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Mixing the Carrots with the Sticks: Are Punishment and Reward Substitutes?*

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Abstract

This paper presents evidence that the demand for costly norm enforcement can be affected by the availability of the means for enforcing the norm. Participants in a laboratory experiment can reward or punish to enforce a distribution norm. Controlling for the extent of norm violation, we find that demand for costly punishment is lower when participants also have the opportunity to reward norm adherence. Similarly, demand for costly reward is lower when participants can punish norm violations, controlling for the extent of norm adherence. The reason is that participants use reward and punishment to signal their approval and disapproval. The availability of reward opportunities allows them to signal their disapproval by withholding reward. Similarly, the availability of punishment opportunities allows them to signal their approval by withholding punishment. This suggests that individuals consider reward and punishment to be substitutes. The resultant reduction in costly enforcement does not affect adherence to the norm, but has a significant impact on earnings in the experiment.

Keywords: punishment, reward, social norms, norm enforcement, third party
JEL Codes: C91, D03, D63, H41

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1. Introduction

In the past decade, experimental economists have gathered extensive evidence showing that many individuals are willing to uphold social norms even if this is at a personal material cost (see e.g., Chaudhuri, 2011; Gächter and Herrmann, 2009). The willingness to punish norm violators and reward norm adherers provides an incentive for others to adhere to norms even in anonymous interactions. It can therefore help to improve efficiency by reducing negative externalities. For this reason, these findings have attracted considerable attention from economists and other social scientists (e.g., Gintis, Bowles, Boyd and Fehr, 2005; Guala, 2011).

A related question to whether individuals are willing to uphold a norm at a personal cost is *how* they uphold them. Most studies so far have focused on the demand for costly punishment. However, in many instances in daily life, punishment opportunities exist simultaneously with reward opportunities. An example of this is online marketplaces, such as eBay, which allow traders to leave either positive or negative feedback. Feedback has a significant impact on the prices sellers can charge, with positive feedback increasing prices and negative feedback decreasing them (Houser and Wooders, 2006). Therefore, positive feedback is a form of reward, while negative feedback is a form of punishment for failing to provide the anticipated level of satisfaction.

Reward opportunities do not only allow one to reward those adhering to a norm. They can also affect the way in which violators are punished. The reason is that punishment is partly an expression of disapproval (e.g., Noussair and Tucker, 2005; Reuben and van Winden, 2008; Xiao and Houser, 2005). When reward opportunities exist, disapproval can be expressed by withholding rewards – a form of punishment which is less costly for the enforcer. Even if an individual decides to use costly punishment, the demand for costly punishment may be lower because an investment in costly punishment may signal greater disapproval when the enforcer has the option of withholding rewards at no personal cost. Therefore, reward and punishment can be substitutes.

From a social perspective, the question of *how* individuals uphold norms is arguably as important as *whether* they are willing to uphold them at a personal cost. Punishment can be costly for both enforcers and violators; it can destroy social capital (e.g. Fehr and Rockenbach, 2003); sever social ties (e.g., Wiessner, 2005; Guala, 2011); trigger counter-punishment (Denant-Boemont, Masclet and Noussair, 2007; Nikiforakis, 2008), and lead to feuds (Hopfensitz and Reuben, 2009; Nikiforakis and Engelmann, 2011; Nikiforakis, Noussair and Wilkening, 2011). Rewards, on the other hand, can have the opposite effects: they are beneficial for receivers; they can increase social capital, strengthen social ties and lead to gift exchange (e.g. Coleman, 1988).

Despite the importance of the topic, little is known about how the availability of different means for enforcing norms affects norm enforcement and efficiency. In this paper, we present the results from a laboratory experiment investigating how individuals use rewards and punishments to enforce a distribution norm. We examine the demand for rewards and punishments separately and jointly. This allows us to explore whether the existence of reward opportunities reduces the demand for costly punishment and vice versa. Withholding punishment is a form of costless rewarding. Therefore, the existence of punishment opportunities may also reduce the demand for costly rewards.

To examine whether the availability of different means for upholding norms affects demand for costly enforcement, we use a game similar to that introduced in the literature by Fehr and Fischbacher (2004). An individual dictates the division of an endowment between herself and a receiver. The norm prescribes that the ‘dictator’ divides the endowment equally with the receiver (Fehr and Fischbacher, 2004; Krupka and Weber, 2008). A third player, the *enforcer*, observes the division and must decide whether to use part of his endowment to reward or punish the dictator, depending on the experimental treatment. Punishing is costly both for the enforcer and for the proposer who receives the punishment. Rewarding is costly for the enforcer, but beneficial for the proposer.

Our main finding is that the availability of multiple means for upholding the norm has a pronounced, negative impact on the demand for costly enforcement. In particular, the demand for costly punishment is substantially and significantly lower when rewards are possible. A similar reduction is observed on the demand for costly rewards when punishment is possible. Evidence from a questionnaire indicates that participants use reward and punishment to signal their approval and disapproval of the dictator’s transfer. Many of our subjects prefer to signal their disapproval or approval in a costless way, by withholding reward or punishment when the opportunity exists. This suggests that participants use reward and punishment as substitutes. Adherence to the distribution norm is unaffected by the changes in costly enforcement, but the availability of different enforcement means has a pronounced effect on individual earnings in the experiment.

This paper is organized as follows. Section 2 reviews the related literature on norm enforcement. Section 3 describes the experimental design. Section 4 presents the results from the experiment. Section 5 concludes.

2. Literature review

Our study contributes to two separate literatures. The first examines whether costly norm enforcement can help uphold norms. The second examines norm enforcement by 'unaffected' third parties.

2.1 The demand for reward and punishment

To date, the focus of most laboratory studies on norm enforcement has been on establishing whether individuals are willing to uphold norms at a personal cost and examining the conditions under which norms can be successfully upheld (e.g., Chaudhuri, 2011; Gächter and Herrmann, 2009). A number of studies have recently provided evidence suggesting that the demand for costly punishment may be reduced if they can withhold rewards from norm violators, but this evidence, as we will see is inconclusive. While the focus of all these studies is on the efficacy of costly enforcement in upholding norms, in this section, we review the findings related to our research question.

Rand et al. (2009) study behavior in an indefinitely-repeated prisoner's dilemma in which subjects can cooperate, defect or punish their partner. They find that subjects are more likely to respond to a defection by withholding cooperation in future rounds than by using costly punishment. Ule, Riedl and Cason (2009) examine participants' willingness to punish in a finitely-repeated, indirect helping game. At the start of each of the 100 periods, subjects are assigned the role of either the donor or the recipient and are then randomly matched in pairs. In each period, donors observe the recipient's recent behavior as a donor in past periods and must decide whether to "help" the recipient (i.e., increase her earnings), do nothing, or punish her (i.e., reduce her earnings). The authors find that subjects prefer to do nothing rather than punish. An important feature of both Rand et al. (2009) and Ule et al. (2009) is that, unlike in our study, individuals have an incentive to build a good reputation by avoiding the use of costly punishment. This may explain, at least partly, the reduced demand for punishment in these studies.

Three further studies examine punishment in conjunction with other means for enforcing cooperation in finitely-repeated, public-good games with fixed groups. Rockenbach and Milinski (2006) find that the frequency of costly punishment is significantly reduced if a separate stage is added at the end of the public-good game allowing individuals to withhold rewards from free riders. However, they also find that the intensity of punishment is higher in the presence of reward opportunities. Sefton, Shupp and Walker (2007) find that the demand for costly punishment is significantly lower in the presence of reward opportunities. And similarly, Noussair and Tucker (2005) observe fewer instances of costly punishment when costless punishment (both for the enforcer and the norm violator) is available.

In contrast to these three studies, Andreoni, Harbaugh and Vesterlund (2003) do not find a reduction in the demand for costly punishment in a finitely-repeated, proposer-responder game when reward opportunities are introduced. Interestingly, unlike in the previous studies, subjects in Andreoni et al. (2003) are randomly rematched in every period. This suggests that at least part of the reduction in the demand for costly punishment may be due to strategic concerns arising from the fixed composition of groups.

Understanding the relation between reward and punishment can be difficult when the game is played repeatedly, even if individuals are randomly rematched in every period. For example, Andreoni et al. (2003) find that the introduction of punishment opportunities reduces the demand for costly reward. The authors attribute this to the fact that offers were significantly higher in the treatment where both punishment and reward opportunities were available. As a result, they argue, an offer that may appear worthy of reward in one experimental treatment because of the relatively low offers made by others, may not appear to be worthy of a reward in another treatment. Therefore, while repeated-game designs may be desirable for studying the efficacy of different means in upholding a norm, a one-shot design is better suited for examining the demand for costly enforcement and for addressing our research question.[1]

In summary, all of the aforementioned studies suggest that there could be interaction effects between punishment and reward opportunities. However, the experiments were not designed to address whether and how the existence of reward opportunities affects the demand for costly punishment (and vice versa). In particular, the fact that the game is repeated a number of times makes it difficult to understand the reason for the interaction effect. Studying the demand for costly enforcement in a one-shot environment is also

[1] Walker and Halloran (2004) study the demand for costly punishment and rewards in a one-shot public-good game. They find that both are equally effective in enforcing cooperation. However, their experimental design does not include a treatment with both reward and punishment opportunities. Sutter, Haigner and Kocher (2010) find that subjects prefer using reward than punishment in a finitely-repeated public good game, even though punishment is more effective in encouraging cooperation.

interesting because many interactions in daily life where norms govern behavior are one-shot (e.g., giving one's seat on the bus to an elder, respecting a supermarket queue).

2.2 Third-party enforcement

A common characteristic of the studies outlined in the previous section is that the violation of the norm affects the earnings of the enforcer directly. This is not the case in our experiment as we investigate how 'unaffected' third-parties uphold norms. Third parties can be essential for upholding norms (e.g., Bendor and Swistak, 2001; Ellickson, 1991), as violators often act in such a way so that they are not caught by those affected by their actions. For example, acts of vandalism or stealing are usually not observed by affected parties, but by unaffected bystanders.[2] Studying third-party norm enforcement has the additional advantage that demand for reward or punishment should reflect normative standards of behavior (Fehr and Fischbacher, 2004) rather than direct reciprocity.

To date, there have been only a handful of studies examining how third parties use costly *punishment* to enforce norms (e.g., Fehr and Fischbacher, 2004; Fehr, Hoff and Kshetramade, 2008; Henrich et al. (2006); Marlowe et al. 2008). These studies find that the demand for costly punishment increases with the extent of the norm violation. The only study we are aware of in which third parties can both reward *and* punish is Charness, Cobo-Reyes and Jimenez (2008). They investigate third-party norm enforcement in a 'trust game' in which, in some treatments, third parties can punish a selfish responder or reward a trusting sender. Therefore, unlike our experiment, punishment and rewards are applied to different individuals.

3. Experimental design

The experiment uses a three-player game similar to that introduced by Fehr and Fischbacher (2004). We examine behavior in three treatments which differ only with respect to the actions available to the third party (Player C).

3.1 Treatment PR

The game in treatment PR is as follows. Player A is given an endowment of 100 ECUs (Experimental Currency Units) and must decide how much of it she wishes to transfer, *t*, to Player B, $t \in \{0, 10, 20, ..., 100\}$. Player B has no endowment or any decision to make. The

[2] Ellickson (1991, p. 236), for example writes: "In ways that are poorly understood … norms emerge to provide the glue that makes possible a surprising degree of order without law. The key to this process is the "altruistic" enforcement of norms by uninvolved third parties."

distribution norm prescribes that Player A should transfer half of her endowment to Player B receiver (Fehr and Fischbacher, 2004; Krupka and Weber, 2008). Player C receives an endowment of 65 ECUs. He can use his endowment to either punish or reward Player A for her transfer (hence the name of the treatment). C's endowment is private information.[3]

In order to punish, Player C must purchase *punishment points*, $p_t \in \{0,1,...,65\}$. Each punishment point costs Player C 1 ECU and reduces Player A's earnings by 2 ECUs. In order to reward, Player C must purchase *reward points*, $r_t \in \{0,1,...,65\}$.[4] Reward points cost 1 ECU and increase Player A's earnings by 2 ECUs. Player C can either reward or punish Player A for a given transfer, therefore if $r_t > 0$ then $p_t = 0$ for a given *t*, and vice versa. The earnings of player A are given by:

$$\pi^A = 100 - t + 2(r_t - p_t)\,. \qquad (1)$$

Player B's earnings are given by:

$$\pi^B = t\,. \qquad (2)$$

Player C's earnings are given by:

$$\pi^C = 65 - (p_t + r_t)\,. \qquad (3)$$

Note that it is possible that Player A could have negative earnings, in which case money was deducted from the $5 show-up fee subjects received.

Equations (1) and (2) are common knowledge amongst participants as are the implications of reward and punishment for Players A and C, and the fact that the game is played only once. If all individuals are maximizing their own earnings and this is common knowledge, the trembling-hand-perfect Nash equilibrium is that Player C neither rewards nor punishes Player A who transfers zero to Player B.

Player C made his decision using the strategy method. This means that Player C had to state whether he would like to reward or punish Player A for each possible level of transfer

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[3] In Fehr and Fischbacher (2004) it was common knowledge that Player C was given 50 ECU. An endowment of 50 ECU implies that, unless Player A gives more than 50 ECU to Player B, A will earn more than Player C. Rewarding thus would increase the earnings difference between A and C while punishing would reduce it. The information about C's endowment was kept private in our experiment in order to preserve the distribution norm of transferring 50 ECU (McDonald, Nikiforakis, Olekalns and Sibly, 2009).

[4] The experimental instructions were adapted from FF (2004) and use neutral language. Punishment points were referred to as *subtraction* points and reward points as *addition points.* The instructions can be downloaded from http://www.economics.unimelb.edu.au/nnikiforakis.

and before finding out what A's transfer was. The responses were incentive compatible as Player C would pay for any points assigned for the transfer level Player A actually chose.

There are three reasons for using the strategy method. First, it allows us to collect more data per individual thus helping us to better understand the motivation behind individual decisions. Second, it guarantees that we will be able to compare the enforcement decisions across treatments even if the decisions of those assigned the role of Player A differ. Third, using the strategy method allows us to compare our results with those reported in previous studies using the third-party punishment game.[5]

3.2 Treatment P

Treatment P is our baseline treatment. The game is identical to that played in treatment PR with one difference. Similar to previous experiments on third-party enforcement, in treatment P, Player C could only punish Player A but not reward her. To keep decision costs equal to those in treatment PR, Player C was asked to enter the number of punishment points he wished to assign into a first box and then was asked to confirm his decision by typing the same number into a second box, for each of the eleven transfer levels.

3.3 Treatment R

The R treatment is the same as the P treatment except that Player C can only reward Player A but not punish her. As in treatment P, Player C was asked to enter the number of reward points they wished to assign into a first box and then was asked to confirm this decision. Table 1 summarizes our experimental design.

3.4 Subject pool and procedures

A total of 327 individuals took part in the experiment. All participants were students at the University of Melbourne with different academic backgrounds (excluding students from psychology or those that had completed their first year in economics). Subjects were recruited through a database of more than 2,500 using ORSEE (Greiner, 2004). Each individual participated in only one treatment. Participants had not previously participated in an experiment involving the study of norms or norm enforcement.

The experiment was conducted in two 'waves'. 222 subjects participated in the first wave of the experiment. Since the rate of norm enforcement was lower than anticipated, we decided to run a second wave in which 105 subjects participated. The second wave also allowed us to

[5] Brandts and Charness (2011) present a survey of the existing evidence on the impact of the strategy method. They report that the treatment effects obtained when using the strategy method are consistent with those obtained when using the direct-response method.

include additional questions in the post-experiment questionnaire about how participants assigned punishment/reward points according to their level of disapproval/approval. We also decided to have both Player B and C make enforcement decisions in the second wave. In particular, all individuals not assigned the role of Player A used the strategy method to decide how many points they would assign to Player A if they were allocated the role of Player C. It was common knowledge that Player Cs would be randomly chosen after all participants made their decisions. This change does not affect the theoretical predictions. We also aimed to collect the same number of observations for each treatment in each wave. In our analysis, we control for the procedure used to elicit the decisions by Player C. Our results regarding treatment effects are unaffected by this change in procedures.

The experiment was conducted at the Experimental Economics Laboratory of the University of Melbourne using z-Tree (Fischbacher, 2007). The smallest session had 12 subjects participating, while the six largest sessions had 30 subjects participating. Upon arrival at the laboratory, subjects were seated in partitioned cubicles and were randomly divided into groups – group composition was not revealed to subjects. At the same time, subjects were randomly allocated the role of either Player A, B or C and received player-specific instructions.[6] The instructions included control questions to ensure that all subjects understood the game. Before the experiment began, the experimenter read a summary of the instructions. After the experiment ended, subjects answered a short questionnaire that included sociodemographic questions and asked how they made their decisions in the experiment.

Sessions lasted, on average, 40 minutes including instruction time. On average, participants earned 23.20 Australian Dollars including a $5 show-up fee. The exchange rate between ECU and the Australian Dollar was 1 ECU = 35 Australian cents. This meant that the stakes were not trivial as Player A’s endowment was $35 and C’s endowment was $22.75 Australian Dollars. At the time of the experiment, the minimum hourly wage in Australia was $14.31. The exchange rate between Australian and U.S. Dollar was approximately one.

[6] In the second wave, all participants not assigned the role of Player A received a set of instructions that explained the roles of Player B and C. These participants were asked to make the decision of Player C using the strategy method and were then randomly allocated the role of either Player B or Player C at the end of the experiment. As mentioned above, all information was common knowledge between participants except the exact endowment of Player C.

3.5 Hypotheses

As mentioned in section 3.1, assuming that it is common knowledge amongst participants that each player is maximizing his/her earnings, the trembling-hand-perfect Nash equilibrium is that Player C will neither punish nor reward A, and that Player A will make a zero transfer to B. The prediction is the same across treatments. This assumption, however, seems unrealistic and the Nash equilibrium under this assumption is a poor predictor of behavior in the third-party enforcement game.

As a guide for analyzing the experimental data, we offer two hypotheses, which are based on the following three assumptions. First, individuals prefer higher earnings than lower earnings, all else equal. Second, a distribution norm exists in our game. Third, individuals like to signal their disapproval to norm violators and their approval to those adhering to the norm (e.g., Noussair and Tucker, 2005; Reuben and van Winden, 2008; Xiao and Houser, 2005).

Hypothesis 1: *The lower transfers are relative to the distribution norm, the greater the demand for costly punishment will be. There will be less demand for costly punishment in PR than in P.*

The first part of the hypothesis is derived from the second and third assumption, and is consistent with previous evidence from third-party enforcement game (e.g. Fehr and Fischbacher, 2004). The second part of the hypothesis is based on our first and third assumptions. The rationale is that when reward opportunities exist, individuals can signal their disapproval without incurring a cost by withholding rewards. Therefore a punishment *p* reflects stronger disapproval in treatment PR than in P. Controlling for the level of transfer, third parties are thus expected to demand less costly punishment when reward opportunities exist.

Hypothesis 2: *The higher transfers are relative to the distribution norm, the greater the demand for costly rewards will be. There will be less demand for costly rewards in PR than in R.*

The first part of the hypothesis is based on the assumption that rewarding increases with adherence to the norm. We expect that individuals may reward transfers that are even higher than the distribution norm. The second part of the hypothesis is again based on our first and third assumptions. In particular, when punishment opportunities exist individuals can signal their approval without incurring a cost by withholding punishment. Therefore, a reward *r* reflects stronger approval in treatment PR than in R. Controlling for the level of transfer, third parties are therefore expected to demand less costly rewards when punishment opportunities exist.

4. Results

The analysis of the experimental data is divided into four sections. In the first two sections, we present the evidence concerning the demand for costly punishment and reward, respectively. In the third section, we provide evidence in support of the assumption that costly punishment and reward are used to express disapproval and approval, while in the fourth section we explore how the availability of means for norm enforcement affects norm adherence and earnings in the experiment.

4.1 The demand for costly punishment

Figure 1 presents the demand for costly punishment as a function of Player A's transfer. As in previous experiments, we find that as transfers to Player B increase, third parties purchase fewer punishment points in both treatments. While transfers above 50 ECUs receive small amounts of punishment, something also observed in previous experiments (e.g., Fehr and Fischbacher, 2004), the behavior of participants in our experiment is consistent with existing evidence that the distribution norm prescribes that Player A shares his endowment equally with Player C because the punishment of transfers greater than 40 ECUs is not significantly different from zero in both treatments. This can be seen in Table A1 in the appendix.

The most striking finding in Figure 1, however, is the substantial reduction in the demand for costly punishment in the PR treatment relative to the P treatment. On average, subjects assigned 3.13 punishment points in treatment P and 1.80 in PR, a reduction of 42.5 percent. The difference is statistically significant using the average number of points assigned by an individual across transfers as an independent observation (Mann-Whitney, two-tailed; p-value = 0.03).

Table 2 presents a regression analysis of costly punishment. The dependent variable is the number of points individual i assigned for a transfer t, p_{it}. Given the patterns observed in Figure 1 punishment is modelled as a linear function of transfers. The regression also includes a treatment dummy (*PR*) and a control for whether the observations are taken from the first or second experimental wave. Further, given that each Player C makes 11 decisions, we include random effects at the individual level.

The coefficients for the constant in (1) and (2) indicate that Player C assigned 5.28 punishment points to Player A in treatment P and 1.73 points in treatment PR for a transfer of zero. The *Transfer* coefficients in (1) and (2) estimate the change in the demand for costly punishment by third parties when Player A transfers 10 more ECUs to Player B in treatments P and PR, respectively. The *Transfer* coefficient estimates from (1) and (2) are significant and negative, as expected, indicating that an increase in the amount transferred by Player A reduced the punishment from third parties. The reduction is smaller in PR than in P, which is also to be expected given the smaller size of the constant in PR. The difference in slopes is significant as can be seen by the significant, positive coefficient of *PR*Transfer* in column (3). The negative, significant coefficient for PR in column (3) provides additional evidence for the significant reduction in the demand for costly punishment. Therefore, we cannot reject Hypothesis 1.[7]

What causes the reduction in the demand for costly punishment? Is it that fewer people assign punishment points when reward opportunities exist, is it that people assign fewer points, or is it both?[8] In treatment P, 59 percent of subjects punished at least one transfer (29 out of 49), while in treatment PR only 37 percent of subjects did the same (18 out of 49). Columns (4) and (5) in Table 2 disaggregate the demand for costly punishment using a hurdle model. The likelihood of punishment is modelled separately from the severity of punishment conditional on punishment occurring (for details see Nikiforakis, 2008). As can be seen in column (4), an increase in the transfer by Player A reduces significantly the probability that he will be punished. The probability of punishment is significantly lower in treatment PR. While the amount of points assigned is smaller in PR (column 5), the reduction is far from being significant. We therefore conclude:

Result 1: *Controlling for the level of norm violation, the demand for costly punishment is 42.5 percent lower when reward opportunities exist. This difference is significant and is driven by the reduced number of individuals punishing when reward opportunities exist.*

[7] The *Wave* coefficient is similar in both P and PR. This suggests that there was more punishment on average in the second wave of experiments than the first. While this may be interesting result worthy of further investigation, for our purposes what is most important is that when an interaction variable *PR*WAVE* is included in the regressions, we find that it is insignificant (*p*-value=0.90). Thus, our treatment effects are unaffected by this parameter. We also tried including additional socio-demographic characteristics in regression (3) to check the robustness of our results. When *Age*, *Economics* [major] and *Gender* variables are included in the estimation, our results are unaffected.

[8] Some readers may wonder whether the reduced demand for costly punishment of a given transfer could be due to certain subjects switching from punishing to rewarding. This is not the case, however, as can be easily seen by examining the demand for punishing transfers of zero in Figure 1. Such transfers are almost never rewarded.

4.2 The demand for costly reward

Figure 2 presents the demand for costly reward as a function of Player A's transfer. The figure illustrates that, in line with Hypothesis 2, individuals purchase more reward points as transfers to Player B increase in both treatments. Transfers of less than 20 ECUs receive small rewards, but as can be seen in Table A1 in the appendix, rewards are not significantly different from zero for transfers less than 30 ECUs in R and less than 50 ECUs in PR.

Figure 2 also shows that, in line with Hypothesis 2, the demand for costly reward in treatment PR appears to be reduced relative to that in treatment P. On average, subjects assigned 3.81 reward points in PR and 4.95 in R, a reduction of 23 percent. The difference is statistically significant using the average number of points assigned by an individual across transfers as an independent observation (Mann-Whitney, two-tailed; p-value = 0.03).

Table 3 presents a regression analysis of costly reward, similar to that for punishment which was presented in the previous section. The dependent variable is the number of reward points individual i assigned for a transfer t, r_{it}. Reward is modelled as a linear function of transfers. We also include a treatment dummy (*PR*) in column (3) and a control for whether the observations are taken from the first or second experimental wave. Given that each Player C makes 11 decisions, we include random effects at the individual level.

The *Transfer* coefficients in columns (1) and (2) capture the change in the demand for costly reward as Player A transfers 10 more ECUs to Player B in treatments R and PR, respectively. The *Transfer* coefficient estimates in columns (1) and (2) are significant and positive as expected, indicating that an increase in the transfer by Player A increased the reward received, in both treatments. The insignificant constants in the same regressions indicate that a transfer of zero was not significantly rewarded. The negative, significant coefficient for *PR*Transfer* in column (3) indicates that the demand for costly reward is lower in treatment PR. We therefore conclude that we cannot reject Hypothesis 2.[9]

Columns (4) and (5) in Table 3 present the results from the hurdle model for rewards. In treatment R, 70 percent of subjects rewarded at least one transfer (32 out of 46). In contrast, in treatment PR, only 45 percent of the subjects rewarded once or more times (22 out of 49). The negative, significant coefficient of *PR* in column (4) and the insignificant coefficient of *PR* in

[9] The *Wave* variable is insignificant as can be seen in columns (1) and (2) in Table 3. This indicates that the demand for reward was the same in both waves of the experiment. When an interaction variable *PR*WAVE* is included in the regressions it is insignificant for all treatments (p-value>0.5). We also tested the robustness of our result by controlling for different socio-demographic characteristics. Controlling for *Age*, *Economics* [major] and *Gender* does not affect our results.

column (5) indicate that the reduction in the demand for costly reward is due to a reduction in the number of individuals who are willing to reward and not due to a reduction in the size of the reward. We therefore conclude:

Result 2: *Controlling for the level of norm adherence, the demand for costly reward is 23 percent lower when reward opportunities exist. This difference is significant and is driven by the reduced number of individuals rewarding when punishment opportunities exist.*

4.3 Costly enforcement as a signal of approval and disapproval

Why does the introduction of reward opportunities reduce the demand for costly punishment? Why does the existence of punishment opportunities reduce the demand for costly reward? A critical assumption underlying Hypotheses 1 and 2 is that individuals use costly enforcement to signal their approval or disapproval. The results in sections 4.1 and 4.2 and our inability to reject hypotheses 1 and 2 provide indirect support for this assumption. In this section, we present evidence providing direct support for this assumption.

In the post-experiment questionnaire in the second wave of experiments, subjects in treatments P and PR (48 in total) were asked to nominate how many punishment points they would assign to Player A if they strongly *disapproved* of Player A's transfer to Player B. Similarly, subjects in treatments R and PR (46 in total) were asked how many reward points they would assign if they strongly *approved* of Player A's transfer. If costly enforcement is used to signal approval/disapproval we would expect to see a positive correlation between subjects' responses and the number of points they assigned in the experiment.

Figure 3 plots the number of punishment points assigned in the experiment by Player C to Player A, when the latter transferred nothing to B, against the number of points Player C said she would assign if she strongly disapproved of A's transfer to B. Figure 4 plots the number of reward points assigned by Player C in the experiment if A transferred 100 ECU to B, against the number of points C said she would assign to signal strong approval.

As can be seen in figures 3 and 4, there is a clear positive correlation between the plotted variables (p-value<0.01, for all cases). This evidence supports the assumption that individuals use punishments to signal disapproval for violating the norm and rewards to signal approval for adhering to the norm. The availability of reward (punishment) opportunities allows individuals to signal their disapproval (approval) by not rewarding (punishing) rather than by demanding costly punishment.

Result 3: *The number of enforcement points assigned in the experiment is highly and positively correlated with the number of points participants stated they would assign, if they strongly approved/disapproved of a transfer by Player A.*

4.4 Norm adherence and earnings

Player A's average transfer was 13 ECUs in treatment P, 15.7 ECUs in treatment R, and 17.3 ECUs in treatment PR. Nevertheless, using the transfer of each Player A as an independent observation, we find that none of the pairwise comparisons is statistically significant (Mann-Whitney, two-tailed, p-value>0.22).

The level of norm adherence in our experiment is slightly lower than that reported in previous experiments (e.g., Fehr and Fischbacher, 2004). However, given the levels of enforcement observed, the optimal strategy for a selfish Player A is to transfer zero in *all* treatments. The fact that the demand for costly enforcement is significantly affected by the availability of means to enforce the distribution norm, together with the fact that norm adherence is unaffected by our treatments, raises the question of how earnings – a measure of efficiency – differ across treatments.

Individual earnings are highest in treatment R, followed by treatment PR and treatment P. On average, individuals earned 55.5 ECU in R, 53.7 ECU in PR and 46.4 ECU in P. Using the average earnings in a group as an independent observation, we find that earnings in PR are significantly higher than they are in P (Mann-Whitney, two-sided, p-value<0.01) and significantly lower than they are in R (Mann-Whitney, two-sided, p-value=0.03). However, the actual earnings can be misleading as participants assigned the role of Player A could have been matched with a different Player C, which could have led to substantially different earnings.

In order to get a better idea of how earnings differ across treatments, we calculated the average change in the earnings of a Player A given his transfer and the average reduction/increase for that level of transfer in the treatment. The average change in earnings given the distribution of transfers was - 15.60 in P, - 4.08 in PR and + 3.30 in R. This implies that while the introduction of reward opportunities increases earnings in our experiment, the introduction of punishment opportunities reduces earnings.

Result 4: *Transfers are not significantly different across treatments. However, there is a significant difference in earnings, with earnings being highest in treatment R, followed by PR and then P.*

5. Concluding remarks

In this paper, we studied the demand for costly norm enforcement by 'unaffected' third parties. Our experimental results indicate that third parties use both reward and punishment to uphold the distribution norm that exists in our game, but that there is a strong interaction between the demand for costly reward and punishment. In particular, we find that the demand for costly punishment is greatly reduced when reward opportunities exist. We also observe that the demand for costly reward is reduced in the presence of punishment opportunities.

Our study contributes to a small, but growing literature investigating how individuals use different means to enforce norms such as those for cooperation and equality. While previous studies have reported that reward opportunities tend to reduce the demand for costly punishment, the experimental designs employed prevented researchers from positively identifying the cause behind the effect. Our results suggest that the reduction in the demand for costly enforcement is due to the fact that punishment is used as a signal of disapproval. In particular, reward opportunities allow individuals to express it in a costless manner, by withholding rewards. Similarly, punishment opportunities allow individuals to signal their approval by withholding punishment. These findings imply that participants perceive punishment and reward to be substitutes. Given the well-documented, negative welfare implications of punishment, this finding can have significant implications for the design of optimal incentives to support cooperation in both formal and informal relations.

Our study also contributes to a recent discussion about the relative infrequency with which costly punishment is observed outside the laboratory (Guala, 2011). Previous studies have identified some factors that may influence negatively the willingness to use costly punishment such as the risk of counter-punishment (e.g., Denant-Boermont et al., 2007; Nikiforakis, 2008) and the preference of some individuals to avoid inflicting harm on norm violators (e.g. Masclet et al., 2003; Noussair and Tucker, 2005). Given that reward and punishment opportunities coexist in many instances outside the laboratory, our study suggests another factor which may limit the demand for costly enforcement outside the laboratory. Returning to the example used in the introduction, online marketplaces, Dellarocas and Woods (2008) find that many disappointed buyers on eBay prefer not to leave positive feedback rather than to leave negative feedback. While this could partly be due to traders anticipating that negative feedback will be reciprocated (Li, 2010), our results suggest another possible explanation. Disappointed traders would be more likely to leave negative feedback, if the option of leaving positive feedback did not exist. The reason is that withholding positive feedback is a less costly form of punishment.

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Figure 1 – The demand for costly punishment

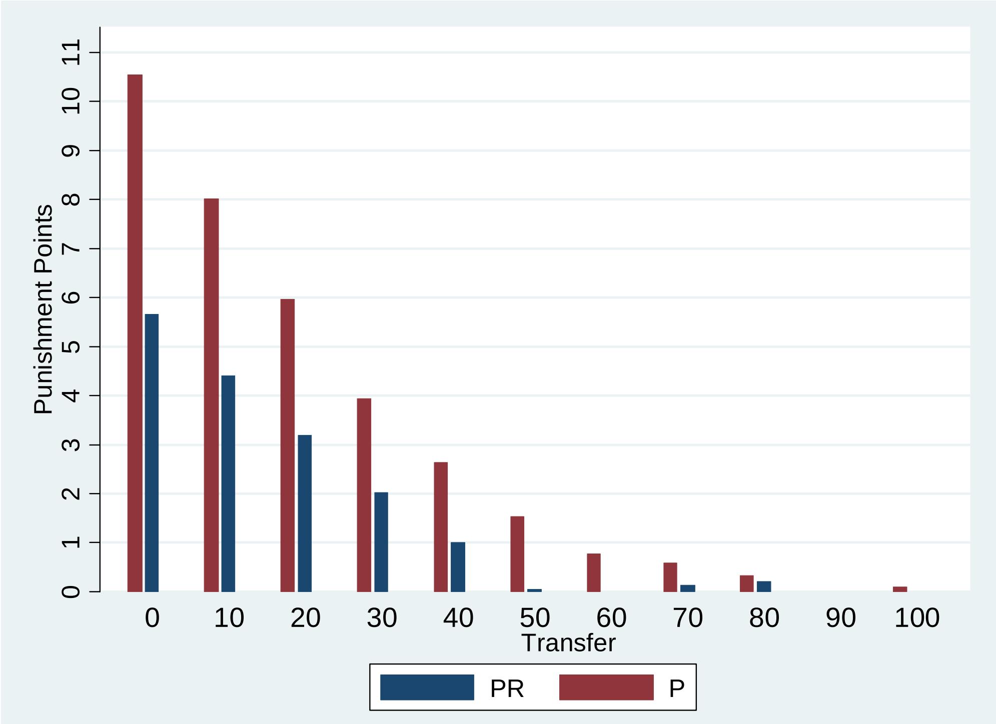
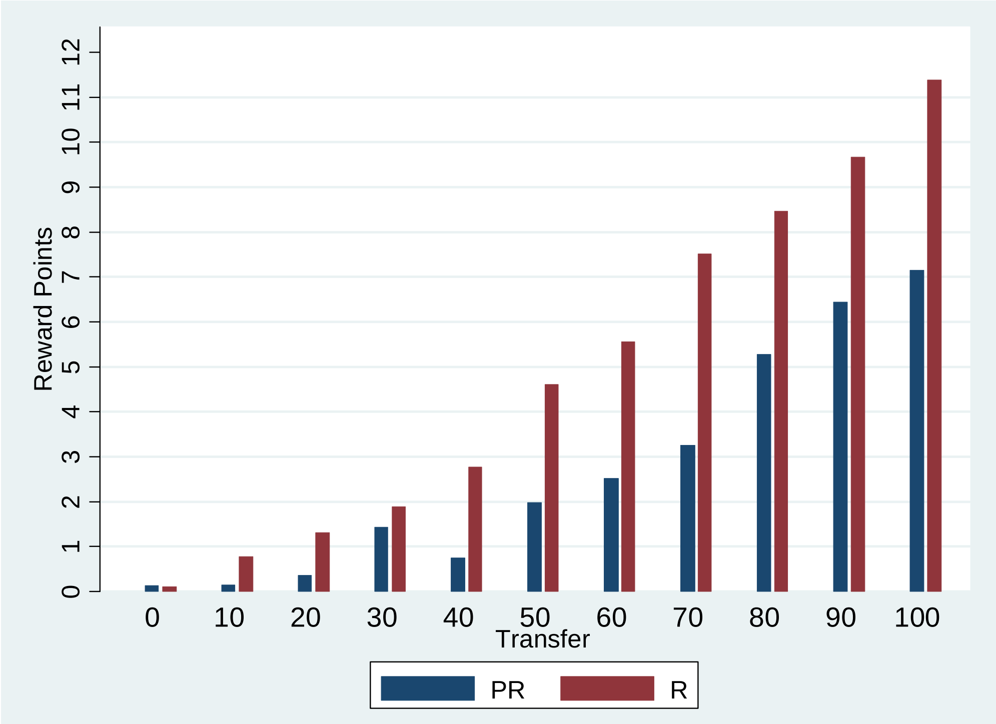


Figure 2 – The demand for costly reward



The figures do not include observations from three subjects. The subjects are included in the statistical analysis, but are excluded here to offer a more accurate representation of behavior in the experiment. The responses of these subjects to a post-experiment questionnaire suggest that they were confused. In particular, subject 445 assigned on average 33.33 reward points for transfers between 0 and 20, and 16.25 reward points for transfers between 30 and 100. Subject 462 rewarded both low and high transfers in a seemingly random manner, while subject 499 rewarded only low transfers.

Figure 3 – Does punishment signal disapproval?

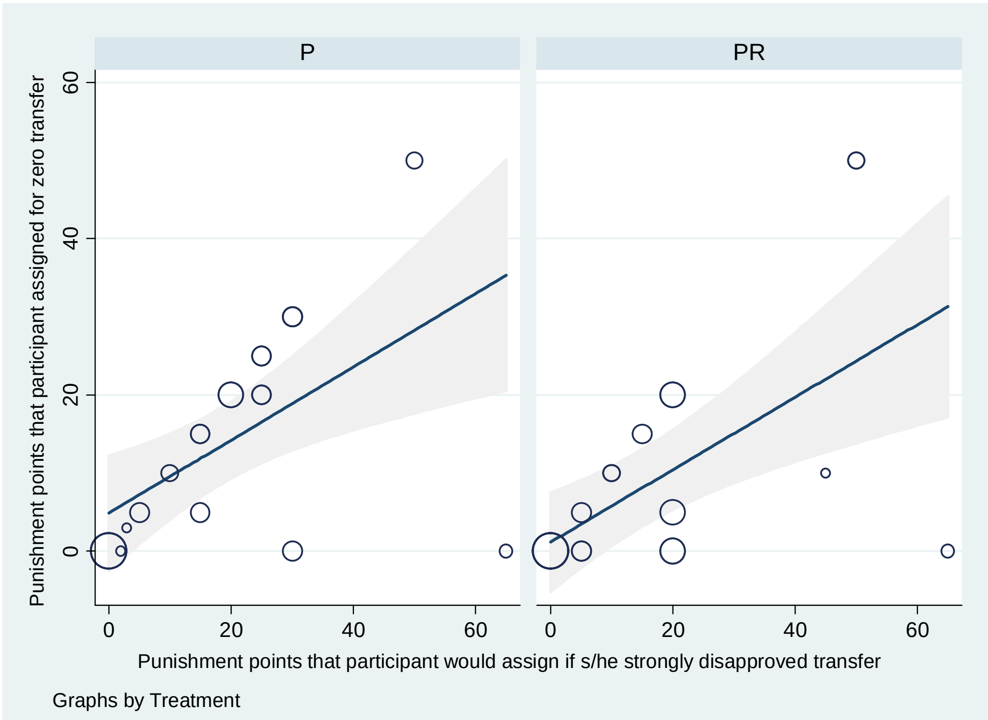


Figure 4 – Does reward signal approval?

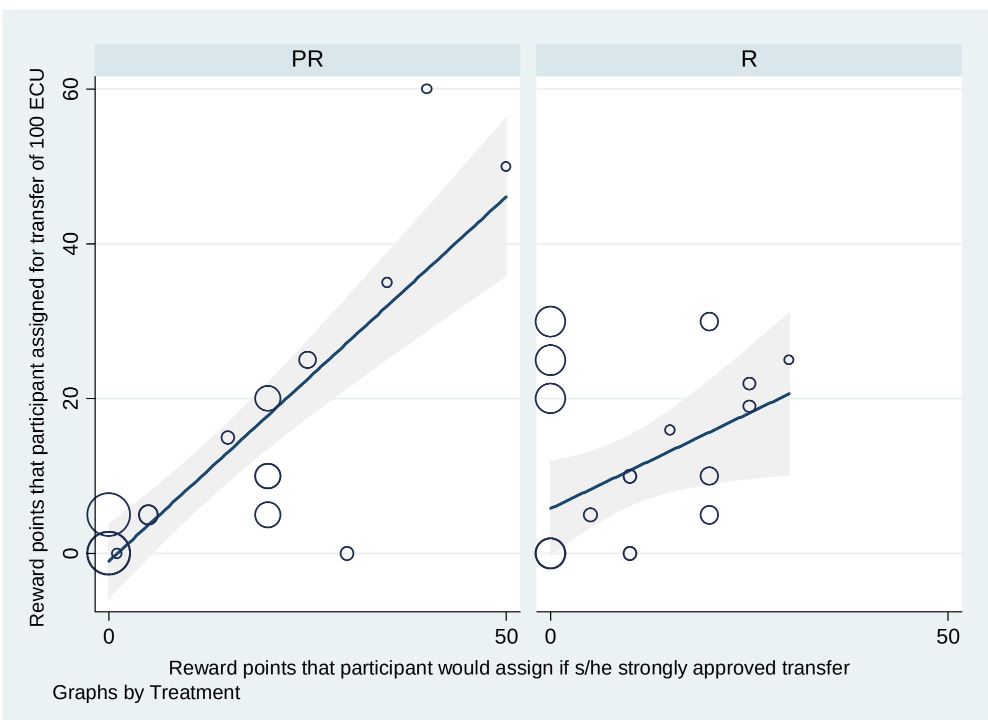


Table 1 - Experimental Design

Treatment	Punishment	Reward	# of participants
PR	Yes	Yes	111
P	Yes	No	111
R	No	No	105

Table 2 – The Demand for Costly Punishment

	P	PR	Both	Punishment Decision	Punishment Level
	(1)	(2)	(3)	(4)	(5)
Transfer	-0.10***	-0.05***	-0.10***	-0.05***	-0.28***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.03)
PR			-3.64***	-1.39**	-2.26
			(0.95)	(0.54)	(2.70)
*PR * Transfer*			0.05***	0.00	0.05
			(0.01)	(0.01)	(0.05)
Wave	1.91	1.84*	1.88**	1.26**	2.19
	(1.19)	(1.07)	(0.80)	(0.51)	(2.45)
Constant	5.28***	1.73	5.33***	-1.64*	14.80***
	(1.91)	(1.72)	(1.36)	(0.86)	(4.27)
Observations	539	539	1078	1078	191
No of subjects	49	49	98	98	46

(1) – (3) and (5) are linear regressions and the dependent variable is the number of points Player C assigned to Player A; (4) is a probit regression and the dependent variable takes a value of 1 if Player C punished A for a transfer *t* and 0 otherwise; in (5) the dependent variable is truncated at zero; all regressions include individual random effects; observations from three individuals are dropped in regression (5) as they were outliers, however, adding them in the analysis does not affect qualitatively our results; * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 3 – The Demand for Costly Reward

	P	PR	Both	Reward Decision	Reward Level
	(1)	(2)	(3)	(4)	(5)
Transfer	0.11***	0.08***	0.11***	0.05***	0.23***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.02)
PR			0.58	-1.88**	4.69
			(1.52)	(0.89)	(3.01)
*PR * Transfer*			-0.03***	-0.00	-0.04
			(0.01)	(0.01)	(0.03)
Wave	-0.08	1.06	0.51	0.85	-0.41
	(1.82)	(2.16)	(1.41)	(0.75)	(2.34)
Constant	-0.48	-1.58	-1.34	-4.88***	-5.39
	(2.87)	(3.42)	(2.36)	(1.26)	(3.87)
Observations	506	539	1045	1045	331
No of subjects	46	49	95	95	51

(1) – (3) are linear regressions and (5) are linear regressions and the dependent variable is the number of points Player C assigned to Player A; (4) is a probit regression and the dependent variable takes a value of 1 if Player C rewarded A for a transfer *t* and 0 otherwise; in (5) the dependent variable is truncated at zero; all regressions include individual random effects; observations from three individuals are dropped in regression (5) as they were outliers, however, adding them in the analysis does not affect qualitatively our results; * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Appendix
Table A1

Treatment	Punishment			Reward		
	P	**PR**	**Both**	**R**	**PR**	**Both**
0-transfer	10.45***	5.63***	10.45***			
	(1.04)	(1.11)	(1.08)			
10-transfer	7.92***	4.43***	7.92***	0.44	0.12	0.44
	(1.04)	(1.11)	(1.08)	(1.03)	(1.27)	(1.83)
20-transfer	5.86***	3.37***	5.86***	1.07	0.02	1.07
	(1.04)	(1.11)	(1.08)	(1.03)	(1.27)	(1.83)
30-transfer	3.84***	1.94**	3.84***	1.74*	0.94	1.74*
	(1.04)	(1.11)	(1.08)	(1.03)	(1.27)	(1.83)
40-transfer	2.53**	2.29**	2.53**	2.39**	0.59	2.39**
	(1.04)	(1.11)	(1.08)	(1.03)	(1.27)	(1.83)
50-transfer	1.43	0.45	1.43	4.17***	1.88	4.17***
	(1.04)	(1.11)	(1.08)	(1.03)	(1.27)	(1.83)
60-transfer	0.67	0.33	0.67	5.11***	2.29*	5.11***
	(1.04)	(1.11)	(1.08)	(1.03)	(1.27)	(1.83)
70-transfer	0.49	1.14	0.49	7.02***	3.31**	7.02***
	(1.04)	(1.11)	(1.08)	(1.03)	(1.27)	(1.83)
80-transfer	0.23	0.20	0.23	7.96***	5.35***	7.96***
	(1.04)	(1.11)	(1.08)	(1.03)	(1.27)	(1.83)
90-transfer	-0.11	0.00	-0.11	9.02***	6.57***	9.02***
	(1.04)	(1.11)	(1.08)	(1.03)	(1.27)	(1.83)
100-transfer				10.70***	7.14***	10.70***
				(1.03)	(1.27)	(1.83)
PR			-0.11			0.81
			(1.31)			(1.79)
PR*0-transfer			-4.82***			
			(1.53)			
PR*10-transfer			-3.49**			-0.31
			(1.53)			(1.65)
PR*20-transfer			-2.49			-1.05
			(1.53)			(1.65)
PR*30-transfer			-1.90			-0.80
			(1.53)			(1.65)
PR*40-transfer			-0.25			-1.80
			(1.53)			(1.65)
PR*50-transfer			-0.98			-2.30
			(1.53)			(1.65)
PR*60-transfer			-0.35			-2.82*
			(1.53)			(1.65)
PR*70-transfer			0.65			-3.72**
			(1.53)			(1.65)
PR*80-transfer			-0.02			-2.61†
			(1.53)			(1.65)
PR*90-transfer			0.10			-2.45†
			(1.53)			(1.65)
PR*100-transfer						-3.55**
						(1.65)
Constant	0.10	0.00	0.10	0.44	1.25	0.44
	(0.93)	(0.93)	(0.93)	(1.14)	(1.37)	(1.29)
Observations	539	539	1078	506	539	1045
Individuals	49	49	98	46	49	95

Coefficient estimates are the income reduction Player C caused to Player A at that transfer level relative to the baseline transfer of 100 ECUs for punishment and baseline transfer of 0 ECUs for reward. Standard errors clustered at the individual level are in parentheses. * Significant at 10% level; ** significant at 5% level; *** significant at 1% level, † Note that these coefficients are marginally insignificant with *p*-value = 0.12 for both.

Figure A1 – The Demand for Costly Punishment by Individual

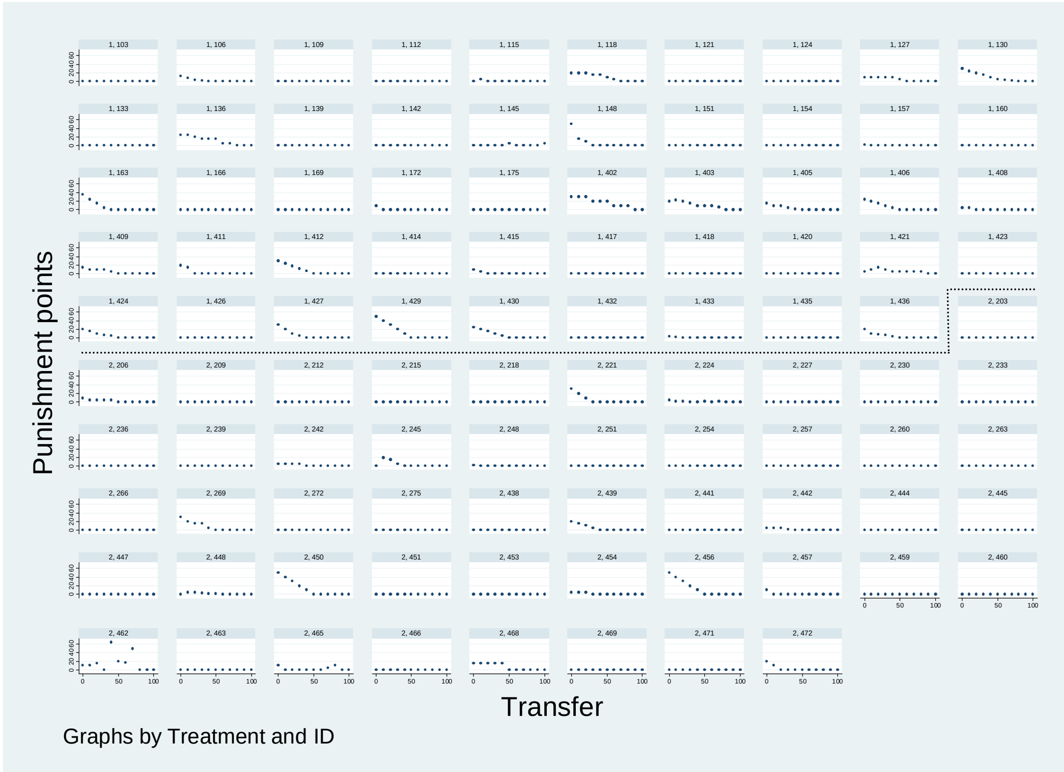
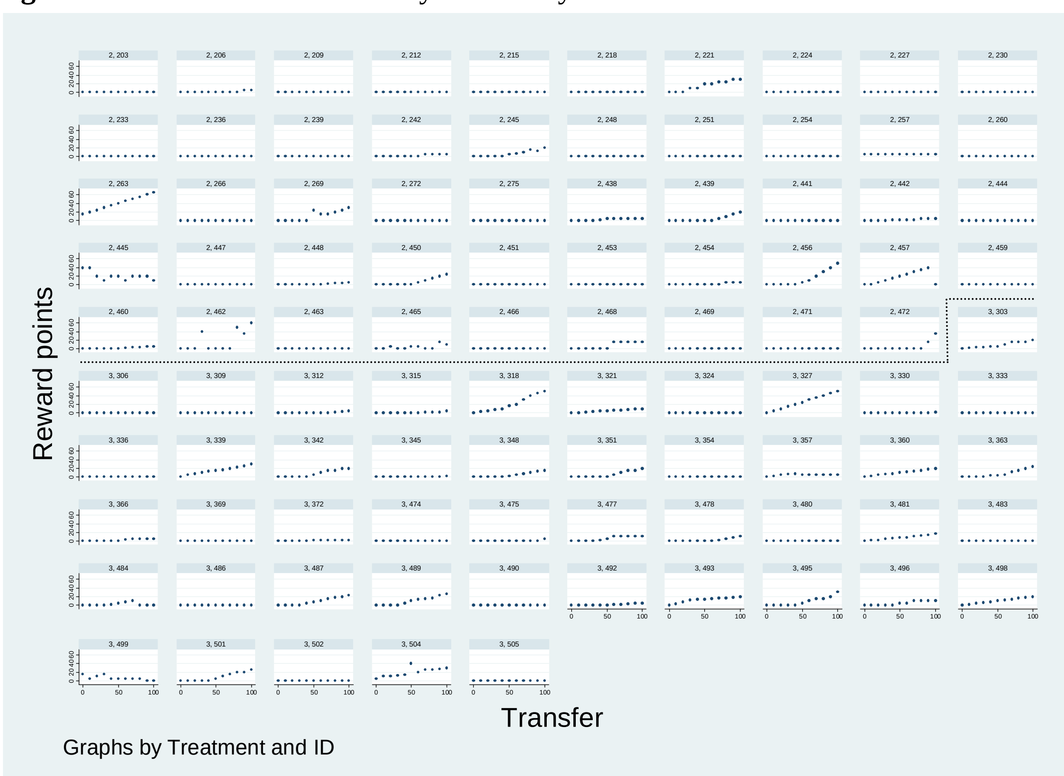


Figure A2 - The Demand for Costly Reward by Individual



The first digit in each subfigure indicates the treatment in which the individual participated (1= Treatment P; 2= Treatment PR; 3=Treatment R). The number after the comma is a unique subject ID. The dashed lines help separate visually subjects belonging to a different treatment.

Instructions

These are the instructions for treatment PR (first wave). The instructions for the other treatments were appropriately adjusted and will be available for download at http://www.economics.unimelb .edu.au/nnikiforakis/

Thank you for agreeing to take part in this experiment. If you read the following instructions carefully, you might be able to earn a considerable amount of money. For this reason it is very important that you take your time to understand the instructions. In addition to your earnings from the experiment, you will also receive a show-up fee of $5. During the experiment it is forbidden to talk to the other participants. Non-compliance with this rule will lead to exclusion from the experiment and all payments.

In this experiment there are three types of participants: type-A participants, type-B participants and type-C participants. Each participant will be matched with two other individuals who will not be of the same type. **You will be a type-A participant**. Therefore you will be randomly matched with a type-B participant and a type-C participant. The identities of the participants with whom you'll be matched will never be revealed during or after the experiment. Likewise, the other participants will never learn the identity of the people with whom they are matched.

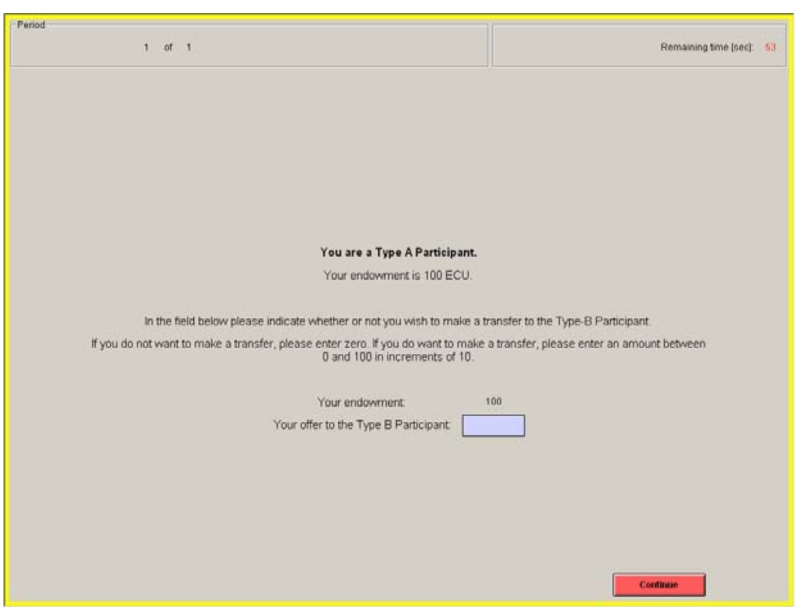
Your earnings in the experiment depend on your decisions in the experiment as well as the decisions of the other individuals with whom you have been matched. During the experiment we will speak of ECUs (Experimental Currency Units), rather than Australian dollars. At the end of the experiment your earnings in ECUs will be converted at the following rate

1 ECU = 35 Australian cents

The experiment consists of two stages, which are described below. Note that each stage will only be entered once. That is, each participant will make each decision once. Therefore, you should take your time to make the decision which is right for you.

<u>The first stage</u>

At the beginning of the first stage, you will receive an endowment of **100 ECUs**. The type-B participant will not receive an endowment and will therefore have **0 ECUs**. **Your task in the first stage is to decide whether or not you want to transfer part of your endowment to the type-B participant.** In particular, you can transfer to the type-B participant between 0 and 100 ECUs in increments of 10 ECUs. That is, you can transfer 0, 10, 20, …,100 ECUs to the type-B participant. You will make your decision using the decision screen pictured below.



Examples: (i) Assume you transfer 60 ECUs to the type-B participant, your earnings after the first stage will be 100 – 60 = 40 ECUs and the earnings of the type-B participant will be 60 ECUs. (ii) If you transfer 10 ECUs to the type-B participant, your earnings after the first stage will be 90 ECUs and the earnings of the type-B participant will be 10 ECUs. (iii) If you transfer 0 ECUs to the type-B participant, your earnings after the first stage will be 100 ECUs and the earnings of the type-B participant will be 0 ECUs. Type-B participants have no decision to make in either the first or the second stage.

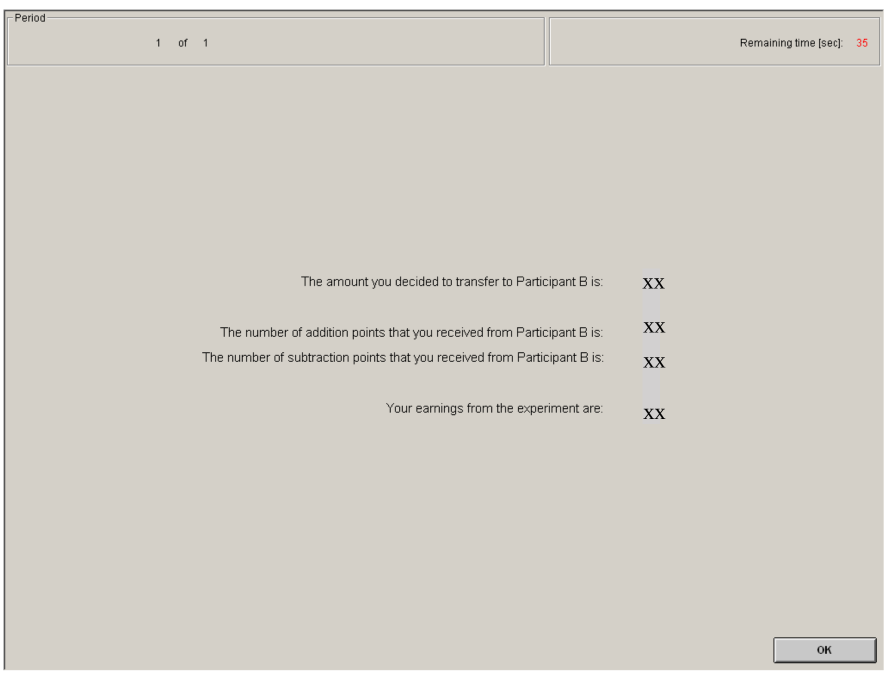
<u>The second stage</u>

In the second stage the type-C participant receives an endowment and must decide whether to increase, decrease or leave unaffected your earnings. This decision may depend on how many ECUs you transferred to the type-B participant in the first stage. No one except the type-C participant will know his or her endowment.

In order for the type-C participant to increase or decrease your earnings, he or she must purchase ‘points’ and assign them to you. Every *addition point* that the type-C participant assigns to you *increases* your earnings by 2 ECUs, and costs them 1 ECU. Every *subtraction point* that the type-C participant assigns to you *reduces* your earnings by 2 ECUs, and costs them 1 ECU.

Examples: (i) Assume a type-C participant assigns 2 *addition points* to you. This will *increase* your earnings by 4 ECUs and reduce the earnings of the type-C participant by 2 ECUs. If a type-C participant assigns 2 *subtraction points* to you, this will *reduce* your earnings by 4 ECUs and reduces the earnings of the type-C participant by 2 ECUs. (ii) If a type-C participant assigns 10 *addition points* to you, it will *increase* your earnings by 20 ECUs, or if a type-C participant assigns 10 *subtraction point*s to you, it will *reduce* your earnings by 20 ECUs and the earnings of the type-C participant will be reduced by 10 ECUs in both cases. (iii) If the type-C participant assigns 0 *addition* or *subtraction points* to you, your earnings and the earnings of the type-C participant will remain unaffected.

After the type-C participant has made their decision you will be informed about his or her decision, and about your final earnings, on the following decision screen.



In summary, the earnings of the type-A, B and C participants are computed as follows:

(A) Earnings of a type-A participant =

Endowment of type-A participant (i.e. 100 ECUs)

minus The number of ECUs transferred to the type-B participant

plus 2 ECUs for every *addition point*, which a type-C participant assigned to the type-A participant

OR

minus 2 ECUs for every *subtraction point*, which a type-C participant assigned to the type-A participant

(B) Earnings of a type-B participant = Number of ECUs received from a type-A participant

(C) Earnings of a type-C participant =

Endowment of Type-C participant

minus 1 ECU for each *addition* or *subtraction point* assigned to Type-A participant

Please note that your earnings can also be negative. In this case the ECUs will be taken from your show-up fee.

If you don't have any questions please answer the following questions. The questions are aimed to help you understand the experiment and how earnings are determined. When you have answered all the control questions, please notify an experimenter by raising your hand. The experiment will begin as soon as all participants have correctly answered the control questions.

<u>Control questionnaire</u>

1. **Consider the case that the type-A participant transfers 0 ECUs to the type-B participant and keeps 100 ECUs.**
   a) If the type-C participant assigns 0 *points* to the type-A participant.
   What are the earnings of the type-A participant? ....
   What are the earnings of the type-B participant? ....

   b) If the type-C participant assigns 10 *addition points* to the type-A participant.
   What are the earnings of the type-A participant? ....
   What are the earnings of the type-B participant? ....

   c) If the type-C participant assigns 10 *subtraction points* to the type-A participant.
   What are the earnings of the type-A participant? ....
   What are the earnings of the type-B participant? ....

2. **Consider the case that the type-A participant transfers 40 ECUs to the type-B participant and keeps 60 ECUs.**
   a) If the type-C participant assigns 0 *points* to the type-A participant.
   What are the earnings of the type-A participant? ....
   What are the earnings of the type-B participant? ....

   b) If the type-C participant assigns 10 *addition points* to the type-A participant.
   What are the earnings of the type-A participant? ....
   What are the earnings of the type-B participant? ....

   c) If the type-C participant assigns 10 *subtraction points* to the type-A participant.
   What are the earnings of the type-A participant? ....
   What are the earnings of the type-B participant? ....

   If you have any questions please notify an experimenter by raising your hand.

Instructions

Thank you for agreeing to take part in this experiment. If you read the following instructions carefully, you might be able to earn a considerable amount of money. For this reason it is very important that you take your time to understand the instructions. In addition to your earnings from the experiment, you will also receive a show-up fee of $5. During the experiment it is forbidden to talk to the other participants. Non-compliance with this rule will lead to exclusion from the experiment and all payments.

In this experiment there are three types of participants: type-A participants, type-B participants and type-C participants. Each participant will be matched with two other individuals who will not be of the same type. **You will be a type-B participant**. Therefore you will be randomly matched with a type-A participant and a type-C participant. The identities of the participants with whom you'll be matched will never be revealed during or after the experiment. Likewise, the other participants will never learn the identity of the people with whom they are matched.

Your earnings in the experiment depend on your decisions in the experiment as well as the decisions of the other individuals with whom you have been matched. During the experiment we will speak of ECUs (Experimental Currency Units), rather than Australian dollars. At the end of the experiment your earnings in ECUs will be converted at the following rate

1 ECU = 35 Australian cents

The experiment consists of two stages, which are described below. Note that each stage will only be entered once. That is, each participant will make each decision once. Therefore, you should take your time to make the decision which is right for you.

<u>The first stage</u>

At the beginning of the first stage, you will not receive an endowment and will therefore have **0 ECUs**. The type-A participant will receive an endowment of **100 ECUs**. **You do not have a task in the first stage.**

The task of the type-A participant in the first stage is to decide whether or not they want to transfer part of their endowment to you. The type-A participant can transfer you between 0 and 100 ECUs in increments of 10 ECUs. That is, the type-A participant can transfer 0, 10, 20, …,100 ECUs to you.

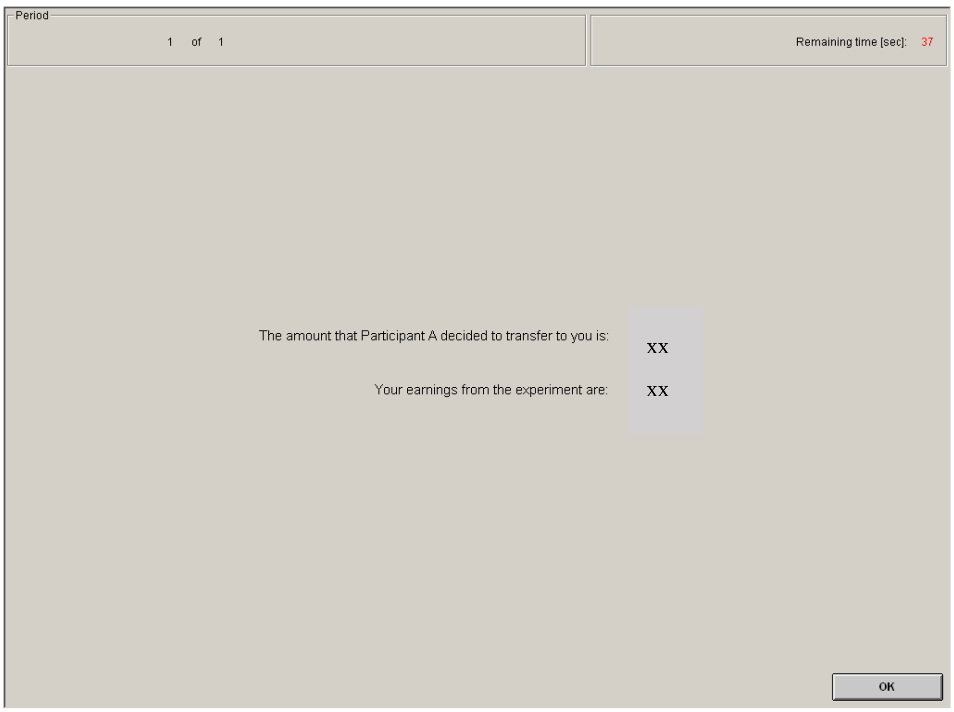
Examples: (i) Assume the type-A participant transfers you 60 ECUs, your earnings after the first stage will be 60 ECUs and the earnings of the type-A participant will be 100 – 60 = 40 ECUs. (ii) If the type-A participant transfers you 10 ECUs, your earnings after the first stage will be 10 ECUs and the earnings of the type-A participant will be 90 ECUs. (iii) If the type-A participant transfers you 0 ECUs, your earnings after the first stage will be 0 ECUs and the earnings of the type-A participant will be 100 ECUs.

<u>The second stage</u>

In the second stage the type-C participant receives an endowment and must decide whether to increase, decrease or leave unaffected the type-A participant's earnings. This decision may depend on how many ECUs the type-A participant transferred to you in the first stage. No one except the type-C participant will know his or her endowment.

In order for the type-C participant to increase or decrease the type-A participant's earnings, he or she must purchase 'points' and assign them to the type-A participant. Every *addition point* that the type-C participant assigns to the type-A participant *increases* the type-A participant's earnings by 2 ECUs, and costs them 1 ECU. Every *subtraction point* that the type-C participant assigns to the type-A participant *reduces* the type-A participant's earnings by 2 ECUs, and costs them 1 ECU.

Examples: (i) Assume a type-C participant assigns 2 *addition points* to the type-A participant. This will *increase* the type-A participant's earnings by 4 ECUs and reduce the earnings of the type-C participant by 2 ECUs. If a type-C participant assigns 2 *subtraction points* to the type-A participant, this will *reduce* the type-A participant's earnings by 4 ECUs and the earnings of the type-C participant by 2 ECUs. (ii) If a type-C participant assigns 10 *addition points* to the type-A participant, it will *increase* the type-A participant's earnings by 20 ECUs, or if a type-C participant assigns 10 *subtraction point*s to the type-A participant, it will *reduce* the type-A participant's earnings by 20 ECUs and the earnings of the type-C participant will be reduced by 10 ECUs in both cases. (iii) If the type-C participant assigns 0 *addition* or *subtraction points* to the type-A participant, the type-A participant's earnings and the earnings of the type-C participant will remain unaffected. After the type-C participant has made their decision you will be informed about your final earnings on the following decision screen.



In summary, the earnings of the type-A, B and C participants are computed as follows:

(A) Earnings of a type-A participant =

Endowment of type-A participant (i.e. 100 ECUs)

minus The number of ECUs transferred to the type-B participant

plus 2 ECUs for every *addition point*, which a type-C participant assigned to the type-A participant

OR

minus 2 ECUs for every *subtraction point*, which a type-C participant assigned to the type-A participant

(B) Earnings of a type-B participant = Number of ECUs received from a type-A participant

(C) Earnings of a type-C participant =

Endowment of Type-C participant

minus 1 ECU for each *addition* or *subtraction point* assigned to Type-A participant

If you don't have any questions please answer the following questions. The questions are aimed to help you understand the experiment and how earnings are determined. When you have answered all the control questions, please notify an experimenter by raising your hand. The experiment will begin as soon as all participants have correctly answered the control questions.

<u>**Control questionnaire**</u>

1. Consider the case that the type-A participant transfers 0 ECUs to the type-B participant and keeps 100 ECUs.

a) If the type-C participant assigns 0 *points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....

b) If the type-C participant assigns 10 *addition points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....

c) If the type-C participant assigns 10 *subtraction points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....

2. Consider the case that the type-A participant transfers 40 ECUs to the type-B participant and keeps 60 ECUs.

a) If the type-C participant assigns 0 *points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....

b) If the type-C participant assigns 10 *addition points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....

c) If the type-C participant assigns 10 *subtraction points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....

If you have any questions please notify an experimenter by raising your hand.

Instructions

Thank you for agreeing to take part in this experiment. If you read the following instructions carefully, you might be able to earn a considerable amount of money. For this reason it is very important that you take your time to understand the instructions. In addition to your earnings from the experiment, you will also receive a show-up fee of $5. During the experiment it is forbidden to talk to the other participants. Non-compliance with this rule will lead to exclusion from the experiment and all payments.

In this experiment there are three types of participants: type-A participants, type-B participants and type-C participants. Each participant will be matched with two other individuals who will not be of the same type. **You will be a type-C participant**. Therefore you will be randomly matched with a type-A participant and a type-B participant. The identities of the participants with whom you'll be matched will never be revealed during or after the experiment. Likewise, the other participants will never learn the identity of the people with whom they are matched.

Your earnings in the experiment depend on your decisions in the experiment as well as the decisions of the other individuals with whom you have been matched. During the experiment we will speak of ECUs (Experimental Currency Units), rather than Australian dollars. At the end of the experiment your earnings in ECUs will be converted at the following rate

1 ECU = 35 Australian cents

The experiment consists of two stages, which are described below. Note that each stage will only be entered once. That is, each participant will make each decision once. Therefore, you should take your time to make the decision which is right for you.

The first stage

At the beginning of the first stage, the type-A participant receives an endowment of **100 ECUs**. The type-B participant does not receive an endowment and therefore has **0 ECUs**. Only the type-A participant makes a decision at the first stage. **The task of the type-A participant in the first stage is to decide whether or not they want to transfer part of their endowment to the type-B participant**. The type-A participant can transfer the type-B participant between 0 and 100 ECUs in increments of 10 ECUs. That is, the type-A participant can transfer 0, 10, 20, …,100 ECUs to the type-B participant. Only the type-A participant makes a decision at the first stage.

Examples: (i) Assume the type-A participant transfers 60 ECUs to the type-B participant, the type-A participant's earnings after the first stage will be 100 – 60 = 40 ECUs and the earnings of the type-B participant will be 60 ECUs. (ii) If the type-A participant transfers 10 ECUs to the type-B participant, the type-A participant's earnings after the first stage will be 90 ECUs and the earnings of the type-B participant will be 10 ECUs. (iii) If the type-A participant transfers 0 ECUs to the type-B participant, the type-A participant's earnings after the first stage will be 100 ECUs and the earnings of the type-B participant will be 0 ECUs. Type-B participants have no decision to make in either the first or the second stage.

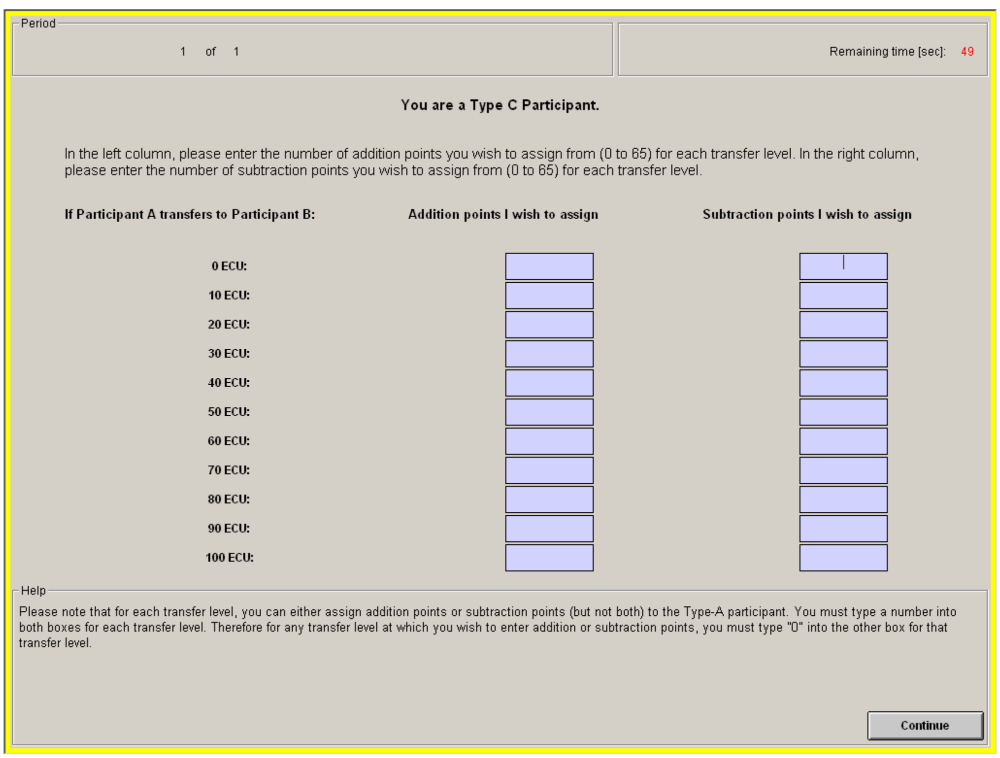
The second stage

Your task in the second stage is to decide whether you want to increase, decrease or leave unaffected the earnings of the type-A participant. If you wish to increase the earnings of the type-A participant you must purchase *addition points*, or if you want to decrease the earnings of the type-A participant you must purchase *subtraction points*. Every *addition point* that you assign to the type-A participant *increases* the type-A participant's earnings by 2 ECUs, and costs you 1 ECU. Every *subtraction point* that you assign to the type-A participant *reduces* the type-A participant's earnings by 2 ECUs, and costs you 1 ECU.

At the beginning of the second stage, you will receive an endowment of **65 ECUs.** Therefore you can assign between 0 and 65 points to the type-A participant. Note that, neither the type-A participant nor the type-B participant will know your endowment. They only know their endowments and that you can assign points to the type-A participant, but not the number of points that you can assign to him/her.

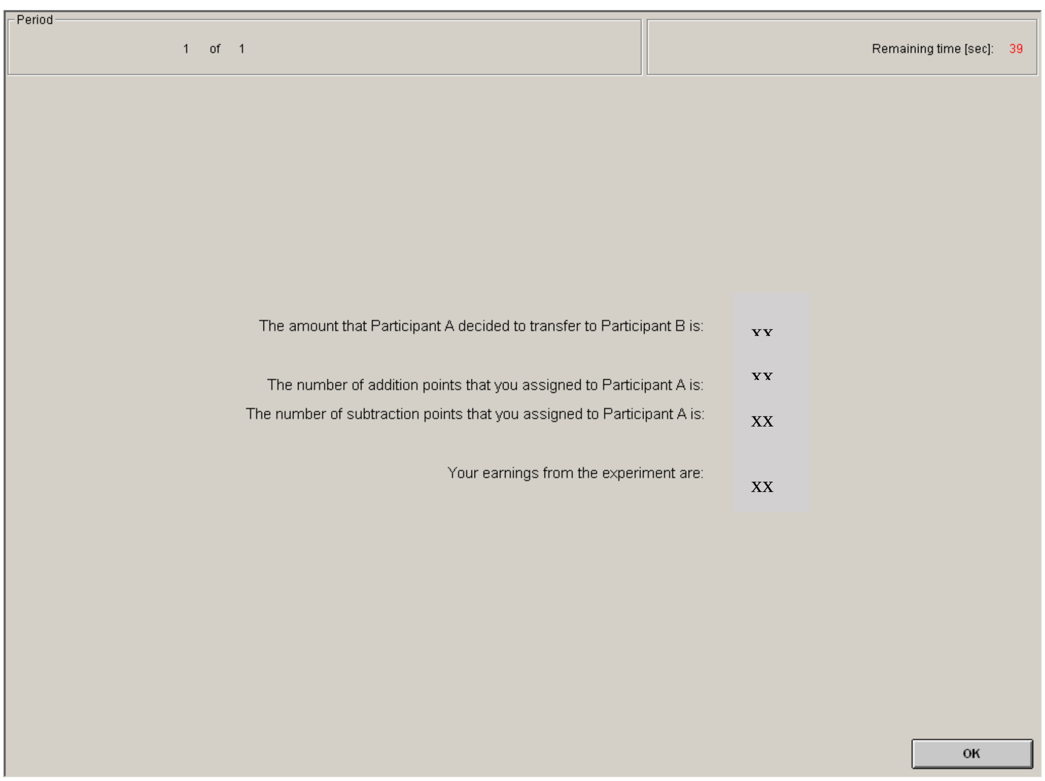
Examples: (i) Assume you assign 2 *addition points* to the type-A participant, it will *increase* the type-A participant's earnings by 4 ECUs and reduce your earnings by 2 ECUs. If you assign 2 *subtraction points* to the type-A participant, it will *reduce* the type-A participant's earnings by 4 ECUs and your earnings by 2 ECUs. (ii) If you assign 10 *addition points* to the type-A participant, it will *increase* the type-A participant's earnings by 20 ECUs, or if you assign 10 *subtraction points* to the type-A participant, it will *reduce* the type-A participant's earnings by 20 ECUs and your earnings are reduced by 10 ECUs in both cases. (iii) If you assign 0 *addition* or *subtraction points* to the type-A participant, the type-A participant's earnings and your earnings will remain unaffected.

Note that you will have to make your decision about how many points (if any) to assign to the type-A participant *before* you find out his/her decision. To make your decision you must use a screen as shown below. On the screen you must indicate how many *addition* or *subtraction* points you will assign to the type-A participant (if any) in the case he or she gives the type-B participant 0 ECUs, in the case he or she gives the type-B participant 10 ECUs, in the case he or she gives the type-B participant 20 ECUs, etc. This means that you will make your decision for each possible transfer level of the type-A participant. You cannot assign both *addition* and *subtraction* points for a given transfer level.



Consider the following example which explains how to make your decision using the decision screen seen above on the previous page. Assume you wish to assign X *subtraction points* in the case the type-A participant gives the type-B participant 0 ECUs. Then you should enter the number ‘X’ in the column of *subtraction points* for the transfer level labelled ‘0 ECU’ under the heading “If Participant A transfers Participant B:” and you must enter the number ‘0’ in the *addition points* box for that transfer level. If you then wish to assign Y *addition points* in the case the type-A participant gives the type-B participant 10 ECUs, you should enter the number ‘Y’ in the *addition points* box on the next row labelled “10 ECU”, and you must enter ‘0’ in the *subtraction points* box for that transfer level. If you then wish to assign no *subtraction* or *addition points* for the case the type-A participant gives the type-B participant 20 ECUs, you should enter the number ‘0’ into both the *addition points* box and the *subtraction points* box for that transfer level. You must enter a number into each box for each transfer level on the screen.

Given that you will not know how many ECUs the type-A participant has transferred to the type-B participant, any of the 11 decisions might be used to determine your final payoff and the payoff of the type-A participant. Which of your decisions is actually realised depends on the *actual* transfer of ECUs from the type-A participant. For example, if the type-A participant has transferred 30 ECUs to the type-B participant, your earnings and that of the type-A participant will be determined by the decision which you have made in this case.
After you have made your decisions, you will be informed of the conclusion of the experiment by the following “exit screen”:



In summary, the earnings of the type-A, B and C participants are computed as follows:

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minus The number of ECUs transferred to the type-B participant

plus 2 ECUs for every *addition point*, which a type-C participant assigned to the type-A participant

OR

minus 2 ECUs for every *subtraction point*, which a type-C participant assigned to the type-A participant

(B) Earnings of a type-B participant = Number of ECUs received from a type-A participant

(C) Earnings of a type-C participant =

Endowment of Type-C participant (i.e. 65 ECUs)

minus 1 ECU for each *addition* or *subtraction point* assigned to Type-A participant

If you don't have any questions please answer the following questions. The questions are aimed to help you understand the experiment and how earnings are determined. When you have answered all the control questions, please notify an experimenter by raising your hand. The experiment will begin as soon as all participants have correctly answered the control questions.

Control questionnaire

1. Consider the case that the type-A participant transfers 0 ECUs to the type-B participant and keeps 100 ECUs.

a) If the type-C participant assigns 0 *points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....
What are the earnings of the type-C participant? ....

b) If the type-C participant assigns 10 *addition points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....
What are the earnings of the type-C participant? ....

c) If the type-C participant assigns 10 *subtraction points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....
What are the earnings of the type-C participant? ....

2. Consider the case that the type-A participant transfers 40 ECUs to the type-B participant and keeps 60 ECUs.

a) If the type-C participant assigns 0 *points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....
What are the earnings of the type-C participant? ....

b) If the type-C participant assigns 10 *addition points* to the type-A participant.
What are the earnings of the type-A participant? ....

What are the earnings of the type-B participant? ....
What are the earnings of the type-C participant? ....

c) If the type-C participant assigns 10 *subtraction points* to the type-A participant.
What are the earnings of the type-A participant? ....
What are the earnings of the type-B participant? ....
What are the earnings of the type-C participant? ....

If you have any questions please notify an experimenter by raising your hand.