

# The Empirical Analysis of Target Ratcheting under Self-Evaluation

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September 30, 2013

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I am deeply grateful to my thesis advisors, Jin Ho Chang, Kyung Tae Lee, and Dae-Hee Yoon (Chair) for their guidance and encouragement. Also, I am thankful to an anonymous reviewer and Steve Wu (the discussant) for the 2013 American Accounting Association (AAA) annual meeting for their helpful comments.

## **Abstract**

In this research, I examine the ratchet principle in the self-evaluation setting using the data from Korean government R&D programs. I find that self-set targets also ratchet because a subordinate anticipates that the self-set targets will be evaluated by external evaluators later on. I also find that qualitative measures interact with quantitative measures in the target setting process. Specifically, I show that when actual performance exceeds the target, the increase in the quantitative target in the next year becomes smaller as the current qualitative performance is higher. It indicates that subordinates are likely to ease the quantitative target to offset the disadvantage from higher expectation for qualitative performance. Finally, to test how much ratcheting occurs, I compare self-set targets with theoretical targets. I find that subordinates set actual targets lower than theoretical targets. It implies that they tend to create slack into their targets.

## **I. Introduction**

Most of the enterprises use performance evaluation to motivate employees and to align their personal goals of performance with those of management. In order to implement successful performance evaluation, a firm must use appropriate performance targets (standards) that reflect the employee's true performance. Previous studies emphasize the importance of performance targets in employee incentives and Murphy (2001) argues that important incentives are induced by performance standards if the participants in the incentive plan can affect the performance-standard or the standard-setting process. Indjejikian and Nanda (2002) document that an executive's current and future incentives are influenced by the way firms use to update and revise the executive's performance standards to reflect past performance.

However, because of the information asymmetry between the principal (superior) and the agent (subordinate), it is difficult for the principal to identify the true performance level of the agent and properly assign an appropriate target. Therefore, the principal uses current performance as a criterion to determine future targets, (Weitzman, 1976) which is known as the ratchet principle. Weitzman (1980) asserts that in such situations the agent confronts a dynamic tradeoff between present rewards from better current performance and future losses from the assignment of higher targets. If the agent is convinced that his or her total wealth will increase from current and expected future performances by manipulating future targets, for example, by reducing current performances, he or she has a strong incentive to manipulate future targets (Bouwens and Kroos, 2011).

In prior research, a principal's target-setting behavior and an agent's strategic response have been investigated when the targets are assigned by the principal (Leone and Rock, 2002; Lee and Plummer, 2007; Bouwens and Kroos, 2011). However, some organizations grant employees the full discretion in setting their own targets. In such circumstances, agents can control both target setting and effort allocation to affect performance evaluation process. However, in the

most of the previous literature, it has not been investigated how agents set the targets and allocate their efforts under the self-evaluation setting and also whether the agents can be motivated in the self-evaluation process. In this research, I focus on how subordinates manage their own targets, which is done before deciding how much effort they should allocate and exert in multiple periods. In particular, I examine whether subordinates' self-set targets also follow the ratchet principle as assigned targets in prior literature, using the government R&D program data in Korea.

When only quantitative measures are used in performance evaluation, their effects on motivating agents can be limited. Using quantitative measures requires selecting appropriate measures that effectively induce agents to set a goal in congruence with the principal's. However, it is not easy to quantifiably describe what constitutes good performance and even more difficult to anticipate whether the measures will yield the intended effect. One way of dealing with such problems is using supplementary measures such as subjective measures or qualitative measures. Qualitative measures are used to complement quantitative measures for performances that are difficult to describe and measure in a quantifiable way (Milgrom and Roberts, 1992). While quantitative measures are more prone to manipulation since they are more controllable by agents, for example, by reducing effort (Bouwens and Kroos, 2011) or managing earnings (Leone and Rock, 2002), qualitative measures are less controllable by agents since they are under the subjective evaluation by the principals. In this research, I examine the effect of the interaction between quantitative measures and qualitative measures on target setting and investigate how the ratcheting pattern is affected by qualitative measure.

A number of ways to extract private information from the agent have been attempted in various situations. One way to incorporate the subordinate's information into the setting of performance standards is participative budgeting (Young, 1985). Participative budgeting is used to coordinate a firm's activities (Kanodia, 1993) and may lead to higher job performance and higher job satisfaction (Cherrington and Cherrington, 1973). However, the subordinate may bias

the communication of private information by setting an easy budget, thereby creating budgetary slack, which is an understatement of his productive capability (Schiff and Lewin, 1970; Young, 1985). An extreme example of participative budgeting would be the budgeting process in which a subordinate sets his own target. The data which current research employs provides the natural setting in which the participative budgeting can be tested and I examine whether subordinates set their targets higher or lower than what is expected in order to investigate how much ratcheting occurs in the self-evaluation setting, which is one extreme case of the participative budgeting.

This research uses the samples from the “self-assessment report of Korean government R&D program” which reports each ministry/agency’s self-evaluation of its programs. The annual performance targets for the performance measures of each program are set by the corresponding ministry/agency. Each program is evaluated by twelve measures that assess the planning, execution, and performance of the program. Among twelve evaluation criteria, this research focuses on quantitative and qualitative performance measures. While the self-set targets and performances of quantitative measures are evaluated by the ministry/agency they belong to, there is no specified target for qualitative measures and only the performances are evaluated by outside experts. After self-evaluations are completed, the reports are finally reviewed by the Ministry of Strategy and Finance and the final evaluation results are fixed.

The most of prior literature explores the ratchet principle when targets are assigned by a superior. Leone and Rock (2002) examine how current performances influence the assignment of future budgets. In the paper, they find asymmetric budgeting, in which below-target performance prompts management to decrease the next-year target to a lesser extent in comparison with that set in the case of above-target performance. They also show that managers make income-decreasing discretionary accruals when positive earnings innovations are transitory. Bouwens and Kroos (2011) document that firms use past sales performances of retail store managers and assign sales targets accordingly. They find that the target setting process

follows asymmetric target ratcheting. They also show that managers with favorable year-to-date performance reduce their end-of-year performance and managers who engage in sales reducing activities are more likely to achieve their next-year sales target.

Unlike the previous papers, the current research focuses on the ratcheting issue in the presence of self-targeting. That is, due to the unique setting of the data, this paper explores new issues in target ratcheting. First, I examine whether the ratchet principle still holds when targets are set by the subordinate rather than by the superior, as in prior studies. Although subordinates have high incentive to set easier targets when they are free to set their own targets, they expect that their targets and performances will be reviewed by superiors. Subordinates' anticipation of the possibility that their targets and performances can be evaluated by the superiors induces subordinates to use prior year performances as the minimum level of performance for setting the targets. White, Kjølgaard, and Harkins (1995) argue that participants are motivated by the fact that the superiors will be able to evaluate their performance. Accordingly, I demonstrate that target ratcheting still occurs in the self-evaluation setting due to the subordinate's anticipation of the superiors' review process. The results show that a subordinate's target setting pattern follows a symmetric ratcheting, in which the magnitude of increase in target after favorable budget variance is the same as that of decrease in target after unfavorable budget variance. However, when subordinates are highly motivated, they follow a unique pattern of asymmetric ratcheting that is not shown in principal's target setting pattern. That is, under self-evaluation, highly motivated subordinates not only increase their targets after above-target performances but also increase targets even after below-target performances, in contrast to the target decrease following unfavorable performances in assigned targets as in the previous literature.

Second, I examine how qualitative measures affect the target setting of quantitative measures. In the sample in this study, outside experts evaluate the qualitative aspects of the subordinates' performance, whereas subordinates set their own quantitative targets and evaluate their performances on quantitative measures. If subordinates feel more pressure from the

qualitative evaluation which is hard to control, they will be more inclined to manipulate the targets for quantitative measures. Dachler and Mobley (1973) document that one's choices are affected by one's perceived chance of performing well on a task. They also argue that there are higher goal rejection and lower performance in response to more difficult goals. Therefore, if subordinates performed well on qualitative measures and anticipate high evaluation result, they can also predict that the evaluator's expectation on qualitative performance for the following year will be high, thus putting pressure on subordinates. Since it is not easy for subordinates to influence the qualitative evaluation besides enhancing the quality itself, I hypothesize that subordinates are more likely to ease the quantitative target to offset the disadvantage from higher expectation for qualitative performance. I find empirical results that support this hypothesis. When current performance exceeds the target, the increase in subsequent target becomes smaller as the qualitative performance is higher. This finding suggests that when both quantitative and qualitative measures are used in performance evaluation, qualitative measure acts as a mitigating factor that lessens the impact of target increase in quantitative measure in case of above-target performances.

Third, to examine how much ratcheting occurs, I investigate whether self-set targets are set higher or lower than theoretical targets. The theoretical target is the target that should be set in consideration of past targets, past performance target deviations, and the ratcheting patterns (Bouwens and Kroos, 2011). Since subordinates tend to create slack into targets, they will set their targets lower than what should be set. I hypothesize that subsequent targets will be set lower than theoretical targets. The empirical results are consistent with the hypothesis that subordinates build slack into targets both when current performances exceed the targets and when current performances fall below the targets.

This research has several contributions to the ratcheting and target setting literature. First, although empirical research on ratcheting is limited due to data constraints, this research examines the ratchet principle using data that have a unique setting and interesting performance

measures such as qualitative measures, thereby making it possible to explore new issues in ratcheting. Second, unlike the previous research, this research examines the ratcheting issue in the self-evaluation setting. In contrast to the conventional belief that self-evaluation is not effective to motivate agents, especially when agents set their own targets, this research shows that self-set targets also ratchet and hence motivate agents. Third, in addition to quantitative measures which have been the primary focus of prior studies in ratcheting research, I demonstrate that qualitative measures have an impact on quantitative target setting. This research shows that a qualitative measure interacts with a quantitative measure in target setting and the interaction results in a different pattern of ratcheting from what prior research shows in the presence of only quantitative measures.

The remainder of this paper is organized as follows. Section 2 reviews the theory in target ratcheting and develops the hypotheses. Section 3 explains the data and the research setting. Section 4 shows the empirical results of the hypotheses. Section 5 concludes and discusses the limitations and implications for future research.

## **II. Theory and Hypothesis Development**

### **2.1. The ratchet principle**

The “ratchet principle” refers to the tendency of using current performance as a criterion in determining future goals (Weitzman, 1976), and it also refers to the tendency for performance standards to increase after a period of good performance. The term “ratchet effect” originated from the Soviet economic system. Since the Soviet enterprise would penalize good performance by managers by increasing the standards for the next quarter, the managers did not exert sufficient effort to improve productivity and they were reluctant to institute changes that could radically reduce costs (Milgrom and Roberts, 1992).



The cause of the ratchet principle stems from the information asymmetry between the principal and the agent. Employees usually have more information that is not available to their superiors about their individual circumstances or interests, possible performances on an assignment, or the returns to various activities that the firm might initiate. Since the agent has private information regarding the true performance and the expected effort level (Waller and Chow, 1985), he or she has an incentive to set a target that is lower than what is expected. It is thus difficult for the principal to identify the true performance and effort level of the agent. As a means of solving this agency problem, the principal uses the current performance as a minimum level of the next-period target performance (Chow et al., 1991).

A few empirical studies have analyzed the ratchet principle. Using business-unit data from a multinational corporation, Leone and Rock (2002) find that budgets change in response to the prior year's variance from the budget and also show asymmetric ratcheting, a phenomenon in which favorable budget variances result in performance budget increases that are larger than the budget decreases associated with unfavorable variances of the same magnitude. Bouwens and Kroos (2011) document that firms use retail store managers' past sales performances to set sales targets. They also find that below-target performance prompts management to decrease the next-year sales target to a lesser extent than above-target performance would prompt management to increase the next-year sales target, which implies the presence of asymmetric target ratcheting. Lee and Plummer (2007) show that the government budgets for school districts ratchet. They find that prior year overspending leads to an increase in budgeted expenditures that are larger than the decrease in budgeted expenditures following prior year's underspending of the same magnitude.

When an agent anticipates that the target will be based on current performance, he or she confronts a dynamic tradeoff between present rewards from better current performance and future losses from the assignment of higher target (Weitzman, 1980). If the agent is convinced that his or her total wealth will increase from current and expected future performances from

manipulated future target, he or she has a strong incentive to manage future targets by reducing current performance (Bouwens and Kroos, 2011).

If subordinates are free to set their own targets and evaluate their own performances compared to the self-set targets, they are more likely to set easier targets. However, at the same time, if they are aware that outsiders or superiors can review their targets and performance, subordinates will decrease the extent of the slack. Young (1985) suggests that the mere existence of private information does not directly cause slack but rather the level of social pressure not to misrepresent the productive capability determines the extent of slack. White, Kjelgaard, and Harkins (1995) argue that subordinates are motivated by the fact that the superior will be able to evaluate their performance. Therefore, subordinates' anticipation of the possibility that their targets and performances can be evaluated by outside reviewers induces subordinates to use prior year performances as the minimum level of performance for setting the targets and increase the target in response to good performance even if subordinates have full discretion at setting targets.

Since the sample I use for analysis implements self-evaluation and the evaluation results are ultimately reviewed by a superior, there exists social pressure in the target setting process. Thus, I expect that self-set targets also ratchet due to the subordinate's anticipation that external raters can evaluate the targets and performances. I therefore propose the following hypothesis:

**Hypothesis 1.** The next-period target will increase as current performance exceeds the target.

## **2.2. The effect of qualitative measure on quantitative target-setting**

When only quantitative measures are used in performance evaluation, the effect of performance evaluation to motivate agents can be limited. While some aspects of performance are quantifiable, there are some other aspects of a subordinate's performance that cannot be

measured and quantified. Although both the subordinate and the superior may know what constitutes good performance, it is often impossible to describe this performance in advance and measure it in a quantifiable way (Milgrom and Roberts, 1992). Moreover, it is even more difficult to anticipate whether the measures will yield the intended effect. Literatures suggest that using a qualitative measure, which can be viewed as a subjective measure and a supplementary measure, mitigates the problems arising from using a quantitative measure alone. Hayes and Schaefer (2000) argue that unobservable measures are used when variance of publicly observable measures is higher and when the public measures are noisier. Murphy and Oyer (2001) insist that subjective measures are used to correct or adjust for narrow objective measures and to reduce the noise in quantitative measures. Feltham and Xie (1994) suggest that multiple performance measures can be used to improve the direction induced by a single non-congruent measure.

When qualitative performance measures are used with quantitative measures in a self-evaluation, it is uncertain whether target ratcheting in quantitative measures will still exist when qualitative measures are used simultaneously. While quantitative measures are more prone to manipulation since they are more controllable by agents, for example, by reducing effort (Bouwens and Kroos, 2011) or managing earnings (Leone and Rock, 2002), qualitative measures are less controllable by agents since they are under the subjective evaluation by the principals. In the sample, outside experts evaluate the qualitative aspects of the subordinates' performance, and thus subordinates' self-set targets and performances for the quantitative measures are relatively more prone to manipulation by the subordinates. If they feel pressure from the qualitative evaluation which they cannot control either by easing the qualitative standard or managing their effort, subordinates will be more inclined to manage the targets for quantitative measures.

Dachler and Mobley (1973) documented that according to the expectancy theory, one's choices are affected by one's perceived chance of performing well on a task. They also argue

that there are higher goal rejection and lower performance in response to more difficult goals. Therefore, if subordinates performed well qualitatively, they may predict that the outside evaluator's expectation on qualitative performance in the following year will be high as well. However, since it is not easy for subordinates to influence the qualitative evaluation except enhancing the quality itself, I anticipate that subordinates are more likely to ease the quantitative target to offset the loss from higher expectation of outside evaluators for the future performance on qualitative measures. In other words, subordinates will set targets lower when their expected future performance on qualitative measures is low high and there is low possibility of performance improvement in the future. Hence, the increase in the quantitative target after an above-target performance will be reduced when qualitative performance is high. Accordingly, the decrease in the quantitative target after a below-target performance will be intensified or adjusted to a larger extent when qualitative performance is high. Thus, I propose the following hypotheses:

**Hypothesis 2.** The quantitative target will be set downward if the qualitative performance is high.

**Hypothesis 2-1.** When actual performance exceeds the target, the increase in the quantitative target will become smaller if the qualitative performance is high.

**Hypothesis 2-2.** When actual performance does not meet the target, the quantitative target will decrease to a larger extent if the qualitative performance is high.

### **2.3. How do subordinates set targets as compared with theoretical targets?**

Various organizations have tried a number of ways to overcome the agency problem and to gain access to the subordinates' private information. One way to bring the subordinate's information to the task of specifying standards of performance is participative budgeting (Young,

1985). Previous studies report the benefit of using participative budgeting on the ground that it can be used to coordinate a firm's activities and to efficiently allocate resources (Kanodia, 1993) and it may lead to higher job performance and higher job satisfaction (Cherrington and Cherrington, 1973). However, the subordinate may bias the communication of private information by setting an easy budget, thereby creating budgetary slack, an understatement of his or her productive capability (Schiff and Lewin, 1970; Young, 1985). The slack is a serious problem for the enterprise because it can be viewed as representing lost opportunity to the firm (Schiff and Lewin, 1970) and eventually leads to underperformance. Some literature finds either no effect or negative effects of participative budgeting on performance (Milani, 1975). An extreme example of participative budgeting is budgeting in which the subordinate sets his or her own target: the subordinates have full discretion in the target-setting process.

Although subordinates set their targets in accordance with the ratchet principle, it is more likely that they will set their targets lower than what is expected. The theoretical target is the target that should be set in consideration of past targets, past performance target deviations, and the ratcheting patterns (Bouwens and Kroos, 2011). It is different from the optimal target because optimal target is the target that should be set, reflecting a subordinate's capability, whereas the theoretical target is the target that is expected from the target-setter's past target-setting behavior or pattern.

After actual performance surpasses the target, the theoretical target for the next period will be set high if the subordinate's target setting behavior follows the ratchet principle. Since subordinates tend to create slack into targets when they take part in target setting, I anticipate that subordinates will have more incentive to adjust their targets lower than the theoretical target. The same incentive will exist when actual performance falls below the target. Even though the theoretical target becomes low after unfavorable performance, owing to subordinates' tendency of building slack into targets, subordinates will set actual targets lower than theoretical targets. Hence, as I expect to find slack in self-set targets, I propose the following hypothesis:

**Hypothesis 3.** Subordinates will set subsequent targets lower than theoretical targets.

### **III. Research setting**

#### **3.1 The data source**

For the analyses, data are obtained from the “self-assessment report of the Korean government R&D program”. According to Chapter 12 of the Framework Act on Science and Technology, government R&D programs based on government R&D budgets implement performance evaluations. Every year, the programs should implement self-evaluations by the corresponding division and one-third of all programs are selected to be reviewed by the Ministry of Strategy and Finance. In the following year, another one-third of the programs is reviewed and the remaining one-third is reviewed in the third year. The self-assessment report and the superior evaluation report are published annually. However, since only one-third of the programs are under superior evaluation, the published self-assessment report only discloses the programs that are subject to superior evaluation. Therefore, every program appears on both reports over a three-year cycle. The Ministry of Strategy and Finance, the superior in this setting, reviews the self-evaluation results and determines the final evaluation results.

I use the self-evaluation reports disclosed in 2010 and 2011, reports that deal with the government R&D programs carried out in 2009 and 2010, respectively. The evaluation result of each program is the aggregated result of individual units that implement the program and there is no adjustment made in the aggregation process. Sixteen ministries/agencies undertook 70 R&D programs in 2009 and fifteen ministries/agencies conducted 87 R&D programs in 2010. Few programs have pre-determined periods for the programs; rather most of the programs are on-going programs that have no specific expiration dates.

[INSERT FIGURE 1 HERE]

The self-evaluation plans for current year are submitted in January and the evaluation of the performance for the previous year starts from February. Figure 1 shows the timeline of performance evaluation. From February to March, each division organizes a self-evaluation committee that implements a self-evaluation of all criteria except for qualitative evaluations. Qualitative evaluations are conducted by qualitative evaluation committees that are comprised of three or more outside experts. After self-evaluation results are submitted to the Ministry of Strategy and Finance, the ministry conducts a review of the self-evaluations from April to May. The Ministry of Strategy and Finance organizes an evaluation support group and a superior evaluation committee to implement the review and assessment of the self-evaluation. An evaluation support group consisting of experts in related fields supports the evaluation process by pre-reviewing the self-evaluation results and the superior evaluation committee confirms the pre-review and determines the final evaluation score and rating of each program. From June to July, the final evaluation results including the qualitative evaluation scores are fixed.

### **3.2 The performance measures and evaluation process**

Each program is evaluated by twelve measures that assess planning, execution, and performance of the program. The programs are classified into four categories by the program implementation period and the size of the budget. Each category is subject to slightly different measures and scores are allotted to each measure. Among twelve measures, this paper focuses on two measures, quantitative performance measure and qualitative performance measure. Each program defines its own quantitative measures that vary in numbers. Since each program is drastically different from the other in terms of characteristics and expertise, it is impossible for the superior to assign consistent and appropriate measures to all programs. Thus, the targets of

the quantitative measures are set by the corresponding division and the performance achievement compared to the self-set target is evaluated.

In order to restrain the subordinates from setting easy targets, the measures have been designed to encourage subordinates to set higher targets. One of the measures evaluates how relevant the performance measures are and another measure evaluates whether the self-set targets are challenging enough to induce sufficient effort from subordinates. If the target is determined to be an easy target, the program receives 0 out of 7.5 points for the measure. A qualitative performance evaluation is based on evidence submitted by the division and considers the scientific and technological effects and social and economic effects comprehensively. 10 points were allocated to the qualitative evaluation score for R&D programs in 2009 and 15 points were allocated in 2010.

Combining the scores in twelve measures, the total score is assigned to five grades of rating, from “excellent” to “very poor”. The scores above 90 receive “excellent”, those between 80 and 90 receive “good”, between 60 and 80 receive “satisfactory”, between 50 and 60 receive “poor”, and below 50 receive “very poor”.

[INSERT FIGURE 2 HERE]

### **3.3 The incentive system**

The evaluation of government R&D programs motivates subordinates primarily by budget allocation. The evaluation results are used to determine the budget allocation for the next year. The allocated budgets for the “excellent” programs are increased in the subsequent year. If a program rated “good” asks for a budget increase, its demand is reflected in the budget allocation process. The programs that receive grades below “poor” are subject to correction and if there is no improvement, the budgets are reduced by more than 10%. During the budget allocation



process, divisions often attempt to use the evaluation results to justify the budget level for their programs (Kim and Park, 2007).

The evaluation also motivates the subordinates through program continuation and termination. The motivation from the threat of program termination is another very important incentive for the individual units that implement a program because the individual units are mostly concerned about their continuous participation in the program. Each program has its own standard of determining the continuation and termination of individual units. In the program level, which is comprised of varying numbers of units, unsatisfactory programs could face program termination or may be merged with other programs.

Even though the evaluation of the programs does not provide a direct incentive for each individual, senior civil servants are anxious for good results, since the evaluation results of their programs will have an impact on their career prospects (Kim and Park, 2007).

### **3.4 Data collection**

I manually collected the annual performance data that are available in 2010 and 2011 self-evaluation reports which provide data for five years (from 2006 to 2011). This research uses the observations that have current target, current performance, and next-year target data and exclude any observations that have missing data in any of the requirements. I use 1,086 quantitative measure data which satisfy above-mentioned criteria for the empirical testing. As the qualitative measure has been included in the evaluation since 2009 and each program appears on the evaluation report every three years, qualitative performance data are only available for one year. Therefore, this research only uses one-year data for the analysis of qualitative measures and consequently, I use 410 qualitative measure data in the empirical analysis.

### 3.5 Descriptive statistics

[INSERT TABLE 1 HERE]

Table 1 shows the descriptive statistics for the main variables.  $Cont_t$  is an indicator variable equal to 1 if the project has no specified duration, and 0 otherwise. On average, 86% of the programs do not have specified durations and only 14% have expiration dates.  $Program\_yr_t$  denotes the number of years the program has been carried out until year t, and the average number of years is 9.347. The average increase in targets is 36% and the median increase is 9.8%.

## IV. Results

### 4.1 Evidence of target ratcheting

Hypothesis 1 predicts that the subsequent targets are affected by current performances. To empirically test whether the ratchet principle is found in self-set targets and whether asymmetric ratcheting also exists in the setting, I use the model proposed by Weitzman(1980). Thus, I estimate the following model:

$$\frac{(T_{t+1} - T_t)}{T_t} = \beta_0 \frac{1}{T_t} + \beta_1 \frac{(A_t - T_t)}{T_t} + \beta_2 \frac{D_t(A_t - T_t)}{T_t} + \beta_3 D_t + \varepsilon_t \quad (1)$$

where  $T_{t+1}$  is the target for year t+1 and  $T_t$  is the target for year t,  $A_t$  is the actual performance for year t,  $T_{t+1} - T_t$  denotes the change in target from year t to year t+1,  $A_t - T_t$  denotes the difference between the actual performance and the target, and  $D_t$  is an indicator variable equal to 1 if the performance is below the target, and 0 otherwise. To relieve the problem associated with the

heteroskedasticity of the residuals, I estimate the model by scaling the entire equation by the current targets ( $T_t$ ).<sup>1</sup>

$\beta_1$  indicates the extent to which the positive performance-target deviation increases the subsequent target. The sum of the coefficient, ( $\beta_1 + \beta_2$ ), indicates the extent to which the negative performance-target deviation influences the subsequent target. I anticipate that  $\beta_1$  will be significantly positive if the target-setting process follows the ratchet principle. I also expect that  $\beta_2$  will be significantly negative if there exists asymmetric ratcheting. However, if the ratcheting pattern is symmetrical for both positive and negative deviation of performances from targets,  $\beta_2$  will be insignificant.

#### 4.1.1 Empirical results of target ratcheting

[INSERT TABLE 2 HERE]

Table 2 presents the results of the ordinary least squares regression of equation (1) for three models after controlling for year effect. Model (1) is the estimated results for the full sample. Model (2) and model (3) are two groups partitioned according to the evaluation result for measure 2-2,  $T\_setting_t$ , which evaluates whether a self-set target is highly motivating or not. It indicates the degree of subordinates' motivation in the target setting. The subordinates whose targets are highly motivating or challenging are classified as highly motivated group and those with poorly motivating targets are classified as poorly motivated group. Model (2) is the estimated results for the group of subordinates who set challenging targets and Model (3) is the estimated results for the group of subordinates who set easily achievable targets. Since the data for  $T\_setting_t$  are available from 2009 to 2010, only a small number of observations are

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<sup>1</sup> While Leone and Rock (2002) scale the model by lagged total assets, using  $T_t$  is more relevant for scaling in my study since the measures I use in the analysis have various units.

available for model (2) and model (3), compared to the number of the full sample. Comparing the two groups of different motivation level makes it possible to find out how subordinates of different motivation level set targets differently.

The results of model (1) are consistent with the ratchet principle. The coefficient  $\beta_1$ , which denotes positive target deviation, is significantly positive at the  $p < 0.01$  level in the full sample. This implies that if the actual performance exceeds the target, approximately 75% of the variance is reflected in the subsequent target increase. The coefficient  $\beta_2$ , the negative target deviation, is insignificant, indicating symmetric ratcheting. This result implies that when actual performance falls short of the target, 75% of the deviation is reflected in the target decrease for the subsequent year. This result shows the weakness of self-evaluation and it is contrasted with the previous results showing asymmetric ratcheting in assigned targets. That is, under self-evaluation, subordinates have less motivation, leading to more radical decrease in targets when current performances fail to meet targets.

The results of model (2) demonstrate the target-setting behavior of highly motivated subordinates. Since the coefficients  $\beta_1$  and  $\beta_2$  are both significant, interestingly, asymmetric ratcheting is present with encouraged subordinates. The coefficient  $\beta_1$  is significantly positive at the  $p < 0.01$  level, indicating that if actual performance surpasses the target in the preceding year, 108.7% of the positive variance is reflected in the target increase for the next year. The coefficient  $\beta_2$  is significantly negative at the  $p < 0.01$  level. The sum of  $\beta_1$  and  $\beta_2$  is -0.033, implying that if actual performance is below the target, the subsequent target is slightly increased by 3.3%.

This asymmetric ratcheting pattern is inconsistent with the results of prior studies (Leone and Rock, 2002; Bouwens and Kroos, 2011) in which the absolute value of  $\beta_2$  is smaller than that of  $\beta_1$ , resulting in a decrease in targets in response to below-target performances. The increase in subsequent target even after current performance falls short of the target can be

attributed to the unique setting of this paper. Since the subordinates are incentivized by the possibility that their programs can be terminated or face a budget cut for bad performance, those with below-target performance have a very strong motivation to protect their programs from being terminated or budget reduction. Thus, they raise their targets even after they fail to meet the targets to show their high motivation and commitment.

The findings of model (3) show how less-motivated subordinates set their targets. The results are similar to the results of model (1). While the coefficient  $\beta_1$  is significantly positive at the  $p < 0.01$  level, the coefficient  $\beta_2$  is insignificant. This also shows the presence of symmetric target ratcheting. 123.8% of the positive deviation in the current year is reflected in the following year's target increase and the same extent is reflected in the target decrease after a below-target performance. In other words, if subordinates are less motivated, the increase in the target after above-target performance and decrease in the target after below-target performance are affected to the same extent.

The  $R^2$  (adjusted  $R^2$ ) for model (2) is 0.728 (0.720) which is much higher than that for model (1) or model (3). This discrepancy is due to the data characteristics that have been changed with time. The data for model (2) mostly consist of programs in 2009 and 2010, the years in which the regulations became stricter and the evaluation results were more closely associated with budget allocation. This change could have affected the high  $R^2$  in the model (2).

#### **4.2 Evidence of the effect of qualitative evaluation on quantitative target**

Hypothesis 2 examines the effect of qualitative evaluation in target ratcheting. In the evaluation process, the qualitative evaluation scores are known to the subordinates after they set quantitative targets, but I assume that subordinates can reasonably expect their qualitative evaluation scores because they can also evaluate the quality internally. In this situation in which

a qualitative measure is used with a quantitative measure, I investigate how the qualitative performance affects the quantitative target next year. To examine the hypothesis, I estimate the following model:

$$\begin{aligned} \frac{(T_{t+1} - T_t)}{T_t} = & \beta_0 \frac{1}{T_t} + \beta_1 \frac{(A_t - T_t)}{T_t} + \beta_2 \frac{D_t(A_t - T_t)}{T_t} + \beta_3 D_t + \beta_4 Q_t \\ & + \beta_5 \frac{(A_t - T_t)Q_t}{T_t} + \beta_6 \frac{D_t(A_t - T_t)Q_t}{T_t} + \varepsilon_t \quad (2) \end{aligned}$$

where  $T_{t+1}$  is the target for year t+1 and  $T_t$  is the target for year t,  $A_t$  is the actual performance for year t,  $T_{t+1} - T_t$  denotes the change in target from year t to year t+1,  $A_t - T_t$  denotes the difference between the actual performance and the target,  $D_t$  is an indicator variable equal to 1 if the performance is below the target, and 0 otherwise, and  $Q_t$  is the scaled qualitative evaluation score.

If the subsequent quantitative target is decreased when the qualitative performance is high and thus the qualitative evaluation is expected to yield a high score,  $\beta_4$  will be negative. I also predict that when current performance exceeds the target, if the qualitative performance is high, a subordinate would increase the quantitative target in the next year to a lesser extent. According to this prediction, I expect that  $\beta_5$  will be negative. On the contrary, when quantitative performance fails to beat the target, I predict that the expectation of a high qualitative evaluation will intensify the decrease in the quantitative target to a larger extent. The sum of the coefficient,  $(\beta_5 + \beta_6)$ , indicates the extent to which the expectation of the qualitative evaluation affects the subsequent quantitative target when the quantitative performance falls below the target in the preceding year. Thus, I expect that  $\beta_6$  will be negative.

#### 4.2.1 Empirical results of the effect of qualitative measure on target ratcheting

[INSERT TABLE 3 HERE]

Table 3 shows the effect of the qualitative measure on quantitative target setting in three models. I also controlled for year effect when regressing the equation (2). Since qualitative evaluation has only been in effect since 2009, I use 330 observations to examine hypothesis 2. Unlike the predictions for  $\beta_4$ , the coefficient is not significant for models (1) and (3). However, in model (2),  $\beta_4$  is significantly positive at  $p < 0.1$ , in contrast to the prediction. This result is presumed to be derived from the distinctive characteristic of the highly motivated group of subordinates. If subordinates are highly motivated, they increase their quantitative target when they anticipate that they will receive a high qualitative evaluation score. In other words, they set quantitative target higher when their expected future performance on qualitative measure is low. It implies that if subordinates are highly motivated, they set challenging targets on easily controllable measure when there is less possibility of future performance improvement on less controllable measure.

However, in all three models,  $\beta_5$  is significantly negative, consistent with the prediction, at the  $p < 0.01$  level for model (1), at the  $p < 0.05$  level for (2) and at the  $p < 0.1$  level for model (3). This implies that when quantitative performance exceeds the target, a high qualitative evaluation motivates a subordinate to increase the quantitative target to a lesser extent. That is, when subordinates gain a high score on the qualitative evaluation, subordinates lower the quantitative target to offset the disadvantage from higher expectation of the subsequent qualitative performance. Under self-evaluation, the qualitative measure acts as a mitigating factor that lessens the impact of a quantitative target increase following a good performance. It also shows that subordinates are more inclined to manage their circumstances with easily controllable measures when they feel pressure from less controllable measures.

### 4.3 Evidence of building slack into targets

In order to test how much ratcheting occurs, I examine whether self-set targets are set higher or lower than theoretical targets. The theoretical target is the target that should be set in consideration of past targets, past performance target deviations, and the ratcheting patterns (Bouwens and Kroos, 2011). They are computed based on the actual difference between the actual performance and the target in the prior period and the ratcheting parameters in Table 2. To investigate whether subordinates build slack into the target, I use the following regression model to examine hypothesis 3 and 4:

$$\frac{(T_{t+1} - T_{th_{t+1}})}{T_{t+1}} = \beta_0 \frac{1}{T_t} + \beta_1 \frac{(A_t - T_t)}{T_t} + \beta_2 \frac{D_t(A_t - T_t)}{T_t} + \beta_3 D_t + \varepsilon_t \quad (3)^2$$

where  $T_{th_{t+1}}$  denotes the theoretical target for year t+1, and  $T_t$ ,  $(A_t - T_t)$ , and  $D_t$  are defined as specified in equation (1).  $T_{t+1} - T_{th_{t+1}}$  indicates the difference between the actual target and the theoretical target. If it has a negative value, it means that the actual target is set lower than theoretical target, which is the existence of slack in the actual target.

If targets are set lower than theoretical targets when current performances exceed the targets, I expect that  $\beta_1$  will be negative, because subordinates will desire to revise the target downward if their current favorable performance pushes the subsequent theoretical target upward. When current performance falls below the target, I also expect that actual target will be set even lower than theoretical target since subordinates will consistently create slack although

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<sup>2</sup> I compute the  $T_{th_{t+1}}$  (theoretical target) as follows:

$$T_{th_{t+1}} = T_t + \beta_1(A_t - T_t) + \beta_2 D_t (A_t - T_t) + \beta_3 D_t$$

where  $\beta_1$ ,  $\beta_2$  and  $\beta_3$  are the coefficients estimated in model (1).



theoretical target is set low. Then,  $\beta_2$  will be positive and its absolute value will be greater than the absolute value of  $\beta_1$ .

#### 4.3.1 Empirical results of building slack into targets

[INSERT TABLE 4 HERE]

Table 4 shows the results from the regression of equation (3) after controlling for year effect. Consistent with the prediction, I find that when current performances exceed the targets, subordinates set their targets lower than theoretical targets. The coefficient  $\beta_1$  is significantly negative at the  $p < 0.01$  level for all three models. This result implies that subordinates build slack into targets when current performance exceeds the target. Combined with the result from hypothesis 1, it shows that subordinates increase their targets after good performances but they do not increase the targets as high as the theoretical targets. Regardless of the motivation level, all subordinates tend to create slack to make their subsequent targets easily achievable. The absolute value of the coefficient for the highly motivated group is smaller than that for the poorly motivated group. It indicates that the poorly motivated subordinates tend to set their targets much lower than theoretical targets than the highly motivated subordinates do when actual performances exceed the targets.

The coefficient  $\beta_2$  is significantly positive at the  $p < 0.01$  level in the full sample and at the  $p < 0.05$  level in model (3). It indicates that when current performance falls below the target, subordinates set their targets lower than theoretical target and the deviation is much greater than the deviation after above-target performances. This result implies that whether subordinates have done good or bad performance, they set their targets lower than what is expected from their past target-setting behavior. They set their targets much lower after below-target performances than after above-target performances. It is a distinctive result particularly observed in self-evaluation setting where subordinates control both the target setting and effort

allocation. It shows that subordinates tend to ease their targets before deciding how much effort should be exerted, thereby reducing the minimum effort level expected for the next period.

## **V. Conclusion**

This paper examines the ratchet principle in self-evaluation. By using self-evaluation samples of government R&D programs, I expect that the ratchet principle will be shown even in self-set targets, consistent with prior studies' findings. The results are consistent with the prediction except for that the full sample follows symmetric ratcheting. However, highly motivated subordinates follow an extreme pattern of asymmetric ratcheting where targets not only increase after current performances surpass the targets but also rise even after current performances fall below the targets. These results suggest that even under self-evaluation, subordinates can be motivated by the possibility that outsider reviewers can evaluate their targets and performances.

I also analyze the impact of qualitative performance measures on target ratcheting. Specifically, I investigate the degree to which the qualitative evaluation affects the quantitative target setting. I predict that when actual performance exceeds the target in the current period, a high performance on qualitative measure induces subordinates to adjust the quantitative target downward. The results conform to the prediction, implying that when qualitative performance is high, subordinates lower the quantitative target to offset the loss from higher expectation of the subsequent qualitative performance.

I additionally examine whether targets are set higher or lower than theoretical targets in order to find out how much ratcheting occurs. I find that subordinates set their targets lower than theoretical targets. This result is consistent with the prediction that subordinates build slack into targets regardless of whether actual performance surpassed or fell below the target. Consequently, combined with the result from hypothesis 1, the results indicate that subsequent

targets are increased after actual performance exceeds the targets, but they are set lower than the theoretical targets. Also, when actual performance falls short of the target, subordinates decrease their targets even lower than theoretical targets.

This study confronts certain limitations. First, unlike most studies in ratcheting in which the targets are assigned by the superiors, this paper deals with a unique setting in which the subordinates set their own targets. Since performance evaluations in firms usually make it a rule to assign appropriate performance targets for each subordinate, self-evaluation might be of less interest to some firms. Nevertheless, I suggest that firms can make use of self-evaluation because it is less costly. Since subordinates know much better than their superiors about the appropriate measures and relevant levels of targets, it reduces the costly effort of superiors in discovering the true performance level of each subordinate. Furthermore, self-evaluation can maximize the efficiency of achieving goal congruence. The findings propose that self-evaluation can have the same effect as superior evaluation in motivating the subordinates. The motivational effect of self-evaluation can be even greater than superior evaluation under certain conditions.

Second, due to the limited use of data, I cannot demonstrate what causes subordinates to be highly motivated or poorly motivated, but rather simply attributing the reason to pressure from program termination and budget decrease in the subsequent period. Thus, I propose that further research should investigate the factors that motivate employees and which factor has the strongest motivational effect. I also find it difficult to gauge the effort level of subordinates with the available data, and therefore this research did not examine the ratchet effect as in prior research, for example, managing earnings (Leone and Rock, 2002) and reducing sales activities. (Bouwens and Kroos, 2011) Hence, in future research, it will diversify the research if we can conduct a study with different proxies of effort reduction under self-evaluation. Nonetheless, a research without investigating the ratchet effect is still meaningful because the setting of this paper is self-evaluation in which subordinates have the authority to set their own targets. Under self-evaluation, subordinates are more likely to deal with the target-setting in the first place, the

strategic behavior followed by the effort allocation depending on the self-set targets.

Despite the aforementioned shortcomings, this paper contributes to the ratcheting research by diversifying the setting and examining the effects of different performance measures. As more research is conducted to supplement the limitations and provide more findings, our understanding of ratcheting will be greatly enhanced.

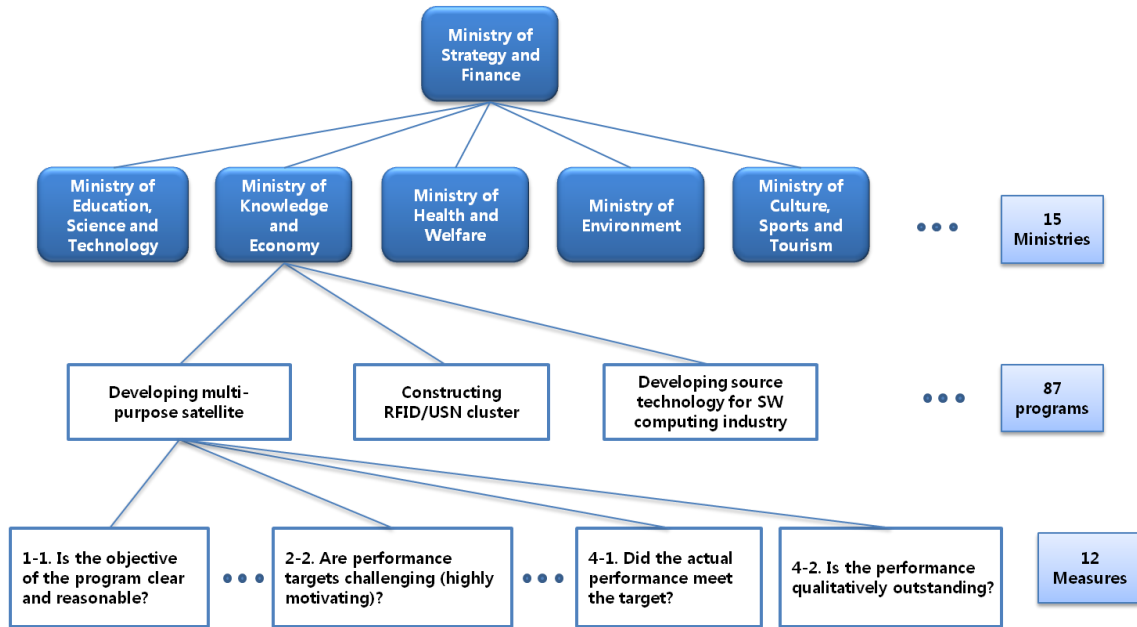
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<Appendices>

1. The self-evaluation and superior evaluation of the government R&D programs (2010)



2. The measures and scores for the self-evaluation and the superior evaluation (2011)

Stage		Measures	Type 1	Type 2	Type 3	Type 4	Total
Plan	Program Plan	1-1. Is the objective of the program clear and reasonable?	5	5	5	5	17.5
		1-2. Are the program formation and implementation plans well designed?	7.5	7.5	7.5	7.5	
		1-3. Is the program designed without overlap with other programs?	5	5	5	5	
	Performance Plan	2-1. Do performance measures have clear link with the program objective?	5	5	5	5	12.5
		2-2. Are performance targets challenging (highly motivating)?	7.5	7.5	7.5	7.5	
Implementation	3-1. Did the program implemented as planned?	5	5	5	5	15	
	3-2. Is the program implementation regularly monitored? Is there an improvement?	5	5	5	5		
	3-3. Is the R&D budget efficiently executed?	5	5	5	-		
	3-3-1. Is the program objective efficiently achieved?	-	-	-	5		
Result	4-1. Did the actual performance meet the target?	25	30	45	45	55	
	4-2. Is the performance qualitatively outstanding?	15	15	-	-		
	4-3. Has the performance been analyzed objectively and comprehensively? Has the program been effectively implemented?	5	-	-	-		
	4-4. Are evaluation results used to supplement or revise the program plans?	10	10	10	10		



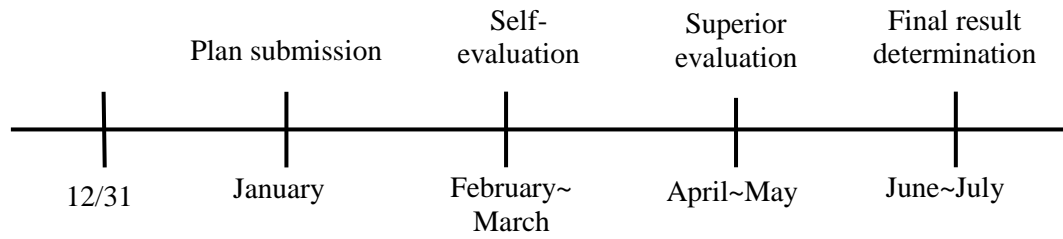
3. The program classification into four types

Average yearly budget for three years	Program Duration	More than 3 years	Less than 3 years
	Greater than 3 billion won	Type 1	Type 3
Less than 3 billion won	Type 2		

- Type 4 : Facilities installation program

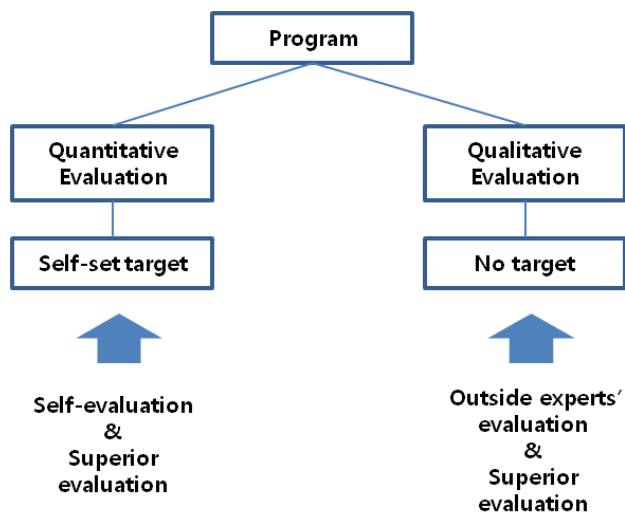
**Figure 1**

**The timeline of performance evaluation**



**Figure 2**

**The diagram of performance evaluation**



**Table 1**

## Descriptive Statistics

Variable	N	Mean	Median	Std.Dev	Min	Max
$Cont_t$	1,716	0.86	1	0.347	0	1
$Program\_yr_t$	1,688	9.347	7	9.188	0	63
$Program\_num_t$	1,369	14.51	15	12.789	1	53
$Measure\_num_t$	1,716	3.993	4	1.485	1	10
$T_t$	1,665	1,098.34	28	9,051.66	0.08	200,000
$A_t$	1,232	1,457.07	30	13,056.09	0	370,000
$(T_{t+1} - T_t)$	1,091	286.900	2	4,040.72	-11,000	120,000
$(T_{t+1} - T_t)/T_t$	1,091	0.360	0.098	1.770	-0.961	49.000
$A_t - T_t$	1,229	297.911	1	5,025.44	-3,456	170,000
$(A_t - T_t)/T_t$	1,229	0.254	0.069	0.691	-0.998	10.48
$D_t$	1,229	0.144	0	0.351	0	1
$Q_t$	410	0.833	0.867	0.167	0.33	1
$T\_setting_t$	576	0.401	0	0.491	0	1

Variable Definition

$Cont_t$	An indicator variable equal to 1 if the project has no specified duration and 0 otherwise.
$Program\_yr_t$	The number of years the program has been carried out until year t.
$Program\_num_t$	The number of programs conducted by the ministry/agency that it belongs to.
$Measure\_num_t$	The number of performance measures used to evaluate the performance of a program.
$T_t$	The target at year t.
$A_t$	The actual performance at year t.
$D_t$	An indicating variable equaling 1 if $A_t$ is less than $T_t$ , else 0.
$Q_t$	The qualitative evaluation score scaled by 10 and 15 for year 2009 and 2010 respectively.
$T\_setting_t$	An indicating variable equaling 1 if $T_t$ is a challenging target, else 0.

**Table 2**

Tests of target ratcheting

$$\frac{(T_{t+1} - T_t)}{T_t} = \beta_0 \frac{1}{T_t} + \beta_1 \frac{(A_t - T_t)}{T_t} + \beta_2 \frac{D_t(A_t - T_t)}{T_t} + \beta_3 D_t + \varepsilon_t \quad (1)$$

Dependent Variable	$(T_{t+1} - T_t)/T_t$			
	Prediction	Full sample (1)	Highly motivated (2)	Poorly motivated (3)
$1/T_t$		0.001 (0.03)	-0.061 ** (-2.47)	0.126 (0.59)
$(A_t - T_t)/T_t$	+	0.753 *** (9.78)	1.087 *** (20.30)	1.238 *** (3.04)
$D_t * (A_t - T_t)/T_t$	-	-0.791 (-1.32)	-1.120 *** (-3.14)	-1.626 (-0.74)
$D_t$		-0.046 (-0.23)	0.065 (0.71)	0.041 (0.05)
$R^2$		0.122	0.728	0.061
$Adj.R^2$		0.116	0.720	0.038
<i>Number of Obs.</i>		1,086	189	253
<i>F-statistics</i>		16.75 ***	81.82 ***	2.67 ***

\* indicates significance at the 10% level

\*\* indicates significance at the 5% level

\*\*\* indicates significance at the 1% level

**Table 3**

Tests of the effect of qualitative measure on target ratcheting

$$\frac{(T_{t+1} - T_t)}{T_t} = \beta_0 \frac{1}{T_t} + \beta_1 \frac{(A_t - T_t)}{T_t} + \beta_2 \frac{D_t(A_t - T_t)}{T_t} + \beta_3 D_t + \beta_4 Q_t + \beta_5 \frac{(A_t - T_t)Q_t}{T_t} + \beta_6 \frac{D_t(A_t - T_t)Q_t}{T_t} + \varepsilon_t \quad (2)$$

Dependent variable	Prediction	$(T_{t+1} - T_t) / T_t$		
		Full sample	Highly motivated	Poorly motivated
		(1)	(2)	(3)
$1/T_t$		0.016 (0.12)	-0.024 (-1.49)	0.092 (0.35)
$(A_t - T_t)/T_t$	+	6.608 *** (3.11)	1.275 *** (3.39)	7.761 ** (2.30)
$D_t(A_t - T_t)/T_t$	-	-4.424 (-0.59)	0.375 (0.97)	-4.121 (-0.31)
$D_t$		-0.057 (-0.11)	-0.082 (-1.52)	-0.143 (-0.12)
$Q_t$	-	0.051 (0.55)	0.019 * (4.46)	0.029 (0.15)
$(A_t - T_t)Q_t/T_t$	-	-6.618 *** (-2.65)	-1.108 ** (-2.53)	-7.706 * (-1.93)
$D_t(A_t - T_t)Q_t/T_t$	-	3.541 (0.40)	-0.796 (-0.58)	2.044 (0.12)
$R^2$		0.079	0.489	0.087
$Adj.R^2$		0.054	0.458	0.037
<i>Number of Obs.</i>		330	158	172
<i>F-statistics</i>		3.08 ***	15.85 ***	1.73 *

\* indicates significance at the 10% level

\*\* indicates significance at the 5% level

\*\*\* indicates significance at the 1% level

**Table 4**

Tests of building slack into targets

$$\frac{(T_{t+1} - T_{th_{t+1}})}{T_{t+1}} = \beta_0 \frac{1}{T_t} + \beta_1 \frac{(A_t - T_t)}{T_t} + \beta_2 \frac{D_t(A_t - T_t)}{T_t} + \beta_3 D_t + \varepsilon_t \quad (3)$$

Dependent variable	Prediction	$(T_{t+1} - T_{th_{t+1}}) / T_{t+1}$		
		Full sample (1)	Highly motivated (2)	Poorly motivated (3)
$1/T_t$		0.018 (0.51)	-0.037 ** (-1.98)	0.060 (0.61)
$(A_t - T_t) / T_t$	-	-0.218 *** (-4.42)	-0.175 *** (-4.30)	-0.754 *** (-3.82)
$D_t * (A_t - T_t) / T_t$	+	1.288 *** (3.36)	0.345 (1.28)	5.714 ** (-1.54)
$D_t$		0.177 (1.40)	0.033 (0.47)	0.622 * (-0.11)
$R^2$		0.040	0.184	0.178
$Adj.R^2$		0.032	0.157	0.158
<i>Number of Obs.</i>		1,086	189	253
<i>F-statistics</i>		4.96 ***	6.87 ***	8.93 ***

\* indicates significance at the 10% level

\*\* indicates significance at the 5% level

\*\*\* indicates significance at the 1% level