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An Experiment about Pecuniary Sanctions and Accountability in Fiduciary Money Management

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Abstract

Asset management often involves a conflict of interests between investors and fund managers. A main goal of financial regulators is to identify and mitigate this conflict. This article focuses on measures that may foster protection of investors' interests. In an experiment capturing the essential elements of asset management, we find that managers' accountability does not prevent their opportunistic behavior if not backed by a threat of punishment. Further, investors inefficiently sanction managers if not completely aware of managers' choices. To effectively protect investors in financial intermediations, financial regulators should ensure both managers' accountability and a credible sanctioning system.

Keywords: Delegated risky decisions, Monetary conflict of interest, Asset management, Experiment.

1 Introduction

The recent financial crisis has fostered a widespread debate about the role of financial institutions in the diffusion of highly risky assets among investors. Mass media often indulge in a stereotypical representation of financial intermediaries as ruthless individuals, eager to take advantage of their client's good faith to pursue their greedy goals.[1] While such a representation is questionable and potentially detrimental, it seems not disputable that financial intermediation often embeds a strong conflict of interest between investors and those managing their resources. Among others, Rajan (2006) points out how current incentives in financial intermediation may lead to distortions in terms of risk borne by investors and managers.

Financial intermediation well fits into what, in the economic literature, is known as an *agency dilemma* or a *"principal-agent" problem*: an agent works on behalf of a principal, with work being beneficial to the principal and detrimental to the agent. Rewards serve as means to align conflicting interests of the two parties. However, agents may behave opportunistically and shirk when actions of the agent are not fully observable by the principal and/or effective sanctions are not available.

We focus in this article on a very specific, yet common, kind of agency dilemma: asset management. Assets are managed by investment managers and brokers (agents) who often have different goals than the asset holders and investors (principals), especially in the retail sector. To elaborate, investment managers may have an incentive to invest their client's money in very risky assets — even if these do not match the investor's risk propensity — because their remuneration is based on a management fee which is proportional to traded wealth, and on a performance fee which is, generally, left-truncated. In other words, managers increase their profits by investing more of their clients' money but do not bear the downside risk of the investments undertaken.

Identifying and mitigating the potential conflicts of interest between investors and investment managers is one of the main goals of financial regulators. A prominent example is given by the directive 2004/39/EC (OJ L 145 21.04.2004) issued by the European Parliament in April 2004, best known as Markets in Financial Instruments Directive (MiFID). The directive introduces guidelines for the regulation of the financial services industry in the European Economic Area, and promotes a *"best execution"* code of conduct: when managing other people's money, managers are always required to take decisions in the investor's best interests.[2] MiFID's best execution regime calls

[1] The pervasiveness of such a representation is testified by the wide success of popular culture products like films (e.g., Scorsese, 2013) and non-fiction books (e.g., Lewis, 2014).

[2] OJ L 145 21.04.2004, p. 4.

for the implementation of transparency and disclosure practices aimed at building an investment portfolio meeting the characteristics and needs of each specific investor, with specific attention to risk bearing capacity.

We present here an experimental study of a decision setting involving two individuals that captures the basic conflict of interest typically inhering in asset management. An individual (agent) has to choose how much of the resources of another individual (principal) to invest in a risky prospect. The principal advises the agent about her desired investment level, but the agent is free to define the actual investment. The reward induces a selfish payoff-maximizing agent to invest all principal's resources in the risky asset, irrespective of the principal's advice. Typically, this will result in an excessive exposure to risks for the principals.

A field of research related to our study is that on *delegated risky decisions*. In such a setting, one party has to choose about a risky investment, knowing that the outcomes of the investment will affect another party. In these studies, payoffs of the two involved parties are usually not interdependent, there is thus no conflict of interests. In this setting, both Brennan et al. (2008) and Chakravarty et al. (2011) find that more risk is taken when investment decisions involve other's money than when they involve own money. In contrast, Eriksen and Kvaløy (2010) find that people take less risk when they are responsible for the earnings of others. The work of Agranov et al. (2013) shows that there is a discrepancy in risk propensity between choices for oneself and for others, both when a conflict of interests is present and when the incentives of the principal and the agent are aligned. The authors label this tendency "*other people's money effect*".

Similar to Agranov et al. (2013), we implement an experiment with an explicit conflict of interests between the principal and the agent. However, we focus on policy interventions aimed at re-aligning conflicting interests and at protecting principal's interests. In a recent experimental work, Pollmann et al. (2014) study the impact of alternative reward schemes on delegated risky decisions. When the agent can reward the principal for the outcome of a risky choice (ex-post accountability), choices for oneself and others do not substantially differ. However, when rewards are given before knowing the actual result of the investment (ex-ante accountability), principals tend to be extremely cautious in terms of risk taken for the other.

We study the role of accountability, but take a different perspective than Pollmann et al. (2014). First, our principals explicitly communicate to their agent their desired level of risk for a specific investment. Second, albeit principals are always informed of the consequences of the investment, we experimentally manipulate principal's knowledge about choices made by the agent. When principals are not aware of choices made by the agent they cannot fully assess whether a negative outcome is due to chance or to an overly risky decision of the agent. Third, we experimentally manipulate the monetary consequences of sanctions imposed by the principal on the agent. Punishment inflicted after knowing the outcome of the investment can either be expensive for the principal and for the agent or it can be purely symbolic, with no monetary consequences for both parties.

Our experiment shows that agents are largely pursuing their own interest, imposing more risk on their principal than what requested. However, when agents' actions are fully disclosed and principals may inflict pecuniary sanctions to agents, these tend to comply with principals' requests. From this we conclude that, in an agency dilemma capturing basic features of financial intermediation, the combination of accountability and monetary punishment is an effective measure to protect principal's interests.

The remaining of the paper is organized as follows: Section 2 contains the experimental procedure, results are discussed in Section 3 and Section 4 concludes.

2 Method

2.1 Experimental Design

We investigate behavior in risky choices in a two-player game: one player is the decision maker (henceforth, the agent) and has to decide how much invest in four different prospects on behalf of the second player (henceforth, the principal).

The prospects (Prospect A, Prospect B, Prospect C, and Prospect D) are modified versions of the lottery used in Gneezy and Potters (1997): with probability $P(L)$ the amount invested is lost and with probability $1 - P(L)$ the investment earns two and a half times the invested amount. As shown by Table 1, the prospects differ in the probability of facing an unsuccessful investment ($P(L)$), with Prospect A having the highest probability of facing a loss and Prospect D having the lowest value; this directly affects the expected returns (ER) of investments: although all prospects can potentially deliver the maximum profit, the expected return radically differs across them, as shown by column ER in Table 1.

The initial endowments are 300 ECU for the principal and 100 ECU for the agent. As mentioned above, the agent invests on behalf of the principal: as a matter of fact, the agent sets $X \in \{0, 1, \dots 200\}$, which represents the amount of her principal's endowment invested in a prospect.

Table 1: The Four Prospects

	$P(L)$	$1 - P(L)$	ER
Prospect A	6/8	2/8	-37.5%
Prospect B	5/8	3/8	-6.2%
Prospect C	3/8	5/8	56.2%
Prospect D	2/8	6/8	87.5%

The size of X directly affects the principal's payoff (Π_P), which is equal to:

$$\Pi_P = \begin{cases} 300 - X & \text{with probability } P(L) \\ 300 - X + 2.5X & \text{with probability } 1 - P(L). \end{cases}$$

Thus, risk borne by the principal monotonically increases in the size of X. Differently, the agent's payoff is not affected by the result of the investment, but it depends only on the amount invested (X). To elaborate, the agent's payoff (Π_A) is equal to:

$$\Pi_A = 100 + 0.5 \cdot X.$$

The decision process consists of two stages: first, the principal advises the agent about the desired investment level in each prospect (X_D); second, the agent is informed about the principal's four desired investment levels and determines X for each of the four prospects, irrespective of X_D.

Given the procedure adopted, each principal states a desired investment level $X_D \in \{0, 1, \ldots 200\}$ for each of the four prospect, and the agent chooses an actual investment level $X \in \{0, 1, \ldots 200\}$ for each of the prospects. After the decisions are made, only one prospect is randomly selected to compute Π_P and Π_A, with all prospects having the same likelihood of being selected.

Two main dimensions are experimentally manipulated in a between-subjects fashion: *Accountability* and *Punishment*. In *Accountability*, we alter the way in which feedbacks are given to the principal: in condition *Unaware*, the principal is only informed about the result of the investment (i.e., how much it has been invested and if the investment was successful or unsuccessful) but no information is given about which prospect was selected. In condition *Aware*, the principal receives the same piece of information as in *Unaware*, but in addition is also informed about the selected prospect.

In *Punishment*, we manipulate the monetary consequences of sanctions inflicted by the principal to the agent. The general structure of this manipulation follows the procedure adopted by Masclet et al. (2003). In condition *Non-monetary*, the principal can express her approval or disapproval about her agent's decision by distributing disappointment points (τ_N): 0 points if she does not disapprove the decision, 10 points if she highly disapproves the decision. Disappointment points are communicated to the agent, but they do not modify players' payoffs. In condition *Monetary*, the principal can sanction the agent for her decision by distributing punishment points (τ_M, from 0 to 10 points), with each received point reducing agent's payoff of 10%. However, punishment is costly also for the principal, as illustrated in Table 2.

Table 2: Non-monetary and Monetary Punishment

	Non-monetary Punishment										
Points (τ_N)	0	1	2	3	4	5	6	7	8	9	10
Cost for Principal	0	0	0	0	0	0	0	0	0	0	0
	Monetary Punishment										
Points (τ_M)	0	1	2	3	4	5	6	7	8	9	10
Cost for Principal (κ)	0	12	16	20	24	28	36	44	56	76	100

By combining the two dimensions *Accountability* and *Punishment*, we obtain four experimental treatments.

- In Treatment UN, the principal remains unaware of the selected prospect and chooses τ_N which does not affect Π_P and Π_A.
- In Treatment UM, the principal remains unaware of the selected prospect and chooses τ_M which affects Π_P and Π_A. Final payoffs are $\Pi_P - \kappa$ for the principal $\Pi_A(\frac{10-\tau_M}{10})$ for the agent.
- In Treatment AN, the principal is informed about the selected prospect and chooses τ_N which does not affect Π_P and Π_A.
- In Treatment AM, the principal is informed about the selected prospect and chooses τ_M which affects Π_P and Π_A. Final payoffs are for principal: $\Pi_P - \kappa$, and for agent: $\Pi_A(\frac{10-\tau_M}{10})$.

At the end of the session, regardless the role played during the first part, we elicit the degree of risk aversion of each participant, with a modified version of the task proposed by Figner et al. (2009). In our task, a participant is presented with 32 cards on the computer screen, face down: 31 cards are gain cards and 1 is a loss card. The participant can turn over as many cards as she wants (from 0 to 32), knowing that for each gain card, she will earn 0.10 Euro. However, if she finds the loss card she loses everything. The participant selects the cards she wants to turn and then the selected cards are simultaneously turned face up. Then, earnings in the task are computed. The number of turned card provides us with a direct measure of participants' risk attitude: a risk neutral subject is expected to turn 16 cards, while risk averse (seeker) subjects should turn less (more) than 16 cards.

After payoff-relevant choices were collected, the Sensitivity for Punishment / Sensitivity for Reward questionnaire (SPSR, Torrubia et al., 2001) and a questionnaire to collect demographic data were administered to participants. Sensitivity for punishment is defined as the passive avoidance of aversive consequences or novelty and the worry produced by the threat of punishment or failure. Sensitivity for reward is defined as the reactivity to individual rewards. In more economic terms, the sensitivity for punishment measures how strongly a person anticipates to experience disutility when confronted with negative consequences of a decision. Sensitivity for reward, on the other hand, measures the utility that a person expects to experience from a beneficial action. The SPSR consists of 48 yes/no questions, of which 24 measure sensitivity for punishment and 24 measure sensitivity for reward. Answers are commonly coded as 1 for "yes" and 0 for "no" and summed up to reach a maximum value of 24 on each dimension: the higher the score, the higher the sensitivity to punishment/reward.

2.2 Behavioral Predictions

The benchmark prediction against which we are going to evaluate behavior in the experiment is based on the common assumption of selfishness. An agent who aims at maximizing her own payoff is going to invest all principal's resources (i.e., $X = 200$), irrespective of the desired investment submitted by the principal, of the expected returns of the investment, and of the treatment condition. In a strictly selfish-rational framework, punishment is a non-credible threat as it delivers negative returns to the principal. Aware of this, the agent will not refrain from investing all principal's resources, independent of the advised level.

Assumptions of selfish rationality provide us with a testable hypothesis. However, relying on previous evidence we expect to observe substantial deviations from the course of actions described above. For what concerns alternative monetary consequences of punishment, previous works have shown that individuals may undertake costly actions to sanction unfair behavior of the counterpart. A widely-known example in this direction is provided by rejections in the Ultimatum Game (Güth et al., 1982). Evidence of non-selfish punishment has been collected also in other types of strategic interactions. As an example, Masclet et al. (2003) and Fehr and Fischbacher (2004) show that in Prisoner's Dilemma-like interactions monetary punishment leads to higher cooperation and to more pro-social behavior than non-monetary sanctions. Several motivations for the adoption of non-selfish punishment have been identified in the literature. Among the most credited, it is possible to identify those based on distributional concerns, i.e., inequity aversion (e.g., Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000) and on emotions, i.e., anger (e.g., Sanfey et al., 2003; Grimm and Mengel, 2011). Thus, relying on previous evidence, we predict that principals dissatisfied with agent's decision may undertake monetary punishment, even though this is economically not justifiable. This should discourage agents from undertaking opportunistic investment decisions. As a consequence, we expect to observe smaller deviations of actual investments from desired investment in condition *Monetary* than in condition *Non-monetary.*

Distinct levels of awareness about choices of the agent should not affect agent's behavior as they do not affect monetary payoffs. However, when considering an extension of the utility function that takes into account beliefs about the counterpart (e.g., Battigalli and Dufwenberg, 2007), different predictions for condition *Aware* and *Unaware* can be obtained. Charness and Dufwenberg (2006) experimentally show that individuals are reluctant to let their counterparts down and adapt their actions to others' expectations to avoid feeling guilty. We speculate that, in our study, agents who deviate from principal's advice should feel more guilty in condition *Aware* than in condition *Unaware.* In the latter, agents can "hide" behind positive value prospects in which larger investments are more acceptable and, generally, more in line with principal's expectations. Further support to this conjecture is given by experimental works showing that individuals try to exploit uncertainty in strategic interactions to alter beliefs of the counterpart about the opportunistic content of their actions (e.g. Güth et al., 1996). Thus, we predict that actual investments are closer to desired investments in condition *Aware* than in condition *Unaware.*

2.3 Participants and Procedures

The experiment was run at LERN (Laboratory for Experimental Research Nuremberg) of the University of Erlangen-Nuremberg (Nuremberg, Germany); the participants were students of the same university. The recruitment was conducted via ORSEE system (Greiner, 2004) and the experiment was programmed and conducted using z-Tree software (Fischbacher, 2007). In total, 192 participants took part in the experiment, equally divided into the four treatments.

Upon their arrival, participants were asked to sit in cubicles and were provided with the instructions: a member of the staff read aloud the instructions and participants had the opportunity to privately ask clarifications on the design. The experimental session did not start until each participant correctly answered eight control questions on the rules of the experiment.

In order to avoid possible demand effects, we used neutral terms both in the software and in the instructions. Thus, instead of using a loaded terminology involving terms like fund manager, client, and investment, we employed terms like Player A, Player B, and prospect.

Participants were informed that the experiment was composed by two independent parts, but instructions for the risk elicitation task were distributed only at the end of the first part.

In addition to a show-up fee of 2.50 Euro, participants received both payoffs, for the first part and for the second part.[3] On average, sessions lasted 45 minutes and mean individual total earnings amounted to 9.20 Euro.

3 Results

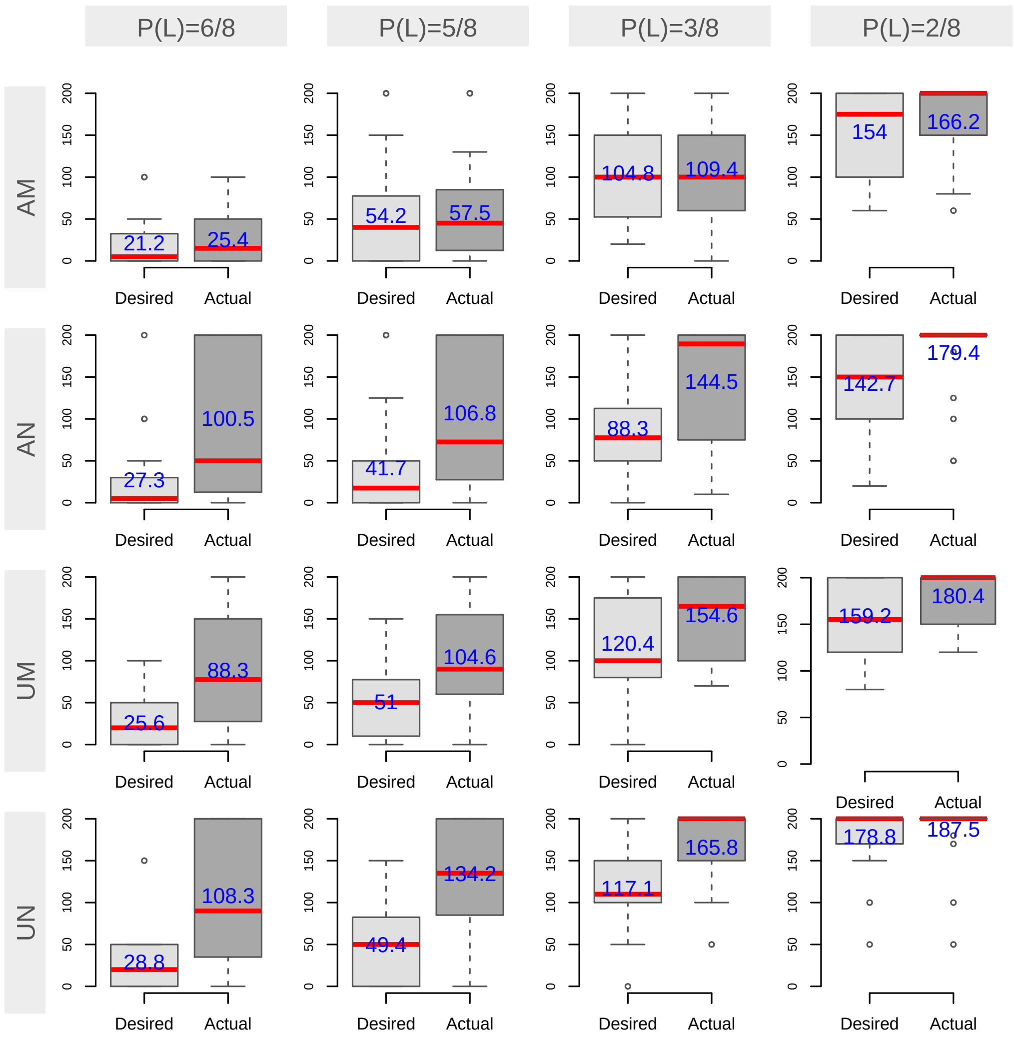
3.1 Investments

3.1.1 Descriptive Statistics

Figure 1 provides a conventional graphical representation of distribution quartiles of *desired* (X_D) and *actual* (X) investments, for distinct experimental conditions and distinct prospects. Desired investment is defined as the amount of ECU that a principal advised her agent to invest in a prospect; while actual investment is the ECU amount that the agent actually invested in the prospect. Average values are conveniently reported within the figure.

[3] The exchange rate for the first part was 40 ECU = 1 Euro. Earnings in the second part were directly in Euro.

Figure 1: Desired and Actual Investments



As shown by Figure 1, in each condition, principals wish to allocate higher shares of their wealth to prospects delivering higher expected returns: a monotonic pattern is observed across all conditions. The lowest average desired investment can be observed in AM for $P(L) = 6/8$ and the highest desired investment is found in UN for $P(L) = 2/8$.

A comparison of individual-level average desired investments across conditions shows that a statistically significant difference is observed only between UN and AN (Wilcoxon Rank Sum test, p-value=0.010; all other p-values ≥ 0.077).[4] The difference between these two conditions is driven by the higher desired investments in UN than in AN, for positive value prospects. Indeed, a series

[4]When not specified, all tests are two-tailed and the significance level is set at the conventional 5%.

of non-parametric tests comparing each prospect across the two experimental conditions shows that a statistically significant difference is observed only for $P(L) = 3/8$ and $P(L) = 2/8$ (Wilcoxon Rank Sum test, p-value=0.027 and p-value=0.026, respectively; all other p-values ≥ 0.300).

For what concerns agents' behavior, similar to what happens for desired investments, a monotonic pattern of actual investments for increasing levels of expected returns is observed. However, average actual investment are larger than average desired investments. Notably, for $P(L) = 2/8$, the median investment is equal to the maximum investment possible in all conditions. The boxplots also highlight higher dispersion of values for actual investments compared to the values of desired investments, in particular for prospects with a negative expected value.

A comparison of individual-level average investments across prospects shows that investments in condition AM are statistically different (smaller) from investment in all other conditions (Wilcoxon Rank Sum test, all p-values ≤ 0.022), while no statistically significant differences are observed for all other comparisons (Wilcoxon Rank Sum test, all p-values ≥ 0.172).

Figure 2 provides a representation of the discrepancies between actual investments (X) and desired investments (X_D), for each prospect and each experimental condition. The dashed horizontal line in each graph captures no discrepancy between actual and desired investments ($X = X_D$), while values above (below) the line testify of larger (smaller) investments made by the agent relative to what asked by the principal.

Figure 2: Discrepancy between Actual and Desired Investments

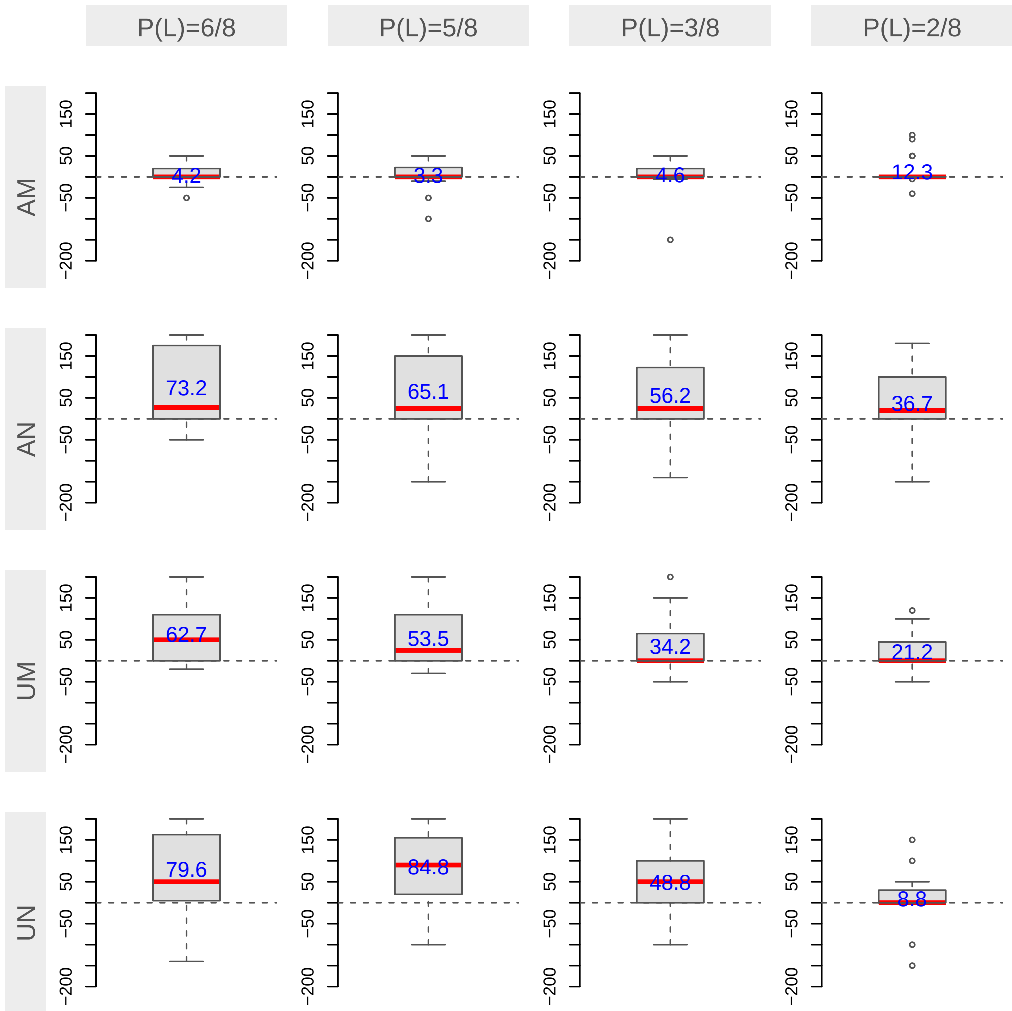


Figure 2 provides evidence that the median difference (captured by the bold horizontal line) between investments implemented by the agent and desired investment is positive in all but one experimental condition: in *AM* it is always equal to 0. Thus, agents tend to undertake higher risks than explicitly requested by their principals, when no monetary retaliation is possible and/or the agent cannot be made fully accountable for her actions. In terms of relative deviations from the desired investment, the lowest average deviation is observed in *AM* (14.3%), while the highest deviation is observed in *AN* (126.3%).

The difference between condition *AM* and other conditions gathered from Figure 2 is confirmed by a series of non-parametric tests showing that discrepancies are not significantly different from zero for all prospects in AM (Wilcoxon Rank Sum test, p-values ≥ 0.05). For other conditions, discrepancies are generally different from zero (Wilcoxon Rank Sum test, all p-values ≤ 0.036), with the exception of prospect D in UN (Wilcoxon Rank Sum test, p-value=0.306).

A series of non-parametric tests shows that, for negative value prospects, discrepancies in condition AM differ from those in all other conditions (Wilcoxon Rank Sum test, all p-values ≤ 0.020), while no significant differences are observed for all other comparisons (Wilcoxon Rank Sum test, all p-values ≥ 0.139). For positive value prospects, a significant difference between AM and AN and UN is observed for prospect $P(L) = 3/8$ (Wilcoxon Rank Sum test, p-value=0.007 in both comparisons), while no significant differences are observed for all other comparisons (Wilcoxon Rank Sum test, all p-values ≥ 0.221). Finally, for prospect $P(L) = 2/8$ a significant difference is observed only when comparing AM and AN (Wilcoxon Rank Sum test, p-value = 0.039). When pooling data across prospects, AM is significantly different from the other conditions (Wilcoxon Rank Sum test, all p-values ≤ 0.025), while no significant difference is observed for other comparisons (Wilcoxon Rank Sum test, all p-values ≥ 0.363).

The analysis reported above shows that agents tend to over-invest relative to what asked by their principal, in all conditions but AM. The impact of accountability and monetary sanctions in the realignment of conflicting interests is confirmed also by the comparison of discrepancies across experimental conditions. Section 3.1.2 further investigates the determinants of agents' choices and highlights the main results of our experiment.

3.1.2 Determinants of Actual Investments

Table 3 displays regression outcomes of a Tobit mixed model controlling for repeated choices at the individual level. The use of a Tobit model is justified by the consistent number of observations equal to extreme values (0 and 200 ECU), especially for the prospects with positive expected returns.

Three distinct estimations are presented: *Pooled* takes into account all prospects, *Prospects (-)* takes into account prospects with $ER < 0$ (i.e., P(L)=5/8 and P(L)=6/8), and *Prospects (+)* takes into account prospects with $ER > 0$ (i.e., P(L)=3/8 and P(L)=2/8). The lower panel of Table 3 displays the outcome of a series of linear hypotheses tests comparing the impact of the two treatment dummies and of choices in condition AM and in other experimental conditions.

The dependent variable in the model ($Actual.Inv$) is given by the investment implemented by the agent. This variable provides us with an indirect measure of the opportunistic stance taken by the agent at the expenses of the principal, in terms of risk borne.

The main explanatory variables are given by the two dummies capturing dimensions which are experimentally manipulated: concerning *Accountability*, variable *Aware* is equal to 1 when choices are collected in condition *Aware* and equal to 0 when collected in condition *Unaware*; concerning *Punishment*, variable *Monetary* is equal to 1 when choices are collected in condition *Monetary* and equal to 0 when collected in condition *Non-monetary*. The interaction term $Aware \times Monet.$ captures the impact of the interaction between these two variables.

A set of control variables is added to the regression estimates of Table 3: $Desired.Inv$ captures the desired investment of the principal; $Risk.tolerance$ captures the degree of risk tolerance via the number of cards turned in the modified CCT administered at the end of the experiment; Age and $Female$ provide us with a control on age and gender of the agent; $Sense.punish$ and $Sense.reward$ are the scores obtained from the questionnaires and measure attitudes of the agents towards punishment and reward, respectively.

Table 3: Determinants of Actual Investment (Tobit Model)

$Actual.Inv \sim$	Pooled	Prospects [−]	Prospects [+]
(Intercept)	90.943 (39.524)*	64.339 (26.735)*	25.674 (91.692)
$Aware$	5.849 (9.386)	−15.125 (6.619)*	25.884 (19.217)
$Monetary$	6.496 (9.380)	−28.717 (6.06)***	−18.000 (23.595)
$Aware \times Monet.$	−79.755 (13.472)***	−67.552 (8.942)***	−43.607 (42.205)
$Desired.Inv$	1.085 (0.053)***	0.864 (0.056)***	1.037 (0.113)***
$Risk.tolerance$	−5.880 (0.742)***	−0.294 (0.437)	−1.117 (1.389)
Age	8.267 (1.271)***	0.935 (0.848)	4.457 (2.863)
$Female$	−29.845 (8.639)***	−26.763 (5.895)***	−24.354 (21.545)
$Sense.Punish$	−4.969 (0.775)***	0.235 (0.468)	−1.221 (1.498)
$Sense.Reward$	−1.364 (0.848)	2.103 (0.624)***	−0.142 (2.324)
N [lc, un, rc]	384 [28, 204, 152]	192 [27, 119, 46]	192 [1, 85, 106]
	Linear Hypothesis Tests (χ^2)		
Acc vs. Mon	0.1	4.5*	4.1*
AM vs. UN	46.4***	259.0***	1.9
AM vs. AN	54.8***	181.3***	5.8*
AM vs. UM	54.5***	181.2***	0.2

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\circ}p < 0.1$

In *Pooled*, the positive coefficient of the intercept shows that agents tend to invest more than what requested in the baseline condition UN. Furthermore, *Aware* and *Monetary* do not significantly impact on actual investments, when considered in isolation. However, when considering the interaction between the two variables, a significant reduction in actual investments is observed when both accountability and monetary sanctions are in place. This is confirmed also by the linear hypothesis tests showing that condition *AM* significantly differs from all other conditions.

Result 1 *Overall, accountability and the threat of monetary sanctions help realign agents' behavior and principals' interests only when both are in place.*

When taking into account only negative-value prospects (*Prospects* [−]), the coefficient of the intercept speaks of a sustained over-investment in the baseline condition. However, both accountability and monetary sanctions restrain the opportunistic behavior of agents. The interaction between the two explanatory variables further strengthens the restraining effect. The linear hypothesis tests corroborate evidence gathered from regression estimates and also show that monetary sanctions have a stronger impact than accountability in terms of realignment of conflicting interests.

Result 2 *For negative-value prospects, in which the conflict of interest is higher, both accountability and the threat of monetary sanctions help realign agents' behavior and principals' interests, with a stronger effect when both measures are in place.*

In the set of positive-value prospects (*Prospects* [+]), no significant over-investment is registered and no significant effects are observed for accountability and monetary sanctions. This is mainly due to the fact that the desired investment level is already close to the maximum investment level. The weaker impact of treatment variables, relative to negative-value prospects is confirmed also by the linear hypothesis tests comparing condition *AM* to other conditions: a statistically significant difference is observed only when comparing *AM* and *AN*.

Result 3 *For positive-value prospects, in which the conflict of interest is low, no significant over-investment is observed.*

In terms of control variables, higher levels of desired investments induce higher levels of investments, across all kinds of prospects. Agents are not insensitive to principal's interests, but tend to add a mark-up to the expressed level of investment. Demographic measures impact on choices when pooling all prospects together, with older agents investing more of their principal's resources and females investing less. As expected, a stronger sensitivity for punishment limits the opportunistic behavior of the agents and a stronger sensitivity for reward promotes more goal oriented behavior in the set of negative-value prospects.

Surprisingly, risk tolerance exerts a negative impact on the level of investment. Thus, the more risk tolerant an agent is, the less of her principal's money she is going to invest.[5]

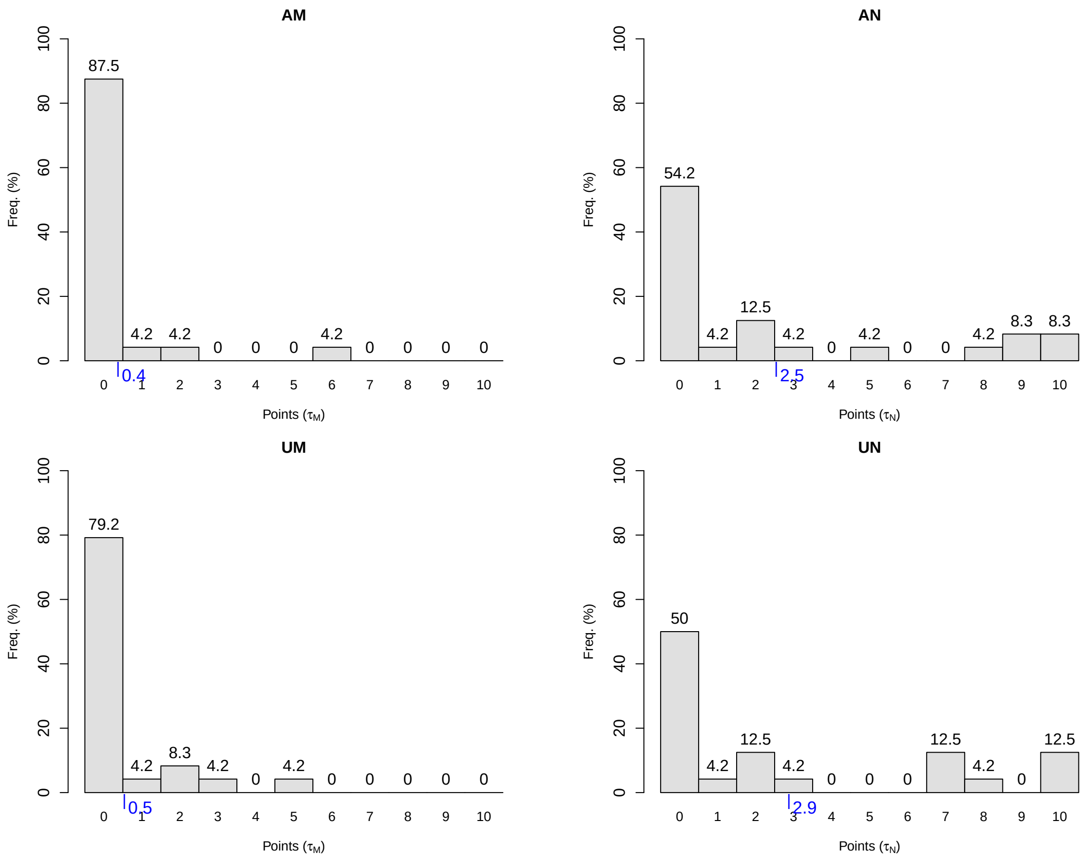
[5] A possible interpretation for this result is the potential reverse causality linking the measure of risk tolerance

3.2 Punishment

3.2.1 Descriptive Statistics

Figure 3 shows the distribution of punishment (τ_M) and disappointment (τ_N) points, across experimental conditions. The height of each bar provides a direct representation of the relative frequency of the corresponding punishment level, while the vertical bar underneath the horizontal axis represents the average punishment.

Figure 3: Punishment



In each condition, the majority of participants decides not to punish the agent, as shown by the frequency of choices in correspondence to 0 points. However, when punishment has direct monetary consequences about 80% of principals choose not to punish their agent, while when no monetary consequences are associated to sanctioning about 50% choose not to punish their agent.

and the investment level. Given that the risk tolerance measure was collected after the investment task, we cannot exclude that those agents investing earning less from the investment task were trying to "compensate" by taking more risk in the modified CCT. This is a common methodological problem faced when taking repeated measures in a an experiment. To rule-out endogeneity issues in our regression estimates, we estimated our models omitting the risk control. Results are robust to this change in model specification.

This is also reflected in average points addressed to the agent, which are close to zero for conditions AM and UM and equal to 2.5 and 2.9 in conditions AN and UN, respectively.

The striking difference between conditions with and without monetary consequences that emerges from Figure 3 is confirmed by a series of non-parametric tests comparing AM and AN, and UM and UN (Wilcoxon Rank Sum test, p-value = 0.008 and p-value = 0.017, respectively). Furthermore, no significant differences are detected when comparing AM and UM, and UN and AN (Wilcoxon Rank Sum test, p-value = 0.455 and p-value = 0.780, respectively).

3.2.2 Determinants of Punishment

A regression analysis about determinants of principal's punishment behavior is presented in Table 4: the dependent variable *Punishment* counts the number of points addressed by a principal to her agent. Given the nature of the dependent variable and the substantial number of zero counts, a Negative Binomial Hurdle Model (NBHM) has been implemented.[6] Accordingly, the column to the left in Table 4 (*Zero Model*) provides us with a measure of the likelihood of observing punishment, while column to the right (*Count Model*) refers to the size of the punishment imposed on the agent.

Concerning the explanatory variables, in addition to treatment dummies and control variables (specified as in the previous section), we focus on two characteristics of the investment. Specifically, *Success* is equal to 1 when the investment was successful (0 otherwise) and *Diff* capture the discrepancy between actual and desired investment (as before, positive values stand for an agent's over-investment with respect to her principal request). *Success* and *Diff* enter also as interaction with *Aware*.

Regression outcomes of Table 4 show that $Monetary$ has a negative impact on punishment, both on the decision to undertake them and on their size. Thus, agents are less likely to sanction, and do it more moderately, when the action is expensive.

Result 4 *Less sanctioning is observed when punishment is expensive for both parties than when it is purely symbolic.*

The estimated coefficient of *Aware* is negative, showing that more sanctioning is observed when the principal does not know for sure the prospect to which the choices of the agents apply.

[6]Hurdle models better deal with the issues of over-dispersion and excess of zeros, as compared to other models for count data (Mullahy, 1986). The model captures a two-stage process in which the principal first decides whether to punish or not the agent (Zero models) and then chooses the level of punishment (Count Model). Tests on over-dispersion show that Negative Binomial is the correct specification (over-dispersion due to excess of zeros) for the count component.

Table 4: Hurdle Regression (Negative Binomial)

Punishment ∼	*Zero Model*	*Count Model*
(Intercept)	1.863 (4.048)	0.842 (1.837)
Diff	−0.004 (0.005)	0.001 (0.001)
Success	−2.226 (0.841)**	−2.960 (1.784)$^{\circ}$
Monetary	−2.019 (0.668)**	−0.870 (0.309)**
Aware	−1.975 (0.900)*	−0.455 (0.326)
Risk.tolerance	−0.109 (0.066)	0.012 (0.030)
Age	0.038 (0.133)	0.050 (0.056)
Female	0.694 (0.692)	0.617 (0.319)$^{\circ}$
Sense.punish	−0.137 (0.079)$^{\circ}$	−0.080 (0.033)*
Sense.Reward	0.145 (0.090)	−0.003 (0.032)
Aware × *Succ*	−0.137 (1.434)	2.158 (1.852)
Aware × *Diff*	0.039 (0.013)**	0.002 (0.003)
Log(theta)	−	3.313 (1.267)**
Num. obs.	96	96

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\circ}p < 0.1$

On the other hand, *Aware* has a positive impact on the choice to sanction when in interaction with the difference between desired investment and actual investment. This suggests that principals who are better informed about actions of their agents are more selective in punishing and tend to direct their disappointment towards discrepancies between advised and actual investments.

Result 5 *Agents tend to punish their agents more when they are less aware about investment choices. However, higher awareness promotes a more targeted sanctioning behavior directed towards agents that largely deviate from the advised investment level.*

Interestingly, the estimated coefficient of *Success* shows that success of the investment reduces both the likelihood of observing punishment (Zero Model) and its size (Count Model). To this it should be added that the estimated coefficient of the interaction between *Aware* and *Success* is not statistically significant. Thus, agents seem to value more consequences of the investments than intentions of the agent when choosing about punishment.

Result 6 *Principals are less likely to punish their agent when the investment is successful than when is not, irrespective of the degree of awareness about agents' behavior.*

Finally, a stronger sense of punishment induces a more moderate access to sanctions. This is most likely due to the fact that, among those with a stronger sense of punishment, psychological "returns" from sanctions are higher.

4 Discussion and Conclusion

Recent experimental studies have shown that incentive structures strongly affect behavior in markets and may lead to excessive speculation (e.g., Kleinlercher et al., 2014). We focus in this paper on a simple incentive structure that captures essential elements of financial intermediation. In our experiment, agents invest the money of principals on their behalf and get a management fee proportional to the invested amount. However, agents do not share with their principals the risk of the investment and they are not required to give information about the investment strategy. With such an incentive structure, agents largely violate investment requests of their principals. They tend to allocate large amounts of principal's resources in investments with expected negative outcomes.

In light of the strong violation of investor's interests, we asses the role of monetary sanctions and of accountability (i.e., transparency) in the protection of investors. In the presence of strong conflicts of interest, the two measures effectively protect investor's interests only when jointly present. To elaborate, agents are induced to respect the dispositions of their principals only when principals have access to an effective punishment device and are made aware of actual choices of the principals. More transparency does not represent a strong enough threat to induce a more respectful behavior on the side of agents, unless it is matched by access to effective sanctions.

From an economic point of view, monetary punishment implies a loss of efficiency. However, monetary punishment is rarely implemented as it represents a credible threat in the eyes of the agents, in particular when principals are fully informed about agents' behavior. Furthermore, monetary punishment and transparency increase the welfare of the agents by realigning the amount of risk desired to the amount of risk actually borne.

Discriminating among alternative motivations for punishment goes beyond the scope of this paper. However, the fact that significantly less punishment is observed after a successful investment provides more support to the interpretation based on inequity aversion than to that based on emotional reactions. Indeed, the loss of utility originating from payoff differences is likely to be lower when the investment is successful than when it is not (Fehr and Schmidt, 1999). Differently, emotional reactions should not heavily depend upon outcomes of the investment, but upon the "breach of faith" by the agent when she chooses to deviate from the advised investment level. Evidence collected calls for further research on this issue.

We also identify a few individual traits that affect agent's opportunistic behavior. Interestingly, females tend to deviate less from principal's advise than males. This represents a stimulating finding when taking into account the highly unbalanced gender composition of the financial industry (e.g., Eriksen and Kvaløy, 2010). In terms of general disposition, agents attaching a higher value to being punished over-invest less that agents with a low sensitivity for punishment. For investments in which the conflict of interest is stronger, agents that attach a higher value to rewards are more likely to behave selfishly and to over-invest.

Increasing transparency in order to align the investment with the characteristics of the investor is, without doubts, a positive and important step towards her protection. Despite that, financial regulators must be aware of the importance of the sanctioning system since, together with transparency, it is a key element for protection of investors. Back to the MiFID, European regulators refer to law and authorities of the member states to implement sanctioning procedures. However, legal uncertainty and discrepancies across member states may weaken the effectiveness of the sanctioning mechanism and considerably reduce investors' protection.

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Appendix

These are translated versions (originally in German) of the instructions used in the experiment. The instructions changed accordingly to the treatment, differences are indicated in the text.

General Instructions

Thank you for taking part in this experiment. In addition to the show-up fee (2.5 Euro), you will receive an amount of money which will be paid as a result of decisions made in the experiment. During the experiment, you are not allowed to talk to other participants. Whenever you have a question, please raise your hand and an experimenter will come to answer your question.

The experiment is composed by two independent parts: in both parts you will earn money; during the first part, ECU (Experimental Currency Units) will be used: at the end of the sessions, your earnings in ECU will be converted in Euro for your real payoff (40 ECU = 1 Euro). In the second part Euro will be used. Earnings in one part do not depend on the result of the other.

Your final and total earning is the sum of the results of the two parts. You will get the instruction for the second part at the end of the first.

PART ONE

In this part, two participants will interact. One of the two participants will be randomly assigned to role *A* and the other participant in the pair to role *B*. The identity of the other in the pair will never be revealed.

You will be informed about your role at the beginning of the experiment and it will be displayed on the screen of your computer: other participants in the room will never know the role you are randomly assigned to.

Role A

If you are assigned to *Role A*, you will receive an initial endowment of 300 ECU. The other in the pair, assigned to *Role B*, can invest up to 200 of your ECU in a risky prospect.

The investment can be *unsuccessful* (you can lose money) or *successful* (you can gain money): with some probability the investment earns two and a half times (2.5×) the invested amount; however, when the investment is unsuccessful, the invested amount is lost.

Your ECU can be invested in four distinct prospects: *Prospect A*, *Prospect B*, *Prospect C*, and *Prospect D*. The prospects differ in the probability of facing an unsuccessful investment, with Prospect A having the highest probability of facing a loss (6/8 or 75%) and Prospect D having the lowest probability of facing a loss (2/8 or 25%). This directly affects the expected returns (ER) of investments: in Prospect A the expected returns are equal to -37.5% for each ECU invested, while in Prospect D the expected returns are equal to +87.5% for each ECU invested. This implies that, on average, when you invest 1 ECU in A you get 0.62 ECU out of the investment, while when you invest in D you get 1.88 ECU. Thus, while in all prospects can potentially deliver the maximum profit, the average outcome differs across them.

The following table provides you with a summary of the four prospects:

	Probability of losing	Probability of gaining	ER
Prospect A	6/8	2/8	-37.5%
Prospect B	5/8	3/8	-6.2%
Prospect C	3/8	5/8	56.2%
Prospect D	2/8	6/8	87.5%

Only one of the four Prospects will be selected for implementation. Each of the four prospects has a positive probability of being chosen.

Before B invests your ECU in the selected prospect, you have the possibility to state how much of your endowment (from 0 to a maximum of 200 ECU) you would like B to invest in each of the four prospects.

After your declarations and before knowing which prospect will be palyed, B will decide how much to invest in each prospect. Please note that B is not bound by your suggestion and can choose any amount between 0 and 200 ECU. Your final payoff directly follows the result of the investment:

1. if the investment is *unsuccessful*, your final payoff will be:

   300 - the amount invested

2. if the investment is *successful*, your final payoff will be:

   300 - the amount invested + 2.5× the amount invested

After the communication on your final payoff

`Treatment UN and UM`

(for you, the selected prospect will remain unknown),

`Treatment AN and AM`

and on the selected prospect

you will have the opportunity to

`Treatment UN and AN`

register your approval or disapproval about B's decision by distributing disappointment points. You can assign a number of points to B if you disapprove his or her decision: 0 points if you do not disapprove the decision, 10 points if you highly disapprove the decision.

Disappointment Points	0	1	2	3	4	5	6	7	8	9	10

`Treatment UM and AM`

punish B for his/her decision by distributing punishment points. The larger the number of punishment points assigned to B the heavier the punishment: each received point reduces your B's payoff by 10%.

Punishment is costly for you: the more you punish, the higher is your cost. The following table gives you an overview of the cost of punishment and its corresponding punishment points.

Punishment Points	0	1	2	3	4	5
Punishment Costs (for A)	0	12	16	20	24	28
Punishment Points	6	7	8	9	10	
Punishment Costs (for A)	36	44	56	76	100	

Your final payoff corresponds to the result of the investment minus the cost of punishment (i.e. how much punishment points you decide to assign to B).

Role B

If you are assigned to *Role B*, you will receive an initial endowment of 100 ECU. You are asked to choose how to invest A's ECU (from 0 to a maximum of 200 ECU).

Before the investment decision you will be informed about A's investment preferences for each Prospect. You are asked to choose an investment level for each of the four prospects, before actually knowing which prospect is going to be implemented. After you have chosen, you are informed which of the four prospects is going to be implemented.

Your decision affects both your payoff and the payoff of A (see above for how the A's payoff is determined).

Your payoff depends only on how much you decide to invest and not on the characteristics of the selected prospect: the higher the amount invested, the higher your final payoff.

More precisely your final payoff is equal to: *100 + 0.5× amount invested.*

After your investment,

`Treatment UN and UM`

only the outcome of the investment, but not the selected Prospect, will be announced to A,

`Treatment AN and AM`

the outcome of the investment and the selected Prospect, will be announced to A,

who will have the opportunity to

`Treatment UN and AN`

communicate his/her approval or disapproval of your decision (see above for how A can state his/her disapproval). The disapproval has no influence on your payoff.

`Treatment UM and AM`

punish your decision by reducing your payoff (see above for how a A can punish B).

The following table summarizes the final payoffs of A and B, in case of an unsuccessful investment and in case of a successful investment (NOTE: x stands for the amount invested by B; it can be set between 0 and 200).

`Treatment UN and AN`

Role	*Unsuccessful Investment*	*Successful Investment*
A	$300 - x$	$300 - x + 2.5 \times x$
B	$100 + 0.5 \times x$	$100 + 0.5 \times x$

`Treatment UM and AM`

Role	*Unsuccessful Investment*
A	$300 - x - PunishmentCost$
B	$(100 + 0.5 \cdot x) \cdot (10 - PunishmentPoints)/10$
Role	*Successful Investment*
A	$300 - x + 2.5 \cdot x - PunishmentCost$
B	$(100 + 0.5 \cdot x) \cdot (10 - PunishmentPoints)/10$

In order ensure that you correctly understood the rules of the experiment, you will be asked to answer some control questions before the beginning of the experiment. The experiment will start only when all participants properly answered to the control questions.

If you have questions, please do not hesitate to ask one of the experimenters by raising your hand.

PART TWO[7]

In this part, you do not interact with other participants and you are going to participate in a card game.

In this game, you will turn over cards to win Euro.

You will see 32 cards on the computer screen, face down. You will decide how many of these cards to turn over. Each card is either a gain card or a loss card (there are no neutral cards). There are 31 gain cards and 1 loss card in the deck of 32. For each gain card you will find, you will gain 0.10 Euro but if you find the loss card you will earn nothing. What you don't know is which of the 32 cards that you see face-down are the gain cards and which is the loss card.

You indicate the cards (from 0 to 32) you want to turn over by clicking on them. Then, the selected cards will be turned over and you will discover if you have chosen the loss card.

The task starts with a score of 0 Euro.

This game is for real money and requires some concentration. Please minimize distractions in your environment and notice that once a card has been selected, it is not possible to deselect it.

[7] Adapted version of the original instruction on http://columbiacardtask.org/

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