction that firms benchmark the pay-performance sensitivity of the firms sharing similar production functions and exogenous shocks (e.g., product market peers) rather than other types of peers (e.g., compensation benchmarking peers).

$$+ \beta_{11} Restructuring_{i,t-1} + \beta_{12} High\_TFP\ Change_{i,t-1}$$
$$+ \beta_{13} Peer\ HHI_{i,t-1} + Controls_{i,t-1} + e_{i,t-1} \qquad (2)$$

In equation (2), the coefficients on the interaction terms between $Log(Peer\_Delta)_{i,t-1}$ and cross-sectional variables ($\beta_2$, $\beta_3$, $\beta_4$, $\beta_5$, $\beta_6$, $\beta_7$) capture whether the peer benchmarking ($\beta_1$) is more or less pronounced in respective conditions.

***Proxies of Deviation from Peer Firms' Characteristics* (H2)**

$High\_|Peer\ ROA - My\ ROA|_{i,t-1}$ is an indicator that takes 1 if a firm's deviation from peer firms' profitability (measured by return on assets) is above the year median, and 0 otherwise. In accordance with H2a, I expect that peer benchmarking attenuates as the peer firms deviate more from the focal firm in terms of profitability ($\beta_2$<0). $High\_|Peer\ MVE - My\ MVE|_{i,t-1}$ is an indicator that takes 1 if a firm's deviation from peer firms' operational scale (measured with market value of equity) is above the year median, and 0 otherwise. In accordance with H2b, I expect that peer benchmarking attenuates as the peer firms deviate more from the focal firm in terms of operational scale ($\beta_3$<0). $Idiosyncratic\ Risk\ Ratio_{i,t-1}$ is defined as stock returns' idiosyncratic volatility divided by systematic volatility during the past 60 months. In accordance with H2c, I expect that peer benchmarking attenuates as the firm's stock returns are more independent from the market returns ($\beta_4$<0).

***Proxies of Changes in Production Functions* (H3)**

$Restructuring_{i,t-1}$ is the sum of acquisition and restructuring costs, scaled by 1-year lagged assets. In accordance with H3a, I expect that peer benchmarking is more pronounced when the firms are undergoing business transformation ($\beta_5$>0). $TFP\_Change_{i,t-1}$ is an indicator that takes 1 if the changing rate of total factor productivity of the firm's industry over a year is above top 10%. Total factor productivity measures how the inputs (e.g., labor, capital, energy, materials, and purchased services) contribute to the output (e.g., amount of goods and services). I obtain the total factor

productivity data at NAICS 3-digit industry level from the website of Bureau of Labor Statistics (BLS).[8] In accordance with H3b, I expect that peer benchmarking is more pronounced when the firm's industry is experiencing an extreme change of production functions ($\beta_6$>0). Finally, $Peer\_HHI_{i,t-1}$ is the Herfindahl-Hirschman Index of a given industry-size group. According to H3c, I expect that peer benchmarking is less pronounced when the firm's cohort is less mature and uncertain ($\beta_7$>0).

***Descriptive Statistics***

Panel A of Table 2 reports the descriptive statistics of the variables. The mean portfolio Delta of a firm is 800.698, indicating that the dollar value of the CEO's option and stock grants increases by about 800 dollars with each 1% change of the firm's stock price. This descriptive statistic is comparable with the findings in a recent paper on compensation Delta by Guay, Kepler, and Tsui (2019). The average new grant Delta in year t, on the other hand, is 21.445. The average $Peer\_Delta_{i,t-1}$ for industry-size matched peers is 1695.290. The absolute deviation of a firm's profitability from that of peers (|*Peer ROA – My ROA*|) is 0.084. The absolute deviation of a firm's log market value of equity from that of peers (|*Peer MVE – My MVE*|) is, on average, 7.234. The average idiosyncratic-to-systematic volatility ratio (*Idiosyncratic Risk Ratio*) is 2.371, indicating that firm-specific stock return volatility is larger than systematic volatility on average. The acquisition and restructuring costs on average account for 4% of total assets (*Restructuring*), which is highly skewed to the left. The annual change of logged total factor productivity (*TFP Change*) is on average 0.008. The Herfindahl-Hirschman Index of industry-size groups (*Peer HHI*) is on average 0.096.

Panel B reports the variations of equity Delta within- and across-peers. I calculate the standard deviation of equity Delta by each industry-size group. (There are 1,712 industry-size groups in total.) The average within-group standard deviation of new grants ($Log(New\ Grants\ Delta+1)_{i,t}$)

[8] https://www.bls.gov/mfp/

is 1.322, as opposed to the across-group standard deviation of 1.798. The average within-group standard deviation of equity portfolio (*Log(Portfolio Delta)*$_{i,t}$) is 1.198, as opposed to the whole-sample standard deviation of 1.528. Collectively, within-group variations of equity Delta are smaller than across-peers, indicating that firms within a peer group tend to have homogeneous equity incentives.

**<Insert Table 2 here>**

Table 3 reports the Pearson correlation coefficients among main variables. Panel A exhibits the correlation matrix of the sample to estimate equation (1) (N=14,230). *Log(New Grant Delta)*$_{i,t}$ is positively correlated with *Log(Peer Delta)*$_{i,t-1}$, which is consistent with my prediction that a firm's new equity grants are associated with industry-size matched peers' pay-performance sensitivity. *Log(New Grant delta)*$_{i,t}$ is also positively correlated with *Log(Sales)*$_{i,t}$, *MTB*$_{i,t}$, *NOL* $_{i,t}$, and the current and previous year's stock returns, while negatively correlated with *CF Shortfall*$_{i,t}$ and *DIV Constraint*$_{i,t}$. Panel B presents the correlation matrix of the sample to estimate equation (2) (N=10,934). *Log(New Grant Delta)*$_{i,t}$ is positively correlated with *Log(Peer Delta)*$_{i,t-1}$, as in the case of Panel A.

**<Insert Table 3 here>**

## 4. EMPIRICAL RESULTS

### *Pay–Performance Sensitivity Benchmarking*

Table 4 reports the estimation results of equation (1) using industry-size matched peers' equity Delta. In column (1), the coefficient on *Log(Peer Delta)*$_{i,t-1}$ is strongly positive ($\beta_1$=0.076, p<0.01). This finding is consistent with firms benchmarking the peer firms' pay-performance sensitivity (H1 supported). In column (2), I further control for the peer firms' new equity grants fair value (*Log(Peer Grant FV)*$_{i,t}$), to mitigate the concern that matching a CEO's labor market value with equity grants may drive our results (Cadman et al. 2021). Even after controlling for it, *Log(Peer Delta)*$_{i,t-}$

$_1$ is positively associated with the new equity grants Delta ($\beta_1$=0.050, p<0.05), indicating that a firm's benchmarking peer pay-performance sensitivity is independent of its intention to meet a CEO's participation constraint. Collectively, the results in Table 4 support that firms incorporate the peer firms' pay-performance sensitivity information when deciding new equity incentives for their CEOs. The results also highlight the role of peer firms in *ex ante* design of optimal sharing rule, above and beyond their role in *ex post* performance evaluation such as RPE (Gibbons and Murphy 1990).

**<Insert Table 4 here>**

***Relative Informativeness of Peer Pay–Performance Sensitivity***

Table 5 reports the estimation results of equations (2). In column (1), I examine H2a–H2c, using three proxies of a firm's deviation from their peer firms' characteristics. In column (2), I examine H3a–H3c, using the proxies of innovations in a firm's production functions. Column (3) include all of those proxies that are interacted with $Log(Peer\ Delta)_{i,t-1}$, jointly testing H2a through H3c.

In column (3), the coefficient on $Log(Peer\ Delta)_{i,t-1} \times |Peer\ ROA - My\ ROA|_{i,t-1}$ is significantly negative ($\beta_2$=-0.268, p<0.1), indicating that peer benchmarking attenuates when the firm's profitability deviates from their peers' profitability (H2a supported). The coefficient on $Log(Peer\ Delta)_{i,t-1} \times |Peer\ MVE - My\ MVE|_{i,t-1}$ is significantly negative ($\beta_3$=-0.031, p<0.01), supporting that peer benchmarking attenuates when the firm's operational scale deviates from their peers' one (H2b supported). I also find a significantly negative coefficient on $Log(Peer\ Delta)_{i,t-1} \times Idiosyncratic\ Risk\ Ratio_{i,t-1}$ ($\beta_4$=-0.010, p<0.1), which suggests that peer benchmarking is reduced when the firms' return volatility is rather idiosyncratic than systematic supporting (H2c supported). Put together, these results are consistent with the theoretical discussion that firms selectively benchmark the firms with similar characteristics with themselves. In other words, firms avoid benchmarking those peers that share less in common with themselves, because those firms are less likely to be informative about their optimal pay-performance sensitivity design.

The coefficient on $Log(Peer\ Delta)_{i,t-1} \times Restructuring_{i,t-1}$ is significantly positive ($\beta_5$=0.398, p<0.01), indicating that peer benchmarking is more pronounced when the firm is spending more on business restructuring (H3a supported). The coefficient on $Log(Peer\ Delta)_{i,t-1} \times High\_TFP\ Change_{i,t-1}$ ($\beta_6$=-0.031, p<0.01), supporting that peer benchmarking increases when the firm's industry is experiencing an extreme productivity innovation (H3b supported). However, I could not find a significant coefficient on $Log(Peer\ Delta)_{i,t-1} \times Peer\ HHI_{i,t-1}$ , providing little support to the notion that firms rely more on peer information when their industry-size segment is less saturated (H3c not supported). In general, these results suggest that firms try to infer more private information from their peers' pay-performance sensitivity when they are uncertain about how the underlying factors of sharing rule would change in the future.

**<Insert Table 5 here>**

## 5. ADDITIONAL ANALYSES

### *Alternative Peer Definitions*

Prior studies on compensation benchmarking have focused on compensation peers that are selected to gauge the appropriate level of compensation, as disclosed on a firm's proxy statement (Bizjak et al. 2008, 2011; Cadman and Carter 2014; Faulkender and Yang 2010). Despite their importance in identifying a CEO's reservation wage (Albuquerque et al. 2013; Cadman et al. 2021), compensation benchmarking peers might not be relevant when boards gauge the optimal pay–performance sensitivity. Gong et al. (2011) find that benchmarking peers (peers not used for RPE) are more likely to be superior in firm performance and less likely to co-move with the focal firm. Faulkender and Yang (2010) and Bizjak, Lemmon, and Nguyen (2011) show that, after controlling for similarities between a firm and its chosen peers, firms are more likely to select, as their benchmarking peers, companies with high-paid CEOs.

In Table 6, I find little evidence that firms mimic the compensation benchmarking peers' equity Delta. Both columns (1) and (2), I do not find

significant coefficients on *Log(Peer Delta)*$_{i,t-1}$, suggesting that firms do not incorporate the pay-performance sensitivity information of benchmarking peers when deciding new equity Delta. This is surprising because Cadman et al. (2020) found that benchmarking peers' equity grant *level* is positively associated with the focal firm's equity grant *level*. Combined with my findings in Table 6, compensation benchmarking peers are used for gauging and matching the CEOs' labor market value and reservation wage, but are not used for inferring the optimal pay-performance sensitivity.

**<Insert Table 6 here>**

In Table 7, I re-estimate equations (1) and (2) using an alternative peer definition of industry-size matched peers, product market peers (Hoberg and Phillips 2016). Product market peers are those that operate in the same market and sell similar products (Jayaraman et al. 2020). Hoberg and Phillips (2016) identified firms with similar product descriptions in their 10-Ks, and defined them as product market peers. Product market peers have a similar set of management skills and production functions, as well as being exposed to the same exogenous shocks. Hence, like the industry-size matched peers, the private information of product market peers about future market changes would be relevant in gauging an optimal pay-performance sensitivity. Throughout columns (1)–(4), I find the results that are consistent with the main analyses using industry-size matched peers. It suggests that my findings are robust to using an alternative peer group that is likely to share similar production functions and exogenous shocks.

**<Insert Table 7 here>**

***Concurrent Peer Information and Channels of Information Acquisition***

In main analyses, I use 1-year lagged peer Delta as the main explanatory variable. I do so, based on the assumption that the board of directors incorporates the peers' compensation information in the year after the information is publicly disclosed. However, the board may acquire peer firms' pay-performance sensitivity information through private channels, reflecting the information in equity grants decisions in advance. Relatedly,

Cadman et al. (2020) find a significant association between a firm's new equity grants and its benchmarking peers' concurrent equity grants (in fair value).

Panel A of Table 8 reports the estimation results of equation (1) using the concurrent portfolio Delta of industry-size matched peers and benchmarking peers, respectively. In column (1), I find that $Log(Peer\ Delta)_{i,t}$ is positively associated with $Log(New\ Grant\ Delta+1)_{i,t}$, implying that firms could acquire peer firms' up-to-date Delta information through channels other than public disclosure, and reflect in their new grants decisions. In column (2), however, I do not find a significant effect of benchmarking peers' concurrent Delta on equity grants decisions. Coupled with Cadman et al. (2020)'s finding, this implies that firms utilize compensation benchmarking peers only to benchmark compensation level, rather than pay-performance sensitivity. The results in Panel A further support my theoretical discussion that firms selectively benchmark the firms sharing similar production functions and exogenous shocks when designing pay-performance sensitivity.

Panel B provides some insight on the channels through which the board acquires the concurrent information about peer pay-performance sensitivity. I divide the sample into two groups, based on the extent to which the firms share the same compensation consultant with their peer firms. Using the firms with available data about their compensation consultants, I measured *Interlocking Consultant* (=the number of peer firms hiring the same consultant with the focal firm/total number of peer firms). I also operationalize the pay-performance similarity between the focal firm and its peers: *Similarity* is defined as $|Log(Peer\ Delta)_{i,t} - Log(Delta)_{i,t}|$, multiplied by (-1). Panel B shows that Similarity is significantly higher among High Interlocking firms than Low Interlocking firms. It suggests that a firm's pay-performance sensitivity more resembles the peer firms' as it shares the same compensation consultant with more peers. Combined with the results in Panel A, it implies that the board acquires the peers' concurrent pay-performance sensitivity through compensation consultants.

**<Insert Table 8 here>**

***Is Benchmarking an Efficient Contracting?***

Throughout the paper, I implicitly argue that pay-performance sensitivity benchmarking improves incentive contracts, by extending available information to the board. In Table 9, I provide supporting evidence from an efficient contracting perspective. In particular, I turn to the explained (unexplained) amount of total compensation, and see whether explained (unexplained) compensation differs across the firms with high and low similarity in pay-performance sensitivity. As in the previous paragraph, *Similarity* is defined as $|Log(Peer\ Delta)_{i,t} - Log(Delta)_{i,t}|$, multiplied by (-1).

In column (1), when I use industry-size matched peers, the Corr(Similarity, Unexplained Compensation) is insignificant. On the other hand, Corr(Similarity, Explained Compensation) is significantly positive ($p<0.0001$). These results provide indirect evidence that benchmarking industry-size peers' pay-performance sensitivity is driven by efficient contracting purpose rather than rent extraction purpose.

In column (2), when I use compensation benchmarking peers, the Corr(Similarity, Unexplained Compensation) is significantly positive ($p<0.0001$). On the other hand, Corr(Similarity, Explained Compensation) is significantly negative ($p=0.012$). These results imply that benchmarking the compensation benchmarking peers in terms of pay-performance sensitivity (if any) would have been driven by rent extraction purpose, rather than efficient contracting.

**<Insert Table 9 here>**

## 6. CONCLUSION

In this paper, I study the peer benchmarking practice of pay–performance sensitivity of CEO equity incentives. Focusing on industry-size matched peers that are known to share common production functions and exogenous shocks, I find that the pay–performance sensitivity of those peers

is positively associated with a firm's pay–performance sensitivity of subsequent equity grants. This highlights the relevance of peer compensation information in improving *ex ante* risk sharing design, above and beyond the well-documented usefulness of peer performance in *ex post* performance evaluation. In addition, my findings further suggest that inferring the appropriate level of pay–performance sensitivity is the primary motive for benchmarking. The finding of particular interest is that firms increase the magnitude of benchmarking when they face a great uncertainty about future productivity.

My study contributes to the literature on compensation peers in several ways. I provide the first empirical evidence that peers' pay–performance sensitivity grant levels help determine a firm's new equity grants sensitivity. My findings extend our understanding of peer firms' role in compensation contract design, by showing that they influence not only ex post relative performance evaluation but also ex ante incentive design.

I also add to the literature on compensation benchmarking practice. While I find the benchmarking against the industry-size peers and product market peers, I find little evidence that compensation benchmarking peers significantly influence decisions on pay–performance sensitivity, despite this group's importance in identifying the reservation wage. These findings highlight that each peer group provides unique informational content that has a distinct use in benchmarking, and that boards of directors, in their compensation decision making, display sophistication in selecting peer groups that suit their purposes (meeting participation constraint vs. inferring optimal incentives).

Finally, I add to the debate on compensation benchmarking practices by providing evidence that pay–performance sensitivity benchmarking is motivated by the desire to enhance informational efficiency in compensation contracts. The fact that the magnitude of benchmarking varies with several proxies of the relative informativeness of peer pay–performance sensitivity suggests that it is the board's desire for contract efficiency—and not opportunism—that drives the use of pay–performance sensitivity benchmarking. Furthermore, the approximation to

the industry-size matched peers' pay-performance sensitivity is positively correlated with economically explained components of executive compensation, further suggesting that pay-performance sensitivity benchmarking could be driven by efficient contracting purpose.

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## TABLE 1. Sample Selection

### Panel A. Sample Selection Procedure

| Sample | Obs |
|---|---|
| Firm-year observations with necessary data of portfolio delta determination model (2005-2018) | 18,296 |
| Observations with necessary data of control variables in the main empirical model (2006-2018) | 15,202 |
| Observations with peer portfolio Delta | 14,230 |
| Observations with necessary data of cross-sectional variables | 10,934 |

### Panel B. Yearly Distribution of Sample Observations

| FYEAR | Freq | % |
|---|---|---|
| 2006 | 1032 | 7.25 |
| 2007 | 1212 | 8.52 |
| 2008 | 1226 | 8.62 |
| 2009 | 1207 | 8.48 |
| 2010 | 1177 | 8.27 |
| 2011 | 1175 | 8.26 |
| 2012 | 1155 | 8.12 |
| 2013 | 1155 | 8.12 |
| 2014 | 1129 | 7.93 |
| 2015 | 1058 | 7.43 |
| 2016 | 905 | 6.36 |
| 2017 | 848 | 5.96 |
| 2018 | 951 | 6.68 |

## TABLE 2. Descriptive Statistics

### Panel A. Summary Statistics of Variables

| Variable | N | Mean | p50 | p25 | p75 | STD |
|---|---|---|---|---|---|---|
| *Log(New Grants Delta+1)*$_{i,t}$ | 15,202 | 1.498 | 0.000 | 0.000 | 3.146 | 1.798 |
| *New Grants Delta*$_{i,t}$ | 15,202 | 21.445 | 0.000 | 0.000 | 22.244 | 45.655 |
| *Portfolio Delta*$_{i,t-1}$ | 15,202 | 800.698 | 217.220 | 83.270 | 609.070 | 2226.900 |
| **Test of H1** | | | | | | |
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ | 14,887 | 6.345 | 6.290 | 5.502 | 6.943 | 1.334 |
| *Peer Portfolio Delta*$_{i,t-1}$ | 14,887 | 1695.290 | 538.101 | 244.153 | 1034.600 | 4946.530 |
| *Log(Peer Grant FV)*$_{i,t+1}$ | 15,202 | 6.659 | 7.638 | 6.445 | 8.462 | 2.899 |
| *Rebalance*$_{i,t}$ | 15,202 | 0.011 | -0.039 | -0.582 | 0.526 | 0.997 |
| *Log(Sales)*$_{i,t}$ | 15,202 | 7.519 | 7.431 | 6.437 | 8.527 | 1.566 |
| *MTB*$_{i,t}$ | 15,202 | 1.475 | 1.121 | 0.670 | 1.842 | 1.233 |
| *NOL*$_{i,t}$ | 15,202 | 0.880 | 1.000 | 1.000 | 1.000 | 0.325 |
| *CF Shortfall*$_{i,t}$ | 15,202 | -0.168 | -0.159 | -0.230 | -0.101 | 0.110 |
| *DIV Constraint*$_{i,t}$ | 15,202 | 0.372 | 0.000 | 0.000 | 1.000 | 0.483 |
| *Return*$_{i,t}$ | 15,202 | 0.133 | 0.091 | -0.141 | 0.331 | 0.453 |
| *Return*$_{i,t+1}$ | 15,202 | 0.129 | 0.094 | -0.147 | 0.335 | 0.453 |
| *Log(Peer Grant FV)*$_{i,t+1}$ | 14,230 | 7.865 | 8.077 | 7.302 | 8.516 | 0.884 |
| **Test of H2** | | | | | | |
| $\lvert$*Peer ROA - My ROA*$\rvert_{i,t}$ | 10,934 | 0.084 | 0.047 | 0.021 | 0.098 | 0.112 |
| $\lvert$*Peer MVE - My MVE*$\rvert_{i,t}$ | 10,934 | 7.234 | 7.077 | 5.628 | 9.138 | 2.180 |
| *Idiosyncratic Risk Ratio*$_{i,t}$ | 10,934 | 2.371 | 1.746 | 1.257 | 2.543 | 2.448 |
| *Restructuring*$_{i,t}$ | 10,934 | 0.041 | 0.000 | 0.000 | 0.026 | 0.113 |
| *TFP Change*$_{i,t}$ | 10,934 | 0.008 | 0.007 | -0.012 | 0.030 | 0.043 |
| *Peer HHI*$_{i,t}$ | 10,934 | 0.096 | 0.054 | 0.035 | 0.119 | 0.096 |
| **Additional Test (Alternative Definition of Peers)** | | | | | | |
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ | | | | | | |
| Product Market Peers | 13,773 | 6.425 | 6.341 | 5.774 | 6.966 | 1.149 |
| Benchmarking Peers | 7,246 | 6.868 | 6.695 | 6.104 | 7.401 | 1.158 |

### Panel B. Within- vs. Across-Peers Variation of Equity Delta

| | Standard Deviation of | N | Mean |
|---|---|---|---|
| Within-Peers | *Log(New Grants Delta+1)*$_{i,t+1}$ | 1,712 | 1.322 |
| | *Log(Portfolio Delta)*$_{i,t}$ | 1,712 | 1.198 |
| Across-Peers | *Log(New Grants Delta+1)*$_{i,t+1}$ | 15,202 | 1.798 |
| | *Log(Portfolio Delta)*$_{i,t}$ | 15,202 | 1.528 |

## TABLE 3. Pearson Correlation Coefficients among Main Variables

### Panel A. Correlation Matrix of Sample for H1 Test (N=14,230)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) *Log(New Grants Delta+1)*$_{i,t}$ | 1 | | | | | | | | | | |
| (2) *Log(Peer Delta)*$_{i,t-1}$ | 0.126 | 1 | | | | | | | | | |
| | <.0001 | | | | | | | | | | |
| (3) *Log(Peer Grant FV)*$_{i,t}$ | 0.171 | 0.508 | 1 | | | | | | | | |
| | <.0001 | <.0001 | | | | | | | | | |
| (4) *Rebalance*$_{i,t-1}$ | 0.003 | -0.049 | -0.010 | 1 | | | | | | | |
| | 0.722 | <.0001 | 0.220 | | | | | | | | |
| (5) *Log(Sales)*$_{i,t-1}$ | 0.232 | 0.373 | 0.486 | -0.042 | 1 | | | | | | |
| | <.0001 | <.0001 | <.0001 | <.0001 | | | | | | | |
| (6) *MTB*$_{i,t-1}$ | 0.051 | 0.163 | 0.167 | -0.004 | -0.196 | 1 | | | | | |
| | <.0001 | <.0001 | <.0001 | 0.597 | <.0001 | | | | | | |
| (7) *NOL*$_{i,t-1}$ | 0.056 | 0.042 | 0.076 | -0.025 | 0.045 | -0.110 | 1 | | | | |
| | <.0001 | <.0001 | <.0001 | 0.003 | <.0001 | <.0001 | | | | | |
| (8) *CF Shortfall*$_{i,t-1}$ | -0.023 | -0.133 | -0.128 | -0.047 | 0.010 | -0.245 | 0.106 | 1 | | | |
| | 0.007 | <.0001 | <.0001 | <.0001 | 0.222 | <.0001 | <.0001 | | | | |
| (9) *DIV Constraint*$_{i,t-1}$ | -0.087 | -0.068 | -0.126 | -0.016 | -0.246 | 0.038 | 0.117 | 0.068 | 1 | | |
| | <.0001 | <.0001 | <.0001 | 0.054 | <.0001 | <.0001 | <.0001 | <.0001 | | | |
| (10) *Return*$_{i,t-1}$ | 0.015 | -0.006 | 0.102 | -0.009 | -0.040 | 0.268 | 0.001 | -0.011 | 0.025 | 1 | |
| | 0.066 | 0.455 | <.0001 | 0.277 | <.0001 | <.0001 | 0.907 | 0.194 | 0.003 | | |
| (11) *Return*$_{i,t}$ | 0.113 | -0.063 | -0.066 | 0.000 | -0.025 | -0.060 | 0.006 | 0.017 | 0.022 | -0.090 | 1 |
| | <.0001 | <.0001 | <.0001 | 0.964 | 0.003 | <.0001 | 0.470 | 0.041 | 0.009 | <.0001 | |

**Panel B. Correlation Matrix of Sample for H2 Test (N=10,934)**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| (1) *Log(New Grants Delta+1)*$_{i,t}$ | 1 | | | | | | | | |
| (2) *Log(Peer Delta)*$_{i,t-1}$ | 0.094 | 1 | | | | | | | |
| | <.0001 | | | | | | | | |
| (3) \|*Peer ROA - My ROA*\|$_{i,t-1}$ | -0.067 | -0.178 | 1 | | | | | | |
| | <.0001 | <.0001 | | | | | | | |
| (4) \|*Peer MVE - My MVE*\|$_{i,t-1}$ | 0.244 | 0.494 | -0.239 | 1 | | | | | |
| | <.0001 | <.0001 | <.0001 | | | | | | |
| (5) *Idiosyncratic Risk Ratio*$_{i,t-1}$ | -0.052 | -0.047 | 0.127 | -0.107 | 1 | | | | |
| | <.0001 | <.0001 | <.0001 | <.0001 | | | | | |
| (6) *Restructuring*$_{i,t-1}$ | 0.012 | 0.022 | -0.006 | -0.009 | 0.039 | 1 | | | |
| | 0.206 | 0.022 | 0.505 | 0.352 | <.0001 | | | | |
| (7) *TFP Change*$_{i,t-1}$ | -0.035 | 0.014 | -0.023 | -0.010 | 0.007 | -0.012 | 1 | | |
| | 0.000 | 0.132 | 0.014 | 0.275 | 0.472 | 0.200 | | | |
| (8) *Peer HHI*$_{i,t-1}$ | -0.042 | -0.128 | -0.107 | 0.017 | -0.025 | -0.049 | -0.105 | 1 | |
| | <.0001 | <.0001 | <.0001 | 0.068 | 0.010 | <.0001 | <.0001 | | |
| (9) *Log(Peer Grant FV)*$_{i,t}$ | 0.162 | 0.498 | -0.160 | 0.577 | -0.089 | 0.022 | -0.006 | -0.113 | 1 |
| | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | 0.023 | 0.502 | <.0001 | |

**TABLE 4. Industry-size Matched Peers' Equity Portfolio Delta and New Equity Grants**

| Variable | (1) | (2) |
|---|---|---|
| | Dep var: *Log(New Grants Delta+1)*$_{i,t}$ | |
| *Log(Peer Delta)*$_{i,t-1}$ | 0.076*** | 0.050** |
| | (3.13) | (2.06) |
| *Log(Peer Grant FV)*$_{i,t-1}$ | | 0.125*** |
| | | (4.33) |
| *Rebalance*$_{i,t-1}$ | 0.036 | 0.031 |
| | (1.55) | (1.31) |
| *Log(Sales)*$_{i,t-1}$ | 0.324*** | 0.284*** |
| | (11.62) | (9.38) |
| *MTB*$_{i,t-1}$ | 0.138*** | 0.128*** |
| | (6.01) | (5.44) |
| *NOL*$_{i,t-1}$ | 0.332*** | 0.325*** |
| | (4.11) | (4.03) |
| *CF Shortfall*$_{i,t-1}$ | -0.165 | -0.097 |
| | (-0.77) | (-0.44) |
| *DIV Constraint*$_{i,t-1}$ | -0.129** | -0.115** |
| | (-2.45) | (-2.18) |
| *Return*$_{i,t-1}$ | -0.015 | -0.044 |
| | (-0.44) | (-1.25) |
| *Return*$_{i,t}$ | 0.429*** | 0.429*** |
| | (12.01) | (11.88) |
| Year FE | Yes | Yes |
| Ind FE | Yes | Yes |
| Clustered SE | by Firm | by Firm |
| Number of Observations | 14887 | 14230 |
| R-Square | 0.516 | 0.514 |
| Adjusted R-Square | 0.514 | 0.511 |

**TABLE 5. Industry-Size Matched Peers' Portfolio Delta and New Equity Grants – Deviation from Peer Characteristics and Changes in Production Productions**

| Variable | (1) | (2) | (3) |
|---|---|---|---|
| | Dep var: *Log(New Grants Delta+1)*$_{i,t}$ | | |
| *Log(Peer Delta)*$_{i,t-1}$ | 0.242*** | -0.039 | 0.193** |
| | (3.25) | (-1.02) | (2.55) |
| *Log(Peer Delta)*$_{i,t-1}$ × \|*Peer ROA - My ROA*\|$_{i,t-1}$ | -0.289* | | -0.268* |
| | (-1.89) | | (-1.77) |
| \|*Peer ROA - My ROA*\|$_{i,t-1}$ | 1.282 | | 1.152 |
| | (1.50) | | (1.36) |
| *Log(Peer Delta)*$_{i,t-1}$ × \|*Peer MVE - My MVE*\|$_{i,t-1}$ | -0.031*** | | -0.031*** |
| | (-2.91) | | (-2.93) |
| \|*Peer MVE - My MVE*\|$_{i,t-1}$ | 0.269*** | | 0.270*** |
| | (3.88) | | (3.9) |
| *Log(Peer Delta)*$_{i,t-1}$ × *Idiosyncratic Risk Ratio*$_{i,t-1}$ | -0.010* | | -0.010* |
| | (-1.73) | | (-1.77) |
| *Idiosyncratic Risk Ratio*$_{i,t-1}$ | 0.068* | | 0.070* |
| | (1.83) | | (1.87) |
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ × *Restructuring*$_{i,t-1}$ | | 0.407*** | 0.398*** |
| | | (2.88) | (2.85) |
| *Restructuring*$_{i,t-1}$ | | -2.097** | -2.074** |
| | | (-2.38) | (-2.38) |
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ × *High_TFP Change*$_{i,t-1}$ | | 0.054 | 0.059* |
| | | (1.58) | (1.74) |
| *High_TFP Change*$_{i,t-1}$ | | -0.312 | -0.347 |
| | | (-1.4) | (-1.56) |
| *Log(Peer Delta)*$_{i,t-1}$ × *Peer HHI*$_{i,t-1}$ | | 0.163 | 0.224 |
| | | (0.79) | (1.12) |
| *Peer HHI*$_{i,t-1}$ | | -0.535 | -1.077 |

| | | | |
|---|---|---|---|
| | | (-0.41) | (-0.86) |
| *Rebalance*$_{i,t-1}$ | 0.024 | 0.026 | 0.026 |
| | (0.84) | (0.92) | (0.93) |
| *Log(Peer Grant FV)*$_{i,t}$ | 0.092*** | 0.147*** | 0.093*** |
| | (3.04) | (4.57) | (3.06) |
| *Log(Sales)*$_{i,t-1}$ | 0.236*** | 0.302*** | 0.244*** |
| | (6.72) | (9.02) | (6.95) |
| *MTB*$_{i,t-1}$ | 0.146*** | 0.165*** | 0.153*** |
| | (5.03) | (5.58) | (5.27) |
| *NOL*$_{i,t-1}$ | 0.336*** | 0.336*** | 0.327*** |
| | (3.27) | (3.27) | (3.2) |
| *CF Shortfall*$_{i,t-1}$ | 0.039 | 0.102 | 0.155 |
| | (0.17) | (0.41) | (0.64) |
| *DIV Constraint*$_{i,t-1}$ | -0.131** | -0.140** | -0.131** |
| | (-2.22) | (-2.34) | (-2.23) |
| *Return*$_{i,t-1}$ | -0.029 | -0.070* | -0.038 |
| | (-0.72) | (-1.71) | (-0.93) |
| *Return*$_{i,t}$ | 0.434*** | 0.425*** | 0.435*** |
| | (10.64) | (10.5) | (10.69) |
| Year FE | Yes | Yes | Yes |
| Industry FE | Yes | Yes | Yes |
| Clustered SE | by Firm | by Firm | by Firm |
| Number of Observations | 10934 | 10934 | 10934 |
| R-Square | 0.529 | 0.527 | 0.530 |
| Adjusted R-Square | 0.526 | 0.524 | 0.527 |

**TABLE 6. Compensation Benchmarking Peers' Portfolio Delta and New Equity Grants**

| Variable | (1) | (2) |
|---|---|---|
| | Dep var: *Log(New Grants Delta+1)*$_{i,t}$ | |
| *Log(Peer Delta)*$_{i,t-1}$ | -0.023 | -0.049 |
| | (-0.49) | (-1.00) |
| *Log(Peer Grant FV)*$_{i,t}$ | | 0.160* |
| | | (1.90) |
| *Rebalance*$_{i,t-1}$ | 0.055 | 0.063 |
| | (1.38) | (1.53) |
| *Log(Sales)*$_{i,t-1}$ | 0.301*** | 0.270*** |
| | (6.55) | (5.17) |
| *MTB*$_{i,t-1}$ | 0.159*** | 0.155*** |
| | (4.93) | (4.7) |
| *NOL*$_{i,t-1}$ | 0.252* | 0.211 |
| | (1.78) | (1.45) |
| *CF Shortfall*$_{i,t-1}$ | -0.059 | 0.022 |
| | (-0.15) | (0.05) |
| *DIV Constraint*$_{i,t-1}$ | -0.211** | -0.211** |
| | (-2.53) | (-2.48) |
| *Return*$_{i,t-1}$ | -0.077 | -0.079 |
| | (-1.34) | (-1.36) |
| *Return*$_{i,t}$ | 0.581*** | 0.572*** |
| | (9.36) | (8.98) |
| Year FE | Yes | Yes |
| Industry FE | Yes | Yes |
| Clustered SE | by Firm | by Firm |
| Number of Observations | 7246 | 6995 |
| R-Square | 0.574 | 0.577 |
| Adjusted R-Square | 0.570 | 0.573 |

**TABLE 7. Product Market Peers' Equity Portfolio Delta and New Equity Grants**

| Variable | Dep var: *Log(New Grants Delta+1)*$_{i,t}$ | | | |
|---|---|---|---|---|
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ | 0.045** | 0.568*** | 0.033 | 0.527*** |
| | (2.05) | (3.93) | (1.04) | (3.70) |
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ × \|*Peer ROA - My ROA*\|$_{i,t-1}$ | | -0.151 | | -0.180 |
| | | (-0.9) | | (-1.03) |
| \|*Peer ROA - My ROA*\|$_{i,t-1}$ | | 1.226 | | 1.102 |
| | | (1.11) | | (0.96) |
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ × \|*Peer MVE - My MVE*\|$_{i,t-1}$ | | -0.062*** | | -0.059*** |
| | | (-3.61) | | (-3.46) |
| \|*Peer MVE - My MVE*\|$_{i,t-1}$ | | 0.434*** | | 0.415*** |
| | | (4.07) | | (3.91) |
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ × *Idiosyncratic Risk Ratio*$_{i,t-1}$ | | -0.001** | | -0.001*** |
| | | (-2.08) | | (-2.33) |
| *Idiosyncratic Risk Ratio*$_{i,t-1}$ | | 0.004** | | 0.004** |
| | | (2.09) | | (2.35) |
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ × *Restructuring*$_{i,t-1}$ | | | 0.393*** | 0.379*** |
| | | | (2.82) | (2.72) |
| *Restructuring*$_{i,t-1}$ | | | -2.046** | -1.969** |
| | | | (-2.26) | (-2.17) |
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ × *TFP Change*$_{i,t-1}$ | | | 0.037 | 0.044 |
| | | | (0.8) | (0.98) |
| *TFP Change*$_{i,t-1}$ | | | -0.193 | -0.239 |
| | | | (-0.62) | (-0.76) |
| *Log(Peer Portfolio Delta)*$_{i,t-1}$ × *Product Market Saturation*$_{i,t}$ | -1 | | -0.009 | -0.005 |
| | | | (-1.34) | (-0.79) |
| *Product Market Saturation*$_{i,t-1}$ | | | 0.081* | 0.058 |
| | | | (1.81) | (1.25) |
| *Rebalance*$_{i,t-1}$ | 0.036 | 0.033 | 0.031 | 0.031 |
| | (1.51) | (1.11) | (1.05) | (1.02) |

| | | | | |
|---|---|---|---|---|
| *Log(Peer Grant FV)*$_{i,t}$ | | 0.109** | 0.123*** | 0.097** |
| | | (2.46) | (2.84) | (2.21) |
| *Log(Sales)*$_{i,t-1}$ | 0.348*** | 0.319*** | 0.336*** | 0.330*** |
| | (14.69) | (12.24) | (11.96) | (12.61) |
| *MTB*$_{i,t-1}$ | 0.144*** | 0.145*** | 0.150*** | 0.148*** |
| | (6.2) | (4.97) | (5.23) | (5.18) |
| *NOL*$_{i,t-1}$ | 0.359*** | 0.367*** | 0.370*** | 0.359*** |
| | (4.37) | (3.52) | (3.54) | (3.48) |
| *CF Shortfall*$_{i,t-1}$ | -0.169 | -0.196 | -0.055 | -0.079 |
| | (-0.77) | (-0.81) | (-0.22) | (-0.32) |
| *DIV Constraint*$_{i,t-1}$ | -0.139*** | -0.188*** | -0.217*** | -0.213*** |
| | (-2.6) | (-2.97) | (-3.38) | (-3.36) |
| *Return*$_{i,t-1}$ | -0.021 | 0.005 | 0.012 | 0.010 |
| | (-0.62) | (0.12) | (0.29) | (0.25) |
| *Return*$_{i,t}$ | 0.429*** | 0.419*** | 0.432*** | 0.431*** |
| | (11.86) | (9.79) | (10.15) | (10.13) |
| Year FE | Yes | Yes | Yes | Yes |
| Industry FE | Yes | Yes | Yes | Yes |
| Clustered SE | by Firm | by Firm | by Firm | by Firm |
| Number of Observations | 13773 | 9938 | 9938 | 9938 |
| R-Square | 0.5134 | 0.527 | 0.5276 | 0.5298 |
| Adjusted R-Square | 0.5105 | 0.5234 | 0.524 | 0.526 |

## TABLE 8. Channels of Information Acquisition – Concurrent Peer Equity Delta and Role of Compensation Consultant Interlocking

### Panel A. Concurrent Peer Equity Delta and New Equity Grants

| | (1) | (2) |
|---|---|---|
| | Dep var: *Log(New Grants Delta+1)*$_{i,t}$ | |
| Variable | Industry-size Peers | Benchmark Peers |
| *Log(Peer Delta)*$_{i,t}$ | 0.086*** | -0.019 |
| | (3.58) | (-0.41) |
| *Rebalance*$_{i,t-1}$ | 0.032 | 0.058 |
| | (1.40) | (1.43) |
| *Log(Sales)*$_{i,t-1}$ | 0.308*** | 0.298*** |
| | (11.17) | (6.58) |
| *MTB*$_{i,t-1}$ | 0.136*** | 0.162*** |
| | (5.85) | (4.97) |
| *NOL*$_{i,t-1}$ | 0.317*** | 0.230 |
| | (3.94) | (1.63) |
| *CF Shortfall*$_{i,t-1}$ | -0.168 | 0.034 |
| | (-0.79) | (0.09) |
| *DIV Constraint*$_{i,t-1}$ | -0.116** | -0.211** |
| | (-2.22) | (-2.54) |
| *Return*$_{i,t-1}$ | -0.050 | -0.087 |
| | (-1.51) | (-1.53) |
| *Return*$_{i,t}$ | 0.414*** | 0.567*** |
| | (11.67) | (9.12) |
| Year FE | Yes | Yes |
| Ind FE | Yes | Yes |
| Clustered SE | by Firm | by Firm |
| Number of Observations | 14462 | 7351 |
| R-Square | 0.512 | 0.575 |
| Adjusted R-Square | 0.509 | 0.571 |

### Panel B. Compensation Consultant Interlocking and Pay-performance Sensitivity Similarity

| | High Interlocking (N=3886) | Low Interlocking (N=3886) | Diff (High - Low) | (t-stat) |
|---|---|---|---|---|
| *Similarity* | -1.404 | -1.623 | -0.218*** | -7.53 |

**TABLE 9. Similarity with Peer Equity Delta and Explained (Unexplained) Compensation**

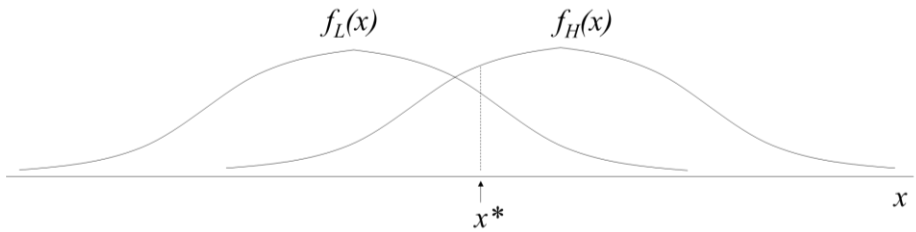
| | (1) | (2) | |
|---|---|---|---|
| Correlation Coefficients (p-value) | *Similarity* (Ind-Size Peers) | *Similarity* (Benchmarking Peers) | Diff in correlation (Ind-Size – Benchmarking) |
| Unexplained Compensation | $\rho$=0.019 | $\rho$=0.060*** | significant (p=0.0005) |
| | (0.115) | (<.0001) | |
| Explained Compensation | $\rho$=0.111*** | $\rho$=-0.030** | significant |
| | (<.0001) | (0.012) | (p<.0001) |

## Appendix A
## Probability Density Functions of Performance Conditional on Managerial Efforts

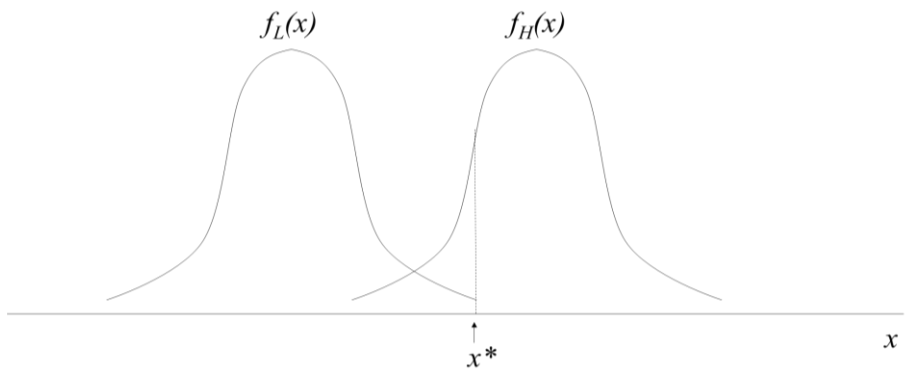
When we discuss why industry-size matched peers are more useful in pay–performance sensitivity design than other peer types, it is helpful to understand how the optimal level of pay–performance sensitivity is determined. Holmstrom (1979) models a standard model of the principal–agent relationship where the agent chooses an unobserved level of effort $e$. The agent's choice of effort leads to an observed performance $x=x(e, \varepsilon)$, where $\varepsilon$ captures random external factors such as market conditions or measurement errors that the agent does not control directly. Because the performance $x$ is influenced by random error ($\varepsilon$) which is ex ante nonobservable, it is convenient to view the agent choosing a distribution over $x$. For a fixed choice $e$, the distribution over $\varepsilon$ induces a distribution over $x$, denoted $F(x|e)$. Before the agent acts, the principal offers the agent an incentive contract $s$, which pays the agent $s(x)$ when the realized performance is $x$. Under the incentive scheme $s(x)$ and effort cost $c(e)$, the utility of the agent is $U = u(s(x)) - c(e)$.

In a moral hazard model with incentive $s(x)$, the agent chooses between two conditional distributions of performance, $F_L$ and $F_H$, where $F_L$ is the performance distribution given low effort and $F_H$ is the distribution given high effort. The optimal incentive scheme only depends on the ratio of density functions of two conditional distributions, $f_H(x)/f_L(x)$. The ratio, in turn, is determined by the measurement error and effort–performance relation. First, as the measurement error increases, the future performance distribution(s) flattens out, and the ratio $f_H(x)/f_L(x)$ decreases (given a performance level $x$), which in turn decreases the optimal level of incentives. Panel A of Figure 1 presents the case with a greater measurement error (larger variance), and Panel B shows the case with a lower measurement error (smaller variance). Compared to Panel A, an observed level of performance $x^*$ in Panel B is clearer evidence that the manager exerted a high level of effort ($f_H(x)$). The principal will offer more pay–performance rewards in the case of Panel B. Second, as the effort–performance sensitivity decreases, it is more difficult to discern between high and low effort given an observed performance, and the ratio $f_H(x)/f_L(x)$ decreases. This, in turn, decreases the optimal level of incentives. Panel C of Figure 1 presents the case with a less sensitive effort–performance relation, and Panel D shows the case with a more sensitive relation. Compared to Panel C, an observed level of performance $x^*$ in Panel D is a clearer evidence that the manager exerted a high level of effort ($f_H(x)$). The principal offers greater pay for performance in the case of Panel D. (Banker and Datar (1989) attribute the first effect to the precision of performance measure, and the second effect to the sensitivity of performance measure.)

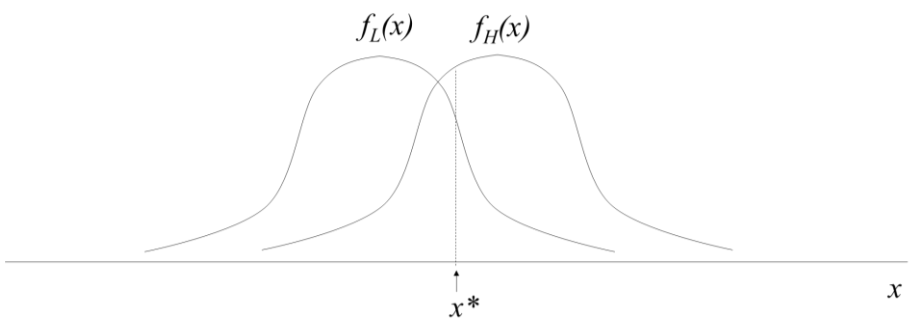
The discussions so far suggest that pay–performance sensitivity is determined by (1) variances of performance distributions, and (2) the effort–performance relation.



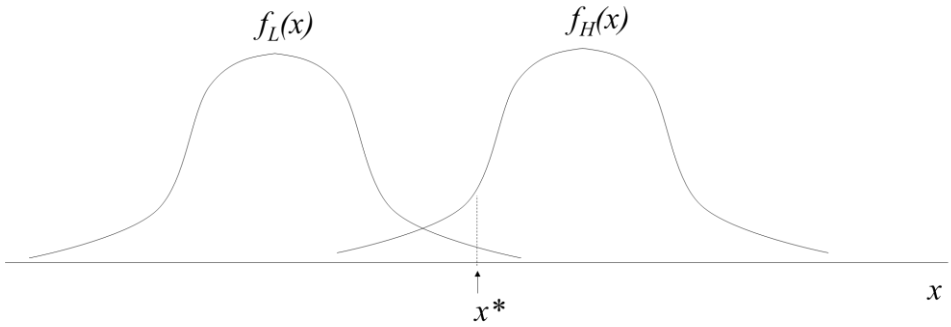

Panel A. Performance distributions with larger variances




Panel B. Performance distributions with smaller variances




Panel C. Performance distributions with less sensitive effort–performance relation




Panel D. Performance distributions with less sensitive effort–performance relation

*Sources of Panel A–D: Hwang, I. (2020). Seminar 1: Incentive Contracts - Introduction, lecture notes, Performance Evaluation & Responsibility Accounting CBA251.715, Seoul National University, delivered 3 March 2020.
(http://etl.snu.ac.kr/mod/ubboard/article.php?id=940130&bwid=1915753)

## Appendix B
## Variable Definitions

| Main variables | Variable Definition |
|---|---|
| *Log(New Grants Delta)* | Log Delta of CEO's annual equity grants (new stock grants + option awards)<br>*Delta = the change in the total value of the CEO's stock and options for a 1% change in the stock price. For stock options, I estimate the sensitivity of an option's value to the stock price as the partial derivative of option value with respect to price. To estimate the option value, I assume that the appropriate risk-neutral valuation for a stock option is given by the Black-Scholes (1973) model, as modified by Merton (1973) to account for dividend payouts. |
| *Log(Peer Delta)* | Mean log Delta of industry-size matched peer firms' equity portfolio (stock holdings + options). Industry-size matched firms are those from the same SIC-2 digit industry and from the same size (measured by MVE) quartile within the industry. |
| *Rebalance* | Residuals from the first stage optimal incentive model of Core and Guay (1999)<br>*first stage model:<br>$log(Portfolio\ Delta)_{it-1} = \beta_0 + \beta_1 Firm\ Size_{it-1} + \beta_2 Idiosyncratic\ Risk_{it-1} + \beta_3 Growth_{it-1} + \beta_4 CEO\ Tenure_{it-1} + \beta_5 Agency\ Problem_{it-1} + \beta_6 Manager\ Ability_{it-1} + \beta_6 Log(New\ Grants\ Delta)_{it-1} + \beta_7 Log(New\ Grant\ FV)_{it-1} + SIC\ 2digit\ Industry + \varepsilon_{it-1}$<br>, where *i* and *t* indicate firm and fiscal year, respectively. |
| *MTB* | Market-to-book value of assets |
| *Log(Sales)* | Log of sales |
| *NOL* | Net operating loss, measured as Core and Guay (1999) |
| *CF Shortfall* | Cashflow shortfall, measured as Core and Guay (1999) |
| *DIV Constraint* | Dividend constraint, measured as Core and Guay (1999) |
| *Return* | Annual stock returns |
| *\|Peer ROA - My ROA\|* | Absolute difference between the firm i's ROA and the industry-size matched peers' mean ROA |
| *\|Peer MVE - My MVE\|* | Absolute difference between the firm i's Log(MVE) and the industry-size matched peers' mean Log(MVE) |
| *Idiosyncratic Risk Ratio* | Idiosyncratic risk/systematic risk. Idiosyncratic (Systematic) risk is idiosyncratic (systematic) volatility of stock returns during the past 60 months |
| *Restructuring* | Acquisition and restructuring cost/1-year lagged total assets |
| *TFP Change* | $Log(TFP)_{j,t} - Log(TFP)_{j,t-1}$. TFP is multifactor productivity of NAICS-3 digit industry of the firm i. Multifactor productivity measures the contribution of inputs (e.g., labor, capital, energy, etc.) to industry output, and is obtained from Bureau of Labor Statistics. |
| *Peer HHI* | Herfindahl-Hirschman Index of industry-size group. |

# Essay 2

## Public Integrity, Monitoring, and Budget Ratcheting in Government Organizations

## 1. INTRODUCTION

This paper examines the budget ratcheting in government organizations. Prior literature on target ratcheting has investigated how for-profit firms rely on various sources of information such as internal planning information (Dekker, Groot, and Schoute 2012), peer performance (Aranda, Arellano, and Davila 2014), and analyst forecasts (Choi, Kim, Kwon, and Shin 2021) when setting and revising targets. In particular, the use of past performance as a basis for setting targets, "target ratcheting", is known to give rise to a dynamic incentive problem of "ratchet effect," because target ratcheting motivates managers to withhold effort in the current period to avoid higher targets in the future (Weitzman 1980; Indjejikian, Matějka, and Schloetzer 2014b; Bouwens and Kroos 2011). For-profit firms often allow for asymmetric target ratcheting whereby the performance target decreases after underperformance to lesser extent than it increases after outperformance (Leone and Rock 2002; Kim and Shin 2017).

Despite the significance of government expenditure, the issue of budget ratcheting in the budget-driven organizations such as governments has received little attention in accounting literature.[9] Budget ratcheting rules in governments involve the motives and incentives that are different from for-profit firms, (1) because the use of past expenditures is unlikely to induce adverse incentives to withhold current efforts ("ratchet effect") in governments,[10] and (2) because public sector workers have different individual characteristics distinguished from for-profit counterparts (Chen, Pesch, and Wang 2020; Perry and Wise 1990). So far, I have only a few studies that document asymmetric budget ratcheting in government budget, where budgets increase to a greater extent in response to overspending than

[9] Compared to for-profit firms, past spending information plays a much more important role than other information sources in government organizations, because future budget is often based on past expenditure in governments (Premchand 1983; McCarty and Schmidt 1997; Lee and Plummer 2007).

[10] Given the lack of formal incentives tied to spending deviation from targeted expenditure, government officials have little occasion to manage the current spending to inflate the future budgets.

they decrease in response to underspending of the same amount (Lee and Plummer 2007; Kuroki and Shuto 2021).

While this asymmetric budget ratcheting in governments has been generally regarded as detrimental to the principal in contrast to asymmetric target ratcheting in for-profit firms (Leone and Rock 2002; Lee and Plummer 2007; Kuroki and Shuto 2021), their arguments overlook the possibility that government administrators could increase spending to deliver services that they believe to be socially desirable (Lee and Plummer 2007). To the extent that budget growth could be effectively used to solve public problems, the increases in past expenditure are unlikely to be driven by managerial self-interests and should be rewarded with access to greater resources by superiors (e.g., fiscal authority, national assembly). The public administration and public economics literature document that government officials often have "public service motivation" (PSM) and gain utility from serving public interests and doing good for society (Perry and Wise 1990; Rotolo and Wilson 2004; Mirvis and Hackett 1983; Mocan and Tekin 2003).[11] Consequently, budget setters are likely to consider an agent's PSM when structuring institutional arrangements regarding a specific agency's budget allocation (Makris 2009; Moynihan 2013).

A high level of PSM among government officials help build a relational contracting with superiors since reputation and perceived legitimacy facilitate a bonding relationship (Kogut 1989; Gulati 1995; Poppo and Zenger 2002). Once the relational trust has been built, engaging parties are more willing to provide credible information (Granovetter 1983). Mutually beneficial arrangement between parties becomes more plausible based on trust (Baker, Gibbons, and Murphy 2002; Bol and Lill 2015).

[11] According to this line of literature, government officials likely have different motivation from for-profit counterparts ("public service motivation"). As such, government officials, *on average*, have a higher level of prosocial motivation to serve the public interest than private sector employees. However, this does not necessarily indicate that all the government officials have a uniformly high level of PSM. In our setting, government agencies exhibit a significant variation in their level of PSM, presumably due to different personal characteristics and organizational culture. In the same vein, the sample agencies are involved in irregularities and corruption cases at varying frequencies.

Since PSM signals the avoidance of self-interested behavior and greater efforts on public services (Perry and Wise 1990; Francois and Vlassopoulos 2008), superiors build trust in high-PSM agents and try to achieve efficient allocation by providing more resources to high-PSM agents (Makris 2009).

Using the information about agent's type, superiors could reach separating equilibrium in which high-PSM agents are rewarded with more generous budget allocation. In the current setting, long-term contracts with high-PSM agents will manifest as asymmetric budget ratcheting—budgets that are sensitive to past overspending but insensitive to past underspending.[12] In contrast, low-PSM agents are penalized with budgets that are sensitive (insensitive) to past underspending (overspending). For example, superiors will trust high-PSM agents not to waste resources and infer that the unfavorable deviation between actual and budgeted expenditure (overspending) is likely to be caused by delivering more goods and services for the public. This separating equilibrium is analogous to a mutually beneficial arrangement between high-type agents and superior in for-profit firms in which well-performing managers repeatedly exceed their profit targets (Indjejikian et al. 2014b; Bol and Lill 2015).

However, the benefit of separating contracts critically depends on the superiors' ability to distinguish different types of agents (Armstrong and Sappington 2007). A superior with a strong monitoring capability is more likely to correctly identify the agent type. Monitoring facilitates the *communication* and reduces the information asymmetry between the parties, thereby improving the superior's ability to interpret the agents' claims (Hoppe and Moers 2011). Highly credible signal about the agent type reduces the cost of offering separating contracts based the types. Hence, I

[12] In for-profit firms, a long-term commitment with high-profitability managers is characterized by a tempered use of prior performance both upward and downward (Indjejikian, Matejka, Merchant, and Van der Stede 2014). In our setting, government agencies avoid underbudgeting because budget revision during the period is extremely difficult and costly. Hence, long-term agreement with high type agents will manifest as "overbudgeting" through asymmetric budget ratcheting, rather than tempered use of past information in general.

expect that the degree of asymmetric budget ratcheting based on integrity level increases when the superiors have greater monitoring resources which enable them to capture the true level of each agency's integrity.

I test these predictions using a unique database of central government agencies in Korea including the survey of public service integrity of each agency and performance evaluation reports during years from 2012 to 2018. Central governments in Korea provides a powerful setting to examine the role of PSM in budget-setting practices and their consequences. The budget setter greatly relies on each agency's reported expenditure when allocating budgets, because Korean central government agencies have a high degree of autonomy in budget formulation.[13] More importantly, a unique survey of public service integrity of each agency provides a powerful proxy for PSM.[14] Furthermore, performance evaluation reports contain the information of performance targets and actual achievement, providing opportunity to examine the performance consequences of asymmetric budget ratcheting.

Consistent with Lee and Plummer (2007), I find that government budgets tend to increase more after overspending than they decrease after underspending ("asymmetric budget ratcheting"). More importantly, I also find that asymmetric budget ratcheting is more pronounced when agencies have higher level of public service integrity. This finding lends support to the existence of separating contracts whereby superiors allocate more budgets to high-PSM and less to low-PSM agents (Francois 2000; Makris 2009). In particular, when agencies are perceived to be more ethical and trustworthy by external stakeholders (e.g., higher rank in the survey on public service integrity), they are rewarded with asymmetric budget

[13] The fiscal authority provides only a broad guideline and leaves detailed spending plans to each agency's discretion.

[14] Most of central bureaucrats in Korea are selected through highly competitive exams. However, their salary level is low compared to private sector and the use of performance incentives is rare. Influenced by Confucian culture, public service motivation and reputational concerns are important motives for becoming a central bureaucrat in Korea (Kim 2012).

ratcheting. Consistent with my prediction that a strong monitoring capability help the superior identify the agent's true type, the increase in asymmetric budget ratcheting with a higher level of PSM is driven by the subsample of agencies under intense monitoring (by National Assembly and fiscal authority). Overall, the results highlight the *communication* role of monitoring, as opposed to the oversight role that has heavily been paid attention in the prior literature (Lee and Plummer 2007).

In additional analyses, I further examine whether asymmetric budget ratcheting indeed leads to better performance. The results reveal that asymmetric ratcheting is associated with higher achievement rate of performance targets and lower amount of budget slacks compared to the previous year, which supports that the budget secured for high-integrity agencies are utilized to provide more public services rather than to be expropriated or wasted. Collectively, my findings are consistent with the view that integrity, by facilitating mutually beneficial agreements between the parties, can improve the resource allocation efficiency and organizational performance.

Central governments face multiple incentives in setting budgets, such as macroeconomic fluctuation and administrative inability to decrease costs ("cost stickiness"). Moreover, risk-averse government officials may stack up resources with consideration of future uncertainty (Balakrishnan et al. 2007). I take steps to rule out these alternative explanations and find that the results are robust to ruling out these alternative explanations.

The paper contributes to the literature on target ratcheting by documenting the evidence of separating equilibrium based on agent's mission-preferences, above and beyond the type distinction based on agents' productivity. Since budgets are outcome of bilateral negotiation (Merchant and Manzoni 1989; Covaleski et al. 2003), contracting parties may reach mutually beneficial agreement (Francois 2000; Makris 2009). In for-profit firms, well-performing managers are offered with tempered use of past performance information and repeatedly exceed their profit targets while

poor-performing managers are penalized by tighter performance targets (Indjejikian et al. 2014b; Bol and Lill 2015). Analogous to mutually beneficial agreement between well-performing managers and firms, my findings suggest that government organizations could reach separating equilibrium by which superiors allocate more resources to high-PSM agencies and the agencies gain utility from increased production of public services.

My study also adds to the studies on organizational control mode. I suggest that soft controls (based on agents' mission-preferences) and formal controls (based on direct monitoring) are complements in budgeting process. Public integrity of government agency is a form of soft controls that align the agent behavior with shared values and beliefs (Abernethy and Brownell 1997; Merchant and Van der Stede 2007; Campbell 2012). While the principal rests on the agent's integrity level to determine the budget ratcheting rules, her direct monitoring complements the use of integrity by improving the signal precision. I add to the debate on whether soft controls and formal controls are complements or substitutes (Strobele and Wentges 2018), by supporting a more contemporary view that stresses the potential advantages of combining different types of controls (Alvesson and Ka¨rreman 2004; Bedford and Malmi 2015; Cardinal, Sitkin, and Long 2004, 2010; Chenhall and Moers 2015; Chenhall and Morris 1995; Davila, Foster, and Oyon 2009; Loughry 2010).

Relatedly, an emerging strand of literature on mission-driven organizations emphasizes the importance of attracting value-congruent employees (Chen et al. 2020; Gartenberg, Prat, and Serafeim 2019). I propose another channel through which value-congruent employees lead to better performance: facilitating relational contracting and acquiring more resources (Pfeffer and Salancik 2003; Gulati 1995). Even with the absence of contract-based control mechanisms such as target-based incentives or the use of peer information in budget revision, government organizations can

achieve the efficient use of budgets by selecting value-congruent workers (Chen et al. 2020).

Finally, my study throws an important policy implication. My findings show that the asymmetric budget ratcheting leads to better public service performance and less redundant budget resources. As such, my study provides evidence against the popular view of budget-maximizing bureaucrats in government organizations (Niskanen 1971; Brennan and Buchanan 1980; Lee and Plummer 2007). It suggests that, while tight government budget may attain a short-term efficiency, it may harm the long-term performance by limiting the principal's ability to allocate more resources to more trustworthy and productive agents.

## 2. INSTITUTIONAL BACKGROUND

### Government Budgeting in Korean Central Agencies

The administrative branch of Korean central government includes 53 agencies, each of which has expertise in and takes responsibility for a particular dimension of national affairs (e.g., defense, education, social welfare, and commerce). Among the agencies, the Ministry of Strategy and Finance (MSF) is the fiscal authority that manages and coordinates the entire budgeting process of 53 agencies. The National Assembly of the Republic of Korea (National Assembly) is the legislative authority in charge of overall operation in the country including budgeting. Government budgeting for central agencies in Korea is a complicated process that involves year-long negotiation and interactions among these multiple parties.

According to the National Finance Act, the government budgeting process progresses in the following two-phase flow; i) preparation of budget proposals which is drafted by agencies and finalized by the fiscal authority and ii) review and approval of submitted budget proposals by National Assembly.

The first-phase begins with MSF, which provides a broad guideline for national fiscal projects to each agency at the beginning of the year. According to the guideline, each agency prepares and submits a 5-year plan for their spending projects to MSF by the end of January. MSF then reviews their spending plans for appropriateness and prioritizes spending projects, with inputs from public experts and external stakeholders. MSF drafts the finalized guideline for fiscal projects and presents it to agencies by April. At this stage, MSF also makes recommendations on expenditure ceilings for each agency. Each agency must prepare and submit their budget requests to MSF no later than June 30, attaching expected expenditures for each policy program. Along with the budget requests, the agencies submit performance plans and (audited) performance evaluation reports.[15] MSF finally reviews and completes the agency budget proposals, and submits them to National Assembly. To finalize the budget proposals, MSF incorporates performance evaluation results of each agency and collects inputs from external organizations such as Board of Audit and Inspection (equivalent to GAO in U.S.) and political parties.

In the second-phase after the budget proposal is formally presented to National Assembly, its subcommittees with expertise in particular administrative sectors (e.g., defense, social welfare, education, etc.) carefully review budget proposals assigned to each committee. Then, a special committee in charge of an integrated budgeting process performs a comprehensive and holistic review of all budget proposals. Policy questioning and departmental evaluation follow to compile and coordinate

[15] Submission of Budget Request, Performance Plans, and Performance Evaluation Report. Performance monitoring system was implemented under the regime of President Roh in 2005, benchmarking Program Assessment Rating Tool (PART) in the U.S.—a program run through the United States Office of Management and Budget instituted by President George W. Bush. Performance evaluation reports are first prepared by each agency and reviewed by a national research center, Korea Institute of Public Finance (KIPF). The reports are finally audited by national audit office, Board of Audit and Inspection (BAI). MSF incorporates the past program performance of each agency when setting expenditure ceilings for upcoming year. For instance, allocated budgets for poor-performing program reduces by 10% in the subsequent year.

agency budgets.[16] Upon the approval of the special committee, the final budget draft is proposed to the plenary session, where all National Assembly members finally cast votes to approve the finalized budget after last-minute review and discussion.

As described so far, the government budgeting in Korea systematically entails multi-lateral interactions such as budget negotiation between agencies and the fiscal authority in the first phase and policy questioning between agencies and National Assembly in the second phase. In addition, each agency possesses a considerable autonomy and plays an active role in preparing budget proposals and approval despite the significant influence of MSF and National Assembly on budgeting process.[17] For instance, once approved by National Assembly, it is extremely difficult to revise government budgets during fiscal year. The only chance is to propose a 'supplementary budget' after the first half of the fiscal year. However, supplementary budgets are known to be largely influenced by political pressure from political parties, local legislators and interest groups, and there is a great deal of uncertainty in securing supplementary budgets. Hence, central agencies work hard to secure sufficient budgets at the first place, through intensive negotiation with MSF and National Assembly. Appendix A shows three main actors of budgeting process and depicts budgeting process of Korean central government.

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[16] Detailed process is as follows. The minister of MSF explains the budget proposal to the special committee, and the experts present their own views on the proposal. Next, the committee carries out a comprehensive policy questioning session in front of ministers and officers, which is then followed by thorough departmental evaluation process of details of the budget. On the last day of the committee meeting, subcommittees consisting of about 10 members adjust the budget with consideration of the results from preliminary evaluation by each standing committee, comprehensive policy questioning session, and departmental evaluations. The adjusted budget is then finalized in the general meeting of the Special Committee.

[17] Under the regime of President Roh, major budget reforms have been made, by the enactment of National Finance Act in 2006. Among the important changes is the implementation of Top-down Budget System. Under new Top-down Budget System, unlike the traditional system, the fiscal authority imposes expenditure ceilings (with room for adjustment) but leaves the detailed planning to the discretion of each agency. The new Top-down Budget System expanded the autonomy of each central agency, while it limits budget wastes by imposing ceilings.

## Control Mechanisms in Government Budgeting

Each agency is a sole producer that has an expertise to serve mandated goal. Their autonomy and superior information seem to allow the agencies to set expenditures at any level they desire during budgeting process, but there are multiple mechanisms to constrain the budgeted expenditures. Unlike for-profit firms, government organizations lack a performance-based incentive plan due to various reasons (Dixit 2002), which requires alternative mechanisms to control budgetary waste.[18] These control mechanisms include expenditure ceilings, financial reporting requirements, and monitoring by multiple parties. First, MSF makes strong recommendations on expenditure ceilings for each agency during the budget negotiation process with agencies, considering the national fiscal policy, each agency's past program performance, specialist opinions, and the voice from interest groups. Because expenditure ceilings play a critical role in determining the resulting budget amount, agencies must obtain positive opinions from external stakeholders (i.e., specialists, political parties, voters, etc.) as well as outperform in their policy programs to increase their spending ceilings. Indeed, government budgets are known to be affected by political support and voters' preferences (Martin 2003; Larcinese, Rizzo, and Testa 2006). Greater support from the president or voters for certain policy programs would lead to lenient budget allocations, whereas a lack of political support would significantly limit the spending.

In addition, agencies prepare and disclose their performance plans and performance evaluation results every year. Performance evaluation reports provide the pre-determined performance targets of each policy

[18] The controlling mechanisms are different from those used in for-profit firms. For-profit firms that pursue economic planning of their profits, often utilize target-based incentive compensation. This target-based incentive compensation motivates managers to constrain the expenditures and maximize profits in private sectors. Government organizations serve for multiple stakeholders with diverse needs, which make them address multiple tasks at the same time. Incentive plan based on a subset of (measurable) performance may distort the effort allocation across different tasks. Researchers have proposed that subjectivity in contracting (Gibbs, Merchant, Van der Stede, and Vargus 2004) and exposure to social norms (Brüggen and Moers 2007) could remedy the distortion of incentives under multi-task settings, instead of formula-based incentive contracts.

program, with achievement rate relative to the targets. Financial reports and performance evaluation reports are reviewed and audited by national research center and national audit office to ensure their reliability. Appendix B provides the summarized performance evaluation reports that are audited and disclosed by the national audit office (Board of Audit and Inspection). Although agencies have cost information in private and may mask their self-interested behavior (Giroux and Shields 1993; Lee and Plummer 2007), expanded accounting disclosure would force government agencies to enhance their accountability and limit potential budgetary waste. [19]

Monitoring by external stakeholders also helps constrain budgetary waste. For example, subcommittees of National Assembly ("Standing Committees") carry out inspections of government agencies during the regular session of the National Assembly (around October). During the inspections, each subcommittee takes charge of particular administrative sectors (e.g., defense, education, commerce, etc.) and audits the related agencies' operation. Monitoring by ACRC is another important control mechanism. ACRC serves as the platform to prevent corruptions of public bureaucrats and protect whistleblowers in government agencies. ACRC also conducts survey of citizens about government integrity every year (Public Service Integrity Survey). The survey contains comprehensive questionnaires about transparency of administrative process, responsibility of public servants, corruptive actions (favor to particular people or parties) and bribery experiences. Panel B of Appendix A summarizes the monitoring process.

[19] Accounting disclosure also helps reduce central agencies' budget overuse, by facilitating informed monitoring by voters and legislators (Zimmerman 1977; Giroux and Shields 1993). By National Finance Act, Korean central agencies must publicly disclose their budgetary reporting (budget books, settlements, budget execution on a daily and monthly basis) and financial reporting (financial statements) that are prepared in accordance with Korean National Accounting Standards, in timely manner. Korean central government has adopted accrual-basis financial reporting system in 2011. To set the reporting standards of accrual-basis financial statements, Korean National Accounting Standards benchmarked SFFAC and SFFAS (Statement of Federal Financial Accounting Concepts and Standards) that are produced by the FASAB (Federal Accounting Standards Advisory Board) in the U.S. and GFS (Government Finance Statistics Manuals and Guides) of IMF (International Monetary Fund) (MSF 2014).

### *Public Service Integrity Survey*

Influenced by Confucian culture, public service motivation and reputational concerns are important motives for becoming a central bureaucrat in Korea (Kim 2012; Ro, Frederickson, and Hwang 1997). Most of central bureaucrats in Korea are selected through highly competitive exams, but their salary level is low compared to private sector and performance-based incentive is almost non-existent.[20] Public Service Integrity Survey ("Integrity Survey" hereafter) by ACRC reveals that perceived level of public service integrity varies greatly across agencies. Every year, ACRC conducts a survey about public service integrity of each agency, which covers topics such as respondents' experiences of corruption, process transparency, and public servants' responsibility in their works. Survey respondents are citizens who have contact with public servants in the agency at work.[21] Integrity Survey provides a unique information about "how transparent and accountable the agency's public servants are in performing their duty" and "whether public servants stay away from any corruptive action, bribery, and favoritism" (Anti-Corruption and Civil Rights Commissions, 2016). This *agency-level* information, unlike country-level corruption index, enables me to directly relate perceived level of integrity to each agency's budget setting practice.[22]

In July, to select survey respondents, agencies first list up the potential respondents from a group of citizens and public officials (from related organizations) who have had contact with them at work during the past one year. For instance, the Survey in 2018 targets the people who have contact with the agency from July 2017 to June 2018. Because most

[20] Collectivism also strengthens public servants' commitment to government organizations, rather than pursuing personal interests (Kim 2009). Several studies suggest that Confucian culture and collectivism in Korea significantly influence the public servant behaviors, including whistle-blowing intention or work motivation (Park, Rehg, and Lee 2005; Kim 2012).

[21] In 2018, for instance, total respondents for all the central agencies, local governments, and other government organizations were about 152 thousands.

[22] Most widely referred measure is Corruption Perception Index provided by Transparency International, an international NGO that measures country-level perception of corruption.

agencies have multiple divisions, agencies draw at least 500 potential respondents from each division. From August to December, each survey is conducted mostly via telephone interviews and online polls to avoid response bias in face-to-face interviews. Survey questionnaires include questions about (1) respondents' direct and indirect experiences of corruption, and (2) how transparent and responsible public servants are in performing their duty. Panel A of Appendix C provides the detailed survey questions. Response rates are about 10% of candidates.[23] In December, ACRC calculates the preliminary Integrity score of each agency with relevant assessment, based on survey responses. As described in Panel A of Appendix C, integrity score puts greater weight on survey items about people's experience of corruption than items about process transparency and accountability.[24] The preliminary score is then adjusted with consideration of detected corruptions and any attempts to manage the survey responses by agencies, finally leading to Integrity Index. Each agency is graded between Grade 1 and Grade 5.[25] Panel C of Appendix C shows the example of Integrity Index disclosure for FY2018. In the empirical analyses, I utilize graded Integrity Index to examine whether budget ratcheting rules differ across agencies with different level of public service integrity.

## 3. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

### 3.1. Budget Ratcheting in Public Sector

[23] I do not have access to the exact number of potential respondents and actual respondents. However, my interview with a manager of ACRC reveals that about 10% of candidates respond to the survey.

[24] Survey items are 7-point Likert scale. Each item is scaled to have range [0, 10] before being summed. Preliminary score is weighted sum of each survey item. Weight on each item is described in Panel A of Appendix C. Because survey items about corruption experiences have greater weights than other items, the preliminary score is largely influenced by unusual occurrence of corruption. Hence, the survey responses of corruption experiences are further normalized before being summed.

[25] Since lower rank in the survey indicates higher integrity score, I use the reversed rank in my empirical analyses so that higher value indicates higher integrity level.

A significant body of prior literature on target setting in for-profit firms has shown that past performance is used as a basis for setting targets; this practice is called "target ratcheting" (Weitzman 1980; Indjejikian et al. 2014b). The literature also shows that the use of past performance in target setting results in a dynamic incentive problem known as the "ratchet effect," because target ratcheting induces self-interested managers to withhold effort in the current period to avoid higher targets in the future (Bouwens and Kroos 2011; Indjejikian et al. 2014b; Bol and Lill 2015). In addition, firms typically revise targets upward following favorable performance but are reluctant to revise targets downward following unfavorable performance, which results in an asymmetric target ratcheting (Leone and Rock 2002; Kim and Shin 2017).

Despite the significance of government expenditure, the issue of budget setting in the budget-driven organizations such as governments, however, has received little attention in accounting literature. Compared to for-profit firms, past spending information plays a much more important role in government budget setting since future budget is often based on past expenditure in governments (Premchand 1983; McCarty and Schmidt 1997; Lee and Plummer 2007). Moreover, unlike for-profit firms, the ratchet effect is unlikely to be a concern in governments given the lack of formal incentive system to reward (penalize) decreases (increases) in spending without corresponding decreases (increases) in performance. Thus, budget ratcheting in governments likely involves the motives and incentives that are different from for-profit firms.

Of particular importance in budget ratcheting in governments is asymmetric budget ratcheting. That is, budgets increase to a greater extent in response to overspending than they decrease in response to underspending of the same amount. This asymmetry is in line with budget maximizing behavior by government administrators. Prior studies argue that managers in public sectors and government administrators have incentives to maximize budgets and this tendency increases with managerial

self-interests and weak monitoring (Lee and Plummer 2007; Blanchard et al. 1986; Eldenburg and Soderstrom 1996; Eldenburg and Kallapur 1997).

Using local government expenditure data from Texas school districts, Lee and Plummer (2007) document evidence of asymmetric budget ratcheting. Specifically, Equation (1) models

that this year's budgeted expenditure ($B_t$) depends on last year's budget variance ($A_{t-1} - B_{t-1}$) through the budget response coefficient λ as well as an independent growth term δ.

$$B_t - B_{t-1} = \delta + \lambda\,(A_{t-1} - B_{t-1}) \qquad (1)$$

Lee and Plummer (2007) find that the magnitude of budget response coefficient λ differs between the case of overspending ($A_{t-1} > B_{t-1}$) and underspending ($A_{t-1} < B_{t-1}$). Kuroki and Shuto (2021) also find the asymmetric budget ratcheting, using a sample of Japanese private colleges and universities. Equation (2) separates the response coefficients into $\lambda^+$ (after overspending) and $\lambda^-$ (after underspending), where $U_t$* equals 1 when actual expenditures fall short of budgeted expenditures in prior year. They show that the coefficient estimates of $\lambda^+$ are positively significant and those of $\lambda^-$ are negatively significant, which is consistent with asymmetric budget ratcheting.

$$B_t - B_{t-1} = \delta + \lambda^+(A_{t-1} - B_{t-1}) + \lambda^-\, U_t^*\,(A_{t-1} - B_{t-1}) \qquad (2)$$

While budget ratcheting in government appears similar to target ratcheting in for-profit firms, there are important differences. First, in contrast to for-profit firms that set earnings targets for earnings-based bonus plan, government budgets expenditures. Second, Leone and Rock (2002) show that asymmetric ratcheting is an incentive mechanism beneficial to shareholders since it encourages managers to pursue permanent earnings innovations rather than transitory earnings innovation. Asymmetric budget ratcheting in governments, however, generally implies more generous budget allocation and has been generally regarded as detrimental to voters

coupled with lack of a profit motive. Third, while target ratcheting in for-profit firms suggests that managers' effort could be penalized by more difficult targets in the future, budget ratcheting in governments suggests that lack of effort to reduce expenditure is rewarded with more slack in future budgets.

Taken together, prior literature suggests that asymmetric budget ratcheting in government organizations reflects the bureaucratic self-interests and greater possibility to expropriate when budgets are larger (Niskanen 1971; Brennan and Buchanan 1980; Lee and Plummer 2007; Kuroki and Shuto 2021). Consistent with these arguments, Lee and Plummer (2007)' findings indicate that asymmetric budget ratcheting is more pronounced when controls on government spending is weaker or when public schools face less competition.

The above arguments, however, overlook the possibility that government administrators could increase spending to deliver services that they believe to be socially desirable (Lee and Plummer 2007). To the extent that budget growth could be effectively used to solve public problems, the increases in past expenditure are unlikely to be driven by managerial self-interests and should be rewarded with access to greater resources by superiors (e.g., fiscal authority, national assembly). Moynihan (2013) discusses the possibility that PSM leads to budget maximization since public servants want to provide more public services. Makris (2009), based on analytical models, predicts that separating equilibrium where the principal distorts the production to allocate more (less) resources to high-PSM (low-PSM) agents.[26]

### 3.2. Public Service Motivation and Separating Contracts

The public administration and public economics literature document that government officials often have "public service motivation" (PSM) and

[26] In a hospital setting, Balakrishnan, Soderstrom, and West (2007) suggest that hospital slack-building reflects the economic behavior to cope with uncertainty in demands and future budgets, based on 31 army hospitals in the U.S.

gain utility from serving public interests and doing good for society (Perry and Wise 1990; Rotolo and Wilson 2004; Mirvis and Hackett 1983; Mocan and Tekin 2003). Public Service Motivation (PSM) theory has emerged against Public Choice theory that emphasizes the supervision and control over public servants (Perry and Wise 1990; Prebble 2016). Traditional perspective on public servants is largely influenced by agency-theory and assumes that they are self-serving with conflicting interests with the principal (Jensen and Meckling 1976; Niskanen 1971).

One of key criticisms on self-interest assumption, however, is that "public employees differ from their private sector counterparts with respect to orientation towards helping other citizens and serving the interests of the relevant community" (Kjeldsen 2012). Perry and Hondeghem (2008) describes PSM as "an individual's orientation to delivering services to people with a purpose to do good for others and society". In line with these arguments, Rotolo and Wilson (2004) report significant differences in worker's propensity to undertake volunteer effort across sectors. Drawing from Current Population Survey, they document that private sector workers are less likely to volunteer than non-profit sector and government workers. Mirvis and Hackett (1983), based on Quality of Employment Survey, also report that non-profit workers exhibit higher levels of intrinsic motivation, feeling of accomplishment, and inclination to vocation relative to money. Furthermore, non-profit workers (e.g., childcare sector workers) are more willing to donate effort while for-profit workers are driven by monetary rewards (Mocan and Tekin 2003; Francois and Vlasspoulos 2008). Chen, Pesch, and Wang (2020) suggest that mission-driven organizations successfully attract intrinsically motivated workers by offering below-market pay.

PSM has known to affect multiple dimensions of worker attitude and organization. High level of PSM increases the organizational commitment and work motivation (Pandey and Stazyk 2008; Perry and Wise 1990; Kim 2011; Kim 2012). Furthermore, even without explicit control mechanism,

high-PSM agents have little incentives to disguise or under-report their productivity (Makris 2009). In Korean context, Kim (2009) suggests that public servants are largely motivated by Confucianism and PSM, and Kim (2012) finds that PSM of Korean public servants is positively related to work motivation, organizational commitment, and job satisfaction.

A high level of PSM among government officials helps build a relational contracting with superiors since reputation and perceived legitimacy facilitate a bonding relationship (Kogut 1989; Gulati 1995; Poppo and Zenger 2002). Once the relational trust has been built, engaging parties are more willing to provide credible information (Granovetter 1983). Mutually beneficial arrangement between parties becomes more plausible based on trust (Baker, Gibbons, and Murphy 2002; Bol and Lill 2015). Since PSM signals the avoidance of self-interested behavior and greater efforts on public services (Perry and Wise 1990; Francois and Vlassopoulos 2008), superiors build trust in high-PSM agents and try to achieve efficient allocation by providing more resources to high-PSM agents (Makris 2009).

In the current setting, there are many channels through which superior receives the signal of the agents' type (e.g., the degree of PSM). For instance, Integrity score of each central agency is publicly available. Agencies are subject to formal performance evaluation every year, and the evaluation results are available to the fiscal authority in a timely manner (also submitted to National Assembly before the next year's budget is settled). Furthermore, National Assembly and Board of Audit and Inspection (BAI) frequently monitor and audit central agencies, directly acquiring information about their public service integrity and service performance.

Based on the information about agent's type, budget ratcheting rules can arrive at separating equilibrium (Indjejikian et al. 2014; Laffont and Tirole 1988). For instance, superior could apply more lenient budget revision rules for high-PSM agents, whereas the agents commit to transparent disclosure of cost information and high efforts (Francois 2000;

Makris 2009). On the contrary, low-PSM agents would face tighter budget revision rules, as the superior tries to avoid potential waste of resources arising from rent-extraction and shirking. Hence, I expect generous budget revision rules to be observed for high-PSM type agents.

Specifically, I predict that high-PSM agents are rewarded with budgets that are sensitive (insensitive) to past overspending (underspending) while low-PSM agents are penalized with budgets that are sensitive (insensitive) to past underspending (overspending). For example, the superiors will trust high-PSM agents not to waste resources and infer that the unfavorable deviation between actual and budgeted expenditure (overspending) is likely to be caused by delivering more goods and services for the public. This separating equilibrium is analogous to a mutually beneficial arrangement between high-type agents and superior in for-profit firms in which well-performing managers repeatedly exceed their profit targets (Indjejikian et al. 2014b; Bol and Lill 2015).

***H1**: Asymmetric budget ratcheting is more pronounced in agency with higher level of integrity.*

The benefit of separating contracts critically depends on the superiors' ability to distinguish different types of agents (Armstrong and Sappington 2007). The lower the accuracy of the signals of each agent's PSM observed by the principal, the lower the benefit of separating contracts. Relatedly, the use of subjectivity in incentives is costly when the superior has a low ability to interpret the signals from the agents (Hoppe and Moers 2011). In the current setting, a superior with a strong monitoring capability is more likely to correctly interpret the agent type.

On the one hand, monitoring serves as an *oversight mechanism* to ensure that employees do not perform certain actions known to be harmful to organizations (Laux and Laux 2009; Faleye, Hoitash, and Hoitash 2011). On the other hand, monitoring facilitates the *communication* and reduces the information asymmetry between the parties, improving the superior's ability

to interpret the agents' claims (Hoppe and Moers 2011). The latter function of monitoring mediates the type identification based on the level of PSM. In the setting where "soft controls" such as public service motivation works, the monitoring can be employed in enabling, not coercive ways (Adler and Borys 1996; Davila et al. 2009; Strobele and Wentges 2018). The superior's close communication with the agent (through intense monitoring) increases her ability to adequately distinguish between different types of agents, increasing the benefits of separating contracts based on PSM.

In our setting, both National Assembly and MSF put substantial amount of human resources to monitoring each agency's operation. The subcommittees of National Assembly specialize in specific administrative sectors such as defense and education and have power to request detailed information and to directly inspect and audit the agency when necessary. The MSF manages and coordinates the budgeting process of 53 agencies, as well as directly negotiates with each agency over budgets. Both frequently interact with each government agency through both formal and informal meetings, in order to (1) solicit necessary data for policy planning, (2) audit their operations and performance, and (3) review their financial reports and monitor budget execution.[27] The frequent interaction with each agency enhances the interpretation about the agent type, because the superior directly obtains concrete evidence supporting/rejecting the prior interpretation about the agent type. The improved signal about the agent type, in turn, reduces the cost of offering separating budget allocation rules based on the identified level of PSM.

Hence, I expect that the degree of asymmetric budget ratcheting based on integrity level is more salient when the superiors have greater monitoring resources to effectively capture each agency's true integrity.[28]

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[27] Nevertheless, the assembly and MSF should put different number of monitoring forces on each agency, due to the limited workforces.

[28] In contrast, Lee and Plummer (2007) document that asymmetric budget ratcheting is negatively correlated with monitoring intensity. The difference between their setting and ours may stem from the distinct role of monitoring in the current setting. In the literature,

***H2**: Asymmetric budget ratcheting is more pronounced in agencies with a higher level of integrity, as long as the superior has a stronger monitoring capacity.*

## 4. METHODS

### 4.1. Data sources and Sample Selection

To examine the hypotheses, I exploit unique data of Korean central government. As described in Section II, ACRC conducts Integrity Assessment targeted to government organizations every year, disclosing the survey results of citizens who have directly contacted with the agency officers during the past year.[29] Integrity index provides a quality proxy for public service integrity, which is an important dimension of public service motivation. In addition, I utilize the performance evaluation results including pre-set performance indicators, achievement rate against each indicator, and audit opinion on the performance reports such as target difficulty of performance goals.

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monitoring is known to serve oversight roles and communication roles (Faleye, Hoitash, and Hoitash 2011; Hoppe and Moers 2006). In the settings where the soft controls (e.g., public service motivation) work, the bureaucratic controls (e.g., direct monitoring) can be employed as complements, rather than substitutes of soft controls (Strobele and Wentges 2018). This is because the soft controls reduce the benefits of direct oversight over the agent actions, as the soft controls align the agent actions with the principal preferences. With a high level of soft controls, monitoring activities focus on communication roles rather than oversight roles. In our setting, a very selective employee selection process in Korean central governments likely opt out money-driven workers. Furthermore, monitoring intensity is likely to differ between central agencies and local governments. Anecdotal evidence reveals that, even within Korean context, the competence and public service motivation of workers are significantly higher in central government than in local governments. Hence, the monitoring in my setting puts greater emphasis on communicating roles than oversight roles.

[29] ACRC also conducts the survey of agency insiders, lawmakers, and people from related institutions. In my setting, I use the survey of citizens because the budget setters are likely to base their type identification on the perception of the primary principal (i.e., citizens). In my additional analysis in Panel A of Table 8, I complement the main proxy with the survey responses of a broader stakeholder group (e.g., agency insiders, lawmakers, people from related institutions). The consistent results with the broader responses mitigate the concern that potential response bias of citizens drive my findings.

My sample starts with 372 agency-year observations available with budget and actual expenditure data during 2011-2018, because Integrity Index and financial statement data are available beginning with 2011. The sample period reduces to 2012-2018 because the model requires one-year lagged Integrity Index. After excluding observations that lack necessary information to measure variables and observations with abnormal changes in budgets,[30] the final sample consists of 234 agency-year observations from 47 agencies. Table 1 describes the sample selection procedure.

**<Insert Table 1 here>**

I obtain budget book and financial statement data from Integrated Fiscal Information System. [31] I manually collected the performance evaluation results including achievement rate of performance targets of policy programs from the audit reports by Board of Audit and Inspection (BAI).[32] I also manually collected the Integrity index of each agency-year from Integrity Survey Reports, which are available on the website of Anti-Corruption and Civil Rights Commission (ACRC). Information about macro-economic conditions is obtained from National Statistics Office.[33]

## 4.2. Empirical Model

### *Budget Ratcheting Model*

Following budget (target) ratcheting model in prior studies (Lee and Plummer 2007; Indjejikian et al. 2014; Kim and Shin 2017), I develop the following baseline model for budget ratcheting in government agency. In equation (3), budget revision is a function of prior year's budget variance and other control variables that are likely to influence budget increase.

$$(B_{i,t} - B_{i,t-1})/B_{i,t-1} = \alpha_0 + \alpha_1(A_{i,t-1} - B_{i,t-1})/B_{i,t-1} + \alpha_2 U_{i,t-1} \times (A_{i,t-1} - B_{i,t-1})/B_{i,t-1}$$

[30] These observations are usually the agency-years that experience structural adjustment of agency such as merger or divestiture.
[31] http://www.openfiscaldata.go.kr/portal/maineng.do
[32] http://english.bai.go.kr/bai_eng/index.do
[33] http://kostat.go.kr/portal/eng/index.action

$$
\begin{aligned}
&+ \alpha_3 U_{i,t-1} + \alpha_4 \Delta Revenue^{+}_{i,t} + \alpha_5 \Delta Revenue^{-}_{i,t} \\
&+ \alpha_6 Operational\ Efficiency_{i,t-1} + \alpha_7 Uncertainty_{i,t-1} \\
&+ \alpha_8 Log(Employees)_{i,t} \\
&+ \alpha_9 \Delta National\_Revenue^{+}_{t} + \alpha_{10} \Delta National\_Revenue^{-}_{t} \\
&+ \alpha_{11} \Delta National\_Debt^{+}_{t} + \alpha_{12} \Delta National\_Debt^{-}_{t} \\
&+ \alpha_{13} \Delta Consumption\_Index^{+}_{t} + \alpha_{14} \Delta Consumption\_Index^{-}_{t} \\
&+ Year\ FE + Agency\ FE + \varepsilon_{i,t} \qquad (3)
\end{aligned}
$$

where:

| | |
|---|---|
| $B_{i,t}$ and $B_{i,t-1}$ | =agency *i*'s budgeted expenditures at the beginning of year *t* and year *t-1*, respectively. |
| $A_{i,t-1}$ | =agency *i*'s actual expenditures for year *t-1*. |
| $U_{i,t-1}$ | =1 if ($A_{i,t-1} - B_{i,t-1}$) is negative, and 0 otherwise. |
| $\Delta Revenue^{+}_{i,t}$ | =change in the agency *i*'s self-generated revenues from year *t-1* to year *t* where the change is positive. |
| $\Delta Revenue^{-}_{i,t}$ | =change in the agency *i*'s self-generated revenues from year *t-1* to year *t* where the change is negative. |
| $Operational\ Efficiency_{i,t-1}$ | =general overhead expenses/total expenses of agency *i* in year *t-1*. |
| $Uncertainty_{i,t-1}$ | =(transferred budgets + re-appropriated budgets)/total budget outstanding of agency *i* at the end of year *t-1*. |
| $Log(Employees)_{i,t}$ | =log of the total number of employees of agency *i* in year *t*. |
| $\Delta National\_Revenue^{+}_{t}$ | =change in the national tax revenues from year *t-1* to year *t* where the change is positive. |
| $\Delta National\_Revenue^{-}_{t}$ | =change in the national tax revenues from year *t-1* to year *t* where the change is negative. |
| $\Delta National\_Debt^{+}_{t}$ | =change in the national debt-to-GDP ratio from year *t-1* to year *t* where the change is positive. |
| $\Delta National\_Debt^{-}_{t}$ | =change in the national debt-to-GDP ratio from year *t-1* to year *t* where the change is negative. |
| $\Delta Consumption\_Index^{+}_{t}$ | =change in the national consumption index from year *t-1* to year *t* where the change is positive. |
| $\Delta Consumption\_Index^{-}_{t}$ | =change in the national consumption index from year *t-1* to year *t* where the change is negative. |

Even though the model abstracts from agency-specific characteristics that can influence the level of budgeted expenditures by taking the changes in budgeted expenditures as main variables (Lee and Plummer 2007), the model still may suffer from omitted variables that are

correlated with budget revisions patterns. To control for all the time-invariant agency-specific time-invariant characteristics, I include agency fixed effects in the model. Even though I deflate all the budget-related and financial variables with CPI (consumer price index) to eliminate the natural growth in nominal budgets, I also control for year fixed effects.

The coefficient $\alpha_1$ represents the ratcheting coefficient of budgeted expenditures after overspending ($A_{i,t-1} \geq B_{i,t-1}$), and the sum of $\alpha_1$ and $\alpha_2$ is the ratcheting coefficient after underspending ($A_{i,t-1} < B_{i,t-1}$). As in Lee and Plummer (2007) that document asymmetric budget growth (i.e., larger magnitude of budget growth after overspending compared to relatively smaller magnitude of budget cut after underspending), I expect that $\alpha_1$ will be significantly positive and $\alpha_2$ will be significantly negative.

I also include control variables that are time-varying and likely influence the budget revision. $\Delta Revenue$ is the change of revenues of each agency from year *t-1* to year *t*.[34] Since government organizations may face innate difficulty in reducing expenditures due to legal or political frictions ("cost stickiness"), I allow the changes in revenues to have differing effects on budget revision depending on the sign on the changes ($\Delta Revenue^{+}$ and $\Delta Revenue^{-}$). I also include other agency-level variables that can constrain the budget growth, such as operational efficiency, uncertainty, and the number of employees. $Operational\ Efficiency_{i,t-1}$ is defined as the ratio of overhead costs to total budgets. $Uncertainty_{i,t-1}$ is defined as the sum of transferred budget and re-appropriation[35] within the agency, and captures the difficulty to accurately predict the spending for each program activity.

[34] Total revenues of an agency consist of tax revenues and self-generated revenues. In principle, national budget system employs the comprehensiveness of budget, where all the revenues (regardless of the source of the revenues) are aggregated into a single account and all the expenditures are allocated from the united national account. However, there are exception rules such that some of self-general revenues are classified as the "money for replacing revenues" which need not be aggregated into national account and be allocated again. Hence, greater self-generated revenues can lead to higher budget growth rate.

[35] Transferred use of the budget refers to transferring of budget between legislative budget items (chapter, section, or paragraph). Re-appropriation refers to the transferring of budget between administrative budget items (subparagraph or item). Transferred use and re-appropriation may be permitted with the approval of the fiscal authority (MSF).

$Log(Employees)_{i,t}$ is the natural logarithm of regular workers in the agency, and controls for the agency size. Since the sample consists of central government agencies, I include several macro-economic variables that may affect budget growth, such as changes in national tax revenues, changes in national debt, and nation-wide consumption activities. I also allow the macro-economic variables to have asymmetric effects on budget growth by dividing the variable into positive changes ($\Delta National\_Revenue^{+}$, $\Delta National\_Debt^{+}$, $\Delta Consumption\_Index^{+}$) and negative changes ($\Delta National\_Revenue^{-}$, $\Delta National\_Debt^{-}$, $\Delta Consumption\_Index^{-}$). All variables are winsorized at top and bottom 1 percentile to avoid outliers driving the results.

### *Public Integrity and Asymmetric Budget Ratcheting*

To examine the hypothesis 1, I include the interaction term between the proxy for public service integrity and ratcheting coefficients in equation (4).

$$
\begin{aligned}
(B_{i,t} - B_{i,t-1})/B_{i,t-1} = {} & \alpha_0 + \alpha_1(A_{i,t-1} - B_{i,t-1})/B_{i,t-1} + \alpha_2 U_{i,t-1}(A_{i,t-1} - B_{i,t-1})/B_{i,t-1} \\
& + \alpha_3 U_{i,t-1} \\
& + \boldsymbol{\alpha_4 Integrity_{i,t-1} \times (A_{i,t-1} - B_{i,t-1})/B_{i,t-1}} \\
& + \boldsymbol{\alpha_5 Integrity_{i,t-1} \times U_{i,t-1} \times (A_{i,t-1} - B_{i,t-1})/B_{i,t-1}} \\
& + \alpha_6 Integrity_{i,t-1} \times U_{i,t-1} + \alpha_7 Integrity_{i,t} + Controls \\
& + Year\ FE + Agency\ FE + \varepsilon_{i,t} \qquad (4)
\end{aligned}
$$

where:

$Integrity_{i,t-1}$ = Standardized score of agency *i*'s Integrity Index for year *t-1*. Integrity Index is the agency-year level measure of public integrity of central agencies based on Public Service Integrity Survey.

According to H1, I predict that the superior achieves separating equilibrium whereby she offers generous (tight) budgeting rules to agencies with higher (lower) level of public integrity. To measure the level of public integrity of each agency, I use Integrity Index from ACRC's public integrity survey. As described in Section II, the survey questionnaires cover direct and indirect experiences of corruption, process transparency, and public

servants' accountability in delivering public services. *Integrity* is the standardized score of Integrity Index for each agency in year *t-1*, which has the mean value of zero and standard deviation of 1. The coefficients $\alpha_4$ and $\alpha_5$ are to examine whether the ratcheting and asymmetric ratcheting are more pronounced with public service integrity of the agency. I expect that $\alpha_4$ is significantly positive, which indicates that budget growth after overspending is more pronounced when the agency is perceived to have higher integrity by external stakeholders. I expect that $\alpha_5$ is significantly negative, indicating that budget cut after underspending is limited for the agency with higher Integrity index (H1).

***Monitoring Intensity, Public Integrity and Asymmetric Budget Ratcheting***

According to H2, I predict that the degree of asymmetric ratcheting increases with public integrity as the superiors' monitoring becomes more intense, because such superiors better identify the agent's type. To examine the hypothesis 2, I divide the sample into two subsamples with high- and low-level of monitoring intensity. Then, I regress the equation (4) with each subsample.

In our setting, monitoring over agencies operates on dual levels—monitoring by MSF and National Assembly. Notably, the number of supervisors would increase with the number of all agencies under their monitoring and the size of each monitored agency as the monitoring burden increases. To measure the monitoring intensity of MSF, hence, I first count the number of MSF officials who are in charge of agency *i*'s budget.[36] Then, I scale the number of MSF officials with both the number of all agencies subject to the MSF officials in charge of agency *i* and the total number of regular workers of agency *i* (*Monitor_MSF*), to incorporate MSF officials' monitoring burden and agency's size effect. Likewise, I measure the monitoring intensity of National Assembly with the number of congress

[36] Because a team of monitoring agents in MSF monitors multiple agencies at a time, I calculate the number of MSF officials in charge of *an* agency, by dividing the number of the team members with the number of agencies under the control of the team. In case of the monitoring by National Assembly, I follow the same process.

members in the subcommittee in charge of monitoring agency *i*, scaled by both the number of all agencies subject to subcommittee members responsible for agency *i* and the total workers of the agency *i* (*Monitor_NA*). By scaling with the total number of workers in the agency, I avoid that the monitoring proxy merely captures the size effect.

*High_Monitor* is an indicator variable that takes on 1 if the monitoring intensity is greater than or equal to the median value of *Monitor* (*Monitor_MSF*, *Monitor_NA*, or the sum of *Monitor_MSF* and *Monitor_NA*), and takes on 0 otherwise. According to H2, I expect that the ratcheting and asymmetric ratcheting will be more pronounced with higher level of public integrity when the agencies are closely monitored. Hence, in the subsample of *High_Monitor*, I expect that $\alpha 4$ and $\alpha 5$ to be significantly positive and negative, respectively. On the other hand, in the subsample of *Low_Monitor*, I expect less significant or insignificant $\alpha 4$ and $\alpha 5$. Table 2 presents the variable definitions.

**<Insert Table 2 here>**

Panel A of Table 3 shows the descriptive statistics and correlation coefficients among variables of the final sample. In panel A, I find that budgets are revised upward by 4% each year ($(B_{i,t} - B_{i,t-1})/B_{i,t-1}$). Actual spending falls short of year-beginning budgets by 3% of total budgets ($(A_{i,t-1} - B_{i,t-1})/B_{i,t-1}$) and 82% of observations have underspent their budgets ($U_{i,t-1}$). Average score of Integrity index is 8.10. Each agency is monitored by seven officials in MSF ($Monitor\_MSF_{i,t}$) and three congress members in subcommittees of National Assembly ($Monitor\_NA_{i,t}$). Positive change of revenues of each agency is about 0.33 and negative change is -0.11 ($\Delta Revenue^{+}_{i,t}$, $\Delta Revenue^{-}_{i,t}$). Transferred budgets and re-appropriated budgets within agency account for 1% of total budgets, on average. Panel B of Table 3 provides Pearson correlation coefficients among variables. ($B_{i,t} - B_{i,t-1})/B_{i,t-1}$ is positively correlated with ($(A_{i,t-1} - B_{i,t-1})/B_{i,t-1}$), reflecting that more spending leads to upward revision of budgets. The main explanatory variables (e.g., $(A_{i,t-1} - B_{i,t-1})/B_{i,t-1}$, $Integrity_{i,t-1}$, $High\_Monitor_{i,t-1}$) are

insignificantly or weakly correlated each other, assuaging the potential multicollinearity problem.

**<Insert Table 3 here>**

## 5. EMPIRICAL RESULTS

### *Public Integrity and Asymmetric Budget Ratcheting*

Table 4 Column (1) reports the estimation results of baseline ratcheting model, equation (3). The dependent variable is $(B_{i,t} - B_{i,t-1})/B_{i,t-1}$ , which is the change rate of budgeted expenditure from year t-1 to year t. In Column (1), ratcheting coefficient after overspending is positively significant ($\alpha_1$=2.021, p<0.01), indicating that spending variance above the budgeted expenditure (when $A_{i,t-1} > B_{i,t-1}$) leads to upward revision. The difference of ratcheting coefficient after underspending is, in contrast, negatively significant ($\alpha_2$=-1.661, p<0.01). The sum of coefficient test rejects the null that budgets are not revised downward after underspending ($\alpha_1+\alpha_2$= 0.360, p<0.05), suggesting that budgets still are adjusted downward to some extent after underspending (when $A_{i,t-1} < B_{i,t-1}$). Overall, Table 4 confirms the finding in the prior studies that budgeted expenditures are revised downward after underspending, but to the lesser extent that they are revised upward after overspending (Lee and Plummer 2007; Kuroki and Shuto 2021).

Column (2) reports the estimation results of equation (4). The ratcheting coefficient after overspending is positive ($\alpha_1$=1.931, p<0.01), indicating subsequent upward revision. On the top of that, the degree of ratcheting after overspending increases with higher Integrity score ($\alpha_4$=1.424, p<0.01). This indicates that spending variance over budgeted expenditure is reflected in future budget to the greater extent when the agency has higher integrity level. It implies that the superiors have more confidence in cost information reported by trustworthy agents when

updating future budgets. Furthermore, I find that the asymmetry also increases among the high-integrity agencies. The ratcheting coefficient after underspending is negative, confirming the evidence of asymmetric ratcheting in column (1) ($\alpha_2$=-1.549, p<0.01). However, the asymmetric ratcheting is even more pronounced with a higher level of public integrity ($\alpha_5$=-1.540, p<0.01). The results in column (2) support my prediction that high-integrity agents are rewarded with budgets that are sensitive (insensitive) to past overspending (underspending).

To clearly show the difference in budget ratcheting between high vs. low-integrity agencies, I estimate the baseline ratcheting regressions with each subsample (column (3) and (4)). I divide the sample into *High_Integrity* group and *Low_Integrity* group based on the median Integrity score in year *t-1*. In column (3) with high-integrity group, I find that ratcheting coefficient is significantly positive after overspending ($\alpha_1$ =3.452, p<0.01). The degree of ratcheting attenuates after underspending ($\alpha_2$ =-3.130, p<0.01), such that I hardly observe any budget revision ($H_0$: $\alpha_1+\alpha_2$=0, p=0.20). It suggests that high-integrity agencies increase their budgets after overspending but do not decrease budgets after underspending. In contrary, in column (4) with low-integrity group, I do not find evidence that budgets are revised upward after overspending ($\alpha_1$ =0.859, p=0.15). Still, I do find that budgets are revised downward after underspending ($\alpha_1+\alpha_2$=0.597, p<0.01). This indicates that low-integrity agencies cannot increase their budgets after overspending, but are penalized with budget cuts after underspending. The subsample tests clearly show that asymmetric ratcheting is only observable among high-integrity agencies and that high-integrity (low-integrity) agents are rewarded (penalized) with generous (tighter) budgets. Overall, my findings in Table 4 support the existence of separating contracts by which the superior enhances resource allocation efficiency by allocating more (less) resources to the agents who would not (would) expropriate resources.

**<Insert Table 4 here>**

***Monitoring Intensity, Public Integrity and Asymmetric Budget Ratcheting***

Table 5 presents the estimation results of equation (4), using subsamples of highly monitored and weakly monitored agencies. The odd-numbered columns use the highly monitored sample, while other columns use the weakly monitored sample. In column (1), I use the *High_Monitor* subsample, measuring the monitoring intensity by the sum of supervisors from MSF and National Assembly. In this subsample, the degree of ratcheting and asymmetric ratcheting increases with the integrity score ($\alpha 4=2.570$, $p<0.05$ and $\alpha 5=-2.675$, $p<0.01$). On the other hand, column (2) with *Low_Monitor* subsample, shows insignificant effects of integrity scores on the ratcheting and asymmetric ratcheting. The results in columns (1) and (2) suggest that separating budget ratcheting rules based on the agent's type (i.e., high vs. low integrity) will only manifest when the superior has a sufficient ability to confirm the credibility of public signal (i.e., public integrity survey results). The results remain consistent with different proxies for monitoring intensity as shown in column (3) through (5).

At a glance, the results in Table 5 seem inconsistent to the finding of Lee and Plummer (2007) that asymmetric budget growth is more pronounced under weak monitoring. The seemingly opposite results are due to difference functions of monitoring activities in Lee and Plummer (2007) and in my study. Monitoring is known to serve oversight roles and/or communication roles (Faleye, Hoitash, and Hoitash 2011; Hoppe and Moers 2006). In our setting, a very selective employee selection process in Korean central governments likely opt out money-driven workers. Because highly motivated agents reduce the need for direct oversight, the monitoring in our setting puts more emphasis on communicating roles than oversight roles, leading to clearer separation based on PSM under higher monitoring. As such, the seemingly inconsistent results are due to the difference in the role of monitoring between the study of Lee and Plummer (2007).

**<Insert Table 5 here>**

## 6. ADDITIONAL ANALYSES

### *Consequences of Asymmetric Budget Ratcheting*

So far, I have argued that superiors reward agents with high integrity and those who are identified to be committed to delivering more goods and services for the public with budgets that are sensitive (insensitive) to past overspending (underspending). Likewise, the agents with low integrity and those who are deemed self-interested will be penalized with budgets that are sensitive (insensitive) to past underspending (overspending). In order to determine whether the asymmetric budget ratcheting is driven by an efficient implicit agreement between the principal and agents, which is enabled by the public trust and strong monitoring or government administrators' self-interests (Lee and Plummer 2007), one needs to estimate the association between the measure of asymmetric budget ratcheting and subsequent performance. If asymmetric budget ratcheting reflects the degree of managerial entrenchment, I would observe a negative association between asymmetric budget ratcheting and subsequent performance. Based on my arguments, however, I expect a positive association between asymmetric budget ratcheting and subsequent performance to the extent that asymmetric budget ratcheting reflects the degree of efficient implicit contracting.

Greater budgets will translate into better achievement of service programs only if more resources are combined with creativity and effort of public employees. If public servants with high integrity who are devoted to delivering more goods and services for the public demand more inputs and the superior allows more resources for them, it should lead to better public service outcome. In our setting, central agencies conduct performance evaluation against pre-set performance indicators related to policy aims and beneficiary satisfaction, which provides a direct measure of public service outcome.

Furthermore, if the budget increase is motivated by the production of more public service rather than managerial self-interests, such budget growth is unlikely to be associated with much unspent resources. In public sector organizations, unexecuted budgets are unused or carried over to the next period. While carried-over budgets are to be spent for service provision in the upcoming year, the unused (discarded) budgets reflect over-budgeting and managerial intention to maximize budgets, because such budgets are not to be used for service provision after all (Lienert and Ljungman 2009; Taylor and Rafai 2003). To the extent that public servants with high integrity, who are devoted to delivering more goods and services for the public, are rewarded with asymmetric budget ratcheting, I expect generous budget allocation to lead to a less amount of unused budgets.

To see whether the asymmetric ratcheting leads to better service performance or less budget slacks, I test the following model.

$$
\begin{aligned}
Dep\ Var_{i,t} &= \alpha_0 + \boldsymbol{\alpha_1\ Asymmetric\_Ratchet_{i,t}} \\
&+ \alpha_2\ \Delta Revenue^{+}_{i,t} + \alpha_3\ \Delta Revenue^{-}_{i,t} \\
&+ \alpha_4\ Operational\ Efficiency_{i,t-1} + \alpha_5\ Log(Employees)_{i,t} + \alpha_6\ Strong\_Monitor_{i,t} \\
&+ \alpha_7\ \Delta National\_Revenue^{+}_{t} + \alpha_8\ \Delta National\_Revenue^{-}_{t} \\
&+ \alpha_9\ \Delta National\_Debt^{+}_{t} + \alpha_{10}\ \Delta National\_Debt^{-}_{t} + \alpha_{11}\ \Delta Consumption\_Index^{+}_{t} \\
&+ \alpha_{12}\ \Delta Consumption\_Index^{-}_{t} + Year\ FE \quad + \varepsilon_{i,t} \qquad (6)
\end{aligned}
$$

where

$\Delta Target\_Achive_{i,t}$ = agency *i*'s achievement rate of performance targets of policy programs in year *t*.

$\Delta Unused\_Expenditure_{i,t}$ = unused expenditures/total unexecuted budgets of agency *i* in year t. Unexecuted budgets = budget carryforward + unused expenditures.

$Asymmetric\_Ratchet_{i,t}$ = takes on 1 if the estimates of ratcheting coefficients of by-agency-year ratcheting regressions exhibit asymmetric budget ratcheting, and 0 otherwise.

Dependent variable is either of the change in policy performance during the year ($\Delta Target\_Achive_{i,t}$) or the change in unused budgets by yearend ($\Delta Unused\_Expenditure_{i,t}$). $Target\_Achieve_{i,t}$ is the achievement rate

of performance targets of policy programs during year t. $Unused\_Expenditure_{i,t}$ is the proportion of unused budgets among total unexecuted budgets, and reflects over-budgeting and managerial intention to maximize budgets. $Asymmetric\_Ratchet_{i,t}$ is the variable of interest, and captures the degree of asymmetric ratcheting of agency *i* for year *t*. I expect that $\alpha_1$ is significantly positive for the dependent variable of $\Delta Target\_Achieve_{i,t}$, in accordance with my prediction that asymmetric budget growth is driven by the intention to deliver more public services. In contrary, I expect that $\alpha_1$ is significantly negative for $Unused\_Expenditure_{i,t}$, if the budgets are allocated to be fully used for public provision during the year, rather than to be driven by over-budgeting behavior.

To measure the degree of asymmetric ratcheting at agency-year level, I estimate the budget revision patterns of sub-activities within an agency.[37] In particular, I estimate the following by-agency-year regression of equation (7).

$$(B_{i,j,t} - B_{i,j,t-1})/B_{i,j,t-1} = \alpha_0 + \boldsymbol{\alpha_1}(A_{i,j,t-1} - B_{i,j,t-1})/B_{i,j,t-1} + \boldsymbol{\alpha_2} U_{i,j,t-1}\,(A_{i,j,t-1} - B_{i,j,t-1})/B_{i,j,t-1} + \alpha_3 U_{i,j,t-1} + \varepsilon_{i,j,t} \quad (7)$$

where *i, j, t* denote agency, sub-activity, and year, respectively. I restrict the sample to regress equation (7) to agency-years with at least 15 sub-activities, which leaves me with 266 agency-years. I use the coefficient estimates of $\alpha_1$ and $\alpha_2$ to measure the degree of asymmetric ratcheting at agency-year level. $Asymmetric\_Ratchet_{i,t}$ is coded as 1 if $\alpha_1$ is significantly positive and $\alpha_2$ is significantly negative, and 0 otherwise. Appendix D describes the structure of program activities within an agency in Panel A and presents the summary

[37] Each agency performs various sub-activities, which are discrete projects to serve certain policy programs. For instance, Ministry of Employment and Labor have 10 policy programs such as "labor welfare and working condition policy" and "equal employment opportunity policy." To serve the program "labor welfare and working condition policy," the ministry runs 3 sub-activities including "supervision of working environment," "protection of working conditions," and "support for severance pay policy." The ministry was running 51 sub-activities in total in FY2018. To operationalize the agency-year level indicator of asymmetric budget ratcheting, I use these sub-activities as the sample for agency-year ratcheting regression.

statistics of activity-agency-year observations in Panel B. About 15% of 234 agency-years has $Asymmetric\_Ratchet_{i,t}$ =1. Panel C provides two examples of by-agency-year regression results and how $Asymmetric\_Ratchet_{i,t}$ is coded for each case.

Finally, Table 6 reports the consequences of asymmetric budget growth. In column (1) of Panel A, $Asymmetric\_Ratchet_{i,t}$ is positively associated with the change in achievement rate of performance targets, $\Delta Target\_Achieve_{i,t}$ ($\alpha_1$=0.063, p<0.1). This finding suggests that asymmetric budget growth leads to greater accomplishment of policy goals, rather than rent-extraction without performance. Column (2) employs $\Delta Unused\_Expenditures_{i,t}$ as the dependent variable. $Asymmetric\_Ratchet_{i,t}$ is significantly and negatively associated with unused budgets ($\alpha_1$=-0.047, p<0.1). This suggests that generous budget allocation is indeed to produce more public services, rather than to maximize budgets without policy execution.

In Panel B, I find no evidence that *Asymmetric_Ratchet* leads to the agent's opportunistic behaviors such as setting easy performance targets ($Easy\_Target_{i,t}$) or managing the reported service performance ($PERF\_MGMT1_{i,t}$, $PERF\_MGMT2_{i,t}$). *Easy_Target* is the indicator that an agency gets fingered for setting easily attainable performance target(s) by the auditor (BAI). *PERF_MGMT1* is the indicator that an agency has above-median number of irregularities in planning and reporting their service performance, as pointed by the auditor report. *PERF_MGMT2* is the indicator that an agency is pointed out for performance management (to inflate the service performance) by the auditor. The results in Panel B mitigate the concern that higher performance (documented in Panel A) is neither driven by easy-to-achieve targets nor opportunistic performance management.

Put together, Table 6 further support that generous budget revision is based on mutually beneficial agreement between the superior and high-PSM agents. Under such contract, the superior transfers more resources to agents

who would exert much efforts to expand public provision and would not expropriate resources. By doing so, the superior achieves the allocation efficiency while high-PSM agents find utility from greater production of public service.

**<Insert Table 6 here>**

***Performance-adjusted Budget Variance Analyses***

There is concern that government agencies may overspend because they are inefficient, even though they provide only the expected level of public service. If it is the case, the asymmetric budget ratcheting does not guarantee more-than-expected public service delivered. To rule out this alternative explanation, I re-estimate the models with performance-adjusted budget variances. I multiply the spending variance with performance achievement rate in the same period ($(A_{i,t-1} - B_{i,t-1})/B_{i,t-1} \times Target\_Achieve_{i,t-1}$). In case that the principal allocates more resources to low-efficiency agents (to assure the expected level of service delivery), rather than outperforming agents, I would not observe the ratcheting and asymmetric ratcheting because the effect of past expenditure on future budget allocation should decrease with higher efficiency. Furthermore, I would not observe the greater degree of asymmetric ratcheting with higher integrity, because the superior has incentives to allocate more resources to inefficient agents than efficient agents.

In Table 7, I use performance-adjusted spending variances ($(A_{i,t-1} - B_{i,t-1})/B_{i,t-1} \times Target\_Achieve_{i,t-1}$) in place of unadjusted spending variance, and find consistent results with the main findings through out column (1) – (3). It provides counter-evidence *against* an alternative argument that inefficient agencies drive the asymmetric ratcheting by consuming more resources than efficient agencies.

**<Insert Table 7 here>**

***Alternative Measures of Public Integrity***

Because the integrity survey is administered over the external citizens, the intensity of an agency's interaction with external respondents may influence the survey results. For instance, agencies who are more engaged in activities associated with external parties may have a greater possibility of receiving more complaints from related stakeholders, potentially leading to a negatively biased integrity score. To reduce the measurement errors of the integrity survey based on citizen responses, I employ an alternative survey measure, *Integrity Broad*. This score is based on the responses from more diverse stakeholders including citizens, the agency insiders, and people from the related institutions (e.g., assistants of National Assembly members). Panel A of Table 8 employs *Integrity Broad* in place of *Integrity*. In column (1), I find the supporting evidence for H1, as evidenced by the positive (negative) coefficient on $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*Integrity\_Broad_{i,t-1}$ ($(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}*Integrity\_Broad_{i,t-1}$). In column (2) and (3), I find supporting evidence for H2, as evidenced by the *Integrity_Broad* increases the degree of ratcheting and asymmetric ratcheting only among the *High_Monitor* agencies. Even though *Integrity Broad* measure also suffers from the potential response bias of insiders, the measure at least assuages the concern that external citizens' response bias drives the main results.

In Panel B, I further employ alternative measure of Integrity. First, the standardized score of Integrity Index may put 'forced' ranking on each agency, even for some agencies with a highly similar level of integrity. To address this concern, I use 5-point grades of Integrity Index provided by ACRC along with the raw score of the index (*Integrity_Grade*). Because the agencies with similar scores fall into the same grade, 5-point grades do not produce a forced distribution of agencies. In column (1) of Panel B, I find the consistent result with the main finding, using 5-point grades of Integrity Index.

Second, the survey-based score may be biased toward the respondents' personal experiences and emotions. For instance, the agencies

that frequently interact with citizens may have poor integrity score, not because they are corruptive, but because more citizens have negative experiences from their interactions. To address this concern, in column (2) of Panel B, I use a hard measure of public integrity. *Prosecution* is the indicator of whether any member(s) of an agency has been prosecuted with the suspicion of corruption or crime, and is the inverse measure of public integrity. I find that both ratcheting and asymmetric ratcheting decrease when there has been prosecution in the year, suggesting that the degree of asymmetric ratcheting decreases with lower level of integrity. In other words, both ratcheting and asymmetric ratcheting increase in the agencies *without* any prosecution. It is consistent with the main findings, and provides a further support to the survey-based measure.

**<Insert Table 8 here>**

## 7. CONCLUSION

In this paper, mutually beneficial arrangement on budget ratcheting between the government organizations and the superior is examined. Building upon the PSM theory, my study suggests that asymmetric budget growth is explained by the public servants' intention to pursue the advancement of public provision. Using a unique database of 47 central agencies of Korean government during 2012 – 2019, I document that asymmetric budget ratcheting is more pronounced for agencies with high public service integrity and monitoring intensity. My findings support the existence of separating equilibrium based on agents' type, by which high-integrity agents are rewarded with generous budgets and low-integrity agents are penalized by tighter budgets. This separating equilibrium is analogous to a mutually beneficial arrangement between high-type agents and superior in for-profit firms in which well-performing managers repeatedly exceed their profit targets. I further find that asymmetric budget ratcheting is associated with better policy performance and less slack-building behavior.

I provide an alternative explanation on asymmetric budget ratcheting in government organizations (Lee and Plummer 2007). An emerging strand of literature on mission-driven organizations suggests that public sector workers have greater intrinsic motivation to serve for society than private sector workers (Chen et al. 2020). While prior studies argue that budget increase is driven by bureaucratic self-interests, I suggest an alternative argument that budget increase in government organizations can be driven by public servants' intention to deliver more public provision and serve for society (Francois 2000; Makris 2009). I also add to target ratcheting literature by providing evidence of separating equilibrium in government sector. I propose that the superior offers more generous budgeting rules to agents with higher integrity, which is analogous to tempered use of past performance for high-profitability managers in for-profit firms (Indjejikian et al. 2014).

My study also has several caveats. Even though my empirical models contain a battery of control variables to rule out alternative explanations of asymmetric budget ratcheting (e.g., cost stickiness, macroeconomic effect, uncertainty, etc.), the models may still have correlated omitted variables. In addition, our inferences based on Korean central governments may not be generalizable to other settings.

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## TABLE 1. Sample Selection

### Panel A. Sample Selection Procedure

| Sample Selection | Obs |
|---|---|
| Agency-year observations from Korean central agencies during 2012 - 2018 | 372 |
| *Less* observations with missing budget information for two consecutive years | (24) |
| | 348 |
| *Less* outliers (observations with budget revision or spending variance greater than 100%) | (14) |
| | 334 |
| *Less* observations with missing data of public integrity survey or monitoring intensity | (83) |
| | 251 |
| *Less* observations with missing data of other control variables | (16) |
| Sample for Main Analyses | 234 |
| Less observations with insufficient sub-activities to estimate agency-year-level asymmetric ratcheting coefficients | (31) |
| Sample for Additional Analyses | 203 |

### Panel B. Yearly Distribution of Sample Observations

| FY | Obs | % |
|---|---|---|
| 2012 | 33 | 14.1 |
| 2013 | 30 | 12.82 |
| 2014 | 28 | 11.97 |
| 2015 | 36 | 15.38 |
| 2016 | 35 | 14.96 |
| 2017 | 36 | 15.38 |
| 2018 | 36 | 15.38 |

**TABLE 2. Variable Definitions**

| Variables | Definition |
|---|---|
| $A_{i,t-1}$ | = agency *i*'s actual expenditures for year *t-1*. |
| $B_{i,t}$ | = agency *i*'s budgeted expenditures for year *t*. |
| $(B_{i,t} - B_{i,t-1})/B_{i,t-1}$ | = Annual budget revision of agency *i*, from year *t-1* to year *t*, presented as the percentage of the budget in year *t-1*. |
| $(A_{i,t-1} - B_{i,t-1})/B_{i,t-1}$ | = Spending variance of agency *i* in year *t-1*, presented as the percentage of the budget in year *t-1*. |
| $U_{i,t-1}$ | = 1 if $(A_{i,t-1} - B_{i,t-1})$ is negative, and 0 otherwise. |
| $\Delta Revenue^{+}_{i,t}$ | = change in the agency *i*'s self-generated revenues from year *t-1* to year *t* where the change is positive. |
| $\Delta Revenue^{-}_{i,t}$ | = change in the agency *i*'s self-generated revenues from year *t-1* to year *t* where the change is negative. |
| $Operational\ Efficiency_{i,t-1}$ | = general overhead expenses/total expenses of agency *i* in year *t-1*. |
| $Uncertainty_{i,t-1}$ | = (transferred budgets + re-appropriated budgets)/total budget outstanding of agency *i* at the end of year *t-1*. |
| $Log(Employees)_{i,t}$ | = log of the total number of employees of agency *i* in year *t*. |
| $\Delta National\_Revenue^{+}_{t}$ | = change in the national tax revenues from year *t-1* to year *t* where the change is positive. |
| $\Delta National\_Revenue^{-}_{t}$ | = change in the national tax revenues from year *t-1* to year *t* where the change is negative. |
| $\Delta National\_Debt^{+}_{t}$ | = change in the national debt-to-GDP ratio from year *t-1* to year *t* where the change is positive. |
| $\Delta National\_Debt^{-}_{t}$ | = change in the national debt-to-GDP ratio from year *t-1* to year *t* where the change is negative. |
| $\Delta Consumption\_Index^{+}_{t}$ | = change in the national consumption index from year *t-1* to year *t* where the change is positive. |
| $\Delta Consumption\_Index^{-}_{t}$ | = change in the national consumption index from year *t-1* to year *t* where the change is negative. |
| *Integrityi,t-1* | = Standardized score of agency i's Integrity Index for year t-1. Integrity Index is the agency-year level measure of public integrity of central agencies based on Public Service Integrity Survey. |
| $Monitor\_NA_{i,t-1}$ | = the number of National Assembly's subcommittee members who are in charge of monitoring agency *i*. |
| $Monitor\_MSF_{i,t-1}$ | = the number of Ministry of Strategy and Finance |

| | | |
|---|---|---|
| | | government officials who are in charge of monitoring agency *i*. |
| $\Delta Target\_Achive_{i,t}$ | = | agency *i*'s achievement rate of performance targets of policy programs in year *t*. |
| $\Delta Unused\_Expenditure_{i,t}$ | = | unused expenditures/total unexecuted budgets of agency *i* in year t. Unexecuted budgets = budget carryforward + unused expenditures. |
| *Easy_Target* | = | indicator that an agency gets fingered for setting easily attainable performance target(s) by the auditor (BAI). |
| *PERF_MGMT1* | = | indicator that an agency has above-median number of irregularities in planning and reporting their service performance, as pointed by the auditor report. |
| *PERF_MGMT2* | = | indicator that an agency is pointed out for performance management (to inflate the service performance) by the auditor. |
| $Asymmetric\_Ratchet_{i,t}$ | = | takes on 1 if the estimates of ratcheting coefficients of by-agency-year ratcheting regressions exhibit asymmetric budget ratcheting, and 0 otherwise. Using the sub-activities of agency i in year t, I regress the following equation: $(B_{i,j,t} - B_{i,j,t-1})/B_{i,j,t-1} = \alpha_0 + \boldsymbol{\alpha_1}(A_{i,j,t-1} - B_{i,j,t-1})/B_{i,j,t-1} + \boldsymbol{\alpha_2} U_{i,j,t-1} (A_{i,j,t-1} - B_{i,j,t-1})/B_{i,j,t-1} + \alpha_3 U_{i,j,t-1} + \varepsilon_{i,j,t}$ , where *i*, *j*, *t* denote agency, sub-activity, and year, respectively. |

## TABLE 3. Summary Statistics

### Panel A. Descriptive Statistics

| Variable | N | Mean | Median | P25 | P75 | STD | Min | Max |
|---|---|---|---|---|---|---|---|---|
| $(B_{i,t}-B_{i,t-1})/B_{i,t-1}$ | 234 | 0.03 | 0.03 | -0.01 | 0.07 | 0.11 | -0.34 | 0.51 |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}$ | 234 | -0.04 | -0.02 | -0.05 | 0.00 | 0.10 | -0.61 | 0.12 |
| $U_{i,t-1}$ | 234 | 0.82 | 1.00 | 1.00 | 1.00 | 0.39 | 0.00 | 1.00 |
| $Integrity_{i,t-1}$ *(Unstandardized)* | 234 | 8.10 | 8.13 | 7.80 | 8.42 | 0.47 | 6.56 | 9.23 |
| $Integrity_{i,t-1}$ | 234 | 0.00 | 0.08 | -0.61 | 0.63 | 0.99 | -3.71 | 2.43 |
| $Monitor\_MSF_{i,t-1}$*(Raw num of supervisors in charge)* | 234 | 2.80 | 1.80 | 1.38 | 4.00 | 1.85 | 0.38 | 7.17 |
| $Monitor\_NA_{i,t-1}$*(Raw num of supervisors in charge)* | 234 | 6.82 | 5.64 | 3.87 | 8.22 | 4.78 | 1.95 | 26.86 |
| $Employee\_Num_{i,t}$ *(unlogged)* | 234 | 3353.57 | 1388.00 | 652.00 | 3111.00 | 5340.29 | 156.00 | 22663.00 |
| $Log(Employee\_Num)_{i,t}$ | 234 | 7.36 | 7.24 | 6.48 | 8.04 | 1.18 | 5.05 | 10.03 |
| *(Monitor_MSF+Monitor_NA)/Employee_Num* | 234 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.05 |
| $Target\_Achieve_{i,t-1}$ | 234 | 0.78 | 0.80 | 0.67 | 0.89 | 0.16 | 0.33 | 1.00 |
| $Crime_{i,t-1}$ | 234 | 0.19 | 0.00 | 0.00 | 0.00 | 0.39 | 0.00 | 1.00 |
| $\Delta Revenue^{+}{}_{i,t}$ | 234 | 0.33 | 0.02 | 0.00 | 0.17 | 1.20 | 0.00 | 9.58 |
| $\Delta Revenue^{-}{}_{i,t}$ | 234 | -0.11 | 0.00 | -0.14 | 0.00 | 0.22 | -1.22 | 0.00 |
| $Operational\ Efficiency_{i,t-1}$ | 234 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | -0.01 | 0.04 |
| $Uncertainty_{i,t-1}$ | 234 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.03 |
| $\Delta National\_Revenue^{+}{}_{i,t}$ | 234 | 0.06 | 0.06 | 0.04 | 0.09 | 0.04 | 0.00 | 0.11 |
| $\Delta National\_Revenue\text{-}_{i,t}$ | 234 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | -0.02 | 0.00 |
| $\Delta National\_Debt^{+}{}_{i,t}$ | 234 | 0.77 | 0.50 | 0.00 | 1.60 | 0.73 | 0.00 | 1.80 |
| $\Delta National\_Debt\text{-}_{i,t}$ | 234 | -0.02 | 0.00 | 0.00 | 0.00 | 0.04 | -0.10 | 0.00 |
| $\Delta Consumption\ Index^{+}{}_{i,t}$ | 234 | 0.22 | 0.20 | 0.00 | 0.40 | 0.15 | 0.00 | 0.40 |
| $\Delta Consumption\ Index^{-}{}_{i,t}$ | 234 | -0.17 | 0.00 | 0.00 | 0.00 | 0.42 | -1.20 | 0.00 |
| $Asymmetric\_Ratchet_{i,t}$ | 203 | 0.15 | 0.00 | 0.00 | 0.00 | 0.36 | 0.00 | 1.00 |
| $\Delta Target\_Achieve_{i,t}$ | 203 | -0.01 | 0.00 | -0.09 | 0.08 | 0.17 | -0.58 | 0.67 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $\Delta$*Unspent Expenditure* $_{i,t}$ | 203 | -0.01 | 0.00 | -0.01 | 0.01 | 0.09 | -0.88 | 0.37 |
| *Easy_Target* | 203 | 0.21 | 0.00 | 0.00 | 0.00 | 0.41 | 0.00 | 1.00 |
| *PERF_MGMT1* | 203 | 1.57 | 2.00 | 0.00 | 2.00 | 1.28 | 0.00 | 6.00 |
| *PERF_MGMT2* | 203 | 0.25 | 0.00 | 0.00 | 0.00 | 0.43 | 0.00 | 1.00 |

**Panel B. Correlation Coefficients**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) $(B_{i,t}-B_{i,t-1})/B_{i,t-1}$ | 1.00 | | | | | | | | | | | | | | | | |
| (2) $(A_{i,t}-B_{i,t-1})/B_{i,t-1}$ | **0.36** | 1.00 | | | | | | | | | | | | | | | |
| (3) $U_{i,t-1}$ | -0.11 | **-0.36** | 1.00 | | | | | | | | | | | | | | |
| (4) *Integrity*$_{i,t-1}$ | -0.03 | -0.07 | 0.02 | 1.00 | | | | | | | | | | | | | |
| (5) *High_Monitor*$_{i,t-1}$ | -0.03 | **0.13** | 0.10 | **0.20** | 1.00 | | | | | | | | | | | | |
| (6) *Target_Achieve*$_{i,t}$ | 0.00 | -0.05 | -0.06 | -0.03 | 0.04 | 1.00 | | | | | | | | | | | |
| (7) $\Delta$*Revenue*$^{+}{}_{i,t}$ | -0.09 | **-0.18** | 0.06 | 0.11 | **0.19** | **0.17** | 1.00 | | | | | | | | | | |
| (8) $\Delta$*Revenue-* $_{i,t}$ | -0.11 | -0.12 | 0.04 | **0.13** | 0.01 | 0.02 | **0.14** | 1.00 | | | | | | | | | |
| (9) *Operational Efficiency* $_{i,t-1}$ | -0.03 | 0.08 | 0.02 | **-0.17** | -0.04 | -0.05 | 0.06 | -0.09 | 1.00 | | | | | | | | |
| (10)*Uncertainty* $_{i,t-1}$ | 0.10 | 0.11 | -0.03 | **-0.13** | 0.09 | -0.10 | -0.04 | 0.08 | -0.05 | 1.00 | | | | | | | |
| (11) *Log(Employee_Num)*$_{i,t}$ | 0.06 | **0.17** | -0.12 | **-0.37** | **-0.71** | -0.04 | **-0.23** | 0.02 | 0.06 | 0.02 | 1.00 | | | | | | |
| (12) $\Delta$*National_Revenue*$^{+}{}_{i,t}$ | -0.07 | 0.05 | **0.15** | 0.00 | 0.00 | **-0.13** | -0.04 | 0.08 | -0.03 | -0.07 | 0.06 | 1.00 | | | | | |
| (13) $\Delta$*National_Revenue-* $_{i,t}$ | -0.16 | -0.11 | **0.21** | 0.00 | 0.00 | -0.08 | 0.03 | **0.15** | -0.03 | 0.01 | 0.06 | **0.62** | 1.00 | | | | |
| (14) $\Delta$*National_Debt*$^{+}{}_{i,t}$ | 0.15 | -0.10 | -0.07 | 0.00 | 0.00 | 0.12 | -0.04 | -0.08 | 0.03 | 0.03 | -0.05 | **-0.79** | **-0.54** | 1.00 | | | |
| (15) $\Delta$*National_Debt-* $_{i,t}$ | 0.04 | -0.05 | -0.02 | 0.00 | 0.00 | 0.09 | 0.02 | -0.05 | 0.00 | 0.05 | 0.01 | **-0.40** | **-0.16** | **0.45** | 1.00 | | |
| (16) $\Delta$*Consumption Index*$^{+}{}_{i,t}$ | -0.08 | -0.02 | **0.14** | 0.00 | 0.00 | -0.08 | **-0.13** | 0.06 | -0.01 | -0.12 | 0.03 | **0.72** | **0.54** | **-0.43** | **-0.50** | 1.00 | |
| (17) $\Delta$*Consumption Index*$^{-}{}_{i,t}$ | 0.05 | 0.02 | 0.00 | 0.00 | -0.01 | -0.03 | **-0.17** | -0.07 | 0.00 | -0.16 | -0.01 | **0.17** | **-0.16** | **0.15** | **-0.17** | **0.58** | 1.00 |

*Bolded are significant at 5%.

**TABLE 4. OLS Estimation Result – Public Integrity and Budget Ratcheting in Government Organizations**

| **Variables** | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Dep var: $(B_{i,t}-B_{i,t-1})/B_{i,t-1}$ | | | |
| | Full Sample | | High_Integrity | Low_Integrity |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}$ | 2.021*** | 1.931*** | 3.452*** | 0.859 |
| | (3.91) | (5.40) | (4.15) | (1.46) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}$ | -1.661*** | -1.549*** | -3.130*** | -0.263 |
| | (-3.03) | (-3.89) | (-3.42) | (-0.42) |
| $U_{i,t-1}$ | 0.053* | 0.061** | 0.108** | 0.006 |
| | (1.94) | (2.21) | (2.44) | (0.19) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*Integrity_{i,t-1}$ | | 1.424*** | | |
| | | (3.38) | | |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}*Integrity_{i,t-1}$ | | -1.540*** | | |
| | | (-3.66) | | |
| $U_{i,t-1}*Integrity_{i,t-1}$ | | 0.024 | | |
| | | (0.89) | | |
| $Integrity_{i,t-1}$ | | -0.031 | | |
| | | (-1.12) | | |
| $\Delta Revenue^{+}_{i,t}$ | 0.001 | 0.001 | 0.009 | -0.005 |
| | (0.12) | (0.20) | (1.15) | (-0.62) |
| $\Delta Revenue\text{-}_{i,t}$ | -0.050 | -0.037 | -0.182** | 0.043 |
| | (-1.32) | (-0.92) | (-2.01) | (1.41) |
| $Operational\ Efficiency_{i,t-1}$ | -2.475 | -2.354 | -19.752* | 3.564 |
| | (-0.40) | (-0.36) | (-1.75) | (0.62) |
| $Uncertainty_{i,t-1}$ | 2.827* | 3.060* | 3.618 | 0.183 |

| | | | | |
|---|---|---|---|---|
| | (1.84) | (1.97) | (1.47) | (0.10) |
| *Log(Employee_Num)*$_{i,t}$ | 0.057 | 0.059* | 0.022 | 0.099*** |
| | (1.63) | (1.69) | (0.52) | (6.63) |
| Δ*National_Revenue*$^{+}{}_{i,t}$ | 0.998** | 1.006** | 1.504* | 1.134* |
| | (2.34) | (2.36) | (1.92) | (1.87) |
| Δ*National_Debt*$^{+}{}_{i,t}$ | 0.060*** | -0.830 | 0.128*** | 0.043** |
| | (3.23) | (-0.45) | (3.26) | (2.04) |
| Δ*Consumption Index*$^{+}{}_{i,t}$ | -0.097 | 0.062*** | -0.169 | -0.163 |
| | (-0.76) | (3.31) | (-0.76) | (-1.11) |
| Δ*National_Revenue-*$_{i,t}$ | -0.872 | -0.281 | 0.944 | 0.508 |
| | (-0.48) | (-1.05) | (0.31) | (0.24) |
| Δ*National_Debt-*$_{i,t}$ | -0.292 | -0.077 | -0.509 | -0.024 |
| | (-1.10) | (-0.62) | (-1.16) | (-0.05) |
| Δ*Consumption Index*$^{-}{}_{i,t}$ | 0.004 | 0.006 | 0.011 | 0.028 |
| | (0.13) | (0.17) | (0.19) | (0.71) |
| *Intercept* | -0.544** | -0.578** | -0.413 | -0.821*** |
| | (-2.04) | (-2.15) | (-1.20) | (-6.96) |
| Year FE | Yes | Yes | Yes | Yes |
| Agency FE | Yes | Yes | Yes | Yes |
| Num of Obs | 234 | 234 | 118 | 116 |
| R-Square | 0.389 | 0.417 | 0.508 | 0.622 |
| Adjusted R-Square | 0.191 | 0.210 | 0.178 | 0.342 |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}+(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}$ | 0.360**(p=0.03) | | | |

Robust t-statistics are presented in parentheses. *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels, respectively. Standard errors are clustered by firm.

**TABLE 5. OLS Estimation Result – Monitoring Intensity, Public Integrity and Budget Ratcheting in Government Organizations**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Dep var: $(B_{i,t}-B_{i,t-1})/B_{i,t-1}$ | | | | | |
| Variables | High_Monitor (MSF + NA) | Low_Monitor (MSF+NA) | High_Monitor (NA) | Low_Monitor (NA) | High_Monitor (MSF) | Low_Monitor (MSF) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}$ | 2.140*** | -0.133 | 2.194*** | -0.095 | 1.953*** | -0.679 |
| | (3.60) | (-0.13) | (3.64) | (-0.09) | (3.35) | (-0.42) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}$ | -1.846*** | 1.041 | -1.901*** | 0.996 | -1.684*** | 1.288 |
| | (-3.05) | (0.96) | (-3.09) | (0.92) | (-2.86) | (0.74) |
| $U_{i,t-1}$ | 0.083 | 0.033 | 0.086* | 0.035 | 0.078* | 0.023 |
| | (1.60) | (0.93) | (1.69) | (1.00) | (1.82) | (0.66) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*Integrity_{i,t-1}$ | 2.570** | -0.158 | 3.018*** | -0.124 | 2.317** | -0.226 |
| | (2.57) | (-0.22) | (3.33) | (-0.18) | (2.03) | (-0.25) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}*Integrity_{i,t-1}$ | -2.675*** | 0.177 | -3.109*** | 0.117 | -2.410*** | 0.192 |
| | (-2.64) | (0.23) | (-3.42) | (0.16) | (-2.10) | (0.21) |
| $U_{i,t-1}*Integrity_{i,t-1}$ | 0.069 | 0.021 | 0.112 | 0.020 | 0.066 | 0.009 |
| | (0.83) | (0.92) | (1.42) | (0.89) | (0.90) | (0.38) |
| $Integrity_{i,t-1}$ | -0.078 | 0.003 | -0.116 | 0.002 | -0.064 | -0.007 |
| | (-0.89) | (0.12) | (-1.42) | (0.09) | (-0.83) | (-0.27) |
| $\Delta Revenue^{+}_{i,t}$ | -0.005 | 0.003 | -0.005 | 0.006 | -0.009 | 0.006 |
| | (-0.80) | (0.08) | (-0.77) | (0.20) | (-1.18) | (0.92) |
| $\Delta Revenue\text{-}_{i,t}$ | -0.039 | 0.009 | -0.057 | 0.011 | -0.074 | -0.017 |
| | (-0.72) | (0.15) | (-1.08) | (0.18) | (-1.59) | (-0.27) |
| $Operational\ Efficiency_{i,t-1}$ | 9.131 | -25.419 | 8.591 | -25.317* | 7.917 | -19.249 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (1.04) | (-1.90) | (1.02) | (-1.91) | (0.92) | (-1.51) |
| *Uncertainty* $_{i,t-1}$ | 2.422 | 3.419 | 2.151 | 4.44 | 2.771 | 4.813 |
| | (1.17) | (1.13) | (1.04) | (1.49) | (1.27) | (1.64) |
| *Log(Employee_Num)*$_{i,t}$ | 0.004 | -0.030 | 0.001 | -0.050 | 0.074* | -0.101 |
| | (0.06) | (-0.40) | (0.01) | (-0.68) | (1.87) | (-1.54) |
| Δ*National_Revenue*$^{+}{}_{i,t}$ | 1.385** | 0.292 | 1.394** | 0.285 | 1.005* | 0.870 |
| | (2.10) | (0.48) | (2.08) | (0.49) | (1.94) | (1.19) |
| Δ*National_Revenue-* $_{i,t}$ | -1.165 | -0.078 | -0.699 | -0.073 | 1.423 | -2.261 |
| | (-0.41) | (-0.03) | (-0.25) | (-0.03) | (0.66) | (-0.72) |
| Δ*National_Debt*$^{+}{}_{i,t}$ | 0.076*** | 0.044 | 0.084 | 0.040 | 0.058*** | 0.066 |
| | (3.03) | (1.47) | (3.30) | (1.38) | (3.29) | (1.91) |
| Δ*National_Debt-* $_{i,t}$ | 0.092 | -0.342 | -0.149 | -0.283 | -0.494 | 0.012 |
| | (0.17) | (-1.24) | (-0.27) | (-1.05) | (-1.11) | (0.03) |
| Δ*Consumption Index*$^{+}{}_{i,t}$ | 0.022 | -0.107 | 0.006 | -0.118 | -0.227 | 0.080 |
| | (0.11) | (-0.63) | (0.03) | (-0.73) | (-1.35) | (0.38) |
| Δ*Consumption Index*$^{-}{}_{i,t}$ | -0.055 | 0.063 | -0.057 | 0.071 | 0.010 | 0.013 |
| | (-1.09) | (1.36) | (-1.07) | (1.55) | (0.23) | (0.22) |
| *Intercept* | -0.412 | 0.218 | -0.399 | 0.371 | -0.669** | 0.647 |
| | (-0.94) | (0.38) | (-0.91) | (0.66) | (-2.19) | (1.28) |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Agency FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of Observations | 118 | 116 | 118 | 116 | 118 | 116 |
| R-Square | 0.502 | 0.491 | 0.508 | 0.497 | 0.578 | 0.352 |
| Adjusted R-Square | 0.244 | 0.220 | 0.252 | 0.229 | 0.359 | 0.019 |

Robust t-statistics are presented in parentheses. *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels, respectively. Standard errors are clustered by firm. *High_Monitor* are the subsample of agencies with monitoring intensity greater than or equal to the median monitoring intensity. I measure the monitoring intensity by the number of MSF officials in charge of agency i's budget (*Monitoring_MSF*), the number of special committee members of National Assembly who monitor the agency *i* (*Monitoring_NA*), or the sum of the MSF officials and National Assembly members (*Monitor*). Three monitoring intensity variables are size-adjusted, as they are scaled by each agency's size (number of regular workers of the agency). MSF bureaucrats in charge of agency i's budget) relative to the agency size (proxied by the number of regular workers of the agency) is above the sample median, and takes on 0 otherwise.

## TABLE 6. Consequences of Asymmetric Budget Ratcheting

### Panel A. Change in Performance Achievement and Budget Slacks

| | (1) | (2) |
|---|---|---|
| | Dep var: | |
| Variables | $\Delta Target\_Achieve_{i,t}$ | $\Delta Unspent\ Expenditures_{i,t}$ |
| $Asymmetric\_Ratchet_{i,t}$ | 0.063* | -0.047** |
| | (1.86) | (-2.08) |
| $\Delta Revenue^{+}_{i,t}$ | -0.008 | -0.029 |
| | (-0.97) | (-0.98) |
| $\Delta Revenue\text{-}_{i,t}$ | 0.090 | -0.037 |
| | (1.29) | (-1.04) |
| $Operational\ Efficiency_{i,t-1}$ | 0.213 | -0.340* |
| | (0.61) | (-1.82) |
| $Log(Employee\_Num)_{i,t}$ | 0.004 | 0.005 |
| | (0.84) | (1.66) |
| $\Delta National\_Revenue^{+}_{i,t}$ | 0.604 | -0.432 |
| | (0.55) | (-0.95) |
| $\Delta National\_Revenue\text{-}_{i,t}$ | 0.864 | -3.822* |
| | (0.29) | (-1.92) |
| $\Delta National\_Debt^{+}_{i,t}$ | 0.014 | -0.027 |
| | (0.37) | (-1.43) |
| $\Delta National\_Debt\text{-}_{i,t}$ | -0.802** | 0.142 |
| | (-2.01) | (0.73) |
| $\Delta Consumption\ Index^{+}_{i,t}$ | -0.266 | 0.156 |
| | (-0.97) | (1.14) |
| $\Delta Consumption\ Index^{-}_{i,t}$ | 0.025 | -0.042 |
| | (0.41) | (-1.44) |
| *Intercept* | -0.028 | -0.035 |
| | (-0.28) | (-1.02) |
| Year FE | Yes | Yes |
| Clustered SE | by Agency | by Agency |
| Number of Observations | 203 | 203 |
| R-Square | 0.056 | 0.206 |

Robust t-statistics are presented in parentheses. *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels, respectively. Standard errors are clustered by firm.

### Panel B. Potential Opportunistic Behaviors

| | (1) | (2) | (3) |
|---|---|---|---|
| | Dep var: | | |
| Variables | $Easy\_Target_{i,t}$ | $PERF\_MGMT1_{i,t}$ | $PERF\_MGMT2_{i,t}$ |

| | | | |
|---|---|---|---|
| *Asymmetric_Ratchet*$_{i,t}$ | -0.119 | -0.129 | 0.201 |
| | (0.140) | (0.240) | (0.478) |
| $\Delta$*Revenue*$^{+}{}_{i,t}$ | -0.002 | -0.089 | 0.089 |
| | (0.000) | (0.51) | (0.478) |
| $\Delta$*Revenue-*$_{i,t}$ | -0.475 | -0.572 | -0.247 |
| | (0.874) | (1.394) | (0.238) |
| *Operational Efficiency* $_{i,t-1}$ | 8.108 | -3.815 | 22.543** |
| | (0.405) | (0.1184) | (3.859) |
| *Log(Employee_Num)*$_{i,t}$ | -0.228** | -0.101 | -0.128 |
| | (4.522) | (1.449) | (1.747) |
| $\Delta$*National_Revenue*$^{+}{}_{i,t}$ | 6.828 | 10.140 | 6.456 |
| | (1.152) | (2.887) | (0.793) |
| $\Delta$*National_Revenue-*$_{i,t}$ | 1.665 | -18.596 | -61.150** |
| | (0.004) | (0.683) | (6.026) |
| $\Delta$*National_Debt*$^{+}{}_{i,t}$ | 0.785** | 0.790*** | 0.160 |
| | (6.135) | (9.494) | (0.273) |
| $\Delta$*National_Debt-*$_{i,t}$ | 47.282 | 0.439 | 2.796 |
| | (0.000) | (0.016) | (0.491) |
| $\Delta$*Consumption Index*$^{+}{}_{i,t}$ | 2.274 | 1.068 | 1.671 |
| | (1.480) | (0.425) | (0.738) |
| $\Delta$*Consumption Index*$^{-}{}_{i,t}$ | -1.253** | -0.561 | -1.311*** |
| | (5.630) | (1.863) | (7.64) |
| *Intercept* | -0.863 | -0.778 | -1.171 |
| | (0.573) | (0.782) | (1.302) |
| Year FE | Yes | Yes | Yes |
| Clustered SE | by Agency | by Agency | by Agency |
| Number of Observations Used | 203 | 203 | 203 |
| R-Square | 0.158 | 0.088 | 0.119 |

Robust z-statistics are presented in parentheses. *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels, respectively. Standard errors are clustered by firm. This table shows the estimation results of logit estimation.

**TABLE 7. Performance-adjusted Budget Variances**

| Variables | (1) Full Sample | (2) High_Monitor (MSF +NA) | (3) Low_Monitor (MSF+NA) |
|---|---|---|---|
| | Dep var: $(B_{i,t}-B_{i,t-1})/B_{i,t-1}$ | | |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*Target\_Achieve_{i,t-1}$ | 2.180*** | 2.353*** | -0.201 |
| | (3.93) | (2.87) | (-0.18) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*Target\_Achieve_{i,t-1}*U_{i,t-1}$ | -1.768*** | -1.942** | 1.089 |
| | (-3.14) | (-2.31) | (0.86) |
| $U_{i,t-1}$ | 0.049* | 0.067 | 0.024 |
| | (1.76) | (1.20) | (0.66) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*Target\_Achieve_{i,t-1}*Integrity_{i,t-1}$ | 1.845** | 4.147* | -0.175 |
| | (2.47) | (1.73) | (-0.21) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*Target\_Achieve_{i,t-1}*U_{i,t-1}*Integrity_{i,t-1}$ | -1.964*** | -4.264* | 0.169 |
| | (-2.65) | (-1.78) | (0.19) |
| $U_{i,t-1}*Integrity_{i,t-1}$ | 0.020 | 0.067 | 0.021 |
| | (0.74) | (0.71) | (0.86) |
| $Integrity_{i,t-1}$ | -0.026 | -0.076 | 0.003 |
| | (-0.92) | (-0.76) | (0.11) |
| $\Delta Revenue^{+}_{i,t}$ | 0.001 | -0.004 | 0.009 |
| | (0.17) | (-0.48) | (0.26) |
| $\Delta Revenue-_{i,t}$ | -0.044 | -0.035 | -0.009 |
| | (-1.04) | (-0.66) | (-0.13) |
| $Operational\ Efficiency_{i,t-1}$ | -2.145 | 9.834 | -23.616 |
| | (-0.34) | (1.31) | (-1.66) |

| | | | |
|---|---|---|---|
| *Uncertainty* $_{i,t-1}$ | 3.099** | 2.594 | 3.602 |
| | (1.99) | (1.21) | (1.19) |
| *Log(Employee_Num)*$_{i,t}$ | 0.051 | 0.020 | -0.032 |
| | (1.43) | (0.27) | (-0.42) |
| Δ*National_Revenue*$^{+}$ $_{i,t}$ | 1.000** | 1.370** | 0.132 |
| | (2.25) | (2.01) | (0.19) |
| Δ*National_Revenue-* $_{i,t}$ | -0.916 | -0.497 | -1.024 |
| | (-0.47) | (-0.17) | (-0.36) |
| Δ*National_Debt*$^{+}$ $_{i,t}$ | 0.057*** | 0.074*** | 0.033 |
| | (2.88) | (2.87) | (0.94) |
| Δ*National_Debt-* $_{i,t}$ | -0.246 | 0.118 | -0.256 |
| | (-0.90) | (0.21) | (-0.84) |
| Δ*Consumption Index*$^{+}$ $_{i,t}$ | -0.082 | -0.002 | -0.048 |
| | (-0.62) | (-0.01) | (-0.27) |
| Δ*Consumption Index*$^{-}$ $_{i,t}$ | 0.010 | -0.046 | 0.053 |
| | (0.29) | (-0.88) | (1.12) |
| *Intercept* | -0.504* | -0.448 | 0.233 |
| | (-1.86) | (-0.99) | (0.41) |
| Year FE | Yes | Yes | Yes |
| Agency FE | Yes | Yes | Yes |
| Number of Observations | 234 | 118 | 116 |
| R-Square | 0.381 | 0.474 | 0.418 |
| Adjusted R-Square | 0.162 | 0.201 | 0.107 |

Robust t-statistics are presented in parentheses. *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels, respectively. Standard errors are clustered by firm.

**TABLE 8. Alternative Measurement of Public Integrity**

**Panel A. Integrity Survey of Broader Stakeholders (Citizens, Insiders, and Related Institutions)**

| Variables | (1) | (2) | (3) |
|---|---|---|---|
| | | Dep var: $(B_{i,t}-B_{i,t-1})/B_{i,t-1}$ | |
| | Full Sample | High Monitor (MSF + NA) | Low Monitor (MSF + NA) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}$ | 1.991*** | 2.658*** | -0.053 |
| | (4.99) | (4.78) | (-0.06) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}$ | -1.540*** | -2.313*** | 0.993 |
| | (-3.41) | (-3.75) | (1.02) |
| $U_{i,t-1}$ | 0.056** | 0.066 | 0.032 |
| | (2.06) | (1.33) | (0.92) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*Integrity\_Broad_{i,t-1}$ | 1.501*** | 1.913** | -0.028 |
| | (2.72) | (2.31) | (-0.03) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}*Integrity\_Broad_{i,t-1}$ | -1.659*** | -2.036** | 0.042 |
| | (-2.99) | (-2.41) | (0.05) |
| $U_{i,t-1}*Integrity\_Broad_{i,t-1}$ | 0.042 | 0.104 | 0.032 |
| | (1.42) | (1.53) | (1.33) |
| $Integrity\_Broad_{i,t-1}$ | -0.043 | -0.109 | 0.005 |
| | (-1.45) | (-1.56) | (0.21) |
| $\Delta Revenue^{+}_{i,t}$ | 0.002 | -0.004 | 0.003 |
| | (0.38) | (-0.78) | (0.08) |
| $\Delta Revenue\text{-}_{i,t}$ | -0.035 | -0.021 | 0.009 |
| | (-0.90) | (-0.40) | (0.15) |
| $Operational\ Efficiency_{i,t-1}$ | -3.968 | 7.104 | -28.032** |
| | (-0.59) | (0.81) | (-2.00) |

| | | | |
|---|---|---|---|
| *Uncertainty* $_{i,t-1}$ | 3.302** | 2.918 | 4.071 |
| | (2.16) | (1.49) | (1.26) |
| *Log(Employee_Num)*$_{i,t}$ | 0.063* | 0.026 | -0.024 |
| | (1.86) | (0.38) | (-0.33) |
| Δ*National_Revenue*$^{+}{}_{i,t}$ | 0.949** | 1.541** | 0.258 |
| | (2.22) | (2.39) | (0.43) |
| Δ*National_Revenue-* $_{i,t}$ | -0.577 | -0.686 | -0.319 |
| | (-0.32) | (-0.26) | (-0.12) |
| Δ*National_Debt*$^{+}{}_{i,t}$ | 0.062*** | 0.076*** | 0.049 |
| | (3.35) | (2.98) | (1.61) |
| Δ*National_Debt-* $_{i,t}$ | -0.271 | 0.101 | -0.375 |
| | (-1.00) | (0.19) | (-1.37) |
| Δ*Consumption Index*$^{+}{}_{i,t}$ | -0.072 | -0.022 | -0.089 |
| | (-0.58) | (-0.11) | (-0.53) |
| Δ*Consumption Index*$^{-}{}_{i,t}$ | 0.008 | -0.039 | 0.060 |
| | (0.24) | (-0.78) | (1.25) |
| Intercept | -0.599** | -0.510 | 0.167 |
| | (-2.32) | (-1.18) | (0.30) |
| | | | |
| Year FE | Yes | Yes | Yes |
| Agency FE | Yes | Yes | Yes |
| N | 234 | 118 | 116 |
| R-Square | 0.414 | 0.504 | 0.507 |
| Adjusted R-Square | 0.206 | 0.247 | 0.243 |

Robust t-statistics are presented in parentheses. *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels, respectively. Standard errors are clustered by firm.

**Panel B. Integrity Survey Grade and Prosecution Indicator**

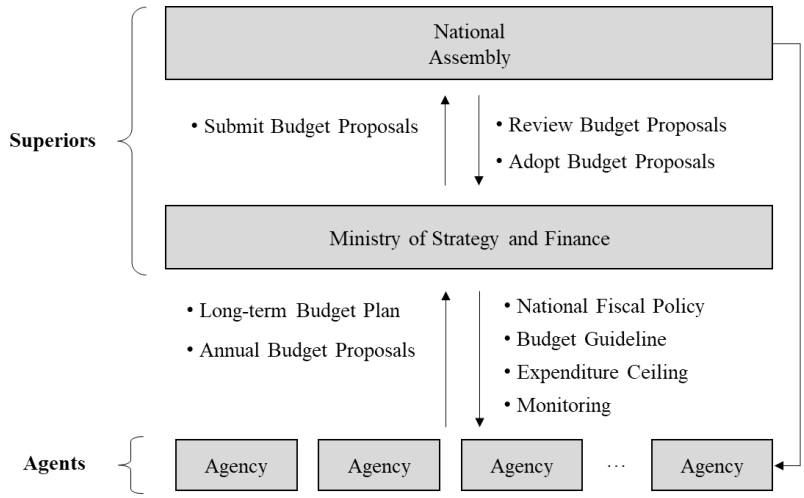
| Variables | (1) | (2) |
|---|---|---|
| | Dep var: $(B_{i,t}-B_{i,t-1})/B_{i,t-1}$ | |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}$ | -1.142 | 2.214*** |
| | (-1.39) | (3.86) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}$ | 1.636** | -1.857*** |
| | (2.05) | (-3.09) |
| $U_{i,t-1}$ | -0.007 | 0.070** |
| | (-0.10) | (2.37) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*Integrity\_Grade_{i,t-1}$ | 1.416*** | |
| | (3.18) | |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}*Integrity\_Grade_{i,t-1}$ | -1.483*** | |
| | (-3.30) | |
| $U_{i,t-1}*Integrity\_Grade_{i,t-1}$ | 0.031 | |
| | (1.02) | |
| $Integrity\_Grade_{i,t-1}$ | -0.042 | |
| | (-1.37) | |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*Prosecution_{i,t-1}$ | | -1.891* |
| | | (-1.66) |
| $(A_{i,t}-B_{i,t-1})/B_{i,t-1}*U_{i,t-1}*Prosecution_{i,t-1}$ | | 2.000* |
| | | (1.74) |
| $U_{i,t-1}*Crime_{i,t-1}$ | | -0.122* |
| | | (-1.72) |
| $Crime_{i,t-1}$ | | 0.104 |
| | | (1.58) |
| $\Delta Revenue^{+}{}_{i,t}$ | 0.001 | 0.001 |
| | (0.22) | (0.14) |
| $\Delta Revenue\text{-}_{i,t}$ | -0.039 | -0.041 |
| | (-0.99) | (-1.12) |
| $Operational\ Efficiency_{i,t-1}$ | -2.987 | -2.939 |
| | (-0.47) | (-0.46) |
| $Uncertainty_{i,t-1}$ | 3.062* | 3.046* |
| | (1.95) | (1.95) |
| $Log(Employee\_Num)_{i,t}$ | 0.060* | 0.062* |
| | (1.68) | (1.77) |
| $\Delta National\_Revenue^{+}{}_{i,t}$ | 1.064** | 1.091** |
| | (2.49) | (2.47) |
| $\Delta National\_Revenue\text{-}_{i,t}$ | -0.636 | -1.038 |
| | (-0.34) | (-0.56) |
| $\Delta National\_Debt^{+}{}_{i,t}$ | 0.064*** | 0.065*** |
| | (3.42) | (3.40) |
| $\Delta National\_Debt\text{-}_{i,t}$ | -0.311 | -0.274 |
| | (-1.18) | (-1.00) |
| $\Delta Consumption\ Index^{+}{}_{i,t}$ | -0.094 | -0.074 |

| | | |
|---|---|---|
| | (-0.76) | (-0.57) |
| $\Delta$*Consumption Index*$^{-}_{i,t}$ | 0.006 | -0.003 |
| | (0.19) | (-0.09) |
| *Intercept* | -0.498* | -0.607** |
| | (-1.77) | (-2.25) |
| | | |
| Year FE | Yes | Yes |
| Agency FE | Yes | Yes |
| Number of Observations | 234 | 234 |
| R-Square | 0.412 | 0.402 |
| Adjusted R-Square | 0.204 | 0.190 |

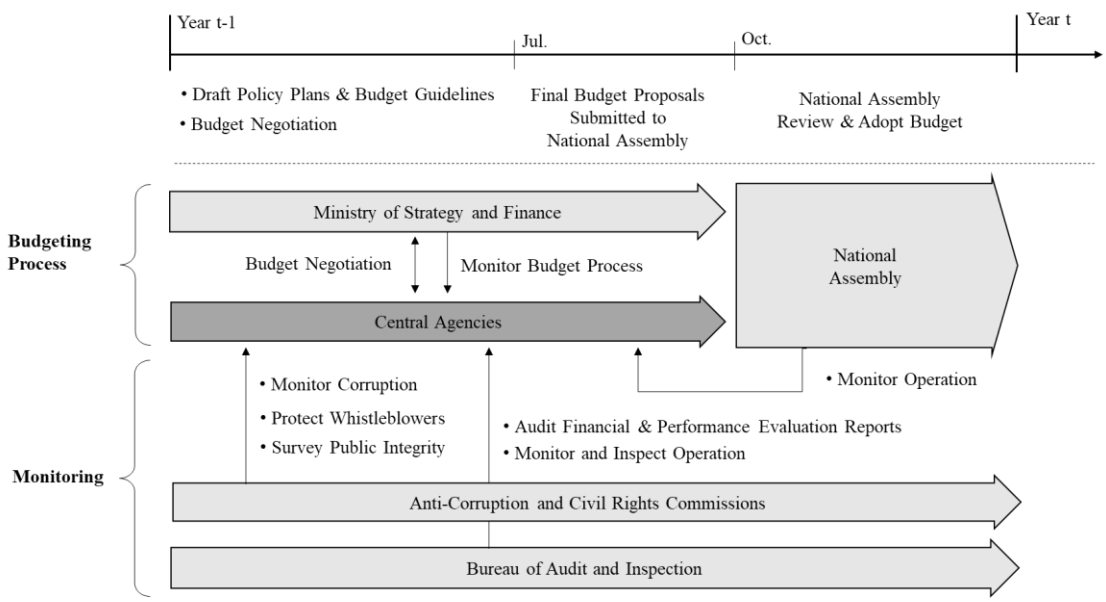
Robust t-statistics are presented in parentheses. *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels, respectively. Standard errors are clustered by firm.

# Appendix A
# Budgeting Process of Central Government in Korea

## Panel A. Main Actors of Government Budgeting and Their Role




## Panel B. Budgeting and Monitoring Process



**Appendix B**
**Summary of Audited Performance Evaluation Report by National Audit Office for FY2018**

| Agency | Strategic Goal | Program Goal | Performance Indicators | Performance Achievement | | |
|---|---|---|---|---|---|---|
| | | | | Achieved | Not Achieved | Achievement Rate |
| Ministry of Strategy and Finance | 4 | 13 | 14 | 13 | 1 | 92.9 |
| Ministry of Education | 4 | 18 | 28 | 22 | 6 | 78.6 |
| Ministry of Science and ICT | 6 | 34 | 50 | 45 | 5 | 90.0 |
| Ministry of Foreign Affairs | 6 | 12 | 25 | 21 | 4 | 84.0 |
| Ministry of National Unification | 2 | 9 | 12 | 9 | 3 | 75.0 |
| Ministry of Justice | 5 | 8 | 13 | 9 | 4 | 69.2 |
| Ministry of National Defense | 5 | 11 | 14 | 9 | 5 | 64.3 |
| Nuclear Safety and Security Commission | 2 | 5 | 7 | 6 | 1 | 85.7 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| **Total** | 181 | 495 | 698 | 541 | 157 | 77.5 |

## Appendix C
## Public Service Integrity Survey

### Panel A. Survey Questionnaires

※ Please answer whether you have provided the following items (money, treat, and favor) during the last one year. Your answers will be used for statistical purpose only and legally protected.

| ■ Corruption Experience | Weight | |
|---|---|---|
| Q1-1. Have you provided money, gift card, invitation ticket, artwork, or present?<br>① Yes ② No | 0.511 | 0.638 |
| Q1-2. Have you provided unduly high lecture fee, consultancy fee, or donation?<br>① Yes ② No | | |
| Q2-1. (If you have provided anything in Q1-1 and Q1-2) How many times did you provide those previously mentioned?<br>① Once ~ ⑧ Over 16 times | | |
| Q2-2. (If you have provided anything in Q1-1 and Q1-2) How much in total did you provide those previously mentioned?<br>① Below 50 dollars ~ ⑩ Over 10,000 dollars | | |
| Q3-1. Have you provided a meal or alcohol over 30 dollars per person?<br>① Yes ② No | | |
| Q3-2. Have you provided entertainment via golf or (domestic or overseas) trip?<br>① Yes ② No | | |
| Q4-1. (If you have provided anything in Q3-1 and Q3-2) How many times did you provide those previously mentioned?<br>① Once ~ ⑧ Over 16 times | | |
| Q4-2. (If you have provided anything in Q3-1 and Q3-2) How much in total did you provide those previously mentioned?<br>① Below 50 dollars ~ ⑩ Over 10,000 dollars | | |
| Q5-1. Have you provided staying or transportation service, sponsorship, or inappropriate business assistance?<br>① Yes ② No | | |
| Q5-2. Have you provided placement service for relatives of relevant public servants or special favor regarding real estate transactions?<br>① Yes ② No | | |
| Q6. (If you have provided anything in Q5-1 and Q5-2) How | | |

| | | |
|---|---|---|
| many times did you provide those previously mentioned?<br>① Once ~ ⑧ Over 16 times<br>Q7-1. (If you answered 'yes' in Q1, Q3, or Q5) When did you provide those previously mentioned? Please choose all relevant answers.<br>① Before process ② During process ③ After process ④ Frequently<br>⑤ Special events (ex. national holidays) ⑥ Personnel transfers ⑦ Etc.<br>Q7-2. (If you answered 'yes' in Q1, Q3, or Q5) Why did you provide those previously mentioned? Please choose all relevant answers.<br>① By public servants' request ② To speed process ③ To obtain private information<br>④ For successful process or reducing penalties ⑤ To express gratitude for successful process<br>⑥ By custom or for networking or greeting ⑦ Etc. | | |
| Q8. Have your acquaintances such as relatives, colleagues, or those in the same business provided money, treat, or favor to public servants or their spouse?<br>① Yes ② No | 0.138 | |
| Q9. Do you think it is likely public servants in charge inappropriately favor some people?<br>① Least likely ~ ⑦ Most likely<br>Q10. Do you think it is likely administrative procedures are affected by regionalism, school relations, and kinship?<br>① Least likely ~ ⑦ Most likely<br>Q11. Do you think public servants in charge make undue request to external partners?<br>① Least likely ~ ⑦ Most likely<br>Q12. Do you think it is likely administrations are unduly processed by the request of related or third parties?<br>① Least likely ~ ⑦ Most likely | 0.351 | |
| **■ Process Transparency and Public Servant Responsibility** | | |
| Q13. Do you think administrative procedure standards are transparently disclosed?<br>① Least likely ~ ⑦ Most likely<br>Q14. Do you think administrative procedure standards are practically appropriate? | 0.552 | 0.362 |

| | |
|---|---|
| ① Least likely ~ ⑦ Most likely | |
| Q15. Do you think it is likely public servants in charge try to be punctual and sufficiently active in their responsibility?<br>① Least likely ~ ⑦ Most likely | 0.448 |
| Q16. Do you think it is likely public servants in charge go beyond their authority in administrative procedure?<br>① Least likely ~ ⑦ Most likely | |
| Weighted Sum = Preliminary Integrity Score | 1.000 |

**Panel B. Measurement of Integrity Index**

| ① **Preliminary Score** | - ② **Detected Corruption** | - ③ **Attempts to Manage Responses** | = ④ **Integrity Score** |
|---|---|---|---|
| Weighted sum of survey items<br>· Corruption Experience<br>· Process Transparency & Public Servants' Responsibility | Detect corruption events (monitoring authority, national audit office, media) | Detect any attempts to inflate survey responses (direct auditing, survey responses) | |

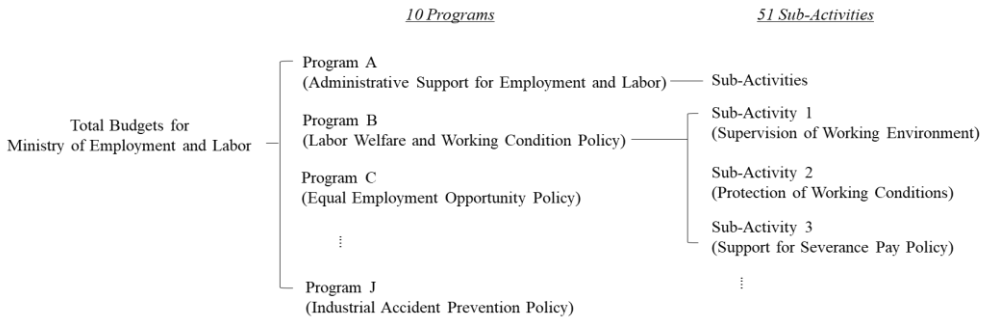
**Panel C. Integrity Index of FY2018**

| Grade | Agency |
|---|---|
| Grade 1 (Highest) | National Statistics Office<br>Saemangeum Development and Investment Agency |
| Grade 2 | Ministry of Patriots and Veterans Affairs<br>Rural Development Administration<br>Cultural Heritage Administration<br>Ministry of Culture, Sports and Tourism<br>Ministry of Foreign Affairs<br>Financial Services Commission<br>Meteorological Administration<br>Ministry of Government Legislation<br>Office of Legislation<br>National Fire Agency<br>Nuclear Safety and Security Commission<br>Ministry of Unification<br>National Agency for Administrative City Construction |
| Grade 3 | Ministry of Employment and Labor<br>Ministry of Science and ICT<br>Korea Customs Service<br>Ministry of National Defense<br>Ministry of Agriculture, Food and Rural Affairs |

| | |
|---|---|
| | Ministry of Justice<br>Ministry of Health and Welfare<br>Korea Forest Service<br>Ministry of Food and Drug Safety<br>Korea Coast Guard<br>Ministry of Public Administration and Security<br>Ministry of Environment<br>Fair Trade Commission<br>Ministry of Strategy and Finance<br>Ministry of Trade, Industry and Energy<br>Ministry of Gender Equality and Family<br>Ministry of Personnel Management<br>Public Procurement Service |
| Grade 4 | National Police Agency<br>Ministry of Land, Infrastructure, and Transport<br>Ministry of Maritime Affairs and Fisheries<br>Ministry of Education<br>Office for Government Policy Coordination<br>Korea Communications Commission<br>Defense Acquisition Program Administration<br>Military Manpower Administration<br>Ministry of SMEs and Startups |
| Grade 5<br>(Lowest) | Korean Intellectual Property Office<br>Public Prosecutors' Office<br>National Tax Service |

## Appendix D. By-Agency-Year Regression of Budget Ratcheting of Program Activities

Panel A. Sub-structure of Program Activities in Ministry of Employment and Labor for FY2018




Panel B. Summary Statistics for By-Agency-Year Regressions

| Variables | N | Mean | Median | p25 | p75 | STD |
|---|---|---|---|---|---|---|
| *(Bi,j,t – Bi,j,t-1 ) / Bi,j,t-1* | 16031 | 0.001 | -0.006 | -0.080 | 0.083 | 0.263 |
| *(Ai,j,t-1 – Bi,j,t-1 ) / Bi,j,t-1* | 16031 | -0.042 | -0.011 | -0.058 | 0.000 | 0.153 |
| *U i,j,t-1* | 16031 | 0.660 | 1.000 | 0.000 | 1.000 | 0.474 |
| *Asymmetric_Ratchet i,t-1* | 266 | 0.124 | 0.000 | 0.000 | 0.000 | 0.330 |

*Unit of observation is activity (j) within agency *i*, in year *t*

Panel C. WLS Estimation Result of By-Agency-Year Regression – Budget Ratcheting of Sub-Activities

| | Dep var: $(B_{i,j,t} - B_{i,j,t-1}) / B_{i,j,t-1}$ | |
|---|---|---|
| | (1) | (2) |
| | Ministry of Strategy and Finance (FY2017) | Ministry of Health and Welfare (FY2014) |
| Variables | Estimate (t-value) | Estimate (t-value) |
| *Intercept* | -0.233*** | 0.030 |
| | (-3.46) | (1.35) |
| $(A_{i,j,t-1} - B_{i,j,t-1}) / B_{i,j,t-1}$ | 2.911*** | 2.953** |
| | (6.81) | (2.35) |
| $U_{i,j,t-1} \times (A_{i,j,t-1} - B_{i,j,t-1}) / B_{i,j,t-1}$ | -3.085*** | -1.714 |
| | (-6.85) | (-0.93) |
| $U_{i,j,t-1}$ | -0.046 | 0.270* |
| | (-0.33) | (1.82) |
| *N* | 43 | 203 |
| *Adjusted R-Squared* | 0.1217 | 0.2447 |
| $Asymmetric\_Ratchet_{i,t}$ | =1 | =0 |

Robust t-statistics are presented in parentheses. *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels, respectively. I estimate by-agency-year budget ratcheting regression with agency-activity-year budgets where there are at least 15 observations per agency-year. This reduces the sample to 266 agency-year observations.

# 국문초록

## 조직 관리통제시스템에 관한 연구

본 학위논문은 조직의 관리통제시스템에 관한 두 개의 독립적인 논문으로 구성된다. 첫 번째 논문은 기업이 최고경영자에게 부여하는 주식보상의 성과-보상민감도가 유사기업의 최고경영자들의 성과-보상민감도에 수렴하는지 검증한다. 미국의 S&P 1500 기업의 2006-2018년 기간동안의 자료를 사용하여 분석한 결과, 기업들이 최고경영자에게 새로운 주식보상을 부여할 때, 동종산업 내 유사규모 기업들의 평균적인 성과-보상민감도를 벤치마킹하는 것으로 나타났다. 경영환경의 변화와 외생적 충격 때문에 미래의 최적 성과-보상 민감도를 결정함에 있어 기업 내부정보가 불충분한 경우, 유사기업에 대한 성과-보상 민감도 수렴현상이 더욱 두드러졌다. 더욱이, 기업과 유사기업들 간에 영업규모, 수익성, 주가위험의 특성이 비슷할수록 수렴현상이 두드러졌다. 본 연구결과는 이사회가 유사기업의 성과-보상민감도 결정이 드러내는 최적 성과-보상 민감도에 대한 정보를 활용하여 효율적인 인센티브 설계를 도모한다는 주장을 지지한다.

두 번째 논문은 정부조직의 청렴도 수준이 정부 예산설정에 미치는 효과를 분석한다. 정부예산은 과거 지출에 연동되어 높아지는 톱니바퀴 현상을 통해 설정되는데, 초과 지출 이후에 차기 예산이 높아지는 정도에 비해 과소 지출 이후에 차기 예산이 삭감되는 정도가 작은, 비대칭적 톱니바퀴 현상으로 인해 예산규모가 점점 커지는 경향이 있다. 한국 중앙관서의 2011-2018년 자료를 사용하여 분석한 결과, 관서의 청렴도가 높을수록 비대칭적 톱니바퀴 현상이 강화되어 예산이 커지는 경향을 보였다. 이는 예산극대화를 꾀하는 관료 이기주의가 예산증가를 초래했다고 본 통상적 시각과는 달리, 예산을 낭비할 가능성이 적은 청렴한 관서에 더 많은 예산을 할당한다는 발견이다. 즉, 재정당국 및 의회는 청렴도 수준에 기반하여 청렴한 관서와 부패한 관서를 분류하고, 청렴한 (부패한) 관서에 많은 (적은) 예산을 할당하여 예산의 효율적인 분배를 도모하는 분리균형을 추구한다는 것을 암시한다. 더욱이, 청렴한 관서 중에서도 재정당국 및 의회에 의한 모니터링이 효과적으로 이루어지는 관서에 대하여 비대칭적 톱니바퀴 현상이 두드러지는 것을 발견하였다. 이는 모니터링이 주인-대리인 간의 정보비대칭을 감소시켜 청렴도 수준에 의한 분리계약의 효익을 높인다는 것을 시사한다. 본 연구결과는 청렴한 조직문화가 주인-대리인 간의 상호호혜적인 계약을 촉진하여 예산분배 효율성과 조직성과를

향상시킨다는 것을 보여준다.

**주요어**: 주식보상; 성과-보상 민감도; 보상 벤치마킹; 유사기업; 예산 톱니바퀴 현상; 비대칭적 톱니바퀴 현상; 정부조직; 청렴도; 모니터링

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