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Participative Budgeting: The Effects of Risk Aversion and Asymmetric Information on Budgetary Slack

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1. Introduction

A number of behavioral studies have attempted to determine the kinds of influences participative budgeting has on such aspects as a subordinate's job satisfaction and job performance. Participative budgeting allows a subordinate to bring his[1] information to the task of specifying standards of performance and as such may lead to higher job performance and higher job satisfaction. The evidence is generally mixed on the former, but reasonably consistent on the latter (Locke and Schweiger [1979]). The existence of information asymmetry on the part of subordinates has recently gained importance in agency theory, where concern is focused on obtaining true revelations of subordinates' inside information (e.g., see Baiman [1982] and Christensen [1982]). The problem is that the existence of private information coupled with participation may give rise to situations in which subordinates intentionally build excess

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[1] Because of the lack of epicene personal pronouns and personal adjectives, words such as "he" or "him" should be also taken to mean "she" or "her."

requirements for resources into the budget, or knowingly understate production capabilities (Schiff and Lewin [1970], Bonin [1976], Lawler and Rhode [1976], and Baiman and Evans [1983]). This practice is known as creating budgetary slack. However, not much is known about the conditions under which participative budgeting can lead to the creation of budgetary slack.

The objective of this paper is to test empirically the effects of private information about productive capability, risk preferences, and participation on budgetary slack in a single-period experimental study. Five hypotheses related to budgetary slack are developed and tested using a laboratory experiment. The major results confirm the hypotheses that a subordinate who participates builds in budgetary slack and that slack is in part attributable to a subordinate's risk preferences. Moreover, while the possession of information gives a subordinate more opportunity to misrepresent his productive capability, this opportunity is mitigated by social pressure to reveal truthful information. Interestingly, the extent of social pressure felt itself was highly correlated with the amount of slack. Finally, although the mean amount of slack created by those having private information (as defined here) was not significantly different from those not having private information, greater variation in slack production was exhibited by subordinates having private information about productive capability than by those who did not have this information.

The following section provides definitions of the terms used in this study and, based on a review of the relevant literature, offers five hypotheses for study. Sections 3 and 4 present the method and results of the laboratory experiment, respectively. The final section summarizes the research including implications and directions for future research.

2. *Definitions, Literature Review, and Hypotheses*

This section defines key terms in this study, reviews the literature, and derives the hypotheses to be tested.

2.1 DEFINITIONS

The integrative nature of this research requires specific definitions of key terms.[2] *Participation* is defined as the process whereby the superior selects the form of the compensation contract and the subordinate is permitted to select a specific value for each parameter in the contract. This definition is consistent with agency research on the topic (Baiman [1982]). A *risk-averse subordinate* is one whose expected utility function for money is concave. *Information* is private when the subordinate has information that is unknown to the superior. Here, private information covers the subordinate's productive capability. *Social pressure* is a feeling

[2] While the literature reviewed is not always in exact agreement with the way these terms have been defined here, none of the above definitions is inconsistent with prior conceptualizations.

discouraging the subordinate from misrepresenting himself when a superior has information on the subordinate's productive capability. Finally, *budgetary slack* is defined as the amount by which a subordinate understates his productive capability when given a chance to select a work standard against which his performance will be evaluated.

2.2 LITERATURE REVIEW AND HYPOTHESES GENERATION

2.2.1. Participation. By definition, participation provides a means whereby subordinates can build budgetary slack into their standards of performance (Schiff and Lewin [1970]). Discussions by Williamson [1964] and casual evidence (Schiff and Lewin [1970] and Kamin and Ronen [1981]) suggest that managers behave as if they were building slack. In fact, Lowe and Shaw [1968] report field evidence of participation leading to slack in the context of sales forecasting. This study tests the effects of participation on budgetary slack, using hypothesis 1.

Hypothesis 1: A subordinate who participates in the budgeting process will build slack into the budget.

2.2.2. Risk preferences. Cyert and March [1963] suggested that slack might be desired by members of the firm to act as a buffer on the effects of uncertainty. Onsi [1973] found that 80% of the managers he interviewed bargained for slack in order to provide a hedge against uncertainty. Roy [1955] and Lupton [1963] report similar slack-creating behavior for production line workers, who understated their productive capability due to risk preferences. These studies suggest that risk preferences also play a role in creating budgetary slack. This leads to hypothesis 2.

Hypothesis 2: A risk-averse subordinate will build in more budget slack than a non-risk-averse subordinate.

2.2.3. Private information and the opportunity for misrepresentation. A subordinate's private information may have the potential to improve productivity within organizations (e.g., see Lammers [1967], Lowin [1968], and Vroom [1969]). After reviewing over 200 studies on participative decision making, Locke and Schweiger [1979, p. 206] concluded that subordinate knowledge is "the single most important contextual factor determining the usefulness of participative decision making." Accounting researchers (e.g., Hopwood [1976] and Lawler and Rhode [1976]) seem to concur. However, in modeling participation within an agency framework, Magee [1980], Christensen [1982], Baiman and Evans [1983], and Dye [1983] have observed that a problem arises for the principal, in inducing agents to honestly reveal their private information, particularly when such information may be used to evaluate the agent's performance. As Christensen [1982, p. 259] notes, when participation occurs between a better-informed subordinate and a less-informed manager, and the subordinate's information is used as a basis for his performance evaluation, "the subordinate has an obvious incentive to cheat." In a single-period model, for instance, Jennergren [1980] and Loeb and Magat [1978] suggest that a division with private information may

misrepresent its productive capability unless headquarters has a method of detecting whether cheating is occurring. If cheating is detected, then sanctions may be applied to that division.

At the individual level, a subordinate's participation would typically involve the selection of a work standard for evaluating the subordinate's subsequent performance. Management would generally prefer a subordinate to choose a higher rather than a lower work standard in order to increase productivity. But if the subordinate has private information about his productive capability, there is the opportunity to misrepresent productive capability. Obviously, if management does not know how well a subordinate can perform, it cannot directly pressure a subordinate to choose a high standard, at least in the short run.[3]

But subordinates who participate, and whose productive capabilities will become known by management, will feel pressure to avoid being accused of shirking or misrepresenting productive capability. Such "social pressure" not to misrepresent can lead subordinates to align their personal goals of performance with those of management. Thus, the mere existence of private information does not directly cause slack, rather the level of social pressure will also determine the extent of slack.

The following hypotheses test the relationship of social pressure felt and private information on slack, given that a subordinate is allowed to participate. Hypothesis 3 refers to the differences in social pressure felt between those workers with private information and those without.

Hypothesis 3: Social pressure not to misrepresent productive capability will be greater for a subordinate whose information is known by management than for a subordinate having private information.

Hypothesis 4 suggests that there is an inverse relationship between the amount of felt social pressure and the amount of slack created.

Hypothesis 4: As social pressure increases for the subordinate, there is a lower degree of budgetary slack.

Finally, hypothesis 5 focuses on the differences in slack between those having private information and those not having private information.

Hypothesis 5: A subordinate who has private information builds more slack into the budget than a subordinate whose information is known by management.

3. *Experimental Method*

3.1 INCENTIVES AND BUDGETARY SLACK

The relationship between budgetary slack and specific reward incentives is well documented (e.g., see Williamson [1964], Schiff and Lewin [1970], and Lowe and Shaw [1968]).

[3] Management may also allow a subordinate to participate even if the subordinate's productive capability is not private information. This may occur to obtain other useful information from the worker, or to increase the subordinate's job satisfaction (see Locke and Schweiger [1979]). However, neither job satisfaction nor other types of subordinate information were concerns in this study.

As stated by Weitzman [1976, p. 252], in a single-period environment a subordinate will game the standard, y, and build in slack because: "It is in the interest of the manager (worker) to convince his superiors that y is likely to be small, thereby entitling him to a lower target and a bonus which is easier to attain. . . . The static incentive problem thus creates a built-in tendency for target misrepresentation."

For the purposes of this paper, this factor introduces two related problems as a result of the subordinate gaming the incentive system. The first is a confounding in the measurement of slack, while the second confounds the testing of the effects of risk aversion on slack.

In this study, slack is measured as the difference between a subordinate's self-report of his best estimate of productive capability, given the information that he has about state uncertainty, and the actual standard selected. If the type of incentive scheme allowed gaming of the type suggested by Weitzman, the actual standard selected could be based on the manipulation of the scheme (selecting a low standard, overproducing, and obtaining a bonus), and not the hypothesized variables. If this measure is confounded, then the effects of risk aversion on slack will also be.

To avoid the possibility of gaming the incentive scheme, the following scheme was chosen:

$$C = K_1(A) - K_2|(S - A)|, \tag{1}$$

where:

A = actual production.
S = the standard or target.
C = the total compensation.
$K_1, K_2 > 0, \quad K_1 = K_2.$

When K_1 and K_2 are equal, the effects of incentives are controlled in the sense that subordinates never have an incentive to produce more than the standard, S, because they will be no better off monetarily by doing so.[4] However, if subordinates are producing less than the standard, there is incentive to increase production. This incentive scheme is similar to Weitzman's scheme ([1976], also see Loeb and Magat [1978]) in that it provides no incentive for a risk-neutral subordinate to create slack yet potentially provides an incentive for a risk-averse subordinate to create slack. Additionally, it is simpler for subjects to understand than Weitzman's scheme.

3.2 MEASUREMENT OF VARIABLES

The method used to elicit each subject's best estimate of productive capability is illustrated in Appendix A. The illustration also indicates how subjects were informed about the incentive scheme and the effect of

[4] Because of the artificial restrictions this incentive scheme has placed on the desire to produce above the standard selected, performance differences are not assessed in this study.

downtime (the amount each had previously experienced) on expected output.

Risk preferences were measured by a standard two-outcome lottery based on the scenario: "I will be willing to give you \$5 for certain, or a gamble that pays \$10 with probability p and \$0 with probability of $1 - p$. What should p have to be (between 0 and 1) so that you are indifferent between the \$5 for certain and taking the gamble?" p reflected the degree of risk preference. If $p > 0.50$, then the subject was considered to be risk-averse. If $p = 0.5$ or $p < 0.5$, then the subject was assumed to follow an expected value or risk-seeking approach, respectively. I should note that this specific gamble was designed to capture subjects' preferences for the approximate magnitude of money used as a payoff in this research.

The following procedures were used to introduce and measure social pressure. First, management's expectations of its workers were communicated in the last sentence of the case which stated, "Management would like you to work as hard as you can on the job." This statement was also reiterated several times during the experiment to reinforce the idea. Second, subjects were asked to provide a self-report of the importance of being seen by management as hardworking, using the question: "How important is it to you that the manager sees you as having high ability and being willing to work hard?" This question was anchored with a (1) "not at all important" and a (7) "very important." High scores on this question indicate that a worker would be susceptible to feelings of social pressure from the manager, due to a concern for being regarded as a hard worker. A final measure of social pressure was obtained by posing the following: "In many social situations, 'social pressure' is defined as a feeling that leads one not to misrepresent oneself when others know 'the facts' about them. How much social pressure did you feel when you met with the manager?" This question was anchored with a (1) "none" and a (7) "a very great deal." In this case, "the facts" referred to the manager's knowledge of a subject's performance (the subject's private information) in phase 1.

Various aspects of the experiment were assessed using five manipulation checks. First, the experimental manipulation of information asymmetry was checked by explicitly asking subjects "How much information did the manager have regarding the number of units that you could produce?" This question was scored on a Likert Scale with a (1) "none" and a (7) "a very great deal." Other tests were designed to determine whether subjects understood the incentive scheme, if they had any prior knowledge of the experiment, whether they perceived that their participation in standard setting gave them influence over the standard set, and how well they could assess the kinds of hypotheses being tested.

3.3 SUBJECTS FOR THE EXPERIMENT

Forty-three full-time MBA students participated in this experiment. Three were dropped from the analysis due to a failure to answer correctly

a manipulation check question on the compensation scheme. Of the 40 subjects remaining, the mean age was 25 years ($s = 3$).

3.4 EXPERIMENTAL DESIGN

The 40 subjects were randomly assigned either to an Information Asymmetry group or a No Information Asymmetry group (20 subjects in each condition). All subjects participated in the setting of their standard.

3.5 EXPERIMENTAL PROCEDURES

There were three experimenters who played the roles of a Manager, a Foreman, and an Administrator. The experimenters followed a detailed script at all times. The site of the experiment was a university's psychology laboratory which had seven separate rooms. Five rooms were used for running subjects independently, one to a room. Subjects were kept separate in order to minimize uncontrolled interactions between them. The sixth room housed the Manager, and the seventh was a waiting room occupied by the Administrator. Subjects were initially met by the Administrator in this room. Eight sessions were run with five subjects per session. Approximately equal numbers of subjects in each cell were run each day.[5]

3.5.1. Training session. Table 1 illustrates the phases of the experiment. Each subject was brought to one of the five work rooms and was asked to read a case (see Appendix B) describing the fictitious firm in which they worked. After reading the case, subjects took part in a training session showing them how to construct the toy output. Each toy was made from Loc-Blocs (a children's toy building block). Each subject was told that he would be making toys in a division of a company, and that other subordinates would be making different toys in different divisions.

Uncertainty was incorporated into the experiment through a coordination problem which could result if the production of toys in a division lagged behind production in another division. When a lag occurred, the Foreman in one division would notify the Foreman in the other and ask him to cease production. This cessation of production was called downtime. A subordinate was not given any chance to make up production time when downtime occurred.

3.5.2. Phase 1. After the training session, phase 1 began. In phase 1, which lasted 11 minutes, each subject was told that for his labor he would be paid a salary of $3.50. During this phase, the goal for each subject was to find out how good he was at performing the task, and to gain information regarding his productive capability. At the end of phase 1, the Foreman and the Administrator then performed the experimental manipulation regarding the information asymmetry.

[5] Two pilot studies were done before the actual experiment was run. The first was designed to assess the difficulty of the experimental task, while the second was a dry run through the entire experiment. Both proved useful to the final design of the experiment.

TABLE 1
Phases of the Experiment

Phase of the Experiment	Time	Procedure	
		For Subject	For Experimenter
Waiting Room	10 mins.	Meet Administrator	
Training	10 mins.	Read case, train to make toys	
Phase 1 (1st Production Period)	11 mins.	Work under flat fee of $3.50	Foreman starts information manipulation New compensation scheme shown; assess Best Estimate of Production
Phase 2	15 mins.	Meet Manager, select standard given new compensation scheme	Manager continues with information manipulation Manager shows new compensation scheme
Phase 3 (2d Production Period)	11 mins.	Work under new compensation schemes	
Debriefing	5 mins.	Subjects are debriefed and paid	

Information asymmetry condition. In the information asymmetry condition, the Foreman would knock on the door of the work room when time was up and inform the subject to close the lid on the box where he was storing completed toys. The Foreman then entered and stated the amount of downtime for the present period, and that he (the Foreman) would have to wait until this time was up. Each subject was told that he might experience downtime in phase 1, but was not told the amount or any distributional information ahead of time. Each subject was told that two minutes of downtime occurred in phase 1 so as not to confound the results. The Foreman then gave each subject the Best Estimate of Production sheet (see Appendix A) and asked him to fill it out. This sheet presented the incentive scheme and each subject was asked to write down his best estimate of his productive capability, given his knowledge of his experience of production, the kind of incentive scheme under which he worked, and under the assumption that downtime would be two minutes.

The Best Estimate of Production sheet was used for two reasons. First, during a pilot study, subjects experienced a certain degree of learning on the task which caused them to select, on average, a higher standard than that previously produced. In order to obtain a stable reading of productive capability for the measurement of slack, each subject was asked to estimate productive capability given his past experience with the task. Second, each subject had previously been working under a salary of $3.50 for phase 1. The salary was used to provide motivation to perform in

phase 1. Before each subject filled out the best estimate of production, the new incentive scheme was introduced in order to avoid an incentive scheme effect on his subsequent selection of a standard.

Once a subject wrote down his estimate, he was asked to place the sheet in an envelope and to keep it with him at all times. After making sure that a subject had no questions about filling out the sheet, the Foreman left the room saying that the Administrator would arrive in several minutes to count the number of units made. The Administrator then entered and counted the number of units made and wrote this number on a Tally sheet. Both the Best Estimate and Tally sheets were placed into the envelope and sealed by the subject. The Administrator left the door ajar as a signal to the Foreman, who then reentered. The Administrator did not leave the room until the Foreman had taken the subject directly to meet the Manager, so that the subject would know that there was no communication between Administrator and Manager of the information contained in the envelopes.

No information asymmetry condition. The major difference between this condition and the information asymmetry condition was that after the Foreman knocked on the subject's door, he entered and told the subject that he had to fill out a Performance Report for management, thereby cueing the subject that management would know his performance in that period. The Foreman counted the toys while the subject filled out the Best Estimate of Production sheet. The Foreman then delivered the Performance Report to the Manager.

3.5.3. Phase 2. In phase 2, each subject met individually with the Manager. The Manager continued with the asymmetry manipulation by saying that he either did or did not know about the subject's performance (depending on the experimental condition). He went over the incentive scheme once again and then brought out a new sheet called a Downtime Report and showed it to the subject. The report showed that there was a uniform distribution over the five possible states of downtime ranging from zero to four minutes. This indicated that the expected value of the downtime would be two minutes, the same downtime experienced previously in phase 1. The subject then selected his work standard. At the end of phase 2, each subject was led back to a room and filled out a questionnaire, designed for data gathering.

3.5.4. Phase 3. In phase 3, each subject produced toys and was then rewarded. Downtime was again manipulated uniformly across subjects and was not different from that experienced in phase 1 for the convenience of the experimenters. Each subject was not aware ahead of time that downtime in phase 3 would be the same as in phase 1. Further, because the effects of downtime on the standard selected had been measured before phase 3 began, the manipulation in this phase no longer played a significant role in the experiment. At the end of phase 3 the Foreman did remark to subjects that it was coincidental that the downtime in that phase was the same as that previously experienced. A final

questionnaire was administered at this time, followed by debriefing and payments to subjects.

4. *Analysis and Discussion of Results*

The major demographic variables were analyzed to ensure randomization of these characteristics across subjects. The data collected included age, sex, number of years of full-time and part-time work experience, undergraduate and graduate major. For all variables, there were no significant differences ($p < .05$) across conditions, indicating random assignment of subjects to each cell. Results of the five sets of manipulation checks listed above indicated that the experimental manipulation of information asymmetry was successful, that subjects perceived that by participating they were influencing the standard, that the incentive scheme was understood, and that there was no contamination of the experiment regarding information about what was being studied from previous subjects ($p < .05$).

4.1 DISCUSSION AND RESULTS OF HYPOTHESES

The results of the tests are presented in terms of the five hypotheses. Means and standard deviations for all of the dependent measures used in the tests of hypotheses appear in table 2.

Hypothesis 1. Hypothesis 1 predicted that subordinates allowed to participate in budgetary standard setting build slack into the budget. The mean for slack (x) over all subjects was .50 (standard deviation, s, of .93), which is significantly different from zero ($t = 3.39$, $p < .01$, $df = 39$). This result supports hypothesis 1.

Hypothesis 2. Hypothesis 2 predicted that a risk-averse subordinate will build in more slack than a non-risk-averse subordinate. Subjects

TABLE 2

Summary of Means and Standard Deviations

Dependent Measure		Experimental Condition: Information Asymmetry	No Information Asymmetry	Overall
		$n = 20$	$n = 20$	$n = 40$
Amount of budgetary slack	$\bar{x}$	0.70	0.30	0.50
	s	1.13	0.66	0.93
Importance of being seen as a hard worker	$\bar{x}$	6.00	5.75	5.88
	s	1.34	1.33	1.34
Degree of social pressure felt	$\bar{x}$	2.30	3.60	2.95
	s	1.08	1.60	1.43
		Risk-Averse	Non-Risk-Averse	Overall
		$n = 15$	$n = 25$	$n = 40$
Risk-preference measure, probability, p	$\bar{x}$	0.72	0.47	0.56
	s	0.45	0.34	0.38

were dichotomized into a risk-averse group with a probability of $p > .50$ ($x = .72$, $s = .45$) consisting of 15 subjects and a non-risk-averse group with a probability of $p \leq .50$ ($x = .474$, $s = .34$) consisting of 25 subjects. A one-way *ANOVA* for unequal cell sizes was performed and a significant difference between the two groups was found ($F = 5.64$, $p < .025$), which supports hypothesis 2.

Hypothesis 3. Hypothesis 3 predicted that social pressure felt by a subordinate will be greater for those workers whose information is shared by management than for those having private information.

Subjects scored very high on the question of the importance of being seen by management as a hard worker: ($x = 6.00$, $s = 1.34$) for the asymmetry group and ($x = 5.75$, $s = 1.33$) for the no asymmetry group respectively, indicating a very high degree of importance placed on this attribute. This result suggests that susceptibility to social pressure from the manager was established. In addition, there was no significant difference between groups on their scores for this question ($t_{39} = 0.834$, $p < .41$), indicating no initial bias for the test of hypothesis 3.

To test hypothesis 3, a *t*-test compared the social pressure felt by the group participating with private information to that of the group participating without private information ($x = 2.30$, $s = 1.08$; $x = 3.60$, $s = 1.60$, respectively). Results showed a significant difference between the groups for degree of social pressure felt ($t_{39} = -3.01$, $p < 0.004$), which supported the hypothesis.

Hypothesis 4. Hypothesis 4 predicted that as the social pressure not to misrepresent productive capability increases, the amount of slack will decrease. Social pressure was significantly negatively correlated with slack ($r = -.377$, $p < 0.02$), indicating that as social pressure not to misrepresent productive capability increased, slack decreased. This result supported hypothesis 4.

Hypothesis 5. Hypothesis 5 predicted that when the budget is participatively set, a subordinate who has private information builds more slack into the budget than a subordinate without private information. To test this hypothesis, a *t*-test with slack as the dependent measure was used to compare the information asymmetry and no information asymmetry groups. Inspection of variances indicated that the variance in the asymmetry group was approximately three times that of the no information asymmetry group ($s^2 = 1.27$, $s^2 = 0.43$, respectively). An *F*-test for the equality of the two variances rejected the null hypothesis of no difference ($F_{(1,38)} = 5.08$, $p < 0.05$). Those participating with private information engaged in much more diverse behavior as far as the building in slack was concerned.

Since the variances of the samples were not equal, I performed a *t*-test assuming unequal variances. The results of the test showed no significant differences in the mean amount of slack built in by both groups ($t_{31} = 1.37$, $p < .05$), which rejected hypothesis 5.

5. *Discussion and Future Directions for Research*

In this paper, I present results from a study designed to test various determinants of budgetary slack drawing on both behavioral and agency models of slack. The results of the experiment support four of the five hypotheses on budget slack. First, subordinates who participated built slack into their standards (hypothesis 1). The amount of slack was positively associated with a measure of risk aversion, supporting the idea that building in slack is a response to uncertainty (hypothesis 2). Social pressure not to misrepresent productive capability was found to be significantly lower for the group which had private information than the group which did not (hypothesis 3). Moreover, as social pressure increased, the amount of slack decreased (hypothesis 4). Finally, participation with private information did not lead to significantly more slack than participation when information was shared (hypothesis 5).

The differences in variances between the asymmetry and no asymmetry groups indicate that having private information appears to lead to wider fluctuations in behavior in terms of the amount of slack produced. Possible reasons for the results are subjects for further research. For instance, the single-period experiment conducted could be expanded so that the effects of having private information over multiperiods can be assessed. Another possibility would be to vary the interaction among workers so that the effects of competition and group norms can be explored.

APPENDIX A

Best Estimate of Production

Suppose I were to offer you the following compensation scheme. First, I will ask you how many units you expect to make. I will compensate you 50 cents for each unit that you actually make, however, I will penalize you if you make less than the amount that you've stated you expect to make, and you will be no better off monetarily for making any more than the amount you expect to make. In equation form, the compensation form would look like this:

$$\begin{aligned}\$ \text{ received} = {} & 50 \text{ cents (actual number you made)} \\ & - 50 \text{ cents} * \text{absolute value (number of units you expect to make} \\ & - \text{the actual number of units made)}.\end{aligned}$$

Let's take several examples to clarify. For example, let's say that you told me you expect to make 8 toys and that when you got a chance to perform, you made 8 and only 8 toys. Here's what your compensation would look like:

$$\begin{aligned}\$ \text{ received} &= 50 \text{ cents } (8) - 50 \text{ cents abs val } (8 - 8) \\ &= \$4.00.\end{aligned}$$

If you agreed to make 8 and only made 6 toys, you would receive the following

compensation:

$$\$ \text{ received} = 50 \text{ cents } (6) - 50 \text{ cents abs val } (8 - 6)$$
$$= \$2.00.$$

Finally, if you agreed to make 8 and then made 10 toys, you would get the following:

$$\$ \text{ received} = 50 \text{ cents } (10) - 50 \text{ cents abs val } (8 - 10)$$
$$= \$4.00.$$

QUESTION

Given what you now know about your ability to make Castles and this new compensation scheme, what is your best estimate of the number of units that you would expect to make, within an 11-minute period, given two minutes of downtime?

APPENDIX B

Castle Division Case

Castle Division is a division of the Toys Unlimited Corporation. It produces only one product. This product is called a Castle. The toy castles that are produced in this division become part of a boxed set of toys including toy knights, bridges, and dragons, all of which have a medieval theme. Production of the castles has to be carefully planned so that the total number of castles will match with the total number of components for each set (one castle per set).

With so many different products, the company often runs into coordination problems, that is, the production of one component, such as the castles, is under- or overproduced, given the number of other toys made. When this occurs, production in one division must cease. The cessation of production is called downtime.

Although the division was established in April 1983, its product has only recently been designed and completed. Full production will start shortly, as soon as enough workers can be hired and trained. Castle Division has selected you to be a full-time production line worker. Your job is to construct toy castles. Management would like you to work as hard as you can on the job.

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