

Oxoby, Robert J.; Friedrich, Colette

**Working Paper**

## Incentive design and trust: comparing the effects of tournament and team-based incentives on trust

IZA Discussion Papers, No. 3424

**Provided in Cooperation with:**

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Suggested Citation: Oxoby, Robert J.; Friedrich, Colette (2008) : Incentive design and trust: comparing the effects of tournament and team-based incentives on trust, IZA Discussion Papers, No. 3424, Institute for the Study of Labor (IZA), Bonn, <http://nbn-resolving.de/urn:nbn:de:101:1-2008040197>

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IZA DP No. 3424

## Incentive Design and Trust: Comparing the Effects of Tournament and Team-Based Incentives on Trust

Robert J. Oxoby  
Colette Friedrich

March 2008

# **Incentive Design and Trust: Comparing the Effects of Tournament and Team-Based Incentives on Trust**

**Robert J. Oxoby**

*University of Calgary  
and IZA*

**Colette Friedrich**

*MIT*

Discussion Paper No. 3424

March 2008

IZA

P.O. Box 7240  
53072 Bonn  
Germany

Phone: +49-228-3894-0

Fax: +49-228-3894-180

E-mail: [iza@iza.org](mailto:iza@iza.org)

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## ABSTRACT

### **Incentive Design and Trust: Comparing the Effects of Tournament and Team-Based Incentives on Trust<sup>\*</sup>**

We explore the extent to which the structure of incentives affects trust. We hypothesize that the degree to which different incentive mechanisms emphasize competition (via the perceived intentions of others) and entitlements (via the perceived property rights) will affect individuals' subsequent behavior. In our experiment, bargaining pairs earned endowments through either tournaments or team-based incentives. Participants engaged in a subsequent trust game in which the sender had access to the total endowment generated by the pair. We find that the structure of the incentive mechanisms has asymmetric effects on observed trust in which participants' relative performance framed trusting behavior.

JEL Classification: J31, J33, C92, D63

Keywords: trust, incentives, experiments, tournaments

Corresponding author:

Robert J. Oxoby  
Department of Economics  
University of Calgary  
2500 University Drive NW  
Calgary, Alberta T2N 1N4  
Canada  
E-mail: [oxoby@ucalgary.ca](mailto:oxoby@ucalgary.ca)

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<sup>\*</sup> We thank Kendra McLeish for valuable research assistance. Financial support was provided by the Social Sciences and Humanities Research Council of Canada, the University of Calgary and Friedrich-Schiller-University Jena, Germany.

# 1 Introduction

Social scientists from across fields have emphasized the importance of trust within organizations. For example, trust (directly or indirectly) yield higher levels of cooperation, more positive workplace attitudes, higher levels of performance, promotes effective responses to crisis, facilitates rapid formulation of ad hoc working groups, and reduces contracting costs.<sup>1</sup> Moreover, trust and trustworthiness in labor markets (via norms of reciprocity) result in higher wages, increased worker effort, and greater efficiency (Fehr et al., 1998; Gächter and Fehr, 2002). As such, many have emphasized the importance of developing social institutions and organizational designs that promote an environment of trust among individuals. Receiving significant emphasis in this regard has been the development of work teams and team-based organizations, which ostensibly increase levels of trust (Mohrman et al., 1995; Tannenbaum et al., 1992; Woodman and Sherwood, 1980).

Based on a cross-disciplinary analysis of the literature and definitions on trust Rousseau et al. (1998) describe it as a psychological state in which one accepts vulnerability or exposure based on the positive intentions or behaviors of others. Given this characterization of trust as a belief or attitude with respect to the actions of others, it is natural to think of trust (as with any psychological state) as being in part motivated by framing effects and the decision environment in which one finds herself. For example, within organizations there exist significant levels of explicit and implicit contracting which may heighten or marginalize the development of trust. These explicit and implicit contracts are embedded in compensation schemes and organizational hierarchies in which decision-makers find themselves. For example, compensation schemes may affect workers' goals and needs, in turn affecting workers' behaviors and their

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<sup>1</sup>For example, see Hardin (2002); Kramer and Tyler (1996); Williamson (1993). Dirks and Ferrin (2001) review the literature on trust in organizations.

manifest trust or trustworthiness (Kramer and Tyler, 1996; Mohrman et al., 1995). Alternately, organizational hierarchies / internal labor markets affect the roles workers accept and an organization’s culture, inherently facilitating or mitigating the way trust is fostered within the organization (Perrow, 1986). These effects may be particularly acute with respect to the “moderating effect” of trust (Dirks and Ferrin, 2001) in which trust facilitates the effect of various determinants of workplace attitudes and the conditions for cooperation.

In this paper we explore the effect of different incentive structures on observed behavior in a simple trust game. More specifically, we explore the use of relative performance evaluations (i.e. tournaments) and joint performance evaluations (i.e. team-based incentives) on behavior in the trust game of Berg et al. (1995). We focus on these two types of mechanisms as they are often observed in internal labor markets and there exists significant divergence between the theoretical predictions and practical applicability of these mechanisms.<sup>2</sup> We find that each mechanism has a different effect on observed trust and trustworthiness, a difference which appears to depend on the relative performance of the individuals. We conjecture that different incentive mechanisms create different contexts for decision-making, thereby creating different perceptions of one’s entitlement to assets which frame trusting behavior. These differences are manifest through different behaviors in our trust game.

Our experiments serve to highlight the relationship between trust in organizations and the incentive design and build on the large literature on behavior in trust games.<sup>3</sup> Moreover, our experiments build on the literature exploring trust

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<sup>2</sup>While theory often predicts the use of strong tournament style incentives, their use in practice is relatively limited. See Che and Yoo (2001), Hart and Holmstrom (1987), Prendergast (1999).

<sup>3</sup>See Camerer (2003) for a review of the literature. Much of this research has focused on disentangling the effects of outcomes and intentions on behavior. See Fehr and Schmidt (1999) (outcome-based model of inequity aversion) and Dufwenberg and Kirchsteiger (2004) (intention-based model of reciprocity). For experiments to this end, see Cox (2004) and McCabe et al. (2003).

and “social preferences” in labor markets (Falk and Fehr, 2003; Gächter and Fehr, 2002), extending this research to the issues of the internal organization of the firm and the contract design.

Our work also builds on recent research examining the influence of rewards and contracts on interpersonal trust. For example, Dirks and Ferrin (2001) conducted experiments in which cooperative (i.e. team performance based) and competitive (i.e. based on relative performance) rewards were used in versions of the moon and wilderness survival tasks.<sup>4</sup> Their results indicate that the reward structure had a strong effect on trust, with greater trust evidenced under cooperative reward structures than under competitive reward structures. The avenue for the effect of reward structure on trust was based on an attribution model in which the reward structure influenced one’s perceptions of a partner’s motives and intentions. Relatedly, Malhotra and Murnighan (2002) investigate the extent to which binding and non-binding contracts influence displayed interpersonal trust. In these experiments, participants played a variant of the trust game against what they perceived to be a real partner (actually a computer). The findings here suggest that non-binding contracts generate less initial cooperation but more personal (as opposed to situational) attributions for observed cooperation. As a result, they suggest that non-binding contracts interfere less with trust development than do binding contracts.

The experiments conducted here are also related to recent research on found money effects and the importance of earnings in bargaining games.<sup>5</sup> Most germane to this paper are the experiments of Fahr and Irlenbusch (2000) in which participants earned money prior to participating in a trust game. Three variants

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<sup>4</sup>These tasks involve participants ranking various tools and items needed for survival in various environments. See Marcic (1995).

<sup>5</sup>In these experiments, legitimizing assets on the part of senders (through having senders earn their wealth) leads to more self-interested behavior in dictator and ultimatum games (Cherry, 2001; Cherry et al., 2002). On the other hand, legitimizing assets on the part of receivers leads to greater offers from senders (Ruffle, 1998).

of this game were conducted: one in which only the trustor earned money, one in which only the trustee earned money, and one in which both the participants earned money. These experiments indicate that (i) the stronger the property rights of the trustor, the greater the amount returned by the trustee and (ii) the stronger the property rights of the trustee, the greater the amount invested by the trustor. As in these experiments, participants in our experiments exerted effort to earn money. However, our interest is more on how structural differences in the earning phase influence subsequent behavior.

We continue as follows: sections 2 and 3 describe our experiment and present the results. In our trust games with earnings, we find that the structure of the incentive mechanisms used in the earnings phase of the experiments had noticeable effects on the ways in which individuals behave in the subsequent trust game. Section 4 discusses our results and section 5 concludes.

## 2 Experimental Design

We conducted the one-shot, two-participant trust game of Berg et al. (1995). In the trust game, a sender is allocated \$10 and asked to choose an investment  $x \in [0, 10]$  to send to a receiver. This amount is tripled by the experimenter and the receiver is allocated  $3x$ . Of this amount, the receiver was asked to choose an amount  $y \in [0, 3x]$  to return to the sender. Final payoffs to the sender ( $S$ ) and the receiver ( $R$ ) are given by

$$\Pi_S = 10 - x + y, \tag{1}$$

$$\Pi_R = 3x - y. \tag{2}$$

Given self-interested preferences over own wealth, the receiver in this game will choose  $y = 0$  to maximize her wealth. Given this behavior, the sender



will choose  $x = 0$ , yielding payoffs of  $\Pi_S = 10$  and  $\Pi_R = 0$  (the sub-game perfect Nash equilibrium). Note that an allocation is not (Pareto) efficient in that both parties could have received larger payoffs if  $x > 0$  and  $y > 0$  had been chosen. However, such an outcome necessitates that the sender trusts the receiver not to choose  $y = 0$ . Experimentally, it has been observed that amounts invested average 50% of the amounts available (i.e.  $x = 5$  in this circumstance) and receivers return approximately one-third of what they receive (Camerer, 2003).<sup>6</sup> Such behavior is often attributed to individuals having preferences over inequity aversion (e.g. Fehr and Schmidt, 1999), reciprocity (e.g. Dufwenberg and Kirchsteiger, 2004), or efficiency (e.g. total payoffs as in Charness and Rabin, 2002). The key to implementing an efficient allocation (i.e. maximizing the amount of available resources) is that the sender must trust the receiver and invest  $x = 10$ , maximizing the gains from trade and yielding  $\Pi_S + \Pi_R = 30$  to distribute between the parties. While this game is often used as a metaphor for instances of international trade (in which one must trust one's trading partner will not expropriate all of one's goods) and non-contractible investments, we focus on the game in the context of the internal organization of a firm in which trust is needed to reduce contracting costs and facilitate the flow of information (Dirks and Ferrin, 2001, 2003; Kramer and Tyler, 1996).

### Earnings Treatments

Our treatment variable was the mechanism utilized to determine the wealth endowment available in the trust game. Our interest is in how the initial interactions required to earn wealth framed subsequent trusting behavior. As such, the earnings mechanisms are independent of the trust game.<sup>7</sup> The ex-

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<sup>6</sup>Results vary based on the nature of the experimental design. In all games, the key determinant of the amounts returned  $y$  is the trust displayed in the receiver by the sender. See Camerer (2003, section 2.7), Fehr and Gächter (2001) and Gächter and Fehr (2002).

<sup>7</sup>This stands in contrast to other experiments, such as Sonnegard (1996), in which the first-mover in a bargaining game is determined by some test of skill or ability.

periments were conducted over a closed computer network and programmed in z-Tree (Fischbacher, 2007).<sup>8</sup> At the end of the experiment participants received their payoffs privately and in cash.

Participants were randomly assigned to one of two possible incentive conditions. In our *joint performance evaluation* (JPE) treatment, the \$10 endowment used in the trust game was earned by way of a team based incentive mechanism. Specifically, each member of the bargaining pair was given eight minutes to answer twelve questions taken from the Graduate Management Admission Test (GMAT). Participants were informed that the pair would be awarded \$10 (for use in the aforementioned trust game) if the sum of their scores exceeded six. After the eight minute exam period elapsed, participants were informed of their score, the score of their bargaining partner, and their respective payoffs. After this information was provided, the participants were randomly assigned to the roles of sender and receiver, the sender was allocated the pair's earnings (\$10) and the trust game ensued.

In the *relative performance evaluation* (RPE) treatment participants were informed that a tournament would be used to allocate the initial \$10 for use in the trust game. Specifically, the individual within the dyad who correctly answered the most questions was allocated \$10. After the eight minute exam period had ended, participants were informed of their scores and whether they or their partner had won the tournament. Participants were then randomly assigned roles in the trust game with the sender being given access to the tournament prize (\$10) for use in the game.

Note that as the total earnings from each group in our JPE and RPE treatments are allocated to a randomly determined sender, the earnings efforts are sunk costs at the time of the trust game. As such, traditional models of behavior suggest that decisions made in the trust game should be independent of the

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<sup>8</sup>Treatment files and instructions are available from the authors upon request.

earnings mechanisms employed and the relative performance of participants in answering the GMAT-questions. Thus, the predicted the sub-game perfect Nash equilibrium in the trust game is  $(x, y) = (0, 0)$  across all treatments. However, the presence of entitlements (Hoffman and Spitzer, 1985; Hoffman et al., 1994; Ruffle, 1998) or preferences over fairness and reciprocity (Bolton and Ockenfels, 2000; Dufwenberg and Kirchsteiger, 2004; Fehr and Gächter, 2001; Rabin, 1993) predict deviations from this equilibrium. The focus in our experiment is on manner in which the alternate incentive mechanisms encountered in the earnings phase influence behavior in the subsequent trust game.

### 3 Results

In this section, we analyze the results of our experiment. Participants were recruited for the experiment from the undergraduate student body at the University of Calgary. A total of 126 individuals (30 bargaining pairs in the relative performance evaluation treatment, 33 in the joint performance evaluation treatment) participated in the experiment.

#### **Trust**

Table 1 provides the average investments and returns for each bargaining pair. Across treatments we find no difference in levels of investment (i.e. observed trust) or returns (i.e. observed trustworthiness):  $F < 1$  in pairwise comparisons between the JPE and RPE treatments. Thus it appears that *in aggregate* the earnings phase of the experiment had little effect on behavior.

However, differences in behavior emerge when looking more closely at the context in which the trust game was played. Specifically, since the roles of sender and receiver were randomly assigned within the pair, senders (and receivers) could have either been winners or losers in the tournament (RPE treatment) or

	RPE	JPE
	$n = 30$	$n = 33$
investment ( $x$ )	5.24 (3.00)	5.61 (2.99)
return ( $y$ )	5.71 (5.42)	5.43 (5.60)

Table 1: Mean investments and returns (standard deviations in parentheses).

have “contributed” more or less towards the pair’s “output” (JPE treatment). Towards this end, we examine the effect of the difference in exam scores (i.e. a participant’s own exam score minus that of her partner) on observed behavior.<sup>9</sup>

Across earnings treatments, this difference could have different meanings to participants. For example, under the tournament incentive, this difference could be construed by participants as a measure of the entitlements or property rights associated with the earned wealth (as in Cherry et al., 2002). Under the team-based incentive, this difference could be construed as measure of one’s relative contribution to the pair’s goal, again dictating a certain distribution of final assets. However, due to the greater ambiguity regarding who “owns” the assets to be used in the trust game, there is a greater potential for self-serving biases regarding the perception of entitlements under this incentive mechanism (as in Konow, 2000).

Table 2 splits the data based on whether the sender scored higher (referred to as a winning sender WS) or lower (referred to as a losing sender LS) than the receiver in on the initial twelve question quiz. Here we find a difference in the investments made by winning and losing senders. Wilcoxon tests reject the null hypothesis that the distributions of investments across winning and losing

<sup>9</sup>We find no effect of the different incentive mechanisms on dyad’s performance on the exam: Wilcoxon tests reject are unable to reject the hypothesis that dyads’ total scores (i.e. sum of each member’s score) differ across the JPE and RPE treatments ( $p = 0.54$ ).

	RPE	JPE
WS	3.26 (3.04) $n = 14$	7.21 (2.97) $n = 18$
LS	6.60 (2.64) $n = 16$	3.75 (3.08) $n = 15$

Table 2: Mean investments ( $x$ ) for earning treatments (standard deviations in parentheses). The notation WS (LS) denote bargaining pairs in which the sender scored higher than the receiver on the initial quiz.

senders are the same:  $p = 0.03$  in the RPE treatment and  $p = 0.02$  in the JPE treatment. Strikingly this effect is asymmetric across earnings treatment: Under the RPE, senders who won the tournament sent noticeably less than senders who had lost the tournament. However, under the JPE, senders who contributed relatively more to the pair’s aggregate score sent significantly more than senders who contributed less. Wilcoxon tests reject the null hypothesis that the distributions of investments across earning mechanism are the same when splitting the population by winning and losing senders. That is, winning senders sent relatively more under the JPE than under the RPE ( $p = 0.02$ ) while losing senders sent somewhat less under the JPE than under the RPE ( $p = 0.046$ ).

While this analysis treats the difference in scores within a pair as binary (i.e. the sender is either a winner or a loser), the results are more defined when looking at the actual relative scores of participants. Table 3 presents regression results restricted to the earnings treatments RPE and JPE.<sup>10</sup> The variable  $\Delta score$  represents the difference between an individual’s score on the twelve question quiz and that of her partner. The variable  $RPE \in \{0,1\}$  is

<sup>10</sup>Tobit results (accounting for the censoring of choices at the 0 and 10) yield similar results.

	coef.	s.e.
Constant	5.013**	0.645
$\Delta score$	0.661*	0.303
$RPE$	-0.388	0.951
$\Delta RPE$	-1.822**	0.702

Table 3: Regression results for investments  $x$ : \*\* indicates significance at  $p = 0.01$ ; \* indicates significance at  $p = 0.05$ . The pseudo-coefficient  $\Delta RPE + \Delta score = -1.161$  is significant at  $p = 0.05$ .

a dummy variable taking on a value of 1 in the RPE treatment and 0 in the JPE treatment. The variable  $\Delta RPE$  is the interaction effect between incentive mechanism and score difference.

The results indicate that under the JPE the lower one's contribution to the pair's aggregate score (i.e. the lower one's score difference  $\Delta score$ ), the lower a sender's revealed trust in her partner (i.e. the lower was  $x$ ). On the other hand, the greater the degree to which one lost the tournament under the RPE, the greater was one's demonstrated trust. This asymmetric relationship across earnings treatments is presented in Figure 1. Again, under the tournament incentive increased differences in exam scores had a negative effect on levels of observed trust. That is, senders who had lost the tournament invested larger amounts than those senders who had won the tournament. Further, as presented in figure 1, losing (winning) senders invested more (less) when their margin of defeat (victory) was greater. Behavior is markedly different under the team-based incentive. As opposed to the RPE treatments, difference in exam scores had a positive effect on levels of observed trust in the JPE treatment. That is, senders who had contributed relatively less to the dyad's aggregate score displayed less trust in their partner (see figure 1).

Figure 1 about here.

The effects of the RPE and JPE incentives appear to be very different on investment behaviors in the trust game. More precisely, if one interprets relative performance on the exam as a proxy for one’s entitlement to the allocated assets, the effect of this proxy differed across earning treatments. In some sense, one can think of the incentive mechanisms as framing the context in which score differences are perceived and thereby influence behavior.<sup>11</sup> What critically matters under each incentive mechanism is the relative performance of the sender. Under tournament style incentives, the winner’s “property right” exhibits a profound effect such that losing senders cede assets and thereby trust the receiver. In team based incentives these property rights are less clear and we therefore observe an asymmetric pattern of trust relative to the case of tournaments. Indeed, team based incentives appear to only motivate a “team identity” which is conducive to trust when the individual contributing relatively more is in the role of the sender.

As in all other trust games, trust is reciprocally rewarded with trustworthiness (Berg et al., 1995; Camerer, 2003; Fehr and Gächter, 2001). As such, the greatest determinant of the amount returned  $y$  (both in terms of absolute amount and proportion received) is investment  $x$  ( $p < 0.01$  across all treatments). In our experiments, the average amount returned was 36% of the amount received and we find no effect from the earning mechanism on trustworthiness. Thus, our results suggest that it is only in the motivation of trust that we observe a treatment effect. As a result, our treatment variable affects only the total surplus accruing to the pair.

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<sup>11</sup>Similar results are obtained when examining senders’ score differentials as in the analysis in Table 3 and Figure 1.

## 4 Discussion

Our results suggest that, while the presence of incentives affects the formation of trust, the manner in which these incentives are designed in the structure of subsequent decision-making environments can exert significant influence on the manifestation of trust. Thus, our analysis suggests that the effect of contracts on trust (e.g. Dirks and Ferrin, 2003) and the inconsistent evidence on the effect of trust on outcomes (e.g. Woodman and Sherwood, 1980) may be partially explained by the manner in which antecedent incentives frame situations and lead to differences in subsequent trusting behaviors.

There is a large literature exploring the effects of earnings on behavior in bargaining games. This literature finds that individuals recognize the entitlements accruing to themselves and others through the exertion of effort (Cherry et al., 2002; Hoffman and Spitzer, 1985; Ruffle, 1998), suggesting that found money effects matter (Arkes et al., 1994; Thaler, 1999). Relatedly, Sonnegard (1996) finds that behavior is influenced by framing effects associated with the description of property rights. In the experiments of Fahr and Irlenbusch (2000), individuals exerted effort to earn money to be used in a trust game and stronger property rights on the part of the receiver (trustee) resulted in larger investments by the sender (trustor).

Senders' behavior in our RPE treatments is explained by this adherence to perceived property rights. Losing senders could have chosen  $x = 0$  but instead opted to invest a significant amount and trust the receiver. From the receiver's standpoint, this indicates not only a level of trust, but also a respect to the implied property rights created by the RPE. Senders who lost the tournament may have considered receivers as more entitled to the assets than themselves, and hence invested more.

The asymmetry trusting behavior of winning and losing senders in our



RPE treatment also suggests an interesting relationship between hierarchies and weak/strong situations (in terms of incentives and contracting). From the standpoint of a winning sender, the trust game can be considered a strong situation in which property rights are well-established and defined. As such, following the ideas of Dirks and Ferrin (2001), trust is unlikely to have large positive effects (defined as the amount which is sent to the receiver). On the other hand, losing senders are in a weak situation in which there is conflict between the previously established property rights and the actual possession of resources. In such a situation, trust has large positive effects.

This asymmetry is reversed in our JPE treatment. Here, it appears that these incentives were only effective in promoting a “team” environment conducive to trust when the individual contributing relatively more was in the role of the sender in the trust game. As opposed to the situation in the RPE treatment, the ambiguous nature of property rights under the JPE treatment created a situation in which losing senders did not trust the behavior of (winning) receivers: Given that the property rights (based on relative contributions) did not favor their share of the resources, they potentially expected winning receivers to withhold the lion’s share of resources and thereby not display trustworthiness. As such, losing senders were unwilling to expose themselves to the behavior of these senders. Moreover, the weak property rights in the JPE treatment may have opened the door for losing senders to construe property rights in a self-serving manner. Previous research (Babcock et al., 1995, 1996; Konow, 2000) has demonstrated that individuals may manipulate their perceptions of fairness in ways which rationalize their actions or improve their self-image. In a similar spirit, senders who had contributed relatively less (i.e. scored lower on the exam) than their partnered receivers may have interpreted their contribution to the pairs target in such a way as to rationalize their property right and hence

sent less.

## 5 Conclusion

In this paper we present an experiment in which the structure of an incentive mechanism influences the way in which individuals behave in a subsequent trust game. Our results seem to indicate that property rights matter, but the interpretation of property rights depends on the context created by the incentives. Specifically, under relative performance evaluations, senders recognized the property rights accruing to themselves or their bargaining partner. However, under joint performance evaluations, where property rights are less well-defined, senders appear to have been less forthcoming in recognizing the property rights of others. This finding suggests some implications in regards to the internal organization of the firm: First, team based structures may not always be as helpful as suggested in the managerial literature in generating and increasing trust between team members. Second, since property rights are less well defined in team environments, such work structure could actually be detrimental in situations where trust is needed (eg. R&D). Third, our findings also suggests that managers have to be careful with their decisions to implement team based compensation schemes vs. individual performance compensation schemes.

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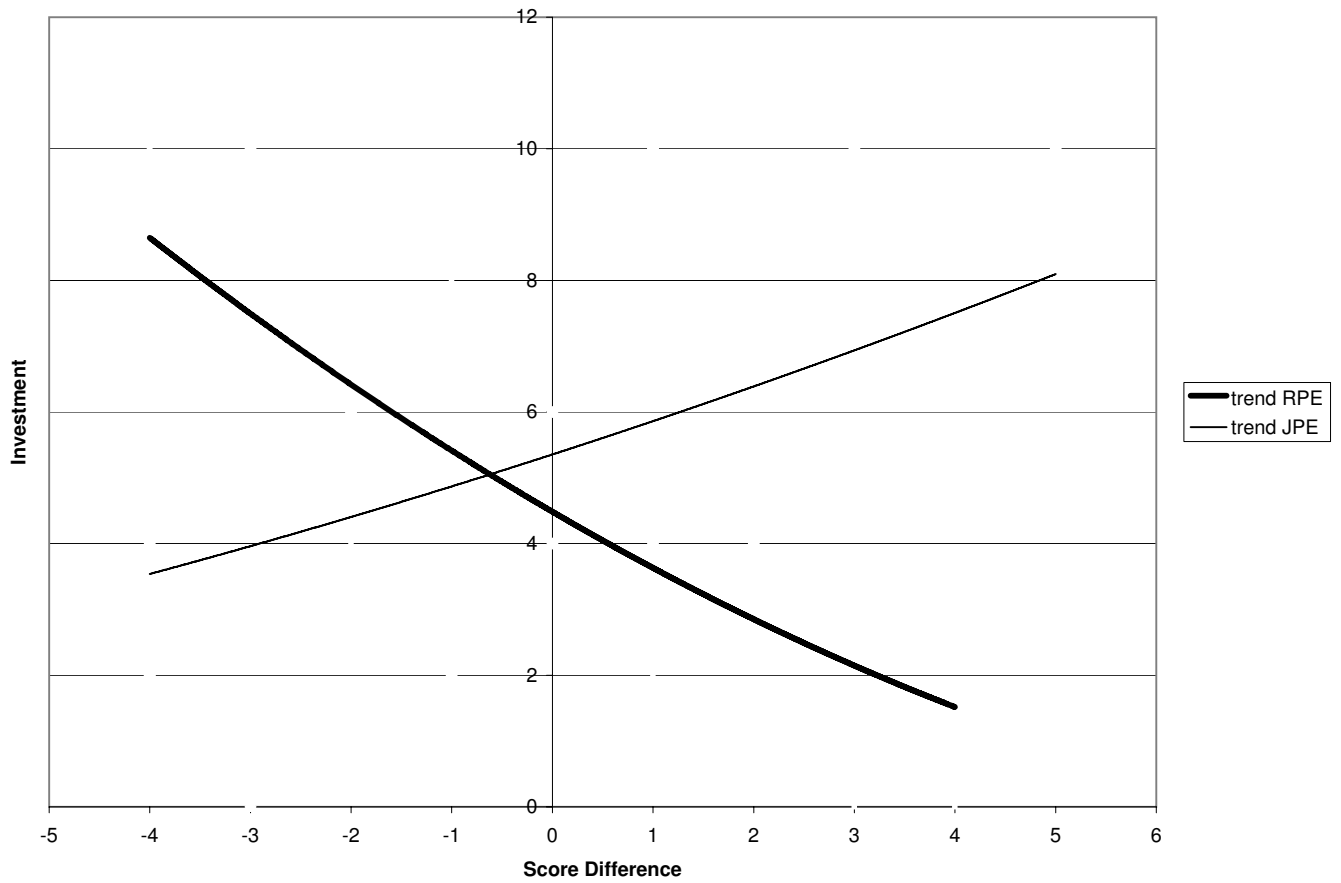


Figure 1: Investments as a function of exam score differences (sender's score less receiver's score).