BEHAVIORAL RESEARCH IN ACCOUNTING
Vol. 25, No. 2
2013
pp. 145–170

American Accounting Association
DOI: 10.2308/bria-50408

The Effects of Risk Preference and Loss Aversion on Individual Behavior under Bonus, Penalty, and Combined Contract Frames

Alisa G. Brink
Virginia Commonwealth University

Frederick W. Rankin
Colorado State University

ABSTRACT: This study examines the effects of risk preference and loss aversion on individual responses to differently framed, yet economically equivalent, incentive contracts. We extend prior research by examining contracts with combinations of bonus, penalty, and clawback incentives. Contracts framed as a combination of bonus and penalty incentives, especially those framed as a clawback, are less attractive to participants than contracts with bonus- or penalty-only incentives. Further, research suggests that individuals' contract preferences are due primarily to loss aversion. We test this conjecture with a new measure of loss aversion. Results indicate that our measure of loss aversion is well calibrated to encompass variation in loss aversion. In addition, participants' loss preferences explain a significant portion of the differences in observed behavior. Importantly, this relation is less significant for clawback contracts, indicating that other preferences may be driving individuals' strong reactions to these contract frames.

Keywords: incentives; framing; clawback; loss aversion.

INTRODUCTION

The design of incentive compensation is an important and controversial issue in today's economic environment. Recent financial crises have led to public outcry demanding changes to the structure of compensation contracts. Many feel that existing compensation

We thank Allen Blay, Bryan Church, Bud Fennema, Jerry Ferris, Jessen Hobson, Ryan Huston, Carolyn Norman, Tim Salmon, Douglas Stevens, Ben Wier, and Yue Zhang for their helpful comments. The paper benefited tremendously from the feedback from the editor, associate editor, and the anonymous reviewers. We also appreciate the helpful comments from the reviewers, discussants, and participants at the Accounting, Behavior, and Organizations (ABO) and Management Accounting Section (MAS) midyear meetings. In addition, this paper has benefited from the comments of workshop participants at Florida State University, Oregon State University, University of North Texas, and Virginia Commonwealth University. The Accounting Department and Office of Graduate Studies at Florida State University and the School of Business at Virginia Commonwealth University provided generous financial support for this study.

A previous version of this paper was the recipient of the outstanding emerging scholar paper award at the 2008 ABO Conference.

Mandy M. Cheng, Associate Editor.

Published Online: January 2013

systems fail to motivate upper-level management to act in the best interest of shareholders. As a result, firms are redesigning their compensation plans. For instance, many companies have cut bonuses, and some have placed penalties and clawbacks into compensation contracts in an effort to match executive compensation with firm performance (Bialik 2009). A clawback provision refers to awarded money or benefits that are taken back due to subsequent events. In fact, more than 64 percent of Fortune 100 companies have clawback policies as a component of executive compensation contracts (Floersch 2009). In addition, the American Recovery and Reinvestment Act of 2009 (U.S. House of Representatives 2009) requires Troubled Asset Relief Program (TARP) recipients to implement clawback provisions to recover bonuses, retention awards, or incentive compensation paid to executives or any of the next 20 most highly compensated employees based on statements of earnings, revenues, gains, or other criteria that are later found to be materially inaccurate. Despite the increasing use of such contracts, there is a paucity of research on individual responses to combinations of bonuses and penalties or on clawback provisions in contracts.

Prior research on contract framing examines bonuses and penalties in mutually exclusive settings. This research indicates that individuals prefer incentive contracts framed as bonuses to those framed as penalties, even if it is clear that both contracts will lead to the same total compensation (Church et al. 2008; Frederickson and Waller 2005; Hannan et al. 2005; Luft 1994; Van de Weghe and Bruggeman 2004). Further, this research suggests that individual preferences for incentives framed as bonuses to those framed as penalty contracts are due primarily to loss aversion. However, this assertion, that loss aversion explains observed behavior, is not directly tested. This leaves questions regarding individuals' preferences over contracts with combinations of bonus, penalty, and clawback incentives, and the extent to which loss aversion explains those preferences. Accordingly, we extend prior research on the design of incentive contracts in several important ways. First, we explore preferences for contracts that contain combinations of bonus and penalty components. Two types of combination contracts are examined: (1) a contract where meeting a target results in receiving a bonus, and failing to meet the target results in a penalty, and (2) clawback settings, where a bonus may be clawed back when the target is not met. In addition to exploring preferences for various contracts, we contribute to the literature by developing a measure of loss aversion to assess and control for the relative levels of loss aversion between participants. We use this measure to test the effect of loss aversion on individual responses to differently framed, yet economically equivalent, incentive contracts.

Using a controlled experiment with monetary incentives, we measure individual risk and loss preferences and manipulate contract frame between subjects. We explore five economically equivalent contract frames: bonus-only, penalty-only, a bonus and penalty combination, a clawback provision where the bonus is larger than the portion of compensation that can be clawed back, and a clawback provision where the bonus is smaller than the portion of compensation that can be clawed back. Participants make choices with regard to their willingness to work under incentive contracts of an assigned frame versus a flat salary. The results indicate that participants prefer bonus-only contracts to economically equivalent penalty-only, bonus and penalty combination, or clawback contracts. Using our measure of loss aversion, we demonstrate that, in general, loss aversion strongly affects preferences for contracts. We also find that penalty-only contracts are just as acceptable as economically equivalent contracts that contain a combination of bonuses and penalties. Note, both of these contracts contain penalty provisions, so from the standpoint of loss aversion, they are similar.

We also find that participants view clawback contracts as the least attractive. In fact, participants demonstrate a significant preference for typical penalty contracts over economically equivalent clawback contracts. Further, we find that loss aversion has less effect on these preferences, indicating that other motivations may be driving individuals' strong reactions to clawback contracts. The difference between the penalty frame and clawback frame is that in the

clawback frame, the bonus is an awarded amount that can be clawed back contingent on some future event. Under the clawback contract, since the bonus is already awarded, it could create an endowment effect. An endowment effect is an implication of loss aversion, and occurs when individuals value something more once it belongs to them. The endowment effect implies that the utility of receiving a bonus is less than the disutility of forfeiting a bonus that one has already obtained (Thaler 1980). Our participants' negative reaction to the clawback frame is consistent with an endowment effect.

Finally, results indicate that when the clawback contracts are compared, participants find the contract frame with the higher base salary to be more attractive. This is a somewhat unexpected result because both of these frames provide an equal initial amount that is not contingent upon a subsequent outcome. The only difference between the two clawback frames is the portion of the amount labeled as the "base salary" and the portion labeled as a "bonus." This very subtle manipulation has a significant impact on participant reactions, thus providing evidence that the labeling of the components of these contracts can have a strong effect on behavior and should, therefore, be carefully considered.

The primary contribution of our research is to demonstrate employees' preferences over contracts that contain combinations of bonus, penalty, and clawback incentives. The finding that clawback contracts are significantly less attractive than even penalty-only contracts is important due to the recent public outcry in favor of such contracts. In particular, since such provisions make these contracts less acceptable, companies may have to raise the overall compensation level of such contracts in order to attract employees. Raising overall compensation would most likely be an unpopular unintended consequence. Also, our research responds to Frederickson and Waller's (2005) suggestion that future research explore the simultaneous use of bonuses and penalties, and Bonner and Sprinkle's (2002) call for research investigating the effects of combinations of incentives. We also contribute in terms of research methodology by introducing a simple and effective way to measure loss aversion. One current method attempts to measure loss aversion with hypothetical choices, but several studies suggest that choices based on hypothetical payoffs may be unreliable proxies for choices affecting real payoffs (e.g., Camerer and Hogarth 1999; Hertwig and Ortmann 2001; Holt and Laury 2002; Smith and Walker 1993). Another method to measure loss aversion uses the difference between the amount one is willing to pay for an object and the amount she would accept as payment for the object. A criticism of this approach is that it is sensitive to the object being used and the fact that people's perspectives differ when engaged in buying behavior compared to selling behavior. Finally, existing methods can be complex and time-consuming to implement. Our loss aversion method involves choices with monetary payoffs and takes approximately ten minutes to administer.

The next section outlines the previous literature, the theories drawn upon in this study, and the resulting hypotheses. We follow this with the experimental design, the data analyses, and results. The final section of the paper addresses the study's implications and limitations, and proposes areas of future research.

THEORY AND HYPOTHESES

Consider two contracts, Contract A and Contract B. Under Contract A, an employee will receive a base salary of $10 and will receive an additional bonus of $5 if he meets his goal. Under Contract B, an employee will receive a base salary of $15, but will be penalized $5 if she does not meet her goal. If the probability of meeting the goal is the same under both contracts, then the contracts are economically equivalent, because they both pay the employee a total of $15 if the goal is met and $10 if the goal is not met. Classical economic analysis of incentive contracts (e.g., Demski and Feltham 1978; Holmstrom 1979; Holmstrom and Milgrom 1991) asserts that the

employee should view these contracts as equivalent and should be indifferent when choosing between them.

The concept of decision-framing suggests that choices are not independent of the way that the available options are presented or described. Framing is well established as an important consideration for a number of decisions in accounting. For instance, prior research demonstrates the role of framing on risk-taking (Moreno et al. 2002; Sawers et al. 2011), managerial decision-making (Lipe 1993; Sullivan and Kida 1995), tax compliance (Christian and Gupta 1994), and acceptance among audit-client dyads (Cohen and Trompeter 1998).

Luft (1994) studies the role of decision-framing on preferences for bonus and penalty contracts. She finds that participants prefer bonus contracts to penalty contracts, and that this preference does not decline with experience. Luft (1994) offers three possible ways in which decision-framing can potentially explain this phenomenon. The first is the notion that nonmonetary factors can influence the attractiveness of a particular job or contract. This notion is related to the literature on compensating differentials. This literature states that employees consider many aspects of a job, such as terms of the contract, geography, degree of autonomy, and working conditions, and that they trade off monetary and nonmonetary characteristics when making employment choices (Lazear 1991; Eckel et al. 2005). In our setting, the bonus and penalty features of contracts are a nonmonetary way for the firm to express approval or condemnation for an employee's performance. In a related a study, Kube et al. (2012) find that worker-participants respond to a nonmonetary gift with 25 percent higher performance, while a cash gift had no effect on performance. Their interpretation is that worker-participants appreciated the time and effort incurred by the employer to choose the nonmonetary gift and reciprocated with greater effort.

Second, prospect theory (Kahneman and Tversky 1979, 1992) suggests that individuals receive greater disutility from losses than the utility they receive from equivalent gains. Third, bonuses and penalties could signify implicit contracts, where the word "bonus" (with its implications of reward and approval) conveys a certain monetary award, as well as some uncertain future reward. A base salary is commonly interpreted as a guaranteed amount, and the usage of the penalty contract framing causes the base pay to become uncertain. This could cause resentment or suspicion among employees. These explanations, along with Luft's (1994) results, indicate that there may be unintended consequences associated with penalty contracts (e.g., a preference for bonus contracts in firms).

Prior research attributes individuals' preferences for incentives framed as bonuses to economically equivalent penalty contracts primarily to loss aversion.[1] However, this assertion, that loss aversion explains observed behavior, is not directly tested. This is particularly problematic given the other plausible explanations, discussed above, for the observed behavior. Hence, we develop a measure of loss aversion (described in the next section) and test for its relation with different acceptance levels of economically equivalent contracts. We expect that the more loss averse someone is, the less he or she will prefer a contract with penalties:

H1: There is a negative relation between individual loss aversion and the willingness to accept contracts with possible penalties.

[1] We do not explicitly hypothesize the role of risk aversion, because a greater degree of risk aversion always increases individuals' preferences for flat pay contracts compared to incentive contracts, regardless of how the incentive contracts are framed. That is, risk aversion does not distinguish between bonuses and penalties as it only relates to variance in pay. However, risk aversion serves as a crucial control variable.

Preferences for Contracts Containing both Bonus and Penalty Components

Most previous studies of contract framing consider bonuses and penalties in mutually exclusive scenarios. However, contracts often contain combinations of bonus and penalty components. Frederickson and Waller (2005) offer several possibilities for such contracts. In settings where there are multiple dimensions to an employee's job, a bonus can provide an incentive for desired behavior on one dimension, while a penalty can provide a disincentive for undesired behavior on another dimension. For example, many sales contracts contain commissions or bonuses penalized by items such as order cancellations and returns (Horstmann et al. 2005; Kaplan and Atkinson 1998). Frederickson and Waller (2005) suggest that future research explore possible explanations of how psychological and economic factors jointly support the use of combination contracts. We respond to Frederickson and Waller's (2005) suggestion by exploring individuals' preferences for economically equivalent contracts that contain bonus and penalty components.

When a contract containing bonus and penalty incentives is compared to an economically equivalent contract with bonus-only incentives, loss aversion, the implicit contract explanation, and the nonmonetary payoffs explanation consistently predict that individuals will prefer the bonus-only contract. Clearly, since losses are only possible in the combination contract, all else being equal, loss-averse individuals will prefer the bonus-only contract. The implicit contract explanation suggests that the bonus contract conveys a minimum certain amount of base pay for the individual, while the combination contract creates uncertainty regarding base pay and, hence, predicts that individuals will prefer the bonus-only contract. Recall that the nonmonetary payoffs explanation is that bonuses signal approval for one level of performance and penalties signal disapproval for another level of performance. Since bonus contracts only signal approval and combination contracts signal approval for some outcomes and disapproval for others, this implies that individuals should prefer bonus contracts to combination contracts. Hence, we expect individuals to prefer the bonus-only contract. Further, our measure of loss aversion allows us to explore the extent to which it explains participants' preferences. We predict that individuals will prefer a bonus-only contract to a contract with a bonus and a penalty:

H2: Individuals are less willing to accept an economically equivalent incentive contract framed as having a combination of a bonus and a penalty than a contract framed as having only a bonus.

The comparison of a contract that has both a bonus and a penalty to an economically equivalent penalty-only contract is interesting because only the concept of nonmonetary payoffs makes an unambiguous prediction. This is particularly interesting given that prior research attributes individuals' preferences over economically equivalent contracts primarily to loss aversion, and from the perspective of loss aversion, the contracts are similar since they both contain a penalty (Luft 1994; Hannan et al. 2005). The logic of the implicit contract explanation is that a contract framed as a bonus conveys a minimum certain amount of base pay for the individual, while a contract framed as a penalty creates uncertainty with regard to base pay (Kreps 1990; Luft 1994). In the case of a penalty contract versus the combination contract, both create uncertainty regarding base pay due to the presence of the penalty. Hence, the only potential explanation that applies to this comparison is the notion of nonmonetary payoffs. Under the conjecture that the implicit approval suggested by the bonus provision in the combination contract makes it more attractive than the disapproval implied by the penalty contract, individuals will prefer the former. We conjecture that compared to a contract with penalties only, individuals will prefer contracts with a combination of bonus and penalty:

H3: Individuals are less willing to accept an economically equivalent incentive contract framed as having a penalty than a contract framed as having a combination of a bonus and a penalty.

Next, we explore clawback contracts. Clawback provisions are an increasingly common way that penalties are present in combination with bonuses in compensation contracts (Floersch 2009; Fried and Nitzan 2011). While these provisions take a variety of forms, in general, a clawback refers to some previously declared or awarded amount of compensation being withdrawn or clawed back. Under a clawback contract, the bonus is already awarded and a penalty is contingent on the occurrence or nonoccurrence of some future event. Since the bonus is already awarded, it becomes part of the employee's endowment and, thus, could make employees prone to the endowment effect. The endowment effect differs from loss aversion in the following manner. Loss aversion concerns behavior toward possible future gains and losses. The endowment effect states that individuals value something more once it belongs to them. That is, the endowment effect implies that the utility of receiving a bonus is less than the disutility of sacrificing a bonus that one has already obtained (Thaler 1980).[2] The endowment effect suggests that individuals may view clawback contracts as more punitive than typical penalty contracts. In related work, Hossain and List (2009) provide evidence that workers will exert more effort to maintain a provisionally awarded bonus than they will for a bonus framed as a potential future bonus. We consider two ways to frame a clawback contract that allow the contract to remain economically equivalent to the penalty-only contract. The penalty is held constant and the amounts of the bonus and base salary are varied.

In the first clawback frame, the bonus component is larger than the penalty component. In this case, a person may view the penalty as a reduction to a previous bonus, leaving the base pay as a guaranteed amount that is inviolable. To keep this contract economically equivalent to a penalty-only contract, the base salary of the clawback contract must be lower. For the following reasons, we expect individuals to prefer the penalty-only contract to this economically equivalent clawback contract. First, if individuals focus on the low level of base pay under the clawback contract, they may possibly view that contract as less attractive than the penalty-only contract. Second, the endowment effect predicts that individuals will prefer the penalty contract to the clawback contract, since the clawback contract takes away previously awarded compensation. Hence, we expect individuals to prefer a penalty-only contract to a clawback contract:

H4: Individuals are less willing to accept an economically equivalent contract framed as a combination of a bonus and a clawback penalty than a penalty-only contract.

In our second clawback frame, the bonus component is smaller than the penalty component. In such a contract, the clawback completely removes the bonus and reduces the base salary. This could lead to the removal of the "guaranteed" portion of the salary. Assuming that individuals have a stronger sense of ownership with regard to the base salary as compared to the bonus, the endowment effect should be stronger. Hence, individuals might find this framing of the contract as even less attractive than the clawback contract where the bonus is larger than the penalty. Compared to a contract where the clawback is bigger than the bonus, we expect individuals to prefer a contract where the clawback is smaller than the bonus:

H5: Individuals are less willing to accept an economically equivalent clawback combination contract where the bonus is smaller than the clawback penalty than a contract where the bonus is larger than the clawback penalty.

[2] The endowment effect influences behavior in many decision contexts. For instance, the endowment effect creates divestiture aversion, *status quo* bias, and can cause real estate prices to be excessively high (Kahneman et al. 1991; Samuelson and Zeckhauser 1988).

Finally, we compare the simple combination contract to the clawback contracts. In the simple combination contract, an individual receives a bonus if a target is met and a penalty if the target is not met. In the clawback frames, the individual is endowed with a base salary and bonus that may be clawed back by a penalty if the target is not met. In an economically equivalent setting, the individual will earn the same amount if the target is met (or not met) under either contract. Both frames contain a penalty that creates uncertainty with regard to base pay, and a bonus component that could convey a nonmonetary payoff of approval. However, as the bonus in the clawback frame is an endowed amount, the endowment effect implies that the utility of receiving a bonus in the combination contract is less than the disutility of sacrificing the bonus in the clawback contract. Thus, we expect individuals to prefer the simple combination contract to the clawback contract:

H6: Individuals are less willing to accept an economically equivalent incentive contract if it is framed as having a penalty that will clawback a bonus if a target is not met than if it is framed as having a bonus if a target is met and a penalty if the target is not met.

EXPERIMENTAL DESIGN

Task

To test the hypotheses outlined in the previous section, we conducted a series of experimental sessions lasting approximately 45 minutes each. The experiment was administered in a computer lab using z-Tree software (Fischbacher 2007). The experiment consisted of six parts. The first three parts of the experiment measured individual preferences for risk in the gain domain, loss aversion, and preferences for risk in the loss domain, respectively. In the fourth part of the experiment, participants were randomly assigned to an experimental treatment where they made choices between flat salary and incentive contracts. Incentive contract frame was manipulated between participants at five levels: bonus-only, penalty-only, bonus and penalty combination, clawback where the bonus is larger than the potential penalty, and clawback where the bonus is smaller than the potential penalty. The fifth part of the experiment disclosed the calculation of participant earnings for each of the previous parts. Finally, participants answered questions about their understanding of the experiment and demographic characteristics in an exit questionnaire.

Monetary Incentives

Participants received a $10 show-up payment for arriving on time, and were able to earn additional money through the choices they made in the first four parts of the experiment. Each of the first four parts of the experiment required participants to make a series of choices between two options. Participants knew they would be paid based on one randomly selected choice from each of the first four parts of the experiment. Basing payment on one randomly selected choice from each part motivated participants to consider each choice independently. In addition, payoff outcomes were disclosed after participants had completed all four parts, thereby controlling for potential wealth effects. Payments (including the $10 show-up fee) averaged $26.28.

Participants

The participants were 156 students (102 undergraduate students and 54 graduate students) with a mean of 4.72 years of work experience (range: 0–20 years). Forty-five percent of participants were female. On average, participants reported that they had completed 4.83 accounting classes and 2.97 economics classes. Table 1 provides detailed demographic information by treatment group.

TABLE 1

Demographics by Treatment[a]

	Bonus-Only	Penalty-Only	Bonus and Penalty	Clawback 1	Clawback 2	Total
n	30	33	29	35	29	156
Gender						
Male	14	18	17	22	15	86
	(46.7%)	(54.5%)	(58.6%)	(62.9%)	(51.7%)	(55.1%)
Female	16	15	12	13	14	70
	(53.3%)	(45.5%)	(41.4%)	(37.1%)	(48.3%)	(44.9%)
Student Classification[b]						
Undergraduate	18	20	18	25	21	102
	(60.0%)	(60.6%)	(62.1%)	(71.4%)	(72.4%)	(65.4%)
Graduate	12	13	11	10	8	54
	(40.0%)	(39.4%)	(37.9%)	(28.6%)	(27.6%)	(34.6%)
Years of Work Experience						
Mean	4.47	5.09	4.83	4.77	4.41	4.72
(S.D.)	(2.80)	(2.81)	(4.47)	(3.05)	(2.29)	(3.12)
Accounting Classes Completed						
Mean	5.57	4.61	5.62	4.26	4.21	4.83
(S.D.)	(6.02)	(5.13)	(4.56)	(4.96)	(4.82)	(5.09)
Economics Classes Completed						
Mean	3.83	2.58	3.41	2.69	2.45	2.97
(S.D.)	(6.10)	(2.18)	(1.82)	(2.99)	(1.45)	(3.34)

[a] Detailed descriptions of each treatment are provided in Table 2. Pearson Chi-square tests indicate no significant difference in the frequencies across treatments for gender ($\chi^2 = 2.00$, $p = 0.74$) or student classification ($\chi^2 = 2.06$, $p = 0.73$), or major ($\chi^2 = 10.42$, $p = 0.22$). One-way ANOVAs indicate no significant differences in treatment means for work experience ($F = 0.24$, $p = 0.92$), number of accounting classes ($F = 0.56$, $p = 0.69$), or number of economics classes ($F = 0.98$, $p = 0.42$). In addition, Scheffe multiple comparison tests reveal no significant differences between treatments for work experience, number of accounting classes, or number of economics classes (all $p > 0.10$).

[b] Of the 102 undergraduate students, 60 (58.8%) were seniors, 26 (25.5%) were juniors, 11 were sophomores (10.8%), and five (4.9%) were freshmen. Of the 54 graduate students, 34 (62.9%) were Master of Accountancy students, five (9.3%) were M.B.A. students, and 15 (27.8%) were enrolled in other master's degree programs.

Individual Measures of Risk Preference

We measure individual risk preferences in the gain domain in the first part of the experiment, and individual risk preferences in the loss domain in the third part of the experiment. Each risk preference measure requires participants to make a series of ten choices between two lottery options, Option A and Option B. In the first part of the experiment, the ten-choice set is based on the Holt and Laury (2002) measure of risk aversion in the gain domain shown in Appendix A. For each choice, there is a "safe" Option A that has two possible outcomes of $4.00 and $3.20, and a "risky" Option B with more variable outcomes of $7.70 and $0.20. The probabilities associated with each outcome and, therefore, the expected values of the options vary systematically across the ten-choice set. The expected value of the safe option is initially higher than that of the risky option. As a person moves through the choices, the expected value of the risky option eventually exceeds that of the safe option. A person's risk preference is estimated from the number of safe options chosen before switching to risky options. For the version of the Holt and Laury (2002) measure

used in this study, a risk-neutral person would choose Option A five times before switching to Option B, and a risk-seeking person would choose Option B prior to the fifth decision.

In the third part of the experiment, participants answered a separate set of ten choices designed to elicit risk preferences in the loss domain. Following the method used in Laury and Holt (2000), the set of questions and procedure used to elicit risk preferences in the loss domain are identical to part one, with the exception that all possible lottery outcomes are negative amounts of money.[3] Therefore, in the measure for risk preferences in the loss domain, the less variable "safe" Option A outcomes are −$4.00 and −$3.20, and the more variable "risky" Option B outcomes are −$7.70 and −$0.20.

Individual Measures of Loss Aversion

The second part of the experiment measures participants' loss aversion. Loss aversion is a phenomenon described in prospect theory (Kahneman and Tversky 1979), which holds that individuals perceive each outcome, X, in terms of a value function defined as:

$$V(X) = \begin{cases} X_t^{v_1}, \ if \ X > 0 \\ -\lambda(-X_t)^{v_2}, \ if \ X \leq 0 \end{cases} \quad (1)$$

where parameters v_1, v_2,and λ are assumed positive. The two terms in Equation (1) are, respectively, gains raised to the power of v_1 and losses raised to the power of v_2, multiplied by a relative loss aversion coefficient λ. The terms v_1 and v_2 refer to a person's risk preferences. When $v_1 = v_2 = 1$, the individual is risk-neutral with respect to gains or losses. A person is loss-averse if λ is greater than one, and this results in a value function for losses that is steeper than that for gains. In other words, losses loom larger than gains.

It is important to note the difference between risk preference in the loss domain and loss aversion. An individual can be loss-averse even in the absence of risk (Tversky and Kahneman 1991). For example, if an individual experiences more disutility from a certain loss of $20 than positive utility from a certain gain of $20, they exhibit loss aversion in the absence of risk. Thus, risk preferences and loss aversion are two separate characteristics.

We present a simple measure of loss aversion using a set of ten paired lottery choices similar to the Holt and Laury (2002) measure of risk aversion (see Appendix B). Some studies attempt to measure loss aversion with hypothetical choices, but several studies suggest that choices based on hypothetical payoffs may be unreliable proxies for choices affecting real payoffs (e.g., Holt and Laury 2002). Other studies attempt to use the difference between the amount one is willing to pay for an object versus the amount that they would accept as payment for that object. This method draws criticism due to the sensitivity of the object being used, and the interference of the different perspectives of a person engaged in buying behavior from one engaged in selling behavior. There is recent interest in developing more reliable loss aversion estimation methods (e.g., Köbberling and Wakker 2005; Abdellaoui et al. 2008, 2007). Accordingly, we contribute to the literature by presenting a new method to measure loss aversion. The measure presented in this paper has the advantage of eliciting responses to gambles involving monetary losses, rather than hypothetical scenarios. In addition, other proposed methods of eliciting loss aversion can be complex and may require an extended period of time to implement. For example, the method reported in Abdellaoui et al. (2007) took

[3] To prevent participants from seeing through this manipulation, these two question sets were administered in the first and third parts of the experimental session. The second part of the experiment consisted of the question set developed to measure loss aversion. Interviews after the pilot study indicated that participants did not realize that they had seen a set of questions that was simply the negative version of another set.

participants approximately 60 minutes to complete.[4] The new measure presented in this paper takes approximately ten minutes to administer (including instructions). Thus, it also has the advantage of being relatively quick and easy to implement.

As in the Holt and Laury (2002) measure, participants make ten choices between two options. Like the risk measure, one of the choices was randomly selected for payment. However, for the loss aversion measure, each option has a 50 percent chance of a positive monetary outcome and a 50 percent chance of a negative monetary outcome. Thus, the level of risk (i.e., the probability of each outcome's occurrence) is held constant. The options differ from one another in only one feature: the size of the potential loss in Option A. Option A has a 50 percent chance of a $5 gain, and a 50 percent chance of a loss that increases with each choice set. Option B remains constant, with a 50 percent chance of gaining a dollar and a 50 percent chance of losing a dollar. As a person goes from the first to the last pair of options, the expected utility of Option A decreases because the size of the loss increases. The payoffs in Option B stay constant, and while it has a lower potential positive outcome, it has a lower potential negative outcome. One would expect that for a loss-averse individual, the negative utility from the increasing size of the loss in Option A would eventually outweigh the positive utility from the larger potential gain from that option. This would lead the person to switch from Option A to Option B. Given a person's risk preferences, the point at which he or she switches from Option A to Option B will indicate his or her relative level of loss aversion. In other words, since the only difference between each choice set is the size of the loss in Option A, the measure progressively tests a person's tolerance for losses. At some point, the loss will become large enough to cause the person to switch over to Option B. A person who switches very quickly is more loss-averse than a person who tolerates higher losses before switching.

Using risk preferences of $v_1 = v_2 = 0.5$ (indicating a moderate level of risk aversion in the gain domain and risk-seeking behavior in the loss domain, as predicted by Kahneman and Tversky [1979]), the measure is designed to give estimates of loss aversion ranging from $\lambda \leq 1$, indicating loss neutrality or loss-loving behavior, to $\lambda \geq 6.75$, indicating an extremely high level of loss aversion. Appendix B shows the estimates of loss aversion indicated by each switching point in the measure for four sets of risk preferences: (1) The reflection effect, with moderate risk aversion in the gain domain and moderate risk-seeking in the loss domain ($v_1 = v_2 = 0.5$), (2) risk neutrality ($v_1 = v_2 = 1$), (3) risk aversion in both domains ($v_1 = 0.5$, $v_2 = 1.3$), and (4) risk-seeking behavior in both domains ($v_1 = 1.3$, $v_2 = 0.5$).

The numerical estimate of an individual's loss coefficient indicated by this measure depends on his or her risk preferences.[5] However, for all levels of risk preference, this measure provides a relative tolerance for losses between participants. For any participant, the more often he or she chooses the

[4] Abdellaoui et al. (2007) use a preference-based method to elicit utility for gains and losses. Participants make a series of hypothetical choices between gambles involving substantial gains and losses of money in an experiment lasting approximately one hour. A set of choices is used to calculate an indifference value between the gambles. This process is repeated 19 times to obtain 11 points of the utility function in the loss domain and eight points in the gain domain. This method allows for the estimation of the utility function for gains and losses, as well as the estimation of loss aversion. Abdellaoui et al. (2008) develop a more efficient method, using interview sessions lasting approximately one hour. Participants make a series of choices used to elicit certainty equivalents to hypothetical two-outcome prospects. The resulting measure requires 10–12 sets of choices eliciting certainty equivalents, which could be administered in less time than the 18–20 elicitations required by the method described in Abdellaoui et al. (2007).

[5] The intervals of loss aversion indicated by the measure are relatively stable if a person exhibits the reflection effect ($v_1 \approx v_2$). If an individual is risk-averse in both the gain and loss domains, as was found for a number of participants in the Laury and Holt (2000) paper, the intervals shift to surround low levels of loss aversion. This can be seen by the example given in the last column of the table in Appendix B, where $v_1 = 0.5$ and $v_2 = 1.3$. If a person is risk-seeking in both the gain and loss domain, the intervals would shift to surround higher levels of loss aversion.

option with higher potential losses, the higher his or her tolerance for losses (i.e., lower level of loss aversion).

Experimental Treatments

The fourth part of the experiment asked participants to make a series of seven choices between a flat pay rate and an incentive scheme framed according to treatment (see Table 2). Incentive contract frame was manipulated between participants at five levels: bonus-only, penalty-only, bonus and penalty combination, clawback where the bonus is larger than the potential penalty, and clawback where the bonus is smaller than the potential penalty. The bonus-only and penalty-only treatments used payments equal to those used in Luft (1994), and the combination and clawback treatments were developed for this study based on Luft's (1994) format. Bonus-only contracts consist of a base salary and a 50 percent chance of receiving a bonus. Penalty-only contracts consist of a base salary and a 50 percent chance of a penalty. Bonus and penalty contracts consist of a base salary with a 50 percent chance of receiving a bonus and a 50 percent chance of a penalty. Clawback contracts consist of a base salary, a bonus, and a 50 percent chance of a penalty. Thus, the bonuses in the clawback contracts are simply a reframing of the base salary from the penalty contracts, as they are not contingent upon any uncertain outcome. This simple clawback setting proxies for a situation where an employee is certain they will be paid their base salary and a bonus in the current period, but there is the potential for a clawback or penalty in the future contingent upon some outcome.[6]

In all treatment frames, the flat pay rate was always $6.00, but the expected value of the incentive scheme increased in increments of $0.50, from $5.50 in the first choice set to $8.50 in the seventh choice set. The incentive contract in the fourth choice was economically equivalent across all four treatments; it gave a payout of $10.00 if the target was met and $4.00 if the target was not met.[7] Thus, participants made seven choices between a fixed flat salary and an increasingly attractive incentive contract. Participants were informed that the computer would randomly select one of the seven choices to be played and they would be paid according to this outcome.

DATA ANALYSIS AND RESULTS

Risk Preferences and Loss Aversion

From the Holt and Laury (2002) risk measures, we use the absolute number of safe choices as the measure of individual risk preference.[8] Table 3 shows the mean and median levels of risk aversion for each participant. We gather evidence of participants' loss aversion using the measure

[6] For example, in the economically equivalent choice for the clawback contract where the bonus is smaller than the potential penalty, the clawback option is: "A base salary of $2.50, and a bonus of $7.50. You will be penalized $6.00 for a number between 1 and 50 (50% probability). You will NOT be penalized if the number is between 51 and 100 (50% probability)." Manipulation checks indicate that only one participant indicated confusion about the receipt of the bonus and potential for a penalty in the clawback contracts. Excluding this participant from the analyses does not change the results.

[7] In Luft (1994), participants answer general business knowledge questions and meet the target by scoring in the top half. This translates to a 50 percent chance of meeting the target. To simplify the experiment and remove the possibility that knowledge and ability led to an increased probability of meeting the target, participants are told that there is a 50 percent chance that they would reach the target, as determined by a random number drawn by the computer.

[8] For a person's preferences to be consistent, they should switch from safe to risky choices only once. The absolute number of safe choices is used because some participants may switch back and forth between the two options more than once, making it more difficult to interpret their preferences. In the gain domain, 129 participants (82.69 percent) showed consistent preferences by switching once or not at all. In the loss domain, 133 participants (85.26 percent) showed consistent preferences by switching once or not at all. Results include all participants, regardless of the number of times they switched. Results do not differ if participants who switched more than once are dropped.

TABLE 2

Contract Choices and Choice Frequencies

Panel A: All Treatments Combined (n = 156)[a]

Choice	Flat Salary	Incentive Contract Expected Value (Constant Across Treatments)	Participants Choosing Flat Salary (Percentage)	Participants Choosing Incentive Contract (Percentage)
1	$6.00	$5.50	145 (92.9%)	11 (7.1%)
2	$6.00	$6.00	136 (87.2%)	15 (12.8%)
3	$6.00	$6.50	115 (73.7%)	41 (26.3%)
4[b]	**$6.00**	**$7.00**	**80 (51.3%)**	**76 (48.7%)**
5	$6.00	$7.50	45 (28.8%)	111 (71.2%)
6	$6.00	$8.00	31 (19.9%)	125 (80.1%)
7	$6.00	$8.50	21 (13.5%)	135 (86.5%)

Panel B: Bonus-Only Treatment (n = 30)[c]

Choice	Base	Bonus (50% Probability)	Penalty	Participants Choosing Flat Salary (Percentage)	Participants Choosing Incentive Contract (Percentage)
1	$4.00	$3.00	–	27 (90.0%)	3 (10.0%)
2	$4.00	$4.00	–	22 (73.3%)	8 (26.7%)
3	$4.00	$5.00	–	12 (40.0%)	18 (60.0%)
4[b]	**$4.00**	**$6.00**	–	**4 (13.3%)**	**26 (86.7%)**
5	$4.00	$7.00	–	3 (10.0%)	27 (90.0%)
6	$4.00	$8.00	–	2 (6.7%)	28 (93.3%)
7	$4.00	$9.00	–	1 (3.3%)	29 (96.7%)

(continued on next page)

TABLE 2 (continued)

Panel C: Penalty-Only Treatment (n = 33)[c]

Choice	Base	Bonus	Penalty (50% Probability)	Participants Choosing Flat Salary (Percentage)	Participants Choosing Incentive Contract (Percentage)
1	$10.00	–	$9.00	31 (93.9%)	2 (6.1%)
2	$10.00	–	$8.00	28 (84.8%)	5 (15.2%)
3	$10.00	–	$7.00	25 (75.8%)	8 (24.2%)
4[b]	**$10.00**	–	**$6.00**	**20 (60.6%)**	**13 (39.4%)**
5	$10.00	–	$5.00	6 (18.2%)	27 (81.8%)
6	$10.00	–	$4.00	3 (9.1%)	30 (90.9%)
7	$10.00	–	$3.00	0 (0%)	33 (100%)

Panel D: Bonus and Penalty Treatment (n = 29)

Choice	Base	Bonus (50% Probability)	Penalty (50% Probability)	Participants Choosing Flat Salary (Percentage)	Participants Choosing Incentive Contract (Percentage)
1	$7.00	$3.00	$6.00	24 (82.8%)	5 (17.2%)
2	$7.00	$3.00	$5.00	24 (82.8%)	5 (17.2%)
3	$7.00	$3.00	$4.00	20 (69.0%)	9 (31.0%)
4[b]	**$7.00**	**$3.00**	**$3.00**	**15 (51.7%)**	**14 (48.3%)**
5	$7.00	$3.00	$2.00	5 (17.2%)	24 (82.8%)
6	$7.00	$3.00	$1.00	2 (6.9%)	27 (93.1%)
7	$7.00	$3.00	$0.00	3 (10.3%)	26 (89.7%)

(continued on next page)

described in the previous section. Participant responses in the exit questionnaire indicate that the loss aversion measure is easy to understand and complete. For a person's preferences to be consistent on the loss aversion measure, they should switch from Option A to Option B only once. One hundred forty-two participants (91 percent) switched once or not at all.

We use the absolute number of choices with the higher loss as the measure of loss aversion. The larger the absolute number of higher loss choices, the more tolerant of losses (i.e., the less loss-averse) an individual is. An analysis of the frequencies of these choices for the participants in this

TABLE 2 (continued)

Panel E: Clawback Treatment 1—Bonus > Penalty (n = 35)

Choice	Base	Bonus	Penalty (50% Probability)	Participants Choosing Flat Salary Percentage)	Participants Choosing Incentive Contract (Percentage)
1	$2.50	$6.00	$6.00	35 (100%)	0 (0%)
2	$2.50	$6.50	$6.00	35 (100%)	0 (0%)
3	$2.50	$7.00	$6.00	32 (91.4%)	3 (8.6%)
4[b]	**$2.50**	**$7.50**	**$6.00**	**26 (74.3%)**	**9 (25.7%)**
5	$2.50	$8.00	$6.00	19 (54.3%)	16 (45.7%)
6	$2.50	$8.50	$6.00	16 (45.7%)	19 (54.3%)
7	$2.50	$9.00	$6.00	11 (31.4%)	24 (68.6%)

Panel F: Clawback Treatment 2—Bonus < Penalty (n = 29)

Choice	Base	Bonus	Penalty (50% Probability)	Participants Choosing Flat Salary (Percentage)	Participants Choosing Incentive Contract (Percentage)
1	$5.00	$3.50	$6.00	28 (96.6%)	1 (3.4%)
2	$5.00	$4.00	$6.00	27 (93.1%)	2 (6.9%)
3	$5.00	$4.50	$6.00	26 (89.7%)	3 (10.3%)
4[b]	**$5.00**	**$5.00**	**$6.00**	**15 (51.7%)**	**14 (48.3%)**
5	$5.00	$5.50	$6.00	12 (41.4%)	17 (58.6%)
6	$5.00	$6.00	$6.00	8 (27.6%)	21 (72.4%)
7	$5.00	$6.50	$6.00	6 (20.7%)	23 (79.3%)

[a] Participants were randomly assigned to one of five treatments, which differed in the framing of the incentive contract. For each choice, they compared the flat salary of $6 to the incentive contract and indicated whether they would choose the flat salary or the incentive contract. The expected value of each choice's incentive contract was held constant across all treatments. Participants were not shown expected values.

[b] The fourth incentive contract in each treatment (indicated by bold rows) is economically equivalent to the fourth choice in other treatments. These contracts pay a total of $10 if the target is met and $4 if the target is not met. Pearson's Chi-square indicates that there is a significant relation ($p < 0.001$) between the treatment and the proportion of participants choosing the incentive contract for the economically equivalent contract in Choice 4.

[c] Dollar amounts used in the Bonus and Penalty treatments (Panel B and Panel C) are taken from Luft (1994).

TABLE 3

Descriptive Statistics by Treatment

	Bonus-Only	Penalty-Only	Bonus and Penalty	Clawback 1	Clawback 2	Total
n	30	33	29	35	29	156
						Test (Sig.)[a]
RiskAversionGain						
Mean	5.93	6.18	6.03	6.14	5.97	0.114
(Median)	(6)	(6)	(6)	(6)	(6)	(0.977)
RiskAversionLoss						
Mean	5.00	4.55	4.55	5.11	4.90	1.489
(Median)	(5)	(5)	(5)	(5)	(5)	(0.208)
LossTolerance						
Mean	6.33	6.15	6.69	6.34	5.66	1.184
(Median)	(6.5)	(6)	(7)	(7)	(6)	(0.320)
IncentiveChoice						
Mean	3.22	3.10	3.79	2.78	4.63	12.614 (<0.001)
EquivalentChoice						
Flat Salary	4	20	15	26	15	25.859
(%)	(13.3%)	(60.6%)	(51.7%)	(74.3%)	(51.7%)	(<0.001)
Incentive	26	13	14	9	14	
(%)	(86.7%)	(39.4%)	(48.3%)	(25.7%)	(48.3%)	

[a] F-tests for the effect of the treatment on *RiskAversionGain*, *RiskAversionLoss*, and *Loss Tolerance* are reported. There are no significant differences in these characteristics for the individuals assigned to each treatment. Pearson's Chi-square is reported for *IncentiveChoice* and *EquivalentChoice*. Chi-squares indicate that the treatment significantly influenced willingness to accept incentive contracts. p-values are two-tailed. Clawback 1 refers to the contract framed with a bonus that is larger than the penalty. Clawback 2's bonus is smaller than the penalty.

Variable Definitions:
RiskAversionGain = the absolute number of safe choices in the Holt-Laury risk measure in the gain domain;
RiskAversionLoss = the absolute number of safe choices in the Holt-Laury risk measure in the loss domain;
LossTolerance = the absolute number of choices with the higher loss on the loss aversion measure;
IncentiveChoice = the absolute number of incentive contract choices made in the experiment. Participants were given seven choices between a flat salary and an incentive contract. This variable reports the absolute number of incentive contract choices made in the experiment. It can range from zero, indicating that the participant always chose the flat salary contract, to seven, indicating that the individual always chose the incentive contract option; and
EquivalentChoice = the choice (flat salary or incentive contract) made on the economically equivalent choice.

study indicates that only one respondent chose zero higher loss choices, and only one chose ten higher loss choices. All other participants selected between three and nine higher loss choices. This provides evidence that the measure is well calibrated to encompass most individuals' varying levels of loss aversion. Table 3 reports the mean and median levels of *LossTolerance* for each participant.

Loss Aversion and Contract Acceptance

H1 predicts a negative relation between loss aversion and the willingness to accept incentive contracts with possible penalties. To test this hypothesis, we first examine participants' willingness

to choose incentive contracts rather than flat salary contracts by estimating the following regression model:[9]

$$IncentiveChoice = \beta_0 + \beta_1 RiskAversionGain + \beta_2 RiskAversionLoss + \beta_3 LossTolerance \quad (2)$$

where:

IncentiveChoice = the absolute number of times the incentive contract was chosen rather than the flat salary. This variable ranges from zero, indicating that the participant always chose the flat salary contract, to seven, indicating that the individual always chose the incentive contract option;[10]

RiskAversionGain = the absolute number of safe choices in the Holt-Laury risk measure in the gain domain (ranging from zero to ten safe choices);

RiskAversionLoss = the absolute number of safe choices in the Holt-Laury risk measure in the loss domain (ranging from zero to ten safe choices); and

LossTolerance = the absolute number of higher loss choices in the loss aversion measure (ranging from zero to ten higher loss choices).

We estimate the regression across all contract frames, penalty frames, and each treatment separately. We expect a negative relation between risk aversion variables and *IncentiveChoice*, reflecting individuals' reluctance to select incentive contracts that have an element of risk. Higher levels of *IncentiveChoice* indicate that the participant is more willing to select the incentive contract, and higher levels of *LossTolerance* indicate a higher tolerance for losses. Therefore, a positive relationship between these two variables is expected.

Table 4 shows the results of the regression models. Considering the entire sample, risk and loss aversion are related to the number of incentive contract choices in the predicted directions. As predicted by H1, loss aversion is significant when observing the subset of treatments that contain penalties ($p = 0.001$), the penalty-only treatment ($p = 0.014$), and the clawback treatment where the bonus is smaller than the penalty ($p = 0.045$). Marginal significance ($p = 0.083$) for loss aversion is detected for the penalty-only treatment. Contrary to expectations, loss aversion is not significant for the clawback contract where the bonus is larger than the penalty ($p = 0.181$). In addition, the model does not fit well for this subset of data overall (Adjusted $R^2 = -0.020$).[11]

To provide a tighter test of H1, we examine participants' responses to the fourth choice, where the incentive contract is economically equivalent across the four contract frames. Panel A of Table 2 reports that 51.3 percent of all participants chose the flat salary rather than the incentive contract

[9] Due to the ordinal nature of the dependent variable, this model was also estimated using ordinal logistic regression. Results do not differ significantly from the linear regression results reported in the paper. The significance of results is slightly stronger with ordinal regression, but the same conclusions are drawn from either model. During the analyses, other control variables (e.g., income levels, class level, number of economics classes, etc.) are added to this regression model and the other regression models reported in this paper. Unless otherwise noted, none of these variables had a significant effect or increased the explanatory power of the model, so they are omitted from the results reported in this paper.

[10] As with the risk and loss preference measures, participants may switch from the flat salary to the incentive contracts more than once. One hundred forty-six participants (93.6 percent) showed consistent preferences by switching once or not at all. Results include all participants, regardless of the number of times they switched. Results do not differ if participants who switched more than once are dropped. In additional sensitivity analyses, the final switching point was used as an alternative measure of the dependent variable. Again, results do not differ significantly from those reported in the paper based on an absolute count of incentive contract choices.

[11] We observed a Pearson correlation of 0.242 ($p = 0.002$) between *RiskAversionGain* and *RiskAversionLoss*, a Pearson correlation of −0.370 ($p < 0.001$) between *RiskAversionGain* and *LossTolerance*, and a Pearson correlation of −0.216 ($p = 0.007$) between *RiskAversionLoss* and *LossTolerance*. Tests for multicollinearity problems reveal no serious issues. However, we note that given the low R^2 values, there may be slight collinearity effects that would decrease the significance levels reported for the correlated dependent variables.

TABLE 4

The Effects of Risk and Loss Preferences on the Number of Incentive Contract Choices[a]

	Coefficient Estimate (p-value)						
	All Treatments (n = 156)	**All Penalty Treatments (n = 126)**	**Bonus (n = 30)**	**Penalty (n = 33)**	**Bonus and Penalty (n = 29)**	**Clawback 1 (n = 35)**	**Clawback 2 (n = 29)**
Constant							
	4.676***	3.857***	5.099***	2.180	4.591**	2.728	3.658**
	(<0.001)	(<0.001)	(<0.001)	(0.247)	(0.025)	(0.307)	(0.046)
RiskAversionGain (−)							
	−0.137*	−0.101	−0.092	−0.006	−0.172	−0.185	0.011
	(0.053)	(0.116)	(0.315)	(0.482)	(0.175)	(0.157)	(0.476)
RiskAversionLoss (−)							
	−0.298***	−0.378***	—	−0.158	−0.305*	−0.107	−0.515**
	(0.006)	(0.001)		(0.244)	(0.078)	(0.375)	(0.022)
LossTolerance (+)							
	0.147**	0.254***	—	0.350**	0.243*	0.155	−0.281**
	(0.033)	(0.001)		(0.014)	(0.083)	(0.181)	(0.045)
R^2	0.124	0.232	0.008	0.277	0.257	0.07	0.376
Adj. R^2	0.107	0.213	−0.027	0.202	0.168	−0.02	0.301
Mean Incentive Choices[b]							
	3.33	3.02	4.63	3.58	3.79	2.03	2.80

*, **,*** Significant at the 10 percent, 5 percent, and 1 percent levels, respectively, (one-tailed for predictors where signs are predicted, two-tailed otherwise).

[a] Participants are given seven choices between a flat salary and an incentive contract. The dependent variable, *IncentiveChoice*, is the absolute number of incentive contract choices (rather than flat salary choices) made in the experiment. It can range from zero, indicating that the participant always chose the flat salary contract, to seven, indicating that the individual always chose the incentive contract option. These values range from zero to seven incentive contract choices. Clawback 1 refers to the contract framed with a bonus that is larger than the penalty. Clawback 2's bonus is smaller than the penalty.

[b] The mean number of incentive contract choices (the dependent variable).

Variable Definitions:

RiskAversionGain = the absolute number of safe choices in the Holt-Laury risk measure in the gain domain. The predicted sign for the coefficient for this variable is negative;

RiskAversionLoss = the absolute number of safe choices in the Holt-Laury risk measure in the loss domain. The predicted sign for the coefficient for this variable is negative; and

LossTolerance = the absolute number of choices with the higher loss on the loss aversion measure. The predicted sign for the coefficient for this variable is positive.

for this choice. We estimate the following logistic regression model across all contract frames, penalty frames, and each treatment separately:

$$EquivalentChoice = \beta_0 + \beta_1 RiskAversionGain + \beta_2 RiskAversionLoss + \beta_3 LossTolerance + \varepsilon \quad (3)$$

where:

EquivalentChoice = the fourth choice, which was economically equivalent across all four treatments (Flat Salary = 0; Incentive Contract = 1).

As in the previous model, the dependent variable is a measure of the frequency of incentive contract choices. Therefore, we expect a negative relation between the risk aversion measures and

the willingness to accept the incentive contract, and a positive relation between *LossTolerance* and willingness to accept the incentive contract when penalties are present. Table 5 reports the results. The relationships between the independent and dependent variables are in the expected directions across all treatments. For contracts that contain a penalty, there is a significant negative relation ($p = 0.008$) between risk aversion for losses and participants' willingness to select the incentive contract. There is also a significant positive relation ($p = 0.001$) between *LossTolerance* (i.e., lower loss aversion) and willingness to accept the incentive contract. This result supports H1, as it indicates that as loss aversion increases, participants are less willing to accept contracts with a component framed as a penalty. This relation between loss aversion and acceptance of incentive contracts is also apparent when analyzing the penalty-only ($p = 0.018$), bonus and penalty combination contract ($p = 0.046$), and the clawback contract where the bonus is smaller than the penalty ($p = 0.024$). However, loss aversion is not significant for participants in the clawback contract where the bonus is larger than the penalty ($p = 0.206$). Thus, it appears that preferences other than loss aversion contribute to individual reactions to contract framing. As a result, researchers should be careful in their assumption that loss aversion is the underlying explanatory difference.

Differences in Incentive Contract Acceptance between Treatments

To address H2–H6, treatments are compared on the basis of the means of the absolute number of incentive contract choices for each treatment, and participants' responses on the economically equivalent fourth contract choice. We report the results in Table 6. Luft (1994) finds that versus a flat-wage contract, participants in the bonus contract are more willing to choose the incentive contract than participants in the penalty contract. Results from the present study support Luft's (1994) findings by indicating that participants in the bonus-only treatment are significantly ($p = 0.004$) more willing to accept incentive contracts than participants in the penalty-only treatment (Table 6). In addition, for the economically equivalent contract, a significantly greater percentage of participants choose the incentive contract in the bonus frame than in the penalty frame ($p < 0.001$).

H2 predicts that participants will be less willing to accept an incentive contract framed as having a combination of a bonus and a penalty than one framed as having only a bonus. Panel A of Table 6 reports that the bonus-only frame leads to a significantly ($p = 0.017$) higher number of incentive contract choices than the combination of a bonus and a penalty. The difference becomes even more significant ($p < 0.001$) when comparing the bonus-only frame to either of the clawback contracts. In support of H2, these results indicate that individuals are more willing to accept a contract framed as having only a bonus incentive than one with both a bonus and a penalty component. Panel B of Table 6 reports that this result holds for comparisons dealing with only the economically equivalent contract ($p < 0.001$). This supports the notion that loss aversion is the primary factor that determines preferences concerning bonuses and penalties and that it extends to combination contracts.

H3 predicts that participants will be less willing to accept an economically equivalent incentive contract if it is framed as having a penalty than if it is framed as having a combination of a bonus and a penalty. The results indicate that there is no significant difference between these contracts. Specifically, for the economically equivalent contract, 39.4 percent and 48.3 percent of participants chose the incentive for the penalty-only and bonus and penalty frames, respectively (see Table 3). Panel B of Table 6 reports that a Chi-square test indicates that these frequencies are not statically significant ($p = 0.241$). The fact that participants are indifferent between these contracts is particularly interesting given that prior research attributes individuals' preferences over economically equivalent contracts primarily to loss aversion, and from the perspective of loss aversion, the contracts are similar. This provides indirect evidence of the importance of loss aversion on participants' preferences.

TABLE 5

The Effects of Risk and Loss Preferences on Participants' Willingness to Accept the Incentive Contract on the Economically Equivalent Fourth Choice[a]

	Logit Coefficient Estimate (p-value)					
All Treatments (n = 156)	**Penalty Treatments (n = 126)**	**Bonus (n = 30)**	**Penalty (n = 33)**	**Bonus and Penalty (n = 29)**	**Clawback 1 (n = 35)**	**Clawback 2 (n = 29)**
Constant						
1.293	0.131	3.246	−2.925	−0.601	4.007	−0.449
(0.312)	(0.930)	(0.118)	(0.393)	(0.866)	(0.318)	(0.874)
RiskAversionGain (−)						
−0.173*	−0.16	−0.223	0.208	−0.169	−0.496**	−0.079
0.053	(0.104)	(0.235)	(0.224)	(0.311)	(0.048)	(0.396)
RiskAversionLoss (−)						
−0.319**	−0.465**	—	−0.581	−0.416	−0.700*	−0.549
(0.023)	(0.008)		(0.109)	(0.138)	(0.091)	(0.128)
LossTolerance (+)						
0.199**	0.413***	—	0.594**	0.520**	0.216	0.63**
(0.022)	(0.001)		(0.018)	(0.046)	(0.206)	(0.024)
Nagelkerke R^2						
0.142	0.268	0.031	0.382	0.268	0.173	0.421
Incentive Contract Choices[b]						
Number 76	50	26	13	14	9	14
% 48.72%	39.68%	86.67%	39.39%	48.28%	25.71%	48.28%

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent levels, respectively, (one-tailed for predictors where signs are predicted, two-tailed otherwise).

[a] The dependent variable is the choice made on the economically equivalent choice (choice 4) in the experiment. *EquivalentChoice* = 1 for the incentive contract, and 0 for the flat salary. Clawback 1 refers to the contract framed with a bonus that is larger than the penalty. Clawback 2's bonus is smaller than the penalty.

[b] The number and percentage of participants choosing the incentive contract in choice 4 (the dependent variable) for each subset.

Variable Definitions:

RiskAversionGain = the absolute number of safe choices in the Holt-Laury risk measure in the gain domain. The predicted sign for the coefficient for this variable is negative;

RiskAversionLoss = the absolute number of safe choices in the Holt-Laury risk measure in the loss domain. The predicted sign for the coefficient for this variable is negative; and

LossTolerance = the absolute number of choices with the higher loss on the loss aversion measure. The predicted sign for the coefficient for this variable is positive.

H4 predicts that individuals are less willing to accept an economically equivalent contract framed as a combination of a bonus and a clawback penalty versus a penalty-only contract. Panel A of Table 6 reports that participants find a penalty-only frame to be more appealing than a clawback frame. The penalty-only frame leads to a significantly ($p < 0.001$) higher number of incentive contract choices than the clawback contract with a higher bonus. There is also a significant difference ($p = 0.037$) when the clawback contract has a bonus that is smaller than the penalty. These results indicate that a clawback frame is viewed as less attractive than a penalty-only frame. Our participants' negative reaction to the clawback frame is consistent with an endowment effect. This result suggests that there may be costs associated with the increased implementation of

TABLE 6

Differences in Participant Acceptance of Incentive Contracts between Treatments

Panel A: Between-Treatment Comparisons for the Absolute Number of Incentive Contract Choices[a]

(I) Treatment	(J) Treatment	Mean Difference (I − J)[a]	Standard Error	p-value
H2 Comparisons				
Bonus-Only	Penalty-Only	1.058	0.375	0.004
	Bonus and Penalty	0.840	0.384	0.017
	Clawback 1	2.605	0.381	<0.001
	Clawback 2	1.840	0.439	<0.001
H3 Comparison				
Penalty-Only	Bonus and Penalty	0.217	0.379	0.284
H4 Comparisons				
Penalty-Only	Clawback 1	1.547	0.374	<0.001
	Clawback 2	0.783	0.429	0.037
H5 Comparison				
Clawback 1	Clawback 2	−0.765	0.432	0.041
H6 Comparisons				
Bonus and Penalty	Clawback 1	1.765	0.385	<0.001
	Clawback 2	1.000	0.433	0.014

Panel B: Between Treatment Comparisons for the Economically Equivalent Fourth Choice[b]

(I) Treatment	(J) Treatment	n	χ^2	df	p-value
H2 Comparisons					
Bonus-Only	Penalty-Only	63	14.891	1	<0.001
	Bonus and Penalty	59	9.954	1	0.001
	Clawback 1	65	24.149	1	<0.001
	Clawback 2	59	9.954	1	0.001
H3 Comparison					
Penalty-Only	Bonus and Penalty	62	0.495	1	0.241
H4 Comparisons					
Penalty-Only	Clawback 1	68	1.452	1	0.114
	Clawback 2	62	0.495	1	0.243
H5 Comparison					
Clawback 1	Clawback 2	64	3.506	1	0.031
H6 Comparisons					
Bonus and Penalty	Clawback 1	64	3.506	1	0.031
	Clawback 2	58	0.000	1	1.000

[a] The treatment means are tested for the hypothesized differences in the absolute number of incentive contract choices made in the experiment. p-values are one-tailed. Clawback 1 refers to the contract framed with a bonus that is larger than the penalty. Clawback 2's bonus is smaller than the penalty.

[b] Chi-square tests are used to test for the hypothesized differences between treatments in the frequency of participants choosing the incentive contract for the equivalent choice (Choice 4) in the experiment. p-values are one-tailed. None of the cells have expected frequencies of less than five.

clawbacks. Since such provisions make contracts less acceptable, companies may have to raise the overall compensation level of such contracts in order to attract employees.

H5 predicts that individuals are less willing to accept clawback contracts when the bonus is smaller than the penalty, versus an economically equivalent clawback contract when the bonus is larger than the penalty. Panel A of Table 6 reports that participants who had clawback contracts framed with a bonus smaller than the penalty are more likely to accept the incentive contract ($p = 0.041$). This result also holds for the economically equivalent choice ($p = 0.031$) displayed in Panel B of Table 6. In the framing of these contracts, the size of the potential penalty is held constant. Therefore, this result provides evidence that the frame that had the higher base salary and lower bonus was more attractive to participants than the economically equivalent frame that has the lower base salary and higher bonus. By design, the size of the penalty is held constant between these two frames; thus, it appears that these results are driven by the size of the base salary. This result is interesting because (also by design) the bonus in these treatments is an amount that is not contingent upon any future outcome. Thus, the difference between the "base salary" and the "bonus" is simply a matter of name. The fact that participants respond to this manipulation is a strong indication of how much framing and word choice can affect perceptions.

H6 predicts that participants are less willing to accept an economically equivalent incentive contract if it is framed as having a penalty that will clawback a bonus if a target is not met than if it is framed as having a bonus if a target is met and a penalty if the target is not met. Results indicate significant ($p < 0.05$) support for this hypothesis for both clawback contracts when comparing the number of incentive contract choices. However, when observing the economically equivalent choice, the predicted difference only appears for the clawback contract with the smaller bonus.

CONCLUSION

This study provides insight into some of the underlying factors that cause employees to react differently to the framing of incentives, and extends prior research in two important ways. First, we examine preferences for contracts that contain combinations of bonus and penalty components. These comparisons include clawback frames, which have recently surged in popularity. We also add to the literature by presenting a new measure of loss aversion developed to assess and control for the relative levels of loss aversion between participants. Using this measure, along with existing measures of individual risk preference, this study examines individuals' reactions to contracts that are economically equivalent, but framed differently.

The results indicate that participants prefer bonus-only contracts to economically equivalent penalty-only, bonus and penalty combination, or clawback contracts. We find that penalty-only contracts are viewed as just as acceptable as economically equivalent contracts that contain a combination of bonuses and penalties. Further, we find that contracts framed with a clawback penalty are significantly less attractive than even economically equivalent penalty-only contracts. These results are important because they provide evidence that there may be unintended consequences associated with the increased implementation of penalties and clawbacks. Since such provisions make contracts less acceptable, companies may have to raise the overall compensation level of such contracts in order to attract employees. An interesting area for future research would be to investigate whether existing compensation contracts containing penalty components end up paying higher total compensation than contracts for similar positions that do not contain penalty components.

Further, we demonstrate that risk and loss preferences affect preferences for contracts. These psychological constructs may be inherent characteristics of potential employees, which can be difficult to change. Rather, companies face the challenge of designing or describing contracts in a manner that makes them more attractive to the types of employees they wish to hire. Whether

penalty or clawback contracts can be described or presented in a manner that mitigates the impact of risk and loss preferences is an interesting area for future research.

The results also demonstrate that our measure of loss aversion provides strong support for the assertion that loss aversion affects acceptance for contracts containing penalties. However, this relation is less significant for clawback contracts, indicating that other preferences may be driving individuals' strong reactions to these contracts. In fact, our results are consistent with participants exhibiting an endowment effect. Whereas loss aversion states that people are more motivated to avoid a future loss than acquire a similar future gain, the endowment effect states that current ownership increases utility. Therefore, the utility of receiving a bonus is less than the disutility of losing a previously awarded bonus. Hence, the endowment effect may have overwhelmed loss aversion under clawback contracts. Finally, results indicate that when the two clawback contracts are compared, participants find the contract frame with the higher base salary to be more attractive. This is a somewhat unexpected result, because these two frames both provide an equal initial amount of pay that is not contingent upon a subsequent outcome. The only difference between the contracts is in the labeling of the portion of this amount called the "base salary" and the portion called a "bonus." This very subtle manipulation has a significant impact on participant reactions. This provides evidence that the verbal labeling of the components of these contracts can have a strong effect on behavior and should, therefore, be carefully considered.

The development and use of a loss aversion measure should be useful in exploring numerous issues in accounting research. For instance, prospect theory-type behavior influences taxpayer compliance decisions (Christian and Gupta 1994; Schepanski and Kelsey 1990), managerial decision-making (Lipe 1993; Sullivan and Kida 1995), investor behavior (Genesove and Mayer 2001), and auditor decisions (Cohen and Trompeter 1998). For example, to what extent do individual loss aversion preferences influence auditors' behavior when faced with issues such as litigation or the loss of a client? Do loss preferences influence auditors' level of audit intensity? Or are individual loss preferences overshadowed by things such as training, experience, and tone at the top? Studies that measure and control for both risk and loss preferences could further explain the impact of these individual characteristics on behavior. Extant research (Fehr and Goette 2007) uses individual differences in loss aversion to predict how long employees will work once a target wage is reached.

Our results should be interpreted in light of certain limitations. First, we design our contract frames to test participants' *ex ante* preferences for contracts. Hence, we do not capture the dynamic aspect of these contracts. Future research should explore how actual experience with these contracts affects individuals' preferences. In addition to the initial contract selection, contract framing may affect employee behaviors such as employee effort choice. Hannan et al. (2005) find evidence of higher effort choices under penalty contract framing than under bonus contract framing, and Church et al. (2008) find a relation between contract framing and performance. Thus, the potential for contract framing to affect employee effort choices, performance, or other behaviors may provide additional tradeoffs to consider when designing contracts.

In addition, clawback contracts are dynamically and behaviorally complex. The clawback framing in this study is simply a matter of reframing part of the base salary as a bonus. This enables the contracts to remain economically equivalent. Further, in the experiment, compensation is clawed back with a 50 percent probability and, hence, is not due to the participants' actions. In practice, compensation is clawed back due to malfeasance on the part of employees. Thus, our results may overstate participants' aversion to clawback contracts compared to situations where their actions trigger the clawback. Additionally, in practice, there would be a much greater period of time between the initial awarding of a bonus and the clawback due to poor performance. Whether such a timing issue would increase or decrease the aversion to clawback contracts is unclear.

We feel that the fact that we find strong reactions to clawback contracts even in our rather simple static setting indicates that there are significant opportunities for further investigation of these contracts. These simplified design elements allow a focus on the impact of the framing itself, while holding constant such items as time value of money. However, removing these elements may possibly weaken individuals' reactions to the contract and, therefore, bias against finding significant differences. Further, we focus on the role of loss aversion to explain observed choices. Future studies of contracts that contain combinations of bonuses and penalties in more contextually rich settings may be useful for exploring other explanations for contract choice. For example, it would be of particular interest to examine clawback contracts in a contextually rich setting where employee participants face a clawback after having to exert effort to earn the funds that will potentially be clawed back. In such a setting, other nonmonetary motivations, such as entitlement, may impact employee reactions. For example, prior research (e.g., Hoffman and Spitzer 1985) finds that when employees exert effort to earn funds, they may feel entitled to these funds despite the outcome of their work.

REFERENCES

Abdellaoui, M., H. Bleichrodt, and O. L'Haridon. 2008. A tractable method to measure utility and loss aversion under prospect theory. *Journal of Risk and Uncertainty* 36 (3): 245–266.

Abdellaoui, M., H. Bleichrodt, and C. Paraschiv. 2007. Measuring loss aversion under prospect theory: A parameter-free approach. *Management Science* 53 (10): 1659–1674.

Bialik, C. 2009. What's in a Wall Street bonus figure? Not accuracy. *Wall Street Journal* (February 20). Available at: http://online.wsj.com/article/SB123509366925028921.html

Bonner, S. E., and G. B. Sprinkle. 2002. The effects of monetary incentives on effort and task performance: Theories, evidence, and a framework for research. *Accounting, Organizations and Society* 27: 303–345.

Camerer, C. F., and R. M. Hogarth. 1999. The effects of financial incentives in experiments: A review and capital-labor-production framework. *Journal of Risk and Uncertainty* 19: 7–42.

Christian, C., and S. Gupta. 1994. The relation between the use of tax preparers and tax payers' prepayment position. *Journal of the American Taxation Association* 16: 72–93.

Church, B. K., T. Libby, and P. Zhang. 2008. Contracting frame and individual behavior: Experimental evidence. *Journal of Management Accounting Research* 20: 153–168.

Cohen, J. R., and G. M. Trompeter. 1998. An examination of factors affecting audit practice. *Contemporary Accounting Research* 15 (Winter): 481–504.

Demski, J. S., and G. Feltham. 1978. Economic incentives in budgetary control systems. *The Accounting Review* 53 (2): 336–359.

Eckel, C., M. McInnes, S. Solnick, J. Ensminger, R. G. Fryer, R. A. Heiner, G. Samms, K. Sieberg, and R. K. Wilson. 2005. Bobbing for widgets: Compensating wage differentials. *Journal of Economic Education* 36: 129–138.

Fehr, E., and L. Goette. 2007. Do workers work more if wages are high? Evidence from a randomized field experiment. *American Economic Review* 97: 298–317.

Fischbacher, U. 2007. z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics* 10 (2): 171–178.

Floersch, R. 2009. The right way to determine executive pay. *Wall Street Journal* (March 5). Available at: http://online.wsj.com/article/SB123621179473834577.html

Frederickson, J., and W. Waller. 2005. Carrot or stick? Contract frame and use of decision-influencing information in a principal-agent setting. *Journal of Accounting Research* 43 (5): 709–733.

Fried, J., and S. Nitzan. 2011. Excess-pay clawbacks. *Journal of Corporation Law* 36: 722–751.

Genesove, D., and C. Mayer. 2001. Loss aversion and seller behavior: Evidence from the housing market. *The Quarterly Journal of Economics* 116 (4): 1233–1260.

Hannan, R. L., V. B. Hoffman, and D. V. Moser. 2005. Bonus versus penalty: Does contract frame affect employee effort? *Experimental Business Research* 2: 151–169.

Hertwig, R., and A. Ortmann. 2001. Experimental practices in economics: A methodological challenge for psychologists? *Behavioral and Brain Sciences* 24: 383–451.

Hoffman, E., and M. Spitzer. 1985. Entitlements, rights and fairness: An experimental examination of subjects' concepts of distributive justice. *Journal of Legal Studies* 15: 259–297.

Holmstrom, B. 1979. Moral hazard and observability. *Bell Journal of Economics* 10: 74–91.

Holmstrom, B., and P. Milgrom. 1991. Multitask principal-agent analyses: Incentive contracts, asset ownership, and job design. *Journal of Law Economics and Organization* 7: 24–52.

Holt, C., and S. Laury. 2002. Risk aversion and incentive effects. *The American Economic Review* (December): 1644–1655.

Horstmann, I., F. Mathewson, and N. Quigley. 2005. Agency contracts with long-term customer relationships. *Journal of Labor Economics* 23 (3): 589–608.

Hossain, T., and J. List. 2009. *The Behavioralist Visits the Factory: Increasing Productivity Using Simple Framing Manipulations*. NBER Working Paper No. 15623. Available at: http://www.nber.org/papers/w15623

Kahneman, D., J. L. Knetsch, and R. H. Thaler. 1991. Anomalies: The endowment effect, loss aversion, and status quo bias. *The Journal of Economic Perspectives* 5: 193–206.

Kahneman, D., and A. Tversky. 1979. Prospect theory: An analysis of choice under risk. *Econometrica* 47 (2): 263–291.

Kahneman, D., and A. Tversky. 1992. Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty* 5: 297–323.

Kaplan, R., and A. Atkinson. 1998. *Advanced Management Accounting*. Third Edition. Upper Saddle River, NJ: Prentice Hall.

Köbberling, V., and P. P. Wakker. 2005. An index of loss aversion. *Journal of Economic Theory* 122: 119–131.

Kreps, D. 1990. Corporate culture and economic theory. In *Perspectives on Positive Political Economy*. Cambridge, U.K.: Cambridge University Press.

Kube, S., M. A. Marechal, and C. Puppe. 2012. The currency of reciprocity: Gift exchange in the workplace. *American Economic Review* 102: 1644–1662.

Laury, S., and C. Holt. 2000. *Further Reflections on Prospect Theory*. Working paper, University of Virginia. Available at: http://www.people.virginia.edu/~cah2k/reflect.pdf

Lazear, E. 1991. Labor economics and the psychology of organizations. *Journal of Economic Perspectives* 5: 89–110.

Lipe, M. 1993. Analyzing the variance investigations decision: The effects of outcomes, mental accounting, and framing. *The Accounting Review* 68: 748–764.

Luft, J. 1994. Bonus and penalty incentives. Contract choice by employees. *Journal of Accounting and Economics* 18: 181–206.

Moreno, K., T. Kida, and J. F. Smith. 2002. The impact of affective reactions on risky decision making in accounting contexts. *Journal of Accounting Research* 40 (5): 1331–1349.

Samuelson, W., and R. Zeckhauser. 1988. Status quo bias in decision making. *Journal of Risk and Uncertainty* 1: 7–59.

Sawers, K., A. Wright, and V. Zamora. 2011. Does greater risk-bearing in stock option compensation reduce the influence of problem framing on managerial risk-taking? *Behavioral Research in Accounting* 23: 185–201.

Schepanski, A., and D. Kelsey. 1990. Testing for framing effects in taxpayer compliance decisions. *Journal of the American Taxation Association* 12: 60–77.

Smith, V., and J. Walker. 1993. Monetary rewards and decision cost in experimental economics. *Economic Inquiry* 31: 245–261.

Sullivan, K., and T. Kida. 1995. The effect of multiple reference points and prior gains and losses on managers' risky decision making. *Organizational Behavior and Human Decision Processes* 64 (1): 76–83.

Thaler, R. H. 1980. Toward a positive theory of consumer choice. *Journal of Economic Behavior and Organization* 1: 39–60.

Tversky, A., and D. Kahneman. 1991. Loss aversion in riskless choice: A reference-dependent model. *Quarterly Journal of Economics* 106 (4): 1039–1061.

U.S. House of Representatives. 2009. *American Recovery and Reinvestment Act*. Public Law 111-5 [H. R. 1]. Washington, DC: Government Printing Office.

Van de Weghe, P., and W. Bruggeman. 2004. Bonus and penalty contract acceptance in a balanced scorecard environment: A case study. In *Performance Measurement and Management Control, Volume 14: Superior Organizational Performance*, edited by Epstein, M. J., and J. Manzoni, 323–353. Bingley, U.K.: Emerald Group Publishing Limited.

APPENDIX A

Risk Preference Measure Adapted from Holt and Laury (2002)

Panel A: The Ten Paired Lottery Choice Decisions for Risk Aversion in the Gain Domain[a]

Option A	Option B	Expected Payoff of Option A − Expected Payoff of Option B[b]
0/10 of $4.00, 10/10 of $3.20	0/10 of $7.70, 10/10 of $0.20	$3.00
1/10 of $4.00, 9/10 of $3.20	1/10 of $7.70, 9/10 of $0.20	$2.33
2/10 of $4.00, 8/10 of $3.20	2/10 of $7.70, 8/10 of $0.20	$1.66
3/10 of $4.00, 7/10 of $3.20	3/10 of $7.70, 7/10 of $0.20	$0.99
4/10 of $4.00, 6/10 of $3.20	4/10 of $7.70, 6/10 of $0.20	$0.32
5/10 of $4.00, 5/10 of $3.20	5/10 of $7.70, 5/10 of $0.20	($0.35)
6/10 of $4.00, 4/10 of $3.20	6/10 of $7.70, 4/10 of $0.20	($1.02)
7/10 of $4.00, 3/10 of $3.20	7/10 of $7.70, 3/10 of $0.20	($1.69)
8/10 of $4.00, 2/10 of $3.20	8/10 of $7.70, 2/10 of $0.20	($2.36)
9/10 of $4.00, 1/10 of $3.20	9/10 of $7.70, 1/10 of $0.20	($3.03)

Panel B: The Estimated Risk Preferences Revealed by Switching Points

Switching Point[c]	Holt and Laury's (2002) CRRA Estimate[d]	Risk Aversion (v_1) Estimate[e]	Interpretation
AAA/BBBBBBB	(CRRA $<$ −0.49)	$v_1 < 1.49$	Risk Loving
AAAA/BBBBBB	(−0.49 $<$ CRRA $<$ −0.15)	$1.49 > v_1 > 1.15$	Slightly Risk Loving
AAAAA/BBBBB	(−0.15 $<$ CRRA $<$ 0.15)	$1.15 > v_1 > 0.85$	Risk Neutral
AAAAAA/BBBB	(0.15 $<$ CRRA $<$ 0.41)	$0.85 > v_1 > 0.59$	Slightly Risk Averse
AAAAAAA/BBB	(0.41 $<$ CRRA $<$ 0.68)	$0.59 > v_1 > 0.32$	Risk Averse
AAAAAAAA/BB	(0.68 $<$ CRRA $<$ 0.97)	$0.32 > v_1 > 0.03$	Very Risk Averse
AAAAAAAAA/B	(0.97 $<$ CRRA $<$ 1.36)	$0.03 > v_1 > -0.36$	Extremely Risk Averse

[a] Participants chose between the "safe" option (Option A) and the "risky" option (Option B). The expected value of the safe option is initially higher than that of the risky option. As a person moves through the choices, the probabilities of the possible outcomes change so that the expected value of the risky option eventually exceeds that of the safe option. The difference between the expected values of the options (the payoff difference) is increasingly in favor of the risky option. The ten paired choices in the loss domain were identical except that all monetary outcomes were negative.

[b] Participants did not see expected payoffs in the experiments.

[c] The Switching Point column indicates the number of Option A choices a participant chooses before switching to Option B.

[d] Holt and Laury (2002) calculate these numbers using a constant relative risk aversion (CRRA) for money, x, where the utility function is: $u(x) = x^{1-r}$ for $x > 0$. This implies risk preference for $r < 0$, risk neutrality for $r = 0$, and risk aversion for $r > 0$.

[e] This column converts the CRRA estimates in the third column to estimates of v_1, in harmony with the value function as presented in prospect theory (see Equation (1)).

APPENDIX B

Loss Aversion Measure

Panel A: The Loss Aversion Choices,[a] Expected Values, and Estimate of λ at Various Risk Levels

Option A		Option B			Upper Limit For λ if Option A is Chosen			
50%	50%	50%	50%	Expected Value of Option A	Risk Neutral $v_1 = v_2 = 1.0$	Reflection Effect $v_1 = v_2 = 0.5$	Always Risk Averse $v_1 = 0.5$ $v_2 = 1.3$	Always Risk Loving $v_1 = 1.3$ $v_2 = 0.5$
$5.00	($1.40)	$1.00	($1.00)	$1.80	10.01	6.75	2.25	38.79
$5.00	($1.50)	$1.00	($1.00)	$1.75	8.00	5.50	1.78	31.61
$5.00	($1.60)	$1.00	($1.00)	$1.70	6.67	4.67	1.47	26.81
$5.00	($1.75)	$1.00	($1.00)	$1.63	5.33	3.83	1.16	22.00
$5.00	($1.90)	$1.00	($1.00)	$1.55	4.44	3.27	0.95	18.77
$5.00	($2.10)	$1.00	($1.00)	$1.45	3.63	2.75	0.76	15.8
$5.00	($2.40)	$1.00	($1.00)	$1.30	2.86	2.25	0.58	12.93
$5.00	($2.90)	$1.00	($1.00)	$1.05	2.11	1.76	0.41	10.11
$5.00	($3.95)	$1.00	($1.00)	$0.53	1.36	1.25	0.25	7.19
$5.00	($7.00)	$1.00	($1.00)	($1.00)	0.67	0.75	0.11	4.32

Panel B: The Estimated Loss Aversion Parameters Revealed by Switching Points, for $v_1 = v_2 = 0.5$

Switching Point	λ Range	Average λ	Interpretation
A/BBBBBBBBB	$5.50 < \lambda < 6.75$	6.125	Extremely Loss Averse
AA/BBBBBBBB	$4.67 < \lambda < 5.50$	5.085	
AAA/BBBBBBB	$3.62 < \lambda < 4.67$	4.145	Very Loss Averse
AAAA/BBBBBB	$3.27 < \lambda < 3.83$	3.550	
AAAAA/BBBBB	$2.75 < \lambda < 3.27$	3.010	Loss Averse
AAAAAA/BBBB	$2.25 < \lambda < 2.75$	2.500	
AAAAAAA/BBB	$1.76 < \lambda < 2.25$	2.005	Moderately Loss Averse
AAAAAAAA/BB	$1.25 < \lambda < 1.76$	1.505	Slightly Loss Averse
AAAAAAAAA/B	$0.75 < \lambda < 1.25$	1.000	Loss Neutral

[a] In prospect theory (Kahneman and Tversky 1979), the value function, $V(X)$ is defined as:

$$V(X) = \begin{cases} X_t^{v_1}, \text{ if } X > 0 \\ -\lambda(-X_t)^{v_2}, \text{ if } X \leq 0 \end{cases}$$

where parameters v_1, v_2, and λ are assumed positive. The terms are, respectively, gains raised to the power of v_1 and losses raised to the power of v_2, multiplied by a relative loss aversion coefficient λ. The terms v_1 and v_2 refer to a person's risk preferences. When $v_1 = v_2 = 1$, the individual is risk-neutral with respect to gains or losses. When $\lambda > 1$, a person is loss-averse.

Participants are asked to choose between the option with the higher possible loss (Option A) and the option with the lower possible loss (Option B). The expected value of Option A is initially higher than that of Option B. Expected values were not displayed on the instrument. As a person moves through the choices, the size of the loss in Option A increases. A loss-averse person will eventually be willing to switch to Option B because the threat of the larger loss outweighs the higher expected value from Option A.