경영학 박사학위논문

Essays on Weight Allocation across Multiple Tasks

다중 과업에 대한 가중치 배분에 관한 연구

2017 년 8 월

서울대학교 대학원

경영학과 경영학 전공

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Abstract

Essays on Weight Allocation across Multiple Tasks

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This thesis is comprised of two essays on weight allocation in performance evaluation. Since weights significantly affect an agent's effort allocation across multiple tasks, understanding how weights are allocated is critical in performance evaluation.

The first essay investigates how an agent's incentive affects weight allocation decisions across multiple tasks. Agents attempt to induce the contract terms to be favorable to themselves. Weight is one of significant contract terms that affect agents' reward; thus, agents have incentive to influence the weights to be allocated in their favor. Past performance provides a signal for future performance; tasks with better prior performance have a higher probability of generating higher outcomes in the future. Hence, agents likely induce rater more weights to be placed on tasks with higher prior performance than on tasks with lower prior performance. Using

valuable performance evaluation data for the Korean Stated-Owned Enterprises (SOEs), I find results consistent with my prediction and a positive relationship between prior performance and weights is only observed in objective measures. In addition, I find that the positive relationship is more pronounced when agents' incentives are salient; when a CEO has post career concern and when a CEO has less probability of being dismissed. Prior studies mainly focus on how to allocate weights to enhance effectiveness of performance evaluation or whether raters' cognitive limitation distorts weight allocation. However, I provide new insight that agents' incentives to have favorable contract terms distort weight allocation.

The second essay examines how the relative weights of subjective and objective measures are determined. Subjective measures are incorporated in performance evaluation in order to complement objective measures. Hence, the relative weight of subjective measures may be greater when objective measures inadequately account for agents' contribution to an organization. My empirical finding show that the relative weight of subjective measures is greater in long-term oriented tasks than in short-term oriented tasks. The long-term oriented tasks need agents' comprehensive and adaptive behavior that cannot be adequately captured by objective measures; thus, the weight of subjective measures relative to objective measures increases with tasks' long-term orientation. In addition, I find that the relative weight of subjective measures increases as the number of objective measures decreases. The more number of objective measures, the

more information about multidimensional agents' actions; thus, the negative relation between the relative weight of subjective measures and the number of objective measures provides evidence that the relative weights of subjective and objective measures are determined in a way to enhance effectiveness of the performance evaluation system.

Keywords: Weight Allocation, Agent Incentive, Objective Measures, Subjective Measures, Relative Weight, Informativeness, Goal Congruence

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Essay 2. Relative Weights on Subjective and Objective Measures in Performance Evaluation

Essay 1

Agent's Incentive and Performance Measure Weight Allocation

1. Introduction

This paper investigates whether and how an agent's incentive affects weight allocation decisions across multiple tasks.[1] Agents induce the contract term to be favorable to themselves, for example, to set an easy target (Anderson et al. 2010; Abernethy et al. 2015). This is because favorable contract terms increase the probability of receiving a higher performance evaluation and reward. The main contract terms comprise measure, target and weight. Prior literature, however, remains silent on the impact of agents' incentives on the weight allocation. Thus, I examine whether and how agents induce the weight allocation to be made in their favor.

Holmstrom and Milgrom (1991) suggest that agents' actions desirable to an organization are multidimensional; thus, performance evaluation systems should use multiple measures. How to distribute weight to various measures, however, is a critical issue in the performance evaluation system, since inappropriately allocated weights distort the optimal distribution of agents' efforts across multiple tasks. Analytic studies argue that the optimal weight distribution depends on goal congruence and the informativeness of performance measures (Banker and Datar 1989; Feltham and Xie 1994; Datar et al. 2001).

However, empirical studies show that weights are not allocated in an optimal way due to the raters' cognitive limitations (Lipe and Salterio 2000; Krishnan et al. 2005; Dai et al. 2016). The distorted allocation of weights can also

[1] In this paper, agents are ratees or subordinates, while principals are raters or superiors.

be explained from the ratees' perspective because ratees could influence the weight determination process in their favor. Agents influence the principal to have favorable contract terms; for example, they attempt to set an easily achievable target (Carter et al. 2009; Anderson et al. 2010; Abernethy et al. 2015). Weights on multiple measures affect agents' performance and reward, which consequently creates an incentive for agents to exert influence over the weight allocation process in their favor. Then, how do ratees influence the allocation of weight in their favor?

Past performance could provide a signal for future performance; tasks with better prior performances have a higher probability of generating higher outcomes in the future (Banker and Hwang 2008; Banker et al. 2012). Hence, ratees likely have an incentive to persuade raters to put more weight on tasks with better prior performance than on measures with lower prior performance. I predict that more weight is placed on tasks with higher prior performance.

I use the performance evaluation data of Korean Stated-Owned Enterprises (hereafter, SOEs), where weights are explicitly determined *ex ante*. Raters in an appraisal committee lack SOE-specific knowledge and therefore heavily rely on SOEs when making decisions in my research site. In addition, raters make the weight allocation decision without information about prior performances while SOEs, by nature, have information about their prior performance. This causes SOEs to more easily set the weight allocation in their favor, utilizing information regarding prior performance. The weights are initially assigned based on the formula and then adjusted reflecting SOE's opinion. Since SOEs can influence the weighting decision in the weight adjustment stage, I specifically develop my

hypothesis that the weights on a task with higher prior performance are adjusted upward. Empirical results show the positive relationship between prior performance and weight adjustment, consistent with my hypothesis.

In addition, I find that the positive relationship between prior performance and weight adjustment is only observed in the objective measure category. From the ratees' perspective, performance evaluation results for the subjective category are difficult to anticipate *ex ante*. Hence, ratees lack conviction that they can obtain a higher performance rating even for subjective measures that were highly rated in the prior year. Hence, ratees have less incentive to *ex ante* influence the weight allocation for the subjective category. Thus, this finding provides more convincing evidence that such upward adjustment is driven by ratees' incentives.

I further examine whether agents' influence on the weighting decision is more pronounced in a setting where ratees' incentives are more salient. CEOs with post-career concerns attempt to obtain a higher performance evaluation at incumbent organizations in order to give a signal about their capability; thus, they have greater incentives to exert more influence on the weighting decision. Consistent with my prediction, I find the upward weight adjustment on tasks with a higher prior performance to be more pronounced when CEOs have greater post-career concerns. In addition, I incorporate the regime change into my analysis. Since CEOs of SOEs in Korea are replaced with the regime change, they have no incentive to manipulate the contract term in their favor when the regime changes. Empirical results show that the positive relationship between prior performance and weight adjustment is not observed when the regime changes.

This paper contributes to the literature in several ways. First, this paper introduces agents' incentives for explaining the distorted allocation of weights while prior studies have mainly focused on principals in the weighting decision process and have introduced a psychological framework for explaining the distortion in the weighting decision. I show that agents' incentives lead them to influence the weighting decision in their favor rather than to achieve the optimal weighting.

Second, I add new evidence that agents manipulate the contract design in their favor through influencing the weight allocation decision. Prior literature on contract design has mainly focused on measure selection and target setting as mechanisms through agents projecting their private incentive onto the contract. However, I additionally find another mechanism, the weight allocation decision.

Third, this paper adds empirical analysis on the explicit weighting decision while most empirical studies adopt an experimental method and focus on a subjective weighting decision. I use explicit weight data from the Korean SOEs' performance evaluation and analyze how *explicit* weight is allocated. Hence, I contribute to the literature on weight allocation by studying the less explored area of the weighting decision.

The rest of the paper is organized as follows: Section 2 describes the research site; Section 3 reviews the related prior literature and develops hypotheses; Section 4 provides the research design; Sections 5 and 6 present the results of the main analysis and additional analyses, respectively; and the final section provides a summary of this study and concluding remarks.

2. Research Setting

2.1. Overview of performance evaluation systems in Korean SOEs

The Korean government enacted the Law for Management of SOEs that introduced a performance evaluation system for SOEs in 1984. Due to the growing Korean economy in the mid-1980s, the government's direct control over the SOE management became less effective. Thus, the government allows SOEs autonomy in their management in order to improve management efficiency and public service quality; however, it imposes responsibility for their management performance. The government established the system where performances of SOEs are evaluated on an annual basis. The results of performance evaluation are used to determine SOEs' bonus sizes, ranging from 200% to 500% of annual salaries. The government also utilizes the performance evaluation results to award prizes to well-performing SOEs or to dismiss CEOs of SOEs. Overall, the monetary and non-monetary rewards for SOEs and CEOs largely depend on the performance evaluation results.

Table 1 presents an example of performance evaluation results for the Korea Electric Power Corporation (KEPCO) in 2013.[2] Performances of SOEs are evaluated based on various measures under three categories: Overall Management, Business Efficiency and Main Business. The Main Business category includes performance measures used only for a specific individual SOE, while the overall

[2] Korea Electric Power Corporation (KEPCO) is a monopolistic supplier of electricity in Korea.

management and business efficiency measures are commonly used to evaluate all SOEs. Hence, the Main Business is referred to as a unique dimension, while the other two categories are referred to as a common dimension.

In addition, performance measures are categorized into two groups: objective measures and subjective measures. The performance of objective measures is rated depending on an actual output relative to a target. In contrast, subjective measures are used for evaluating less-quantifiable agents' actions; thus, the performance evaluation of those measures relies entirely on the raters' subjective judgment. *Score* in the eighth column of Table 1 indicates the performance rating score of individual measures, which range from zero to one.

[INSERT TABLE 1 ABOUT HERE]

The weight on an individual measure in the sixth column indicates how much performance evaluation slants toward an individual measure and adds up to 100 points each year for an SOE. Finally, *ScoreRate* in the last column is computed as the product of *Weight* and *Score*. For example, "Effort for Stable Supply of Electricity Power," a subjective KEPCO-specific measure, has *Weight* of 6 and *Score* of 0.60, resulting in a *ScoreRate* of 3.60.

2.2. Appraisal committee and timeline of the performance evaluation process

The Ministry of Strategy and Finance (hereafter MOSF, equivalent to the U.S. Department of the Treasury) composes the appraisal committee anew every year. The appraisal committee consists of private sector professionals (such as professors, researchers, certified public accountants and business consultants) who have no affiliation with the SOEs.[3] Raters in the appraisal committee are assigned to individual SOEs but evaluate different SOEs every year during their tenure; thus, raters have little opportunity to accumulate knowledge about specific SOEs during their tenure.

[INSERT FIGURE 1 HERE]

A timeline of the performance evaluation process is as follows. At first, in November and December of the year *t*, the appraisal committee determines *ex ante* design of the performance evaluation for the year *t+1*, which measure to choose for the performance evaluation, the target of selected objective measures and the weights on selected measures. Then, after year *t* ends, SOEs prepare annual reports that include actual output of objective measures and describe how they contribute to the subjective measures in year *t*. These reports must be submitted to the appraisal committee by March of the subsequent year *t+1*. Then, raters give *Score*

[3] In our setting, the appraisal committee is newly composed every year, but each member can be appointed consecutively for several years.

to each individual measure, referring to the performance reports and interview with SOEs' staff. Finally, the appraisal committee ranks SOEs according to the aggregate *ScoreRate* of an individual SOE.[4] The performance evaluation is finalized in June of the subsequent year $t+1$.

According to the timeline of the SOE performance evaluation in Figure 1, weights for the year $t+1$ are allocated before the performance rating process for the year t begins; therefore, raters conduct the weight allocation decision without information about prior performances. SOEs also do not have complete information about prior performances since the weight allocation for the year $t+1$ is made before year t ends. However, SOEs, by nature, have more information about their performance in year t than raters. SOEs can estimate their performances more accurately than raters. Consequently, information about the prior performance in my research site can be conceptualized as a continuum between (a) information available only to agents and (b) information available to both agents and principals, but more close to (a). As a result, at the weight allocation stage, there exists information asymmetry about the prior performance between raters and SOEs.

2.3. Weight allocation procedure

Weights are allocated in the following order. First, they are allocated across three different categories: Overall Management, Business Efficiency and Main

[4] One of six grades (i.e., S, A, B, C, D and E) is assigned to an SOE; S is the top rank, while E is the lowest rank. Bonus size and CEO turnover are determined according to the rank.

Business. Then, assigned weights in each category are allocated across objective and subjective measure categories and then allocated across multiple tasks.

[INSERT FIGURE 2 HERE]

The weight allocation in Overall Management and Business Efficiency category is unilaterally determined by MOSF. MOSF has sufficient information about measures in two categories since those are common dimensions. Hence, MOSF makes the weighting decision for tasks in common dimension without relying on SOEs' knowledge and information.

However, the weight allocation for tasks in the Main Business category uses a different approach comprising two stages. First, weights are *initially* allocated based on a formula and then adjusted after a discussion between raters and SOEs. MOSF provides the guideline for how to determine the weight of tasks based on a formula at the initial stage: 0.3*task priority + 0.4*budget ratio + 0.3*employee ratio. The guideline documents that the initial weight assignment decision relies on three factors: how important a task is in terms of an SOE's long-term strategy (i.e., task priority), how much of the available budget is used for a task (i.e., budget ratio) and how many employees work for a task (i.e., employee ratio). The guideline, however, is not enforceable. Hence, the formula is not strictly applied when initially allocating weights on tasks. It is applied in the following way: α_1*task priority + α_2*budget ratio + α_3*employee ratio, where the sum of α_1, α_2 and α_3 equals one, but α1, α2 and α3 varies depending on the SOE and year.

Overall, the initial weight allocation depends on three factors, but how each of three factors affects the weight determination varies depending on the SOE and year.

[INSERT FIGURE 3 HERE]

After the formula-based allocation, the weights are adjusted, reflecting the SOEs' voice. As aforementioned, the Main Business category is about SOE-specific tasks. Hence, raters have little knowledge about the Main Business. For example, in Table 1, the "Electricity Power Transmission" task is difficult to understand without the expertise of electricity. Moreover, due to the rotation system, raters have no opportunity to accumulate knowledge about individual SOE-specific tasks. Hence, the Korean SOE performance evaluation system allows raters to reflect SOEs' knowledge when raters make weighting decisions for the Main Business. After the formula-based weight allocation, raters and SOEs discuss it; then, the weight is adjusted to reflect the SOEs' information and opinion. At this weight adjustment stage, SOEs actively raise their voice about the weight allocation and attempt to induce the weight assignment in their favor.

[INSERT TABLE 2 HERE]

Panel A of Table 2 presents the weight allocation across multiple tasks of KEPCO in 2013, while Panel B shows the task priority, budget rationing and

employee ratio of individual tasks. Initially, 50 points are assigned to the Main Business category; then, 26 points are assigned to the objective measure category and 24 points to the subjective measure category. Then, in the objective (subjective) measure category, 9 (6) points of 26 (24) points are allocated to 'Electricity Power Demand and Supply Management,' 7 (6) points to 'Electricity Power Transmission' and 10 (7) points to 'Electricity Power Distribution.' According to Panel B, the 'Electricity Demand and Supply Management' task uses 7% of the total budget and 26% of total employees work on the task, and its priority in terms of long-term strategy is 25%. However, 35% (=9/26) of weight in the objective category is assigned to 'Electricity Power Demand and Supply Management,' whereas 25% (=6/24) of weight in the subjective category is assigned to the same task.

3. Related Literature and Hypothesis Development

3.1. Weight allocation and ratees' incentive

When multiple measures are used in the performance evaluation system, the relative weight allocation across various measures is a critical issue (Hemmer 1996; Ittner and Larcker 1998). This is because the weight allocation affect agents' effort distribution across multiple tasks.

Analytic papers suggest that optimal weights depend on informativeness and goal congruence; how informative signal measures provide about agents' actions and how much measures are aligned with the principal's goal (Banker and

Datar 1989; Feltham and Xie 1994; Datar et al. 2001).[5] However, empirical studies report that the weights are not always determined in an optimal way, and factors other than informativeness and congruity influence the weighting decision (Ittner et al. 1997; Ittner et al. 2003).

Prior empirical studies have suggested that raters' psychological factors primarily drive the weighting decision in a way inconsistent with the optimal weighting allocation. The weighting decision is a cognitively challenging task to managers (Deason et al. 2014). Hence, managers' cognitive limitations hinder them from assigning weights in an optimal way (Krishnan et al. 2005). Lipe and Salterio (2000), in an experimental setting, show that superiors' evaluations about their subordinates' performances ignore unique measures even when superiors have information on both common and unique measures due to their judgmental difficulties in using unique measures. Managers' decisions of performance evaluation is influenced by objective measures more than by subjective measures since managers perceive objective measures to be more scientific and reliable (Dai et al. 2016). Ittner et al. (2003) also show that most weights are placed on financial measures used in *earlier* bonus plans since financial measures have been mainly used in earlier bonus contracts and managers are more familiar with financial measures.[6]

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[5] They suggest that more weights are placed when informativeness and the goal congruence of measures are greater.

[6] Most empirical papers focus on raters' subjective weighting decisions in their experimental setting. In the subjective weighting setting, raters have full discretion *ex post* in allocating weights, which consequently induce raters' subjectivity is involved in the weighting decision. Hence, prior studies mostly use psychology-based explanations for the weighting allocation inconsistent with the optimal weighting.

In addition to raters' psychology, raters' private incentives could also affect the weighting allocation. Agents attempt to influence a principal when a principal's decision affects their own benefit, including both monetary and non-monetary rewards (Milgrom 1988; Milgrom and Roberts 1988; Meyer et al. 1992). For example, subordinates exert significant influence to have easily achievable targets in a participative target setting and to receive a higher rating score in a subjective rating process (Prendergast and Topel 1996; Anderson et al. 2010; Du et al. 2012). In addition, several studies find evidence that CEOs or executives use their power to influence a board's decision about their compensation contract terms in their favor: a measure choice, evaluation method or target level (Carter et al. 2009; Morse et al. 2011; Abernethy et al. 2015). Similarly, Wruck and Jensen (1994) and Ittner and Larcker (1995) document the influence of workers on compensation plan design. Overall, agents attempt to affect the contract terms of the performance evaluation and reward system for their own benefit. Likewise, weights placed on multiple measures also affect subordinates' performance and rewards; therefore, this creates the potential for subordinates to exert influence toward the weight allocation process.

3.2. Weight allocation and prior performance

From an agent's perspective, in a multi-measure setting, it is desirable to obtain a higher rating on measures with larger weights. Given limited effort and time, agents allocate their resources in a way that maximizes their ultimate reward. Hence, agents exert more (less) effort to measures that have relatively higher

(lower) marginal benefit (Dewatripont et al. 2000). Thus, agents put more effort to measures with a higher weight in order to obtain a higher performance rating (Ahn and Kim 2014). However, they can achieve higher rating by inducing higher weights to be placed on measures for which they are able to generate a higher performance. In other words, ratees can exert influence over the superior's weighting decision to slant their performance evaluation more toward favorable measures.

Past performances provide a signal of future performance (Asness 1995). Past performance and accomplishment show greater potential for generating performance for the future period (Banker and Hwang 2008; Banker et al. 2012). Better past performance indicates a higher probability of generating a higher outcome even for the future, reducing *ex ante* uncertainty about the high future performance. Thus, ratees likely have incentive to persuade raters to put more weight on measures with better prior performance.

In my argument, whether the information of prior outcome is available only to agents or to both the principal and agents does not matter. When agents have private information unknown to principals, they can easily manipulate the contract terms and can pursue their own benefit. However, even when agents' information is shared with the principals, agents pursue their private interest through their influencing activity toward the principals. Thus, my argument does not rely on an assumption that prior performance information is ratees' *private* information unavailable to the principal. However, in my research site, prior performance is similar to information available only to ratees, which consequently

causes information asymmetry about prior performances between raters and ratees when the weighting decision is made.[7] Hence, ratees can more easily induce the weight allocation decision in their favor, with more weight on tasks with higher prior performance. In my research site, the weights are initially allocated based on a formula and then adjusted. Hence, ratees influence to put more weight on tasks is reflected only at the adjustment stage. Hence, I develop my first hypothesis as follows:

H1: *Weights on tasks with higher prior performance are adjusted upward.*

3.3. Weight allocation, prior performance and measure characteristics

Hölmstrom (1979) suggests that "any costless performance measures that are informative about agents' actions should be used for an incentive purpose." Agents' actions desirable to an organization are multidimensional, and thus a contract incorporates subjective measures as well as objective measures to capture both agents' quantifiable and less-quantifiable actions toward an organization (Baker et al. 1994; Baiman and Rajan 1995; Hayes and Schaefer 2000). Since subjective measures are introduced for capturing less quantifiable actions, they do not have clear evaluation standards. Performance ratings of subjective measures

[7] Figure 1 shows the timelines of the SOE performance evaluation stages that makes it easier to understand the information asymmetry about prior performance between raters and SOEs.

entirely rely on raters' subjective judgment and thus are difficult for subordinates to anticipate *ex ante* and verify *ex post* (Baker et al. 1994; Murphy and Oyer 2003).

Higher performance ratings of subjective measures do not necessarily indicate that agents highly perform their tasks since raters' subjective judgments entirely determine the score of subjective measures and thus raters' bias could affect the performance rating of subjective measures (Moers 2005; Ahn et al. 2010; Bol 2011; Du et al. 2012). In particular, due to the *ex ante* unpredictability of the subjective rating results, ratees cannot be sure whether they can obtain a high rating score even for measures that were highly rated in the prior year. If subjective measures with higher prior performance are poorly rated in the subsequent year, the *ex ante* upward adjustment of weight for those tasks (i.e., tasks with higher prior performance) would rather reduce overall performance and adversely affect ratees' rewards. Ratees face greater *ex ante* uncertainty about performance results for the subjective measures and thus have less incentive to influence the raters' weight allocation process for the subjective measures. Thus, I develop my second hypothesis as follows:

H2*: Upward weight adjustment on tasks with higher prior performance is more pronounced when tasks are objectively evaluated than when tasks are subjectively evaluated.*

4. Sample and Research Design

4.1. Sample

This study uses the performance evaluation results of 65 Korean SOEs.[8] My research interest in this paper is whether and how weight allocation is influenced by ratees' incentives. As aforementioned in the research setting section, however, there is no chance for SOEs to influence the weighting decision in Overall Management and Business Efficiency categories; weights are unilaterally assigned by raters and MOSF. By contrast, SOEs are actively involved in the weight allocation for the Main Business. Hence, my focus is on the Main Business category.

The policy of formula-based weight allocation began in 2011. Three factor data in 2015, however, are provided on the basis of functional or regional division rather than on the basis of task. Consequently, my sample period is from 2011 to 2014. Data on task priority, budget ratio and employee ratio are not publicly available, but I obtained the data, with confidentiality agreements, from a

[8] MOSF designates SOEs and classifies them into public corporations, quasi-governmental institutions, and non-classified public institutions. Approximately 100 organizations are designated (Article 5 of Act on the Management of Public Institutions). However, my sample includes only two types of SOEs, namely, public corporations and quasi-governmental institutions. Compared with public corporations and quasi-governmental institutions, non-classified public institutions are very small in size and exhibit considerably different characteristics. Accordingly, I exclude non-classified public institutions from the sample.

proprietary source.[9] The final sample comprises 1,155 observations, and I winsorize the top and bottom 1% of all the continuous variables.

4.2. Research design and variables

I introduce an empirical strategy of a two-stage model. I examine whether and how ratees induce the weight allocation decision to be made in their favor. In the Main Business category, however, weights are initially determined based on the formula and then adjusted. SOEs are allowed to participate only in the weight adjustment, not in the formula-based allocation; the formula-based weight determination is beyond the SOEs' influence. Therefore, I need to figure out the adjusted portion of weight in order to capture the impact of SOEs' influence on weight allocation. As aforementioned in the research site section, the formula is applied in the following way: α_1*task priority + α_2*budget ratio + α_3*employee ratio, where α1, α2 and α3 vary depending on the SOEs and year.[10] Thus, in the first stage, I regress actual weights of individual tasks on three factors and then use the residual from the first stage as a dependent variable of my main analysis. The first-stage model is as follows:

$$Weight_{ijot} = \alpha_0 + \beta_1 * Task\_Priority_{ijt} + \beta_2 * Budget\_Ratio_{ijt} + \beta_3 * Employee\_Ratio_{ijt}$$

[9] The performance evaluation results are publicly available from various sources, for example, the website of All Public Information In-One (http://www.alio.go.kr) and the National Assembly Digital Library (http://www.nanet.go.kr).

[10] Even though MOSF recommends the specific formula (i.e., 0.3*task priority + 0.4*budget ratio + 0.3*employee ratio), the formula is not strictly applied. How each of three factors affects the weight determination varies depending on the SOE and year.

$$+ Year\_Dummy + SOE\_Dummy + e_{ijot} \qquad (1)$$

where *i*, *j* and *t* indicate an SOE, an individual task and a year, respectively, and *o* indicates a measure category, an objective measure category or a subjective measure category.[11]

The dependent variable in the first regression, *Weight*, represents actual weights. It is calculated as weights for an individual task *j* of an SOE *i* in year *t* divided by total weights of the Main Business category for an SOE *i* in *t* year. As mentioned in the research setting, weights are first allocated across objective and subjective categories and then allocated across multiple tasks. Thus, I calculate *Weight* separately for the objective and subjective measure categories. For example, in the case of KEPCO in 2013 (in Panel A of Table 2), in the objective category, *Weight* for 'Electricity Power Transmission' is 0.27 (=7/26), and *Weight* for 'Electricity Power Distribution' is 0.38 (=10/26), while weights of the corresponding tasks in the subjective measure category are 0.25 (=6/24) and 0.29 (=7/24), respectively.

Task_Priority is the priority of an individual task in terms of the long-term goal of the SOEs. The higher the task priority of a task, the more important the task is for achieving the long-term goal of the SOEs. *Budget_Ratio* is defined as the

[11] I conduct the first-stage regression analysis for a full sample that includes both objective and subjective measure categories. According to the government guideline, three factors are designed to determine the weights on individual tasks for both the objective and subjective measure categories to the same extent. Hence, I do not estimate the first-stage regression separately for the objective and subjective measure categories. As a robustness check, however, I estimate the first-stage model separately for the objective and subjective measure categories. However, the results of the second stage remain similar.

proportion of an individual task budget to the total budget of an SOE (budget for a task *j*, divided by total budget of an SOE *i* in year *t*) and represents how many financial resources are invested in the task. *Employee_Ratio* is the proportion of the number of employees of an individual task to the total number of employees of an SOE (# of employees for a task *j*, divided by total # of employees of an SOE *i* in year *t*) and shows how many workforces are invested in the task.

The residuals from the first-stage model capture the deviation of actual weights from the formula-based weights and thus represent the extent of the weight adjustment. Thus, I use it as the dependent variable for the main analysis. The main research model is as follows:

$$\begin{aligned} Adj_{ijot} = a_0 &+ \beta_1 * Prior\_Score_{ijot} + \beta_2 * OBJ_{ijot} + \beta_3 * Task\_Age_{ijt} \\ &+ \beta_4 * Num\_Measure_{ijot} + \beta_5 * Rater\_Tenure_{it} + \beta_6 * Ln\_At_{it} \\ &+ Year\_Dummy + SOE\_Dummy + e_{ijt} \qquad (2) \end{aligned}$$

where *i*, *j* and *t* indicate an SOE, an individual task and a year, respectively, and *o* indicates a category of objective and subjective measures.[12]

Prior_Score is a main explanatory variable and represents prior

[12] Some studies on weight allocation interpret weights as a pay slope of contingent pay. Therefore, weights increase as incentive intensity increases or weights decrease as incentive intensity decrease. Thus, weights of all measures can increase or decrease simultaneously. However some studies view weights as percentages adding up to 100% (e.g., 60% of an agent' performance rating or monetary incentive depends on one measure, while 40% is based on another measure). Thus, weights in this stream have a relative concept where weights of all measures cannot simultaneously increase or decrease. This paper is in line with the latter. Thus, weights in this paper mean relative weights. Consequently, upward adjustment of weight on tasks with a higher prior performance indicates downward adjustment of weight on the other tasks.

performance. It is defined as an average of prior years' *Score* of measures within an individual task. Ahn and Kim (2014) find evidence that raters focus more effort on measures with larger weights, which results in higher performances for those measures. Thus, they show a positive impact of weights on performances.[13] Ahn and Kim (2014)'s argument combined with a serial correlation of weights (i.e., the positive correlation between a prior year's weight and a current year's weight) possibly drives spurious correlation between prior performances and weights. Thus, some may raise doubt on the endogeneity problems of my research model. However, the dependent variable of my research model is not the weight level but is the difference between the actual weight and the formula-based weight, i.e., the extent of the weight adjustment. There is no reason to believe that tasks with higher weight can be further adjusted upward. My first hypothesis is that weights for tasks with higher prior performances are adjusted upward. Thus, I expect β_1 is positive.

OBJ is an indicator variable that equals one if an observation is classified into the objective measure category and is zero otherwise. I conduct the main analysis using both the objective and subjective measure categories. However, the features of the objective measures and subjective measures are different. The weight adjustment may appear in a different way between the two measure categories. Thus, I include the *OBJ* variable in order to capture such difference.

Task_Age is the age of an individual task of an SOE. The age is calculated as the number of years that the task has been included in the performance

[13] However, they assume that the weight is exogenously given, and ratees cannot affect the weight allocation process. In addition, they assume that the weight is determined in an optimal way.

evaluation system.[14] Ahn et al. (2014) show that long-aged measures are dropped more since those are, to some extent, outdated and cannot appropriately capture agents' desirable actions in a rapidly changing business environment. A measure-drop means that a zero weight is assigned to the measure. Hence, their findings can be interpreted as that beyond a certain measure age; as a measure age increases, allocated weights decrease and so eventually result in a zero weight. Their argument can also apply to the adjustment of weights on tasks. As the task age increases, weight downward adjustment becomes greater, and, finally, a zero weight is assigned to tasks. Thus, I include *Task_Age* as a control variable.

In this paper, I attempt to argue that the upward weight adjustment for tasks with higher prior performances arises from the SOEs' incentives. However, it may arise from the attempt to avoid a distortion of the weight allocation if the higher prior performance of a task captures factors that optimally determine weight (i.e., congruence and informativeness of a task). Hence, the research model needs to incorporate proxies of congruence and informativeness.

Regarding goal congruence, three factors in the formula represent goal congruence. As mentioned in the research site, the task priority is about how important a task is in terms of the SOEs' long-term goal and thus represents the congruence in terms of the long-term strategy. In addition, the budget ratio and employee ratio are resource inputs into individual tasks and capture how important

[14] In 2007, the Act on the Management of Public Institutions was newly introduced and replaced the Law for Management of SOEs enacted in 1984. Therefore, there was a significant change in the performance evaluation system in 2007; thus, I use the year 2007 as a starting year to calculate an age. Thus, the age of a task introduced before the year 2007 is calculated as shorter than its actual age.

a task is in terms of current operation. Hence, two input ratios represent the congruence in terms of the current operation. Thus, the formula-based weights are determined depending on the congruence of a task. Hence, my research model already incorporates the goal congruence since the dependent variable is the weight deviation from the formula-based weight.

However, it is difficult to incorporate the informativeness in the research model due to measurement difficulty. Of prior empirical studies on the compensation contract, some studies using archival data use volatility of historical performances (such as earnings and stock returns) to capture precision of performance measures; less volatility of historical performances is interpreted as more informativeness. However, such measurement strategy applies only to measures that have sufficient historical observations. The average age of measures in my research site is slightly greater than 3 years since I restrict my sample to the unique dimension. Thus, the measurement strategy of prior studies is not suitable for my setting. Moreover, there may exist doubt about whether the prior studies' methods of measuring the informativeness are meaningful in terms of subjective measure category since the performance rating of the subjective measures relies entirely on the raters' judgment.

Hence, in an attempt to control for the informativeness, I include Num_Measure, which is defined as the number of measures within an individual task of an SOE. Gibbs et al. (2004) argue that a single measure or fewer numbers of performance measures cannot incorporate all information about agents' contributions since agents' actions desirable to organizations are multi-dimensional.

Hence, they argue that the more measures a compensation contract has, the more informative and the more complete the contract is. Relying on their argument, I use Num_Measure as the proxy of informativeness. Prior_Score and Num_Measure are calculated separately for the objective and subjective measure categories.

In addition, it is possible that raters affect the weight adjustment. Raters can accumulate knowledge of performance evaluation systems and SOEs' behaviors during their tenure even though they cannot accumulate SOE-specific knowledge due to the rotation system.[15] Hence, their weighting decision likely change as their tenure increases. In an attempt to control for this effect, I include raters' tenure, *Rater_Tenure*, which is defined as the average tenure of raters of an SOE.[16] Since three or four raters are assigned to one SOE, I use the average tenure of raters in an SOE. The tenure of individual raters is defined as the number of years that a rater has worked as a rater in the appraisal committee.

To control for the effect of a firm size, I include a variable of an asset size, *Ln_AT*, that is calculated as the natural logarithm of total assets. Finally, I include year and SOE fixed effects in order to control for the potential impact of the observable and unobservable factors of year and SOE (*Year_Dummy* and *SOE_dummy*). In all regression specifications, I adjust the standard errors by task clusters to correct for heteroscedasticity and serial dependence (Rogers 1987). For

[15] Raters evaluate different SOEs every year during their tenure due to the rater-rotation system.

[16] Tenures of raters assigned to one SOE are all different. If raters with longer tenure share their knowledge about the system with other raters in the same SOE, the longest tenure of raters within an SOE would be a better proxy for rater characteristics than the average tenure of raters. Thus, as a robustness check, I use the longest tenure of raters in an SOE, but the main results remain unchanged.

the second hypothesis, I estimate Equation (1) separately for the objective and subjective measure categories, and I expect that β_1 for the objective measure category becomes more significant than for the subjective measure category.

5. Empirical Results

5.1. Descriptive statistics

Table 3 presents the descriptive statistics of the variables. Panels A and B show those for the full sample and for the subsamples of the objective and subjective measure categories, respectively. For the full sample, *Weight* is, on average, 0.272. However, the average value of *Weight* for the objective category is 0.286, while it is 0.257 for the subjective category. Moreover, a standard deviation of *Weight* is greater for the objective category than for the subjective category (0.136 for the objective category vs. 0.101 for the subjective category). Hence, the objective measure category shows more variation of *Weight* across multiple tasks than the subjective measure category does.

Adj, which is a residual from the first-stage model and represents the weight adjustment, has the average value of zero. Since the weight is relative in my setting, the upward weight adjustment for one task implies the downward adjustment for the other tasks. Hence, the average value of *Adj* is zero. In addition, a standard deviation of *Adj* is greater for the objective category than for the subjective category (0.074 for the objective category vs. 0.050 for the subjective category). The weight adjustment is more volatile in the objective measure

category than in the subjective measure category. *Prior_Score* also shows distinct differences between the two groups: the mean value is 0.962 for the objective category and 0.739 for the subjective category. The objective category in an individual task has a higher prior performance than the subjective category.

[INSERT TABLE 3 HERE]

[INSERT TABLE 4 HERE]

5.2. Empirical results for hypotheses

Table 5 presents the results from the regression analysis for the relationship between prior performances and weight adjustment. I estimate Equation (2) for the full sample including both the objective category and the subjective category. The coefficient on *Prior_Score* is positive and statistically significant. It implies that the weight of a task with a higher prior performance is adjusted upward compared to the formula-based weight.

The performance evaluation design that slants toward tasks that can continuously obtain higher score in the future imposes relatively low uncertainty about higher future performance on SOEs. In the unique research setting where SOEs have influential power over the weighting decision and information about the prior performance is available only to SOEs, SOEs can easily induce the weighting decision to be made in their favor. Thus, the upward weight adjustment for tasks with higher prior performance can be interpreted as a result of SOEs' influence over the weighting decision for their benefit.

In addition, the research model controls for the congruity and the informativeness of tasks; three factors related to the congruence (i.e., task priority, budget ration and employee ratio) and *Num_Measure*. Thus, the significantly positive coefficient on *Prior_Score*, after controlling for congruence and informativeness, implies that the positive relationship is not driven by the optimal weighting decision. Hence, this supports my arguments that SOE's incentive induces upward weight adjustment to be made for tasks with a higher prior performance.

The coefficient of *OBJ* is significantly negative. This implies that the upward adjustment of weights in the objective measure category is less than that in the subjective measure category or that weights in the objective measure category are adjusted downward while weights in the subjective measure category are adjusted upward.[17]

Objective measure performances are easy for ratees to manipulate; for example, agents tend to manipulate earnings to meet their target earnings or improve quantity at the expense of quality (Lazear 1986; Murphy and Oyer 2003). From the principal's perspective, objective measures cause agents' gaming behavior (Murphy and Oyer 2003); consequently, the principal likely has incentive to make objective measures less influential in the performance evaluation system, to some extent.

Hence, from the principal's perspective, it is not desirable to place more weight on objective measures than weight that was supposed to be (i.e., formula-

[17] The negative coefficient on *OBJ* appears after controlling for prior performance of a task.

based weight). Thus, the negative coefficient on *OBJ* represents the principal's intent to adjust weight on objective measures downward or make less upward adjustment of weight on objective measures compared to upward adjustment of weight on subjective measures.[18] In my research site, raters are not the principal; they represent the system designer, MOSF. Hence, this result can be interpreted as MOSF's attempt to make the performance evaluation system more effective.

Num_Measure, defined as the number of measures within a task, shows a significantly positive coefficient, indicating that the weights are adjusted upward on tasks with greater informativeness.

[INSERT TABLE 5 HERE]

For the H2, I separately conduct the subsample analysis, the objective category and the subjective category. The coefficient on *Prior_Score* is significantly positive in the objective category but statistically insignificant in the subjective category, indicating that the upward adjustment of weight on tasks with higher prior performance is observed only in the objective category. Ratees cannot be sure whether they can obtain a higher score for subjective measures with a higher prior performance since the performance rating of subjective measures solely depends on raters' judgment. Therefore, ratees have less incentive to influence raters' weight allocation even for the subjective measures that were

[18] From ratees' perspective, however, it is the opposite; ratees would prefer to place more weight on objective measures than benchmark weight since they can manipulate objective measure performance.

highly rated in the prior year.[19]

Consequently, this finding that the upward adjustment of weight for tasks with a higher prior performance is observed in the objective measure category provides convincing evidence that ratees' incentives drive distortion of weight allocation.

My argument assumes that tasks with a higher prior performance can continuously generate higher performance in the future. To support the assumption, I compare the persistence of the performance scores between the objective and subjective measures. In my research site, however, the average age of measures is slightly above three years. Therefore, I calculate the standard deviation of the performance score for the previous three years and use the inverse of the standard deviation as the proxy for persistence. The persistence of the performance score in the objective measure category is higher than that in the subjective measure category; 1/0.046 in the objective category and 1/0.060 in the subjective category. The difference is statistically significant with t-value of 3.26. This result empirically supports that a higher prior performance can be a signal for a higher higher performance in the future.

[INSERT TABLE 6 HERE]

[19] In terms of subjective measures, ratees' influences over raters' rating decisions likely reduce the uncertainty about higher future performances more than the influence over the weighting decision. Hence, with regard to subjective measures, ratees likely influence raters' *ex post* performance rating for the measures with greater weights rater than induce more weights to be placed on measures with a higher prior performance.

6. Additional Analysis

6.1. CEO post career concern

As an additional test, I examine whether the upward weight adjustment on tasks with a higher prior performance is more pronounced in a setting where ratees' incentive is more salient. Since CEO pilot firms and play a critical role in implementing firms' strategy, firms' performance is largely attributed to CEOs. Reward to CEOs depends on firm performance. Hence, CEOs' incentives are in line with SOEs' incentives.

First, I incorporate a CEO post-career concern argument into my analysis. If CEOs have post-career concerns, they want to be seen as capable in an external labor market (Gibbons and Murphy 1992). The labor market perceives good performance of a firm to be attributed to CEOs' high capabilities. Consequently, CEOs attempt to achieve good performance at an incumbent organization. In Korea, the press spotlights CEOs of SOEs with excellent performance, and those CEOs are awarded by the Korean government for their excellent management. Based on such perceived high ability and greater visibility, those CEOs often obtain jobs at other larger SOEs, become members of the cabinet or run for election to the National Assembly after leaving SOEs. Hence, CEOs of SOEs attempt to obtain good performance score at an incumbent SOEs for their post career.

Prior literature on post-career concerns suggests that CEOs who are close to retirement have less post-career concerns since they have little probability of being externally hired after leaving their firm (Gibbons and Murphy 1992).

Younger CEOs, however, have a longer remaining career horizon, which generates greater post-career concerns. Hence, they are motivated to create good performance at an incumbent organization.[20] Thus, I expect that those different types of CEOs in terms of post-career concerns show different behaviors during the weight allocation process. It is likely that CEOs having longer remaining career horizons have stronger incentives to obtain good performance than CEOs near retirement and thus exert more influence for raters to make the upward weight adjustment on tasks with higher prior performances.

[INSERT TABLE 7 HERE]

Gibbons and Murphy (1992) use 64 years old as the cutoff level for distinguishing CEOs with greater and less career concerns, assuming that most of them retire at age 65. However, the oldest CEOs of SOEs are 74 years old, and one-fourth of CEOs in my sample are over 65 years old, meaning that there is the opportunity to obtain a job even after 65 years of age. Hence, the subsample analysis using 64 years old as the cutoff level seems not suitable in my research site. Hence, I conduct a full-sample analysis, including the interaction term of *Prior_Score* and *CEO_Age* and the stand-alone term *CEO_Age*. In Table 7, the coefficient on the interaction term of *Prior_Score* and *CEO_Age* is significantly

[20] In addition, the prior literature on post-career concerns also provides evidence that agents with post-career concerns show different behaviors from those without it as well as different acquisition behaviors of CEOs and different forecasting behaviors of analysts (Hong et al. 2000; Yim 2013).

negative, implying that the upward weight adjustment on tasks with a higher prior performance is less pronounced for older CEOs.

6.2. Regime change and CEO turnover

In addition, I incorporate regime change into my argument. CEOs appointed by the former president may not share the values of the current administration, which in turn makes them less likely to implement the policies of the new president (Ahn et al. 2016). Hence, a newly elected president generally forces incumbent CEOs appointed by a former president to resign, regardless of the CEOs' remaining tenure and performance. Under these circumstances, CEOs anticipate that they will be replaced when a regime changes.[21] Hence, it is likely that CEOs have less incentive to manipulate the performance evaluation in their favor since they would be replaced with high likelihood; they would not exert influence to adjust the weight on tasks with higher prior performance to be upward when the regime changes.

[INSERT TABLE 8 HERE]

During my sample period, in December of 2012, the new president was elected, and she took over the presidential office in February of 2013. Thus, CEOs

[21] Since 1985, when the performance evaluation system for SOEs was introduced, CEO turnover rate has been significantly higher in the first year of a presidential term than in other years; the probability for CEOs to be replaced in the first year of the presidential term is 58%, while that in other years is below 35%.

knew that they would be replaced in the subsequent year when the weight allocation decision was made for the year 2013. Hence, it is likely that CEOs exert no influence on the weight allocation decision for the year 2013; thus, the upward weight adjustment for tasks with higher prior performance would not be observed for the year 2013.[22] Hence, I classify the year 2013 as the regime change year and the other years as no_regime change year; then, the research models for those two subsamples were estimated separately. Table 8 shows that the upward weight adjustment on tasks with a higher prior performance is observed only in no_regime change year, consistent with my prediction. Overall, Tables 7 and 8 show evidence that the upward weight adjustment on tasks with a higher prior performance is more clearly observed when CEOs' incentives are more salient.

Regardless of CEOs' incentives, there may exist SOEs' incentives to manipulate the weight allocation in their favor. In an attempt to find a proxy for SOEs' incentive to influence the weight allocation, I incorporate the final grade of SOEs. At the final stage of the SOE performance evaluation, one of six grades (i.e., S, A, B, C, D and E) is finally assigned to an SOE according to aggregate *ScoreRate*. SOEs whose final grade is below B (i.e., C, D and E) are perceived as low performers and receive pressure to improve their grade. Hence, those SOEs with a below-B grade in the prior year have more incentive to obtain a higher score,

[22] Korea has a five-year, single-term system for the president. Hence, when the weighting decision for the year 2013 was being processed in November and December of 2012, CEOs of SOEs knew that the regime would change in February 2013. Therefore, they would not exert influence on the weight allocation process.

which consequently results in SOEs' stronger influence to adjust upward the weights on tasks with a higher prior performance.

However, in a subsample analysis with one group with the top three ranks (S, A and B) and the other group with the lowest three ranks (C, D and E), I do not find any significant difference. However, this result does not necessarily mean that SOEs' incentives do not affect weight allocation. It is possible that the measurement error of the SOEs' incentive drives the insignificant result. Hence, I leave this issue (i.e., the effect of SOEs' incentive) for an additional test in the future.

7. Conclusion

The main objective of this paper is to investigate whether and how ratees' incentives affect weight allocation decisions. Agents induce the contract term to be made in their favor since it is related to their benefit. Weights placed on multiple measures also affect ratees' aggregate performance and rewards, which consequently creates the potential for agents to exert influence toward weight allocation process. Tasks with better prior performance have a higher probability of generating higher outcomes in the future. Hence, ratees likely have incentive to induce more weight to be placed on tasks with a higher prior performance.

Using valuable explicit weight data of the Korean SOE performance evaluation system, I find weights on tasks with higher prior performance are placed more than the weights that were supposed to be; weights on tasks with higher prior performance are adjusted upward, compared to the formula-based weight. I also

find that the upward adjustment of weights on tasks with higher prior performance is only pronounced in a setting where SOEs' private incentives are salient, in the objective category of a task, when a CEO has post-career concerns and when a CEO has an expectation that they will not be replaced.

This paper contributes to the performance evaluation literature in the following ways. First, this paper introduces agents' incentives for explaining the distorted allocation of weights. Unlike prior studies that provide raters' psychology-based explanation for the distortion in the weighting decision, I show that ratees' private incentives also influence the weight allocation in ratees' favor. Second, I provide evidence that agents' pursuance of private benefit occurs in the contract design also through distorting weight allocation. Prior literature on contract design has mainly studied the influence of agents' incentives on the measure selection or target setting. However, I find another mechanism through which agents project their private incentive onto the contract design: the weight. Third, this paper adds empirical analysis on *explicit* weighting decisions to the literature. Due to data availability, most empirical studies have focused on subjective weighting decisions in an experimental setting. However, I empirically analyze the *explicit* weighting determination process using valuable field data of the Korean performance evaluation results. Thus, this is a rare empirical paper on *explicit* weighting decisions.

Despite several contributions, this paper is subject to certain limitations. First, one must exercise caution in generalizing my findings. Although the Korean SOE performance evaluation system provides a valuable dataset that eliminates

data constraint, it is field data. Hence, by nature, it has a generalizability problem. In particular, ratees' involvement in the weight allocation process could be a unique setting of the Korean SOE performance evaluation system. My findings could not apply to other settings where ratees are not allowed to participate in the weight allocation process.

Second, Due to the unique research setting where ratees have more information and influential power in the weight allocation process, I suggest the positive relationship between prior performance and weight adjustment is a result of agents' influence. However, there exists concern that the optimal weighting decision or raters' private incentives would drive the upward adjustment of weights on tasks with a higher prior performance. As an attempt to rule out such concern, I control for congruence and informativeness and raters' tenure in the research model. Despite several attempts, however, more elaborate method must be used for clearly addressing that the weight upward adjustment on tasks with a higher prior performance is not driven by the optimal weighting decision or raters' incentives. I leave this issue for future research.

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Appendix A

Variable Definition

Variable		Definition
Weight	=	Weight of a task, divided by total weight of the Main Business for an SOE (i.e., sum of weights for individual tasks within the Main Business), calculated separately for the objective and subjective measure categories.
Task_Priority	=	How important a task is in terms of an SOE's long-term strategy; sum of task priority of an SOE is 100% each year.
Budget_Ratio	=	What proportion of the budget for an SOE is used for a task; budget of a task, divided by total budget of an SOE; sum of budget ratio of an SOE is 100%.
Employee_Ratio	=	What proportion of the employees of an SOE works for a task; the number of employees of a task, divided by total number of employees of an SOE; sum of employee ratio of an SOE is 100%.
Adj	=	The residuals form the following model: $Weight_{ijot} = a_0 + \beta_1 * Task\_Priority_{ijt} + \beta_2 * Budget\_Ratio_{ijt} + \beta_3 * Employee\_Ratio_{ijt} + Year\_Dummy + SOE\_Dummy + e_{ijt}$ The residuals represent how weights on individual tasks are deviated from the formula-based weights on individual tasks in the Main Business: the extent of adjustment of weights on individual tasks.
Prior_Score	=	Average prior year's *Score* of measures within a task; calculated separately for the objective and subjective measure categories.
OBJ	=	One if an observation is in the objective measure category of a task, and 0 if an observation is in a subjective measure category of a task.
Task_Age	=	Age of a task; how long a task is incorporated in the performance evaluation for an SOE.
Num_Measure	=	The number of measures within a task, calculated

		separately for the objective and subjective measure categories.
Ln_At	=	The natural logarithm of total assets.
Rater_Tenure	=	Average tenure of raters of an SOE; the tenure of individual raters is defined as the number of years that a rater has worked as a rater in the appraisal committee.

Appendix B

Regression Results of Equation (1)

$$Weight_{ijot} = \alpha_0 + \beta_1 * Task\_Priority_{ijt} + \beta_2 * Budget\_Ratio_{ijt} + \beta_3 * Employee\_Ratio_{ijt} + Year\_Dummy + SOE\_Dummy + e_{ijot}$$

Variables	Dependent Variable = *Weight*
Constant	0.084***
	(0.000)
Task_Priority	0.378***
	(0.000)
Budget_Ratio	0.166***
	(0.000)
Employee_ratio	0.156***
	(0.000)
Year_Dummy	Yes
SOE_Dummy	Yes
Clustered by	Task
Observations	1,155
Adjusted R^2	0.694

This is a result of the first stage model. Weights are initially allocated based on the formula and then adjusted after a discussion between raters and SOEs. MOSF recommends the specific formula; 0.3*task priority + 0.4*budget ratio + 0.3*employee ratio. However, the formula is not strictly applied. How each of three factors affects the weight determination varies depending on the SOE and year. Hence, to figure out the adjusted portion of weights, I regress the actual weights on three factors, year dummy and SOE dummy.

FIGURE 1

Timeline of Performance Evaluation for Korean SOEs

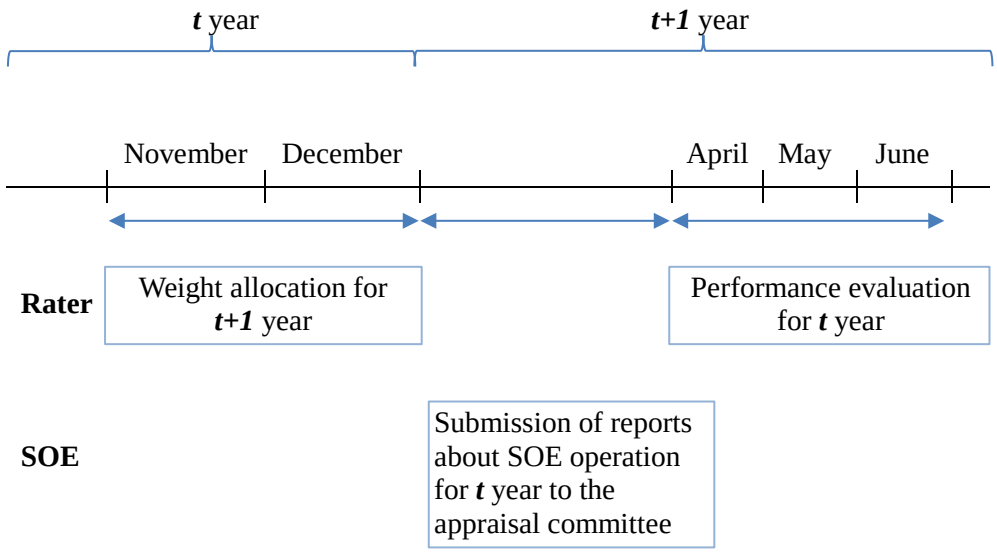

FIGURE 2

Weight Allocation Procedure

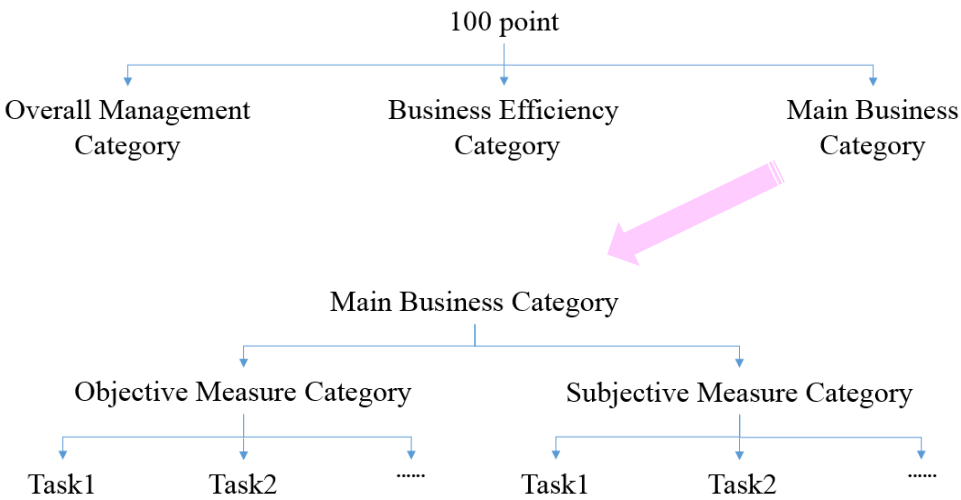

FIGURE 3

Timeline of Weight Allocation on Tasks

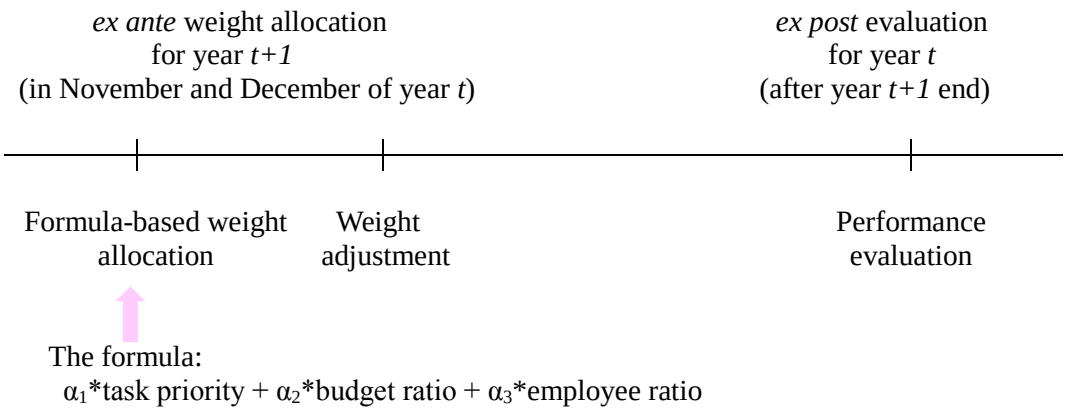

TABLE 1

An Example of Performance Evaluation Results of KEPCO in 2013

Category	Task	Measure	OBJ_ SBJ	Unique_ Common	Weight (Point)	Rating	Score	Score Rate
1. Overall Management (Common Dimension)								
	Leadership		SBJ	Common	5	B0	0.70	3.50
	Customer Satisfaction		OBJ	Common	5		0.95	4.75
	Social Contribution							
		Effort for Social Contribution	SBJ	Common	2	B+	0.80	1.60
		Conformity to Government Policy	OBJ	Common	5		0.92	4.61
	⋮							
2. Business Efficiency (Common Dimension)								
	Operation Efficiency							
		Labor Productivity	OBJ	Common	3		0.85	2.56
		Capital Productivity	OBJ	Common	3		0.85	2.54
	Organization and HR Management							
		Effort for Organization and HR Management	SBJ	Common	2	B+	0.80	1.6
	⋮							
3. Main Business (Unique Dimension)								
	Electricity Power Demand and Supply Management							
		Effort for Stable Supply of Electricity Power	SBJ	Unique	6	C	0.60	3.60
		Maintaining High Load Factor	OBJ	Unique	5		1.00	5.00
		Global Competitiveness of High Load Factor	OBJ	Unique	2		1.00	2.00
		Per-capita Electricity Rate of Residential Service to Per-capita GDP	OBJ	Unique	2		1.00	2.00
	Electricity Power Transmission							
		Effort for Efficient Operation of Facility	SBJ	Unique	6	C	0.60	3.6
		Failure Rate of Transmission Facility	OBJ	Unique	7		1.00	7.0
	⋮							

SBJ Total	47	31.50
OBJ Total	53	51.40
Total	100	82.90

Korea Electric Power Corporation (KEPCO) is a monopolistic supplier of electricity in Korea

TABLE 2

An Example of Weight Allocation across Multiple Tasks of KEPCO in 2013

Panel A: An example of weights in the Main Business category of KEPCO in 2013

Category	Task	Total	OBJ	SBJ
Unique Dimension		50	26	24
	(1) Electricity Power Demand and Supply Management (Task1)		9 (9/26=35%)	6 (6/24=25%)
	(2) Electricity Power Transmission (Task2)		7 (7/26=27%)	6 (6/24=25%)
	(3) Electricity Power Distribution (Task3)		10 (10/26=38%)	7 (7/24=29%)
	(4) New Business (Task4)		0 (0/26=0%)	5 (5/24=21%)

Panel B: An example of criteria for a formula-based weight allocation in the Main Business of KEPCO in 2013

Task	Task Priority	Budget	# of Employees
Task1	34%	11,732 (7%)	5,064 (26%)
Task2	21%	56,454 (35%)	5,877 (30%)
Task3	25%	54,283 (33%)	7,313 (37%)
Task4	20%	40,108 (25%)	1,369 (7%)
Total	100%	162,577 (100%)	19,623 (100%)

Task priority represents how important a task is in terms of long-term strategy.
The unit for budget is billions of Korean Won (₩).

TABLE 3

Descriptive Statistics

Panel A: Full sample

Variables	N	Mean	Std	Min	Q1	Median	Q3	Max
Weight	1,155	0.272	0.121	0.1	0.2	0.257	0.333	0.676
Adj	1,155	0.000	0.065	-0.156	-0.036	0.000	0.037	0.199
Prior_Score	1,155	0.855	0.147	0.381	0.75	0.9	1	1
Task_Age	1,155	5.699	1.118	1	5	6	7	8
Num_Measure	1,155	1.468	0.826	1	1	1	2	8
Rater_Tenure	1,155	1.523	0.454	1	1.167	1.5	1.75	3
Num_Task	1,155	3.865	0.767	1	3	4	4	6
Task_Priority	1,155	0.271	0.136	0.05	0.2	0.25	0.333	0.74
Budget_Ratio	1,155	0.272	0.231	0.005	0.097	0.21	0.387	0.864
Employee_Ratio	1,155	0.27	0.209	0.014	0.121	0.224	0.363	0.904
Ln_At	1,155	9.936	2.086	5.168	8.169	10.123	11.338	14.366

The sample comprises observations between 2011 and 2014 for 65 SOEs. Variable definitions are presented in Appendix A. All continuous variables are winsorized at 1% and 99%.

Panel B: Subsample of objective and subjective measure categories

Objective measure category

Variables	N	Mean	Std	Min	Q1	Median	Q3	Max
Weight	603	0.286	0.136	0.1	0.182	0.267	0.367	0.676
Adj	603	0.002	0.074	-0.156	-0.042	0.000	0.050	0.199
Prior_Score	603	0.962	0.091	0.381	0.978	1	1	1

Subjective measure category

Variables	N	Mean	Std	Min	Q1	Median	Q3	Max
Weight	552	0.257	0.101	0.1	0.2	0.24	0.318	0.655
Adj	552	-0.002	0.050	-0.156	-0.031	-0.002	0.028	0.189
Prior_Score	552	0.739	0.101	0.45	0.7	0.75	0.8	1

TABLE 4

Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Weight									
(2) Adj	0.538								
	<0.0001								
(3) Prior_Score	0.155	0.069							
	<0.0001	0.019							
(4) Task_Age	0.121	0.039	0.050						
	<0.0001	0.186	0.091						
(5) Num_Measure	0.597	0.320	0.359	0.118					
	<0.0001	<0.0001	<0.0001	<0.0001					
(6) Rater_Tenure	-0.033	-0.004	0.009	-0.238	-0.071				
	0.257	0.887	0.758	<0.0001	0.016				
(7) Task_Priority	0.720	0.004	0.144	0.088	0.457	-0.030			
	<0.0001	0.882	<0.0001	0.003	<0.0001	0.305			
(8) Budget_Ratio	0.590	0.003	0.108	0.113	0.342	-0.016	0.364		
	<0.0001	0.931	0.000	0.000	<0.0001	0.584	<0.0001		
(9) Employee_Ratio	0.643	0.002	0.072	0.090	0.353	-0.033	0.547	0.369	
	<0.0001	0.935	0.015	0.002	<0.0001	0.257	<0.0001	<0.0001	
(10) Ln_At	0.181	0.004	0.049	0.008	0.153	0.109	0.167	0.101	0.117
	<0.0001	0.896	0.097	0.792	<0.0001	0.000	<0.0001	0.001	<0.0001

The sample comprises observations between 2011 and 2014 for 65 SOEs. Variable definitions are presented in Appendix A. All continuous variables are winsorized at 1% and 99%.

TABLE 5

Prior Performance and Weight Adjustment (H1)

	Dependent Variable = Adj
Variables	Full
Constant	-0.297
	(0.263)
Prior_Score	0.060***
	(0.005)
OBJ	-0.037***
	(0.000)
Task_Age	0.002
	(0.393)
Num_Measure	0.037***
	(0.000)
Rater_Tenure	-0.001
	(0.826)
Ln_At	0.008
	(0.457)
Year_Dummy	Yes
SOE_Dummy	Yes
Clustered by	Task
Observations	1,155
Adjusted R^2	0.083

The sample comprises observations between 2011 and 2014 for 65 SOEs. Variable definitions are presented in Appendix A. All continuous variables are winsorized at 1% and 99%. All specifications are estimated with robust standard errors clustered by task and include year and firm fixed effects. The robust t-statistics are in parentheses. *,**,*** represent statistical significance at the 10%, 5% and 1% two-tailed levels, respectively.

TABLE 6

Prior Performance and Weight Adjustment: Objective Measures vs. Subjective Measures (H2)

	Dependent Variable = Adj	
Variables	OBJ	SBJ
Constant	-0.547	-0.039
	(0.224)	(0.898)
Prior_Score	0.063**	0.038
	(0.049)	(0.179)
Task_Age	0.004	-0.001
	(0.356)	(0.755)
Num_Measure	0.040***	0.056***
	(0.000)	(0.000)
Rater_Tenure	0.002	-0.005
	(0.865)	(0.475)
Ln_At	0.015	-0.002
	(0.381)	(0.887)
Year_Dummy	Yes	Yes
SOE_Dummy	Yes	Yes
Clustered by	Task	Task
Observations	603	552
Adjusted R^2	0.096	0.035

This table shows results of subsample analysis for objective and subjective measure category. The sample comprises observations between 2011 and 2014 for 65 SOEs. Variable definitions are presented in Appendix A. All continuous variables are winsorized at 1% and 99%. All specifications are estimated with robust standard errors clustered by task and include year and firm fixed effects. The robust t-statistics are in parentheses. *,**,*** represent statistical significance at the 10%, 5% and 1% two-tailed levels, respectively.

TABLE 7

Prior Performance and Weight Adjustment: Incorporating CEOs' Post-Career Concerns

	Dependent Variable = Adj
Variables	Full
Constant	-0.577*
	(0.061)
Prior_Score	0.380**
	(0.016)
Prior_Score*CEO_Age	-0.005**
	(0.042)
CEO_Age	0.005**
	(0.047)
OBJ	-0.038***
	(0.000)
Task_Age	0.002
	(0.441)
Num_Measure	0.038***
	(0.000)
Rater_Tenure	-0.001
	(0.872)
Ln_At	0.007
	(0.471)
Year_Dummy	Yes
SOE_Dummy	Yes
Clustered by	Task
Observations	1,155
Adjusted R^2	0.084

The sample comprises observations between 2011 and 2014 for 65 SOEs. Variable definitions are presented in Appendix A. All continuous variables are winsorized at 1% and 99%. All specifications are estimated with robust standard errors clustered by task and include year and firm fixed effects. The robust t-statistics are in parentheses. *,**,*** represent statistical significance at the 10%, 5% and 1% two-tailed levels, respectively.

Variables	Mean	Std	Min	Q1	Median	Q3	Max
CEO_Age	61.678	4.757	51	58	61	65	74

TABLE 8

Prior Performance on Weight Adjustment: Incorporating Regime Change

	Dependent Variable = Adj	
Variables	Regime_Ch (2013)	No Regime_Ch (2011, 2012, 2014)
Constant	-0.013	-0.410
	(0.834)	(0.131)
Prior_Score	0.042	0.069**
	(0.297)	(0.010)
OBJ	-0.042***	-0.036***
	(0.001)	(0.000)
Task_Age	0.002	0.002
	(0.500)	(0.572)
Num_Measure	0.043***	0.035***
	(0.000)	(0.000)
Rater_Tenure	0.017	0.005
	(0.150)	(0.494)
Ln_At	-0.003	0.011
	(0.240)	(0.287)
Year_Dummy	-	Yes
SOE_Dummy	Yes	Yes
Clustered by	Task	Task
Observations	387	768
Adjusted R^2	0.082	0.032

Korea has a five-year, single-term system for the president. During my sample period, in December of 2012, the new president was elected, and she took over the presidential office in February of 2013. Thus, CEOs knew that they would be replaced in the subsequent year when the weight allocation decision was made for the year 2013. Hence, I classify the year 2013 as the regime change year and the other years as no_regime change year; then, the research models for those two subsamples were estimated separately. The sample comprises observations between 2011 and 2014 for 65 SOEs. Variable definitions are presented in Appendix A. All continuous variables are winsorized at 1% and 99%. All specifications are estimated with robust standard errors clustered by task and include year and firm fixed effects. The robust t-statistics are in parentheses. *,**,*** represent statistical significance at the 10%, 5% and 1% two-tailed levels, respectively.

Essay 2

Relative Weights on Subjective and Objective Measures

1. Introduction

A performance evaluation system includes various performance measures that can be classified into various dimensions, including financial versus nonfinancial performance measures, individual versus aggregate performance measures, and objective versus subjective performance measures. To complement traditional performance evaluation system that mainly uses financial, aggregate, and objective performance measures, firms have adopted nonfinancial, individual, and subjective performance measures in their evaluation and compensation practice. The weights on these measures significantly affect the effort allocation of agents. Therefore, given the use of complementary measures, determining the relative weights on two complementary measures is a critical issue in the performance evaluation system since it affects how agents allocate their effort between two types of measures.

I focus on subjective and objective performance measures, and their relative weights in performance evaluation. Relying only on objective measures results in an incomplete contract and distorts provision of incentives due to limitations of objective measures (Baker 1992; Holmstrom and Milgrom 1991). Objective measures are largely affected by external shocks beyond agents' control. These measures also cannot easily capture agents' desirable but less quantifiable contribution to an organization (Feltham and Xie 1994). By contrast, subjective measures can capture information about agents' actions that cannot be objectively measured and adjust the noise inherent in objective measures (Baker et al. 1994;

Baiman and Rajan 1995). Therefore, subjective measures complement objective measures and make the performance evaluation system more complete. Given the purpose of adopting subjective measures, a relative weighting decision must be made in a way that makes the performance evaluation system provide highly informative and goal-congruent indications of agents' contribution to an organization (Banker and Datar 1989; Feltham and Xie 1994; Höppe and Moers 2011).

Using explicit weight data on the subjective and objective measures in the performance evaluation system of Korean state-owned enterprises (SOEs), I examine how the relative weight on subjective measures is determined to improve the informativeness and congruity of the performance evaluation system. Weight allocation in the SOE performance evaluation system has a unique approach. It depends on long-term orientation of a task, that is, how much a task is operated in a long term. Given that long-term orientation inherently involves greater uncertainty, SOEs face less certainty in operating long-term-oriented tasks than short-term-oriented ones.

According to Demsetz and Lehn (1985), information available only during the period, not at the contract design, has more decision-relevance in an uncertain environment than in a certain one. Thus, agents should show responsive actions in unpredictable environments. In addition, in less certain environments, the principal cannot completely and clearly define what are desirable agents' actions to increase a firm's value (Prendergast 2002).

A contract that entirely relies on objective measures cannot incorporate information that is not foreseen *ex ante* and cannot capture comprehensive actions that are beyond what is captured by objective measures. Consequently, objective measures cannot deliver informative and congruent indications about agents' desirable actions for a long-term-oriented task. Thus, long-term-oriented tasks require a greater use of subjective measures compared to short-term-oriented tasks.

The weighting decision must be made in a way that enables the performance evaluation system to provide highly informative and congruent indications of the agents' actions toward an organization's objectives (Banker and Datar 1989; Feltham and Xie 1994; Datar et al. 2001; Höppe and Moers 2011). Therefore, it is likely that relative weight on subjective measures is greater in long-term oriented tasks than in short-term oriented ones. Such weighting decision motivates agents to adopt a comprehensive and adaptive behavior for long-term-oriented tasks, thereby enhancing the informativeness and congruence of the performance evaluation system. Consistent with my prediction, I find that the relative weight on subjective measures increases when the long-term orientation of tasks increases.

I also find that the relative weight on subjective measures increases along with the decreasing number of objective measures. A performance evaluation system that uses a larger number of objective measures can capture more and multidimensional information about agents' contributions to a task, thereby making the performance evaluation system more complete (Gibbs et al. 2004). Given the purpose of adopting subjective measures, the need to use subjective measures

decreases along with the number of objective measures and therefore relative weight on subjective measures decreases with the number of objective measures.

This paper contributes to the literature in several ways. First, I revisit prior literature on the relative weights on complementary measures and show that the relative weights are determined in a way to improve informativeness and goal-congruence of performance evaluation system.

Second, prior studies show that long-term orientation of a firm's strategy affects the relative weights on financial and non-financial measures. This paper, however, shows that due to the inherent uncertainty of long-term orientation, the relative weight on subjective measures is larger for tasks that are operated in a long horizon. I find that long-term orientation affects the determination of weights on subjective measures relative to objective measures.

Third, this paper shows how weight on subjective measures can be determined relative to objective measures. Although several empirical papers have examined this issue, they have not studied the relative weights on subjective and objective measures and instead examined the relative weights on subjective and financial measures or those on individual and aggregate financial measures. However, I use a strictly defined objective measures (i.e., measures that capture agents' quantifiable contributions and whose performance rating standards and methods are determined *ex ante*) and subjective measures for examining the research question.

Finally, this paper uses an explicit measure of weight while prior studies use discretionary bonus ratio or survey weight data as proxies of weight. Despite of

their effort to check validity of their proxies, there still exists doubt that such indirect measures can be appropriate proxies for weights. The use of explicit weight data in this study lower the measurement errors compared to those in prior studies.

The rest of the paper is organized as follows: Section 2 describes the research site; Section 3 reviews the related prior literature and develops hypotheses; Section 4 provides the research design; Sections 5 and 6 present the results of the main analysis and additional analyses, respectively; and the final section provides a summary of this study and concluding remarks.

2. Research Setting

2.1. Overview of performance evaluation system in Korean SOEs

The Korean government enacted the Law for Management of SOEs that introduced a performance evaluation system for SOEs in 1984. Due to the growing Korean economy in the mid-1980s, the government's direct control over the SOE management became less effective. Thus, the government allows SOEs autonomy in their management in order to improve management efficiency and public service quality; however, it imposes responsibility for their management performance. The government established the system where performances of SOEs are evaluated on an annual basis. The results of performance evaluation are used to determine SOEs' bonus sizes, ranging from 200% to 500% of annual salaries. The government also

utilizes the performance evaluation results to award prizes to well-performing SOEs or to dismiss CEOs of SOEs.

Table 1 presents an example of performance evaluation results for Korea Agro-Fisheries and Food Trade Corporate (aT) in 2013.[1] Performance of SOEs are evaluated under three categories. Performance measures in Main Business are only used for a specific individual SOE while those in Overall Management and Business Efficiency are commonly used to evaluate all SOEs. Therefore, Main Business is regarded as a unique dimension, while the other categories are regarded as common dimensions.

In addition, performance measures can be categorized into objective measures and subjective measures. Objective measures are used for evaluating quantifiable contributions of an agent and those measures' performance is rated based on an actual output relative to a target. By contrast, subjective measures are used for evaluating less quantifiable contributions and performance evaluation of those measures entirely depend on the raters' judgement.

Score is a performance rating result of individual measures and takes a value from 0 to 1. *Weight* indicates how much performance evaluation slants toward an individual measure and adds up to 100 points each year for an SOE. *ScoreRate* is computed as the product of *Weight* and *Score*. For example, "Effort for Export Promotion," a subjective aT-specific measure, has a *Weight* of 8 and a

[1] Korea Agro-Fisheries and Food Trade Corporate (aT) was founded, in 1967, to support export and distribution of the agricultural and fishery product, and lead sustainable growth of the agricultural and fishery product industry.

Score of 0.80, thereby resulting in a *ScoreRate* of 6.40. According to the aggregate *ScoreRate*, one of six grades (i.e., S, A, B, C, D, and E) is assigned to an SOE, with S representing the top rank and E representing the lowest rank. Bonus size and CEO turnover are determined according to the final grade.

[INSERT TABLE 1 ABOUT HERE]

2.2. Weight Allocation Process

The weight allocation for year *t* is determined in November and December of year *t-1* at the design stage of the performance evaluation for year *t*. Total weights are allocated to Overall Management, Business Efficiency, and Main Business. The weights assigned to each category are then allocated across objective and subjective measure categories before they are allocated to multiple tasks.

[INSERT FIGURE 1 ABOUT HERE]

The Ministry of Strategy and Finance (MOSF; equivalent to the US Department of Treasury), the system designer of the SOE performance evaluation, unilaterally allocates weights in Overall Management and Business Efficiency categories. Overall Management and Business Efficiency are evaluated using common measures with the same weights for identical tasks. Table 2 shows that in 2013, two different SOEs have identical tasks in the Overall Management category and the weights on identical individual tasks are the same across two SOEs.

[INSERT TABLE 2 ABOUT HERE]

However, the weight of each task in Main Business is unique to each SOE and is assigned based on task priority, budget ratio, and employee ratio of a task according to government guidelines. Task priority represents how much a task is emphasized in an SOE's long-term strategy, budget ratio is how much budget is used for a task, and employee ratio represents how many employees are working on a task.

The guideline of the SOE performance evaluation system provides explicit definition of the task priority as follows; "Task priority represents the importance of a task for achieving the long-term goal of an SOE." For example, aT establishes its *long-term* goal, "nurturing the future agricultural product industry through export and distribution," and then specifies four tasks for achieving the goal, including "strengthening the agricultural product export system," "innovating the distribution system of agro-fisheries products," "improving the competitiveness of the food industry," and "stabilizing the domestic prices of agricultural and fishery products." aT then determines which tasks must be prioritized and the relevance of each individual task in accomplishing its *long-term* goal. Those tasks that are considered highly relevant in achieving the *long-term* goal of the company are given higher task priority.

All the process from setting a long-term goal to assigning task priority is referred to as "establishment of a long-term goal." Given that the establishment of a long-term goal is significant for sustainable growth, an extensive and thorough

discussion takes place during this process. Consequently, there is no possibility that SOEs manipulate the task priority to induce a weighting decision to be favorable to themselves. Table 3 shows that "exports promotion" has a higher task priority than "price stabilization" (27% vs. 23%) because aT considers the former as more relevant in achieving the long-term objective of the company. This weight allocation policy applies to both objective and subjective measures.

[INSERT TABLE 3 ABOUT HERE]

Weights are, at first, assigned to objective and subjective measure category and then allocated across tasks within each category. Hence, due to the order of the weight allocation, it seems that the weight allocation in the subjective measure category is insulated from that in the objective measure category and vice versa. However, an interview with the raters in the appraisal committee reveals that characteristics and weights of the matched objective measures within a task are both considered when making the weighting decision in the subjective measure category.[2]

[2] My hypotheses in the following section assume that characteristics and weights of the matched objective measures within a task are taken into account when making the weighting decision in the subjective measure category.

3. Related Literature and Hypothesis Development

3.1. Effectiveness of formula-based contract and use of subjective measures

Effective performance measures provide "accurate and informative indications of the individual's actions desirable to organizational goals" (Hölmstrom 1979). Objective measures, which are traditionally used in a contract, have several defects that limit their effectiveness. For instance, objective measures are easy to manipulate and are largely affected by external shocks that are beyond the agents' control, thereby imposing undue risks on the agents. These measures also often generate noisy signals about an agent's actual performance. In addition, objective measures are difficult to capture agents' desirable but less quantifiable actions for achieving the goal of an organization. For example, a senior manager in a sales department puts effort in increasing the sales performance of her team and tries to keep her subordinates motivated at the same time by showing her excellent leadership. Her action on the first dimension can be measured by using sales revenue while her action on the second dimension cannot be quantified and so cannot be measured using objective measures. Overall, relying only on objective performance measures results in a less effective contract and distorts the incentive provision, which, in turn, leads to dysfunctional agents' behavior (Baker 1992; Holmstrom and Milgrom 1991; Feltham and Xie 1994).

Incorporating subjective measures in a contract can mitigate those problems arising from the use of objective measures (Hölmstrom 1979; Baker 1992;

Holmstrom and Milgrom 1991). By capturing agents' actions that cannot be objectively quantified, subjective measures provide incremental information and complement objective measures. Hence, the use of both objective and subjective measures becomes very prevalent in most of organizations. When various dimensions of measures are incorporated in the performance evaluation system, how to assign relative weights across various dimensions is a critical issue because weights play a critical role in allocating the agents' efforts across various dimensions.

3.2. Relative weight on subjective measures

A weighting decision is made in a way that enables the performance evaluation system to provide highly informative and congruent indications of an agent's contributions toward an organization's goal (Banker and Datar 1989; Feltham and Xie 1994; Datar et al. 2001; Höppe and Moers 2011). The relative weights on subjective and objective measures can be determined in such way.

Several empirical papers have examined the relative weights on subjective and objective measures. However, these studies do not examine that issue in a strict sense. Most of these studies focus on objectively evaluated *financial* performance measures rather than on objective measures and examine the relative weight on financial and subjective measures. For example, Bushman et al. (1996) find that the relative weight on subjective measures is greater in CEO compensation when objective accounting and stock-price-based measures do not clearly indicate CEOs' contributions toward the firms' value: accounting and stock-price-based measures

induce managers to be short-term oriented, thereby making these measures inadequate for growth firms or those companies with a long product time horizon. However, objective measures include objectively evaluated financial and nonfinancial measures and therefore their studies, in fact, relate the relative weights on subjective measures to a subset of an objective measure category.

In addition, due to data availability, most of papers use indirect measures of weight. For example, Gibbs et al. (2004) use a ratio of discretionary bonus to total compensation as a proxy of weight on subjective measures. Some papers even use the number of subjective measures divided by the total number of measures as a proxy for the weight of subjective measures, assuming equal weights on individual measures. Thus, in this paper, I study what determines the relative weights on subjective and objective measures using explicit weight data from the performance evaluation system of Korean SOEs.[3]

Ittner et al. (1997) suggest that organizational strategy affects the relative weights on complementary measures. They document that in *prospectors* firms which try to identify new opportunities and pursue growth, managers should be encouraged to show long-term oriented actions. However, financial measures induce them to be fixated on short-term financial numbers while nonfinancial measures induce them not to be. Therefore, financial measures cannot provide a goal-congruent and informative indication of the contributions of managers in

[3] Most of the extant studies also use survey data. For example, the weights data in Bushman et al. (1996) are drawn from Hewitt Associates' compensation surveys of firms. Although Hewitt verified the accuracy of their survey data by doing follow-up telephone interviews with the respondents, the accuracy of these data remains dubious.

prospector firms. Thus, *prospector* firms place more relative weights on nonfinancial measures compared with *defender* firms. Similarly, Prendergast (2002) show that which complementary measures are informative and goal-congruent measures depends on business environment. Overall, they suggest that not just features of performance measures but also other factors such as business environment and organizational goal can affect the informativeness and goal congruence of measures and thus affect how to determine the relative weights on complementary measures. I adopt this argument in developing my first hypothesis.

A business environment dynamically evolves by nature. Therefore, firms face uncertainty because a dynamically evolving business environment always brings unexpected events that affect the business operations of firms in an unexpected manner. This uncertainty can be reduced to some extent but cannot be completely eliminated. Therefore, given the uncertainty, firms must flexibly operate their businesses and adapt to changing business environments to successfully perform their tasks.

How to evaluate objective performances and their targets are determined *ex ante* before the contract is signed (Gibbs et al. 2004). Therefore, a contract that entirely relies on objective measures cannot incorporate information not foreseen *ex ante*. Such rigidity of objective measures cannot induce agents to show adaptive behavior to changes in their business environments. In addition, objective performance measures are specifically defined and therefore are less comprehensive, compared to subjective measures (Bol 2008). Consequently, objective measures cannot motivate agents to expand their activities beyond what

these measures can capture. For example, suppose that a supervisor of a customer service call center is paid based on two specifically defined objective measures, namely, the number of calls and the customer satisfaction score. In this case, she has little incentive to improve the morale of her call center employees which, in the long term, will improve the quality of customer service calls because improving employees' morale is beyond the action dimension that is captured by objective measures.

As aforementioned, task priority represents how much emphasis is placed on a task for achieving the long-term goal of SOEs. Therefore, high-priority tasks should be operated from a long-term perspective and in a longer horizon. Consequently, SOEs face less certainty in operating high-priority tasks than low-priority ones. According to Demsetz and Lehn (1985), the information that becomes available after the signing of a contract has more decision relevance in an uncertain environment than in a certain one. Thus, in an unpredictable environment, agents must show a responsive behavior after considering the post-contract information. In addition, in less certain environments, the principal cannot easily define what the agents must do to increase the firm's value (Prendergast 2002). Therefore, objective measures are unable to deliver informative and congruent indications about the desirable actions of agents for high-priority tasks.

By contrast, subjective performance measures allow the principal to consider any additional relevant information that becomes available during the period (Bol 2008). In addition, subjective measures are comprehensive. Therefore, the subjective measures for high-priority tasks make the performance evaluation

more complete and effective, increasing the congruence of the performance evaluation with SOEs' goal and providing more valuable information about desirable actions. I develop my first hypothesis as follows:

H1: *Relative weights on subjective measures are greater for high-priority tasks than for low-priority tasks.*

Subjective measures are introduced to complement the objective measures in a contract. Thus, the significance of subjective measures for a contract becomes greater when objective measures inadequately account for the agents' contributions to an organization. Most tasks involve multiple types of agent actions. For example, one of tasks of aT is "Distribution and Marketing Support for Agricultural and Fishery Products." To achieve the distribution–support task, aT must establish an effective and efficient distribution platform for *both* online and offline markets. Likewise, various types of agent actions are required even for a single task.

The performance evaluation system should incorporate all actionsdesirable to the task (Holmstrom and Milgrom 1991). However, it is hard to develop all objective measures required to capture all of agents' actions. Given that objective measures must be specifically defined, these measures need considerable time and effort to develop. Therefore, the contract cannot include all objective performance measures that capture all agent actions. Consequently, the contract with only objective measures is almost invariably incomplete and can only capture a small set of information about agent actions. Similarly, Gibbs et al. (2004) also document that the more number of objective measures, the more complete the contract.

Therefore, less number of objective measures indicates less information, which consequently calls for more use of subjective measures for the completeness of a contract. A weighting decision is made in a way that makes the performance evaluation more complete (Höppe and Moers 2011). Therefore, I expect that less number of objective measures within a task, the more relative weights on subjective measures. My second hypothesis is as follows:

H2: *Relative weights on subjective measures are greater for tasks with less number of objective measures than for tasks with more number of objective measures.*

4. Sample and Research Design

4.1. Sample

This paper uses the performance evaluation results of 63 Korean SOEs.[4] Since my focus is on the relative weights on subjective measures, I need to use tasks that involve objective and subjective measures. However, tasks in the common dimension do not always include objective and subjective measures whereas tasks in the unique dimension do include both measures. In addition, the main research question focuses on whether the relative weights on the subjective

[4] MOSF designates public institutions and classifies them into public corporations, quasi-governmental institutions, and non-classified public institutions. Approximately 100 organizations are designated. However, my sample includes only two types of public institutions, namely, public corporations and quasi-governmental institutions. Compared to public corporations and quasi-governmental institutions, non-classified public institutions are very small in size and have considerably different characteristics. Accordingly, I exclude non-classified public institutions from the sample.

measures depend on the tasks' congruence in terms of the long-term goal of SOEs. However, the weights in the common dimension are determined by the government policy and not by long-term goal congruence of a task. Thus, the weight data for the common dimension are not suitable for testing my research question. Accordingly, I restrict my sample to Main Business.

For Main Business, the weight allocation policy based on task priority and the other factors started in 2011. Thus, my sample period starts from 2011 and ends in 2013. In 2014, MOSF adopted a policy that evaluates the SOEs' less quantifiable contribution for Main Business aggregately, not separately by individual task. In other words, since 2014, the Main Business category has included only one subjective measure, effort for Main Business. Therefore, the individual tasks in Main Business category do not include their own subjective measures since then. Thus, the relative weight between objective and subjective measures within a task is not available since 2014. Consequently, I restrict my sample period from 2011 to 2013.

Data of the task priority and the other twofactors are not publicly available, but I obtain the data, with confidentiality agreements, from a proprietary source.[5] I use an individual task as the unit of analysis, obtain a final sample of 514 observations, and winsorize the top and bottom 1% of all continuous variables.

[5] The performance evaluation results are publicly available from various sources, for example, the website of All Public Information In-One (http://www.alio.go.kr) and the National Assembly Digital Library (http://www.nanet.go.kr).

4.2. Research design and variables

To test my hypotheses, I estimate the following regression model:

$$\begin{aligned} RWeight\_SBJ_{ijt} = \alpha_0 &+ \beta_1 * Task\_Priority_{ijt} + \beta_2 * Num\_Measure\_OBJ_{ijt} \\ &+ \beta_3 * Budget\_Ratio_{ijt} + \beta_4 * Employee\_Ratio_{ijt} \\ &+ \beta_5 * Task\_Age_{ijt} + \beta_6 * Prior\_Score\_SBJ_{ijt} \\ &+ \beta_7 * Prior\_Score\_OBJ_{ijt} \\ &+ \beta_5 * Ln\_AT_{it} + Year\_Dummy + SOE\_Dummy + e_{ijt} \end{aligned} \quad (1)$$

where *i*, *j*, and *t* indicate an SOE, an individual task, and a year, respectively.

The dependent variable, *RWeight_SBJ*, is a relative weight of subjective measures within a task. This variable is calculated as the weights of subjective measures within task *j* of SOE *i* in year *t* divided by the total weight of task *j* of SOE *i* in year *t* (i.e., the sum of weights of objective and subjective measures within task *j* of SOE *i* in year *t*). For example, in the case of aT in 2013, the relative weight on subjective measures for the "Price Stabilization" task is 0.545 (= 6/11), while that for the "Distribution and Marketing Support" task is 0.462 (= 6/13). For an additional test, I create an indicator variable that equals to 1 if *RWeight_SBJ* is higher than 0.5 and equals to 0 if otherwise. For example, the *RWeight_SBJ_Dummy* of the "Price Stabilization" task is equal to 1, while that for the "Distribution and Marketing Support" task is equal to 0.

Task_Priority is the priority of an individual task in terms of long-term goals of an SOE; the sume of task priority for an SOE *i* in year *t* is 100%. A task that is more important for achieving the long-term goals of the company is given a higher task priority. *Budget_Ratio* is defined as a proportion of an individual task budget to the total budget of an SOE (the budget for a task *j* of an SOE *i* in year *t*

divided by the total budget of an SOE *i* in year *t*) and represents the amount of financial resources that are invested for the task. *Employee_Ratio* is a proportion of the number of employees working on an individual task to the total number of employees in an SOE (the number of employees working on a task *j* divided by the number of employees in an SOE *i* in year *t*) and shows how much workforce are invested in a task of an SOE in *t* year.

Num_Measure_OBJ is defined as the number of objective measures within a task *j* of an SOE *i* in year *t*. The more objective measures a task has, the more information about ratees' action. Hence, *Num_Measure_OBJ* represents the informativeness of a formula-based contract. My first and second hypotheses are that relative weights on subjective measures increase with *Task_Priority* and decrease with the number of objective measures, respectively. Consequently, I expect β_1 to be positive and β_4 to be negative.

Additionally, as control variables, I include a task age and prior performance of objective and subjective measures. *Task_Age* indicates how long a task has been operated in an SOE and is calculated as the number of years that the task has been included in the performance evaluation system.[6] The relation between input and output may be less defined for a newly introduced task. For developing objective measures, such relation should be well-defined. In

[6] In 2007, the Act on the Management of Public Institutions was newly introduced and replaced the Law for Management of SOEs enacted in 1984. Therefore, there was a significant change in the performance evaluation system in 2007; thus, I use the year 2007 as a starting year to calculate an age. Thus, the age of a task introduced before the year 2007 is calculated as shorter than its actual age.

addition, due to little accumulated knowledge about the newly adopted task, setting appropriate performance standard for objective measures is challenging. Hence, using objective performance measures for new tasks may prevent the system from accurately capturing SOEs' contribution. Therefore, it is likely that, the relative weights on objective measures increase with task age while the relative weights on subjective measures decrease with task age.

Agents can influence the principal's decision to make their contract terms in their favor; therefore they likely induce more weights to be placed on tasks with higher probability of obtaining a higher performance. Prior performance can be a signal of future performance (Jegadeesh 1990; Banker et al. 2012). Thus, agents may influence the weight determination in a way that more weights are placed on tasks with a higher prior performance. If objective (subjective) measures within a task show higher prior performance, then relative weight on subjective measure likely decreases (increases). Hence, I control for *Prior_Score_OBJ* and *Prior_Score_SBJ* that are defined as an average of previous years' *Score* of objective measures and subjective measures within a task, respectively.

To control for the effect of a firm size, I include a variable of an asset size, *Ln_AT*, that is calculated as the natural logarithm of total assets. Finally, I include year and SOE fixed effects in order to control for the potential impact of the observable and unobservable factors of year and SOE (*Year_Dummy* and

SOE_dummy). In all regression specifications, I adjust the standard errors by task clusters to correct for heteroscedasticity and serial dependence (Rogers 1987).

5. Empirical Results

5.1. Descriptive statistics

Table 4 presents the descriptive statistics of the variables. In Panel A for the full sample, the relative weight of subjective measures within a task, *RWeight_SBJ*, is 0.479 and ranges from 0.188 to 0.750 on average. Meanwhile, the relative weight of objective measures within a task, *RWeight_OBJ*, is 0.521 and ranges from 0.250 to 0.813 on average. Thus, on average, a higher weight is placed on the objective measure category than on the subjective measure category within a task. However, among the 514 task observations, approximately 39% (202 observations) presents a relative weight of subjective measures that is higher than 0.5, while 61% (312 observations) presents a relative weight that is equals to or lower than 0.5.

The number of measures within a task is, on average, larger for objective measures than for subjective measures; an average number of measures is 1.045 for subjective measures and 1.774 for objective measures.

[INSERT TABLE 4 ABOUT HERE]

Panel B of Table 4 shows average value of *RWeight_SBJ*, *RWeight_OBJ*, *Num_Measure_SBJ*, *Num_Measure_OBJ* by quartile of task priority. The relative weight on subjective measures slightly decreases as the task priority increases; specifically, the weight decreases from 0.484 for the lowest quartile of thetask priority to 0.471 for the highest quartile. On the contrary, the relative weight on objective measures slightly increases along with the task priority; specifically, the weight increases from 0.516 for the lowest quartile of the task priority to 0.529 for the highest quartile. Panel B shows that the descriptive statistics are inconsistent with my prediction that the relative weight on subjective measures becomes greater for tasks with higher task priority.

By contrast, the relative weight on objective measures increases along with the task priority. However, the number of objective measures also increases with the task priority, while the number of subjective measures does not show any distinct increasing or decreasing trends. Thus, I am not sure whether the relative weight on subjective measures decreases with the task priority even after controlling for the *Num_Measure_OBJ*.

Panel C shows average value of *Rweight_SBJ* and *Rweight_OBJ* by the quartile of the task priority at the same number of objective measures. After controlling the number of objective measures, *Rweight_SBJ (Rweight_OBJ)* shows a slightly increasing (decreasing) trend by the quartile of the task priority.

[INSERT TABLE 5 ABOUT HERE]

5.2. Empirical results for hypotheses

Table 6 presents the regression analysis results for the relative weight on subjective measures. The coefficient on *Task_Priority* is positive and statistically significant. This supports my first hypothesis, implying that relative weight on subjective measures increases when tasks are more long-term oriented.

High-priority tasks have a higher need for subjective measures than for objective ones because such tasks require comprehensive and adaptive behavior of agents due to inherent uncertainty in their long-term orientation. Thus, the finding that weights on subjective measures relative to those on objective measures are larger in high-priority tasks than in low-priority task implies that relative weights on subjective measures and objective measures are determined in a way to establish an effective performance evaluation system that provides informative and goal-congruent indications of the agents' contributions.

According to the guidelines of the SOE performance evaluation, more weight is placed on a task that is highly relevant to the long-term goal of an SOE. This weighting policy applies to both subjective and objective measure categories. Thus, the weights on tasks increase along with *Task_Priority* in both subjective and objective measure categories. Given that the weights on objective and subjective measures increase along with *Task_Priority*, the positive relation between *Task_Priority* and the relative weights on subjective measures indicates that the extent to which the weight on subjective measures increases with the task priority is greater than the extent to which the weight on objective measures increases along with the task priority.

On the contrary, two other factors, *Budget_Ratio* and *Employee_Ratio*, do not show any significant results, meaning that relative weights on subjective measures stay constant regardless of two resource input. However, the insignificance on *Budget_Ratio* and *Employee_Ratio* does not mean that two factors do not affect weights on measures, but indicates that weights on objective measures and weights on subjective measures increase to the same extent as *Budget_Ratio* and *Employee_Ratio* increase.

[INSERT TABLE 6 ABOUT HERE]

Num_Measure_OBJ shows a significantly negative coefficient, consistent with my prediction. It indicates that relative weight on subjective measures decreases with the number of objective measures used for evaluating performance of tasks. The contract with more number of objective measures provide more information about SOEs' contribution to tasks. Hence, the negative coefficient on *Num_Measure_OBJ* implies that relative weight on subjective measures becomes greater when the performance evaluation system does not provide sufficient information about agents' contributions using objective measures.

Regarding control variables, *Prior_Score_SBJ* does not show significant results, but *Prior_Score_OBJ* shows a significantly negative coefficient. It indicates that the relative weight on subjective measures is not affected by previous years' performance of subjective measures, but affected by previous years' performance of objective measures. These contrasting results can be interpreted as

follows. From SOEs' perspective, performance evaluation results for subjective measures are difficut to anticipate *ex ante*. Hence, SOEs face greater *ex ante* uncertainty about performance results for subjective measures, and thus do not induce more weights to be placed on subjective measures relative to those on objective measures.

My sample includes two types of SOEs: public corporations and quasi-government institutions. SOEs whose self-generated revenue exceeds one-half of their total revenue are classified as public corporations. Two types of SOEs have different revenue structures and organizational characteristics that may affect the empirical results. Consequently, I include *SOE_type_dummy*, which equals one if SOEs are classified as public corporations and equals zero otherwise. However, this inclusion does not change the results.

6. Additional Analysis

In the previous analysis, I examine whether relative weight on subjective measures increases with the task priority and decreases with the number of objective measures. As an additional test, I examine whether a weight of higher-than-0.5 is placed on subjective measures in long-term oriented tasks or in tasks with less number of objective measures.

Dai et al. (2016) show that raters place more weights on objective measures than on subjective measures in a setting where where raters have *ex post* discretion in allocating weights. They hold informativeness and congruity of two measures to be constant. As a result, Dai et al. (2016) interpret their findings as

raters' heuristics that weights on objective measures are higher than those on subjective measures.

However, my research site adopts an *ex ante* setting of weight allocation where the impact of raters' heuristics on the weight allocation process is very limited by design. Moreover, significance of subjective measures for an informative and goal-congruent performance evaluation system increases with task priority and decreases with the number of objective measures. Hence, the finding of Dai et al. (2016) is less likely to be applied to my setting. Instead, weights that exceed 0.5 are likely to be placed on subjective measures, depending on the significance of subjective measures for informative and goal-congruent performance evaluation.

Hence, I examine whether more weight is placed on subjective measures than on objective measures in long-term oriented tasks or in tasks with less number of objective measures.

[INSERT TABLE 7 ABOUT HERE]

For this analysis, I create a dummy variable that equals one if a weight of higher-than-0.5 is placed on subjective measures and zero otherwise, *RWeight_SBJ_Dummy*. I conduct the logit regression analysis, using *RWeight_SBJ_Dummy* as the dependent variable. In Table 7, *Task Priority* shows significantly positive coefficients in all columns, indicating that the probability of a weight of higher-than-0.5 being placed on subjective measures increases when

tasks' long-term orientation is greater. In addition, the coefficient on *Num_Measure_OBJ* is significantly negative. Thus, when a task involves less number of objective measures, a weight of higher-than-0.5 is more likely to be placed on subjective measures.

Overall, these results imply that the probability of a weight of higher-than-0.5 on subjective measures increases when informativeness and congruity of objective measures becomes smaller. Hence, weights on subjective measures that exceed 0.5 in my research site can be interpreted in a optimal decision view. As a robustness check, I additionally include SOE_type_dummy in order to control for difference in SOE characteristics. But, the results do not change.

7. Conclusion

The main objective of this paper is to revisit the relative weights on subjective measures and objective measures, and to investigate how the relative weight on subjective measures is determined. Using the explicit weight data of the Korean SOE performance evaluation system, I find that a relative weighting decision is made in a way that makes the performance evaluation to be informative and to be congruent with the organization's objective.

This paper contributes to the literature in several ways. First, I revisit prior literature on the relative weights on complementary measures and show that the relative weights are determined in a way to improve informativeness and goal-congruence of performance evaluation system. Second, I show that long-term orientation affects determination of the relative weights on subjective measusres

while prior literature find that long-term orientation of firms' strategy affects relative weights on nonfinancial and financial measures. Third, I shows how to determine the relative weights on subjective measures and objective measures, using strictly defined objective and subjective measures while prior studies examine relative weights on subjective measures and financial measures. Finally, this paper uses a dierct measure of weights while prior studies use discretionary bonus ratio or survey data as proxies of weights. Despite of their effort to check validity of their proxies, there still exists doubt that such indirect measures can be appropriate proxies for weights. However, I use the explict weight data, and thus the measurement error may be lower in this study than in prior studies.

Despite of several contributions, this study is subject to certain limitations. First, I need to more specifically figure out what the high task priority really implies. I argue that high-priority tasks are operated from a long-term perspective and in a longer-horizon, which involve greater uncertainty in performing tasks. Despite that the guideline of the SOE performance evaluation system provides such explicit definition of the task priority, I need to empirically show the direct or indirect linkage between task priority and uncertainty. But, I do not empirically show the linkage yet.

Second, I should be cautious in arguing the negative relationship between the relative weight on subjective measures and the number of objective measures. Even though the interview with raters reveals that weight allocation in the subjective measure category is affected by characteristics and weights of the matched objective measures, such interaction could be limited due to the weight

allocation procedure of my research site. If there is no or very limited interaction, it is possible that such negative relationship is mechanically driven due to the weight allocation procedure. Therefore, I need to further investigate this probability.

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APPENDIX A

Variable Definition

Variables		Definition
Task_Priority	=	The degree of emphasis placed on a task in terms of an SOE's long-term strategy; the total task priority of an SOE is equal to 100% in each year
Budget_Ratio	=	The proportion of budget that an SOE uses for a task; budget of a task divided by the total budget of an SOE; the sum of budget ratio of an SOE is equal to 100% in each year
Employee_Ratio	=	The proportion of employees in an SOE who are working on a task; the number of employees working on a task divided by total number of employees of an SOE; the sum of employee ratio of an SOE is equal to 100% in each year
RWeight_SBJ	=	Relative weight of subjective measures within a task; weight of subjective measures within a task divided by total weights of a task (i.e., the sum of weights of objective measures and subjective measures within a task)
RWeight_OBJ	=	Relative weight of objective measures within a task; weight of objective measures within a task divided by total weights of a task (i.e., the sum of weights of objective measures and subjective measures within a task)
RWeight_SBJ_Dummy	=	1 if *RWeight_SBJ* is greater than 0.5; and 0 otherwise
Num_Measure_SBJ	=	The number of subjective measures within a task
Num_Measure_OBJ	=	The number of objective measures within a task
Prior_Attain_SBJ	=	Average prior year's *Attain* of subjective measures within a task
Prior_Attain_OBJ	=	Average prior year's *Attain* of objective measures within a task
Task_Age	=	Age of a task; how long a task is incorporated in the

		performance evaluation
Ln_At	=	The natural logarithm of total assets

FIGURE 1

Weight Allocation Procedure

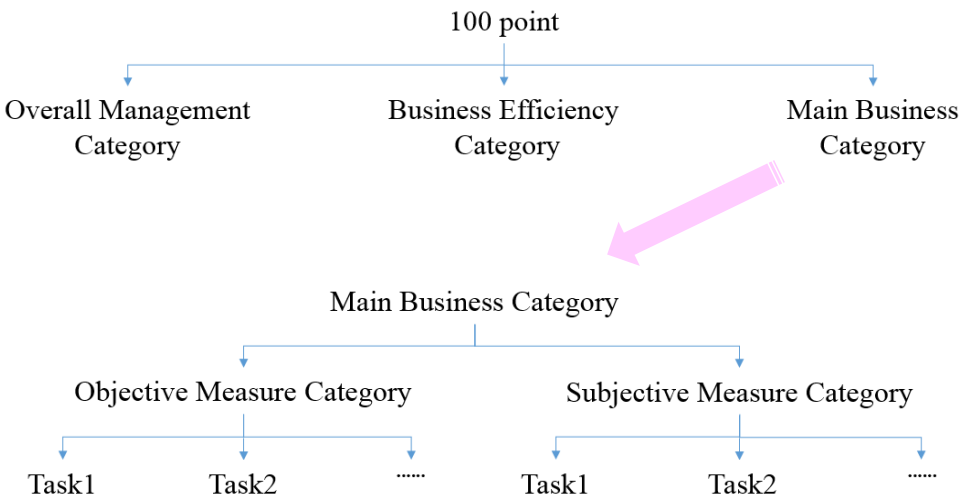

TABLE 1

An Example of Performance Evaluation Results of aT in 2013

Category	Task	Individual Measure	OBJ_ SBJ	Unique_ Common	Weight (Point)	Rating	Score	Score Rate
1. Overall Management								
	Leadership		SBJ	Common	5	B0	0.700	3.500
	Responsibility Management		SBJ	Common	3	B0	0.700	2.100
	Evaluation from Public		OBJ	Common	5		0.940	4.699
	Social Contribution							
		Effort for Social Contribution	SBJ	Common	2	B+	0.800	1.600
		Conformity to Government Policy	OBJ	Common	5		0. 987	4.934
2. Business Efficiency								
	Financial Budgeting Management							
		Effort for Financial Budgeting	SBJ	Common	5	B0	0.700	3.500
	Management							
		Budget Execution Rate	OBJ	Common	2		1.000	2.000
		Ratio of Administrative Cost to Sales	OBJ	Common	5		1.000	5.000
	⋮							
3. Main Business								
	Exports Promotion							
		Effort for Export Promotion	SBJ	Unique	8	B+	0.800	6.400
		Export Promotion for Strategic Item	OBJ	Unique	4		0.949	3.794
		Increase Rate of Export	OBJ	Unique	4		0.200	0.800
	Distribution and Marketing Support							
		Effort for Improvement of	SBJ	Unique	6	B0	0.700	4.200

		Distribution Structure							
		Electronic Commerce			OBJ	Unique	5	1.000	5.000
		Operation of Flowering Plant Joint			OBJ	Unique	2	0.886	1.771
	Market								
	⋮								
SBJ Total							50		
OBJ Total							50		
Total							100		

TABLE 2

An Example of Weight Allocation across Multiple Tasks in Overall Management in 2013

Category	Task	Individual Measure	OBJ_ SBJ	Unique_ Common	Weight	
					aT	KEPCO
1. Overall Management						
	Leadership		SBJ	Common	5	5
	Responsibility Management		SBJ	Common	3	3
	Evaluation from Public		OBJ	Common	5	5
	Social Contribution					
		Effort for Social Contribution	SBJ	Common	2	2
		Conformity to Government Policy	OBJ	Common	5	5

Korea Electric Power Corporation (KEPCO) is a monopolistic supplier of electricity in Korea

TABLE 3

An Example of Weight Allocation across Multiple Tasks in the Main Business of aT in 2013

Task	Task Priority	Budget Ratio	Employee Ratio	# of Measures		Actual Weight	
				OBJ	SBJ	OBJ	SBJ
(1) Price Stabilization	23.0%	16.5%	26.1%	1	1	5 (5/11=45.5%)	6 (6/11=54.5%)
(2) Exports Promotion	27.0%	41.1%	28.0%	2	1	8 (8/16=50.0%)	8 (8/16=50.0%)
(3) Distribution and Marketing Support	27.0%	22.5%	28.6%	2	1	7 (7/13=53.8%)	6 (6/13=46.2%)
(4) Food Industry Support	23.0%	19.9%	17.3%	1	1	5 (5/10=50.0%)	5 (5/10=50.0%)
Total	100%	100%	100%	6	4	25	25

Task priority represents the degree of importance of a task in terms of a long-term goal of an organization.

TABLE 4

Descriptive Statistics

Panel A: Full sample

Variables	Mean	Std	Min	Q1	Median	Q3	Max
RWeight_SBJ	0.479	0.123	0.188	0.375	0.500	0.571	0.750
RWeight_OBJ	0.521	0.123	0.250	0.429	0.500	0.625	0.813
RWeight_SBJ_Dummy	0.393	0.489	0.000	0.000	0.000	1.000	1.000
Task_Priority	0.257	0.129	0.020	0.200	0.250	0.300	0.800
Budget_Ratio	0.266	0.224	0.001	0.097	0.208	0.376	0.921
Employee_Ratio	0.265	0.200	0.008	0.127	0.221	0.352	0.932
Num_Measure_SBJ	1.045	0.207	1	1	1	1	2
Num_Measure_OBJ	1.774	0.840	1	1	2	2	4
Prior_Attain_SBJ	0.739	0.106	0.200	0.700	0.750	0.800	1
Prior_Attain_OBJ	0.964	0.085	0.469	0.974	1	1	1
Task_Age	4.221	1.607	2	3	4	5	7
Num_Task	4.088	0.680	3	4	4	5	5
Ln_At	21.39	2.11	16.68	19.61	21.6	22.84	26.70

The sample comprises 514 observations between 2011 and 2013 for 63 SOEs. Variable definitions are presented in Appendix A. All continuous variables are winsorized at 1% and 99%.

Panel B: Mean value of variables by quartile of *Task_Priority*

Variables	Task Priority	N	Mean
RWeight_SBJ	Lowest	109	0.484
	↓	137	0.486
		138	0.475
	Highest	130	0.471
RWeight_OBJ	Lowest	109	0.516
	↓	137	0.514
		138	0.525
	Highest	130	0.529
Num_Measure_SBJ	Lowest	109	1.028
	↓	137	1.007
		138	1.000
	Highest	130	1.177
Num_Measure_OBJ	Lowest	109	1.339
	↓	137	1.533
		138	1.804
	Highest	130	2.438

Panel C: Mean value of *RWeight_SBJ* and *RWeight_OBJ* by quartile of *Task_Priority* and *Num_Measure_OBJ*

Variables	Task Priority	Num_Measure_OBJ					
		1		2		>=3	
		N	Mean	N	Mean	N	Mean
RWeight_SBJ	Lowest	51	0.520	43	0.417	16	0.370
	↓	57	0.543	58	0.444	25	0.414
		64	0.555	55	0.450	30	0.401
	Highest	56	0.555	42	0.436	17	0.419
RWeight_OBJ	Lowest	51	0.480	43	0.583	16	0.630
	↓	57	0.457	58	0.556	25	0.586
		64	0.445	55	0.550	30	0.599
	Highest	56	0.445	42	0.564	17	0.581

TABLE 5

Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) RWeight_SBJ											
(2) RWeight_OBJ	-1.000										
	<.0001										
(3) RWeight_SBJ_Dummy	0.775	-0.775									
	<.0001	<.0001									
(4) Task_Priority	-0.055	0.055	0.068								
	0.248	0.248	0.155								
(5) Budget_Ratio	-0.089	0.089	-0.003	0.386							
	0.062	0.062	0.952	<.0001							
(6) Employee_Ratio	-0.114	0.114	0.002	0.566	0.353						
	0.016	0.016	0.967	<.0001	<.0001						
(7) Num_Measure_SBJ	0.151	-0.151	0.162	0.493	0.285	0.367					
	0.001	0.001	0.001	<.0001	<.0001	<.0001					
(8) Num_Measure_OBJ	-0.421	0.421	-0.282	0.554	0.445	0.437	0.358				
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001				
(9) Prior_Attain_SBJ	-0.134	0.134	-0.037	0.218	0.188	0.148	-0.036	0.208			
	0.005	0.005	0.436	<.0001	<.0001	0.002	0.455	<.0001			
(10) Prior_Attain_OBJ	0.072	-0.072	0.038	-0.028	-0.035	-0.127	-0.097	-0.147	0.070		
	0.127	0.127	0.423	0.553	0.460	0.008	0.041	0.002	0.142		
(11) Task_Age	-0.020	0.020	-0.079	-0.013	-0.029	0.026	-0.037	0.054	0.040	-0.039	
	0.670	0.670	0.095	0.781	0.548	0.586	0.435	0.260	0.400	0.415	
(12) Ln_At	-0.283	0.283	-0.144	0.190	0.116	0.152	0.009	0.289	0.254	-0.121	0.030
	<.0001	<.0001	0.002	<.0001	0.014	0.001	0.843	<.0001	<.0001	0.011	0.532

The sample comprises 514 observations between 2011 and 2013 for 63 SOEs. Variable definitions are presented in Appendix A. All continuous variables are winsorized at 1% and 99%.

.

TABLE 6

OLS Regression of Relative Weights on Subjective Measures

Variables	Dependent Variable = RWeight_SBJ		
Constant	0.597***	0.602***	0.668***
	(0.006)	(0.005)	(0.004)
Task_Priority	0.150***	0.150***	0.151***
	(0.000)	(0.000)	(0.001)
Num_Measure_OBJ	-0.057***	-0.057***	-0.056***
	(0.000)	(0.000)	(0.000)
Budget_Ratio	0.017	0.017	0.012
	(0.408)	(0.410)	(0.586)
Employee_Ratio	-0.005	-0.005	-0.026
	(0.844)	(0.851)	(0.385)
Task_Age		-0.001	-0.002
		(0.744)	(0.486)
Prior_Attain_SBJ			0.045
			(0.376)
Prior_Attain_OBJ			-0.106**
			(0.017)
Ln_AT	-0.007	-0.007	-0.007
	(0.398)	(0.398)	(0.463)
Year_Dummy	Yes	Yes	Yes
SOE_Dummy	Yes	Yes	Yes
Clustered by	Task	Task	Task
Observations	514	514	445
Adjusted R^2	0.576	0.575	0.569

The dependent variable in the regression is *RWeight_SBJ*, which represents the relative weight on subjective measures. The sample comprises observations between 2011 and 2013 for 63 SOEs. Variable definitions are presented in Appendix A. All continuous variables are winsorized at 1% and 99%. All specifications are estimated with robust standard errors clustered by task and include year and firm fixed effects. The robust t-statistics are in parentheses. *,**, and *** represent statistical significance at the 10%, 5%, and 1% two-tailed levels, respectively.

TABLE 7

Logistic Regression of Relative Weight on Subjective Measures

Variables	Dependent Variable = RWeight_SBJ_Dummy		
Constant	7.752	7.725	21.640***
	(0.137)	(0.142)	(0.001)
Task_Priority	7.113***	7.120***	7.966***
	(0.000)	(0.000)	(0.000)
Num_Measure_OBJ	-2.235***	-2.234***	-2.415***
	(0.000)	(0.000)	(0.000)
Budget_Ratio	1.566**	1.567**	1.736**
	(0.045)	(0.046)	(0.048)
Employee_Ratio	1.301	1.299	0.241
	(0.192)	(0.19)	(0.829)
Task_Age		0.009	-0.030
		(0.948)	(0.826)
Prior_Attain_SBJ			3.451
			(0.132)
Prior_Attain_OBJ			-5.294*
			(0.065)
Ln_AT	-0.369	-0.369	-0.366
	(0.169)	(0.17)	(0.228)
Year_Dummy	Yes	Yes	Yes
SOE_Dummy	Yes	Yes	Yes
Clustered by	Task	Task	Task
Observations	514	514	445
Pseudo R^2	0.388	0.388	0.410

The dependent variable in this regression is RWeight_SBJ_Dummy, an indicator variable that equals 1 if the relative weights on subjective measures are greater than 0.5 and 0 otherwise. Given that the dependent variable is a binary variable, I conduct the logistic regression analysis. The sample comprises observations between 2011 and 2013 for 63 SOEs. Variable definitions are presented in Appendix A. All continuous variables are winsorized at 1% and 99%. All specifications are estimated with robust standard errors clustered by task and include year and firm fixed effects. The robust t-statistics are in parentheses. *,**, and *** represent statistical significance at the 10%, 5%, and 1% two-tailed levels, respectively.

국문초록

다중 과업에 대한 가중치 배분에 관한 연구

본 논문은 성과평가 시스템에서 성과지표의 가중치 배분에 대한 두 개의 논문으로 구성되어 있다. 성과지표의 가중치는 피평가자의 노력 배분에 큰 영향을 미친다. 따라서, 성과지표의 가중치 배분이 어떻게 이루어지는지 연구하는 것은 성과평가 연구에서 큰 의미를 갖는다.

첫 번째 논문은 피평가자의 인센티브가 가중치 배분에 영향을 미치는지에 대해 연구하였다. 성과지표의 가중치는 중요한 계약 조건들 중 하나로, 피평가자의 최종 성과 및 금전적 · 비금전적 보상에 영향을 미친다. 따라서, 피평가자들은 성과지표의 가중치 배분이 자신에게 유리하게 결정되도록 영향력을 행사할 유인이 있다. 과거에 좋은 성과를 창출한 과업은 미래에도 좋은 성과를 창출할 가능성이 높다. 따라서, 피평가자들은 과거 성과가 좋은 과업에 더 많은 가중치가 배분되도록 유도할 유인이 있다. 본 연구는 한국 공기업 성과평가 자료를 활용하여, 예상한 바와 일치하는 실증 결과를 도출하였다. 또한 본 연구는, 과거 성과가 좋은 과업에 더 많은 가중치가 배분되는 현상이 공기업 경영자의 경력관리유인이 클 때, 정권 교체가 없는 해에 더 명확하게 나타남을 실증적으로 보였다. 본 연구는, 평가자 인지능력의 한계가 가중치 배분에 준최적화된 방향으로 영향을

끼침을 보인 선행연구들과는 달리, 피평가자의 사적 인센티브 또한 성과지표 가중치 배분에 영향을 끼침을 보여준다는 점에서 중요한 시사점을 제공한다.

두 번째 논문은 비계량지표와 계량지표 간의 상대적 가중치가 어떻게 결정되는지를 연구하였다. 비계량지표는 계량지표의 한계점을 보완하기 위하여 성과평가에 도입되었다. 따라서, 계량지표가 피평가자의 공헌에 대한 적절한 정보를 제공하지 못할 때, 비계량지표에 배분되는 가중치가 증가할 것이다. 한국 공기업 성과평가 자료를 활용하여 실증 분석한 결과, 비계량지표에 부과되는 상대적 가중치는 과업의 장기 지향성을 클수록 증가하였다. 장기 지향성을 갖는 과업은 보다 불확실한 환경에서 수행되어진다. 그러한 과업에서는, 피평가자 변화하는 환경에 적응하고, 보다 포괄적으로 행동해야 한다. 계량지표 보다 비계량 지표가 이러한 피평가자의 행동을 잘 포착하기 때문에, 비계량지표에 배분되는 상대적 가중치는 과업의 장기 지향성에 비례하여 증가한다. 또한, 본 연구는 비계량지표에 배분되는 상대적 가중치가 성과평가에 사용된 객관지표의 개수가 감소할수록 증가함을 보였다. 성과평가에 사용된 객관지표의 개수가 적을수록, 해당 시스템이 제공하는 피평가자의 공헌에 대한 정보량은 제한적이다. 따라서, 계량지표의 개수가 적을수록, 계량지표가 제공하는 제한적인 정보를 보완하기 위하여, 비계량지표 사용에 대한 요구가 증가하였고 비계량지표에 배분되는 상대적 가중치가 증가하였다. 이러한 결과들은 비계량지표에 배분되는 상대적 가중치에 대한 결정은 성과평가 시스템이 피평가자의 공헌에 대한 정보를 보다

효과적으로 제공할 수 있는 방향으로 이루어짐을 보여준다는 점에서 중요한 시사점을 제공한다.

주요어: 가중치 배분, 피평가자의 인센티브, 계량지표, 비계량지표, 상대가중치, 지표의 정보성, 지표의 목표일치성

학번: 2013-30163