

# Locus of control in reward and punishment decisions

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## Abstract

We use a laboratory experiment to analyze the relationship between locus of control (LOC) and the behavior of a responding party in an asymmetric bargaining setting. We find that the availability of reward and punishment options to responders in bilateral ultimatum bargaining affects the behavior differently depending on their LOC type. Internal subjects are more likely to accept an offer when both reward and punishment options are available upon acceptance, therefore allowing them the largest range of possible payoff adjustments. Internal subjects are more likely to reward (and reward by larger amounts) when both options are available and are more likely to punish (and punish by larger amounts) when only the punishment option is available. The results suggest that the availability of more post-acceptance instruments to affect payoffs, and thus a perception of greater control, promotes the acceptance decision of internal subjects.

**JEL classification codes:** C90, D03, C78

**Keywords:** locus of control, rewards and punishments, ultimatum bargaining, experiments

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# 1 Introduction

It has been long known that the effectiveness of rewards and punishments as operant conditioning tools depends on personality. For example, Gray (1970) suggests that introverts are relatively more sensitive to punishment than extraverts, who are, in turn, more responsive to reward. McCord and Wakefield (1981) find that this regularity translates into students' academic achievements. In their study, introverts performed better in arithmetics classes where teachers mostly used punishment, whereas the reverse was true for extraverts.<sup>1</sup> The connection between personality and responsiveness to reward and punishment is a well-established phenomenon (for a review see, e.g., Hardin et al. 2006 and references therein).

Most of the previous studies, however, focused on the behavior of subjects to whom punishments and/or rewards were applied (e.g., Rosenbaum and Hadari 1985), as opposed to those who are in a position to use reward and/or punishment. In many situations in the field, such as management and reinforcement decisions by leaders in organizations, rewards and punishments are determined endogenously. A number of studies in organizational psychology reported a link between leaders' personality traits and leadership effectiveness (see, e.g., Silverthorne 2001, Bono et al. 2002, Bono and Judge 2004). Atwater et al. (1998) suggested that self-esteem, moral reasoning, and physical fitness are the key predictors of the leader's use of either contingent or noncontingent punishment. A considerable amount of research has been done on worker performance and attitudes-related determinants of contingent and noncontingent reward and punishment use by managers (for a review, see Podsakoff et al. 2006). At the same time, little is known about the effect of personality on the decision about whether, and how strongly, to reward or punish in economic situations without social leadership roles, for example, in bargaining settings, which is the focus of this paper.

Rewards and punishments are at the core of virtually all economic incentive provision mechanisms (Andreoni et al. 2003b). The role of personality is important since mechanisms may trigger systematic behaviors depending on personality. The behavior in these mechanisms is often well-understood "on average," either within the payoff maximization paradigm, or factoring in behavioral deviations from it. Experimental studies typically document substantial individual heterogeneity in behavior (e.g., Andreoni et al. 2003a), which could be explained by personality differences (e.g., Boone et al. 1999b). Understanding the impact of personality on behavior in economic settings where rewards and punishments are available can inform decision makers and institutional designers, and al-

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<sup>1</sup>Although, as shown in later studies, these results are sensitive to implementation (Farrell 1997), task types (Matthews and Gilliland 1999), and gender and cultural differences (Li et al. 2007).

low them to better tailor particular mechanisms to different personality types. It may also inform on the possible differences in performance of certain personality types in negotiations and other economic settings involving bargaining. Finally, such understanding may help identify the best mechanisms in fields which are dominated by specific personality types due to self-selection.

In this paper we employ the setting of bilateral bargaining to investigate those questions. Bargaining is part of many economic and social interactions such as salary negotiations, real estate transactions, or family vacation planning. It was demonstrated by Pevnitskaya and Ryvkin (2022) that the behavior of parties in a simple bargaining game changes when the responder has an option to reward or punish the proposer. Certain types of reward and punishment options lead to higher average acceptance rates. In the present paper, we examine whether the relevant personality trait, *locus of control*, explains individual differences in the use of rewards and punishments by responders in that experiment. We also investigate the role of gender in applying rewards and punishments and reaching successful bargaining outcomes.

Locus of control (LOC, Rotter 1966) is a personality trait measuring the extent to which an individual believes that her life is controlled by her own actions as opposed to external circumstances. According to Rotter (1966), people can be classified as internals (those who believe they control their life) and externals (those who believe their life is largely governed by the environment). We investigate the effect of LOC because it was found that LOC is an important predictor of job performance and satisfaction (Ng et al. 2006), wages (see, e.g., Skinner 1996, or Semykina and Linz 2007 and references therein), educational choice and human capital investment decisions (see, e.g., Boone et al. 2009a, Coleman and DeLeire 2003). Internal LOC was linked, both in observational data (Rubin and Brown 1975, Greenhalgh et al. 1985) and experimentally (Spector 1977), to a more competitive and exploitative style of bargaining negotiations; and to more competitive behavior in children (Cook and Chi 1984, Cook and Sloane 1985). Boone et al. (1996) identified the relationship between the CEO LOC and firm performance. Therefore, we believe it is appropriate to study the effect of LOC on reward and punishment decisions in our setting.

A number of experimental studies explored the relationship between LOC and behavior in games in other environments. Boone et al. (1998) found that teams comprised of internals outperform those of externals, and mixed teams, in an experimental competitive market environment (see also Boone et al. 2009b). The internals' advantage is especially pronounced under unstable conditions, and increases with experience (Phelan and Alder 2006). Boone et al. (1999a, 1999b) found that internals are more likely to try to influence

the behavior of others in repeated Prisoner’s Dilemma games by cooperating early on and defecting at the end, whereas externals seem to play less strategically and show less variation in play. At the same time, Kurzban and Houser (2001) did not find the effect of LOC on cooperativeness in their circular public good game. Many important economic environments, however, do not have a coordination element or symmetry, which characterized games in these previous studies, but represent bargaining situations where two or more participants are negotiating on how to allocate a fixed amount. In such bargaining situations, players’ interests are in conflict and decisions may be taken sequentially, introducing asymmetry, so the effect of LOC is important but cannot be determined from the previously studied environments. In addition, there are no prior studies on the effect of LOC on decisions to apply reward and punishment in any economic game.

In this paper, we experimentally study the relationship between LOC and decisions to use reward and/or punishment in a bargaining setting; we also look at the effect of gender. As a baseline, we use the well-known ultimatum game (UG) that has been extensively studied experimentally since Güth et al. (1982). In the UG, there are two players – the proposer and the responder. At the first stage, the proposer offers a split of a fixed amount (“pie”) between herself and the responder. At the second stage, the responder either accepts the split, in which case it is implemented, or rejects it, in which case both players receive nothing. Although the behavior consistent with individual payoff maximization is for proposers to offer responders a very small positive amount, and for the responders to accept it, multiple studies have shown that small offers are typically rejected, and the modal offer is often the equal split (see, e.g., reviews by Güth and Tietz 1990, Güth 1995, Roth 1995, Camerer and Thaler 1995, Cooper and Kagel 2016). Modifications of the UG were studied (e.g., Suleiman 1996, Andreoni 2003a, Declerck et al. 2009) and multiple theories introducing various forms of other-regarding preferences proposed (e.g., Rabin 1993, Fehr and Schmidt 1999, Bolton and Ockenfels 2000, Cox et al. 2008) to explain the observed behavior (see also Cooper and Kagel 2016 for a review of experiments conducted in response to some of the theories).

The link between other personality traits and behavior in the baseline UG (and a related dictator game which is the UG without the second stage; for a review see, e.g., Engel 2011) was studied by a number of authors. Brandstätter and Güth (2002) found that benevolence of proposers is linked to higher offers, whereas reciprocity orientation of responders can be linked to higher acceptance rates. Swope et al. (2008) found that proposers’ extraversion affects offers positively, while more intuitive types offer less; the effects, however, are weak. The results regarding gender differences in the UG are somewhat mixed. Swope et al. (2008) found no gender differences controlling for personality

differences; Eckel and Grossman (2001) report higher offers by females and higher rejection rates by males; whereas Solnick (2001) reports small differences in offers between genders but higher rejection rates by females. In the dictator game, it was found that personality can explain giving, especially for women (Ben-Ner et al. 2004). The results on the effect of gender alone are mixed: Eckel and Grossman (1998) found that women give more than men, while Bolton and Katok (1995) report no gender differences. For the public good game, it was found that gender (Kurzban and Houser 2001) and also gender composition of groups (Nowell and Tinkler 1994, Brown-Kruse and Hummels 1993) affect contributions. To our knowledge there are no prior studies that investigate the role of LOC in ultimatum bargaining or dictator games.

In our environment the standard UG game is augmented by a third stage at which the responder, if she accepts the proposer’s offer, can subsequently reward and/or punish the proposer at a cost. In addition to the baseline (UG) treatment, we consider three treatments that differ by the availability of the reward and punishment options: reward, punishment, and reward&punishment. This taxonomy of treatments has been analyzed previously in the dictator game (Andreoni et al. 2003b), the public good game (Sefton et al. 2007), and the ultimatum game (Pevnitskaya and Ryvkin 2022); however, there are no studies about the role of personality or gender in behavior in these settings.

Our design focuses on the effect of the LOC personality trait in the desire to get access to payoff adjustment instruments and to actually use rewards and punishments, rather than strategic considerations for their use. Rewarding and punishing is costly and, therefore, decreases the responder’s payoff, so the presence of any rewards or punishments indicates a behavioral phenomenon that may be moderated by personality. Further, subjects are matched in such a way that each proposer interacts with each responder only once, so rewards and punishments cannot serve as reinforcement tools. Thus, reward and punishment, if used, likely measure reactions of responders to proposers’ behavior (see, e.g., Xiao et al. 2005 for a discussion of emotional reactions) and/or the responder’s propensity to influence the proposer’s payoff while still earning a positive amount. Responders can apply rewards and punishments only after accepting an offer, so our first main hypothesis is that internal LOC leads to a higher acceptance rate in treatments with reward and/or punishment. The second hypothesis is that internal LOC results in a greater frequency of reward and/or punishment use, when available. The two hypotheses jointly conjecture that individuals who believe in having more control over the events in their lives have a greater desire for access to additional payoff adjustment instruments and also are more likely to use them.

We find that subjects with internal LOC are more likely to accept a given offer in the

treatment where both reward and punishment options are available to them. This setting provides subjects with the greatest (two-sided) range of payoff adjustment, giving more control over payoffs, and is consistent with our hypothesis. Internal subjects are less likely to accept an offer in the treatment with reward only, however, although the effect is only marginally significant. In the reward-only case, subjects have less control over payoffs, and the available adjustment does not allow them to express their dissatisfaction with the offer after acceptance. After acceptance, when the instruments become available, internal subjects are more likely to reward in the treatment with the reward and punishment options (where they also reward by larger amounts), although again the effect is significant only marginally; and are more likely to punish in the treatment with punishment only (with larger punishment sizes). We conclude that although internal subjects are more likely to accept an offer to gain the ability to apply reward and punishment, once they reach that stage, they appear to be satisfied with having the control, act “nicer,” and reward more. The finding that differences in acceptance behavior do not necessarily translate into differences in rewarding/punishing behavior, is consistent with the nature of LOC in that it measures a perception of control rather than propensity to apply control.

The rest of the paper is organized as follows. The next section presents a formal description of our treatments, procedures and hypotheses. Section 3 describes the experimental data, estimation methods and results. Section 4 discusses the results and concludes.

## 2 Method

### 2.1 Treatments

We consider the following two-player bargaining games representing the baseline bargaining situation and three extended bargaining situations with reward and/or punishment options available to the responder.

**Baseline game (B)** is the standard ultimatum game consisting of two stages. At stage 1, one of the players, the *proposer*, chooses an offer  $x$  between 0 and  $S$  to divide the “pie,”  $S$ , between herself and the other player, the *responder*. At stage 2, the responder either accepts the offer, in which case the payoffs are  $S - x$  to the proposer and  $x$  to the responder, or rejects the offer, in which case the payoffs for both players are zero.

**Reward game (R)** is the B game augmented by the possibility for the responder, if she accepts the offer, to reward the proposer by transferring her some amount  $t$  between 0 and  $x$ . Final payoffs are  $S - x + t$  to the proposer and  $x - t$  to the responder.

| Treatment | Sessions | Subjects per session | Rounds per session |
|-----------|----------|----------------------|--------------------|
| B         | 2        | 10, 26               | 5, 13              |
| R         | 2        | 20, 20               | 10, 10             |
| P         | 2        | 20, 14               | 10, 7              |
| R&P       | 2        | 16, 18               | 8, 9               |

Table 1: Summary of experimental sessions and treatments.

**Punishment game (P)** is the B game augmented by the possibility for the responder, if she accepts the offer, to punish the proposer by decreasing both the proposer’s and the responder’s payoffs by some amount  $r$  between 0 and  $\min\{x, S - x\}$ . Final payoffs are  $S - x - r$  to the proposer and  $x - r$  to the responder.

**Reward and Punishment game (R&P)** is the B game augmented by the possibility for the responder, if she accepts the offer, to either reward or punish the proposer as in the R and P games combined.

In the R, P and P&R games the reward and/or punishment options become available to the responder only if she accepts the offer. If the responder rejects the offer, both players receive zero.

## 2.2 Procedures

All experimental sessions were conducted in the XS/FS experimental laboratory at Florida State University. Subjects were volunteers from the population of undergraduate students at FSU recruited using the online announcement system ORSEE (Greiner 2015). Each subject participated in the experiment only once. Subjects made decisions at computer terminals using the z-Tree software (Fischbacher 2007).

The experiment consisted of four treatments corresponding to the B, R, P and R&P games defined above. We ran two independent sessions per treatment, thus resulting in 8 sessions total. The total number of subjects in the experiment is 144, and the breakdown by treatments and sessions is summarized in Table 1.

Each session consisted of three parts. In part one, the main game (B, R, P, or R&P, depending on treatment) was administered; in part two, subjects answered the LOC questionnaire (see Appendix A); and in part three, subjects made other decisions unrelated to this study. Instructions for each part were given separately at the beginning of that part. Subjects were informed that the experiment may consist of several parts but they did not know about the number of parts or the nature of each part until it was announced.

In part one, instructions containing a complete description of the rules were read out

loud with a copy distributed to subjects to follow. All subjects were completely informed about the structure of the game (i.e., in treatments R, P and R&P both proposers and responders knew that the reward and/or punishment options would be available if an offer is accepted). After receiving the instructions subjects went through two unpaid practice rounds in which they did not interact with each other. Importantly, during practice rounds subjects made decisions for both proposers and responders. They saw both interfaces and were forced by the software to try all available types of choices in each role. Only after the practice rounds have the subjects been randomly assigned their roles – half of the subjects the role of the proposer and half the role of the responder. The roles were fixed for the entire experiment.<sup>2</sup>

After practice, subjects went through a series of two-player interactions with re-matching in every round following the “zipper” (or “turnpike”) matching scheme.<sup>3</sup> The number of rounds, thus, was equal to half of the number of subjects in the session and varied from 5 to 13 (cf. Table 1). The amount of money for division in each round was 5 USD (or 500 cents; in what follows all amounts are expressed in cents). Two decision rounds were randomly chosen at the end of the experiment to base subjects’ payments on. Each session lasted 60 to 90 minutes, with the average earnings of approximately \$20 per subject including a \$10 show-up fee.

## 2.3 Hypotheses

In the three treatments where post-acceptance modification of payoffs by the responder is available (R, P, and R&P), the responders can have some control over the payoffs while still being able to earn positive amounts. In the baseline treatment, the only way to modify payoffs, relative to the offer, is through rejection. We conjecture that the effect of LOC might be two-fold. Having access to reward and punishment options affects the perception of control. We, therefore, hypothesize that internals have a higher propensity to accept a given offer in treatments with reward and punishment options.

**Hypothesis 1:** responders with more internal LOC are more likely to accept a given offer in treatments R, P, and R&P, compared to B.

We also consider a refinement of Hypothesis 1 that while having any control over payoffs is more desirable for internal LOC subjects, the type of control matters as well. Specifically, in a bargaining setting where the responder, a party applying rewards or punishments, most likely has a lower payoff and views that as unfair, the ability to reward may be viewed differently from the ability to punish. The latter instrument provides

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<sup>2</sup>For sample instructions in part one, see Pevnitskaya and Ryvkin (2022).

<sup>3</sup>The instructions stated “You will be paired with the same participant only once.”

control that is consistent with the adjustment of the proposer’s payoffs in the direction of 50-50 split, the direction the responder likely views as fair. However, the former instrument, the ability to reward, represents control that only allows for adjustments in the direction the responder likely views as unfair. We will investigate the interplay between the desire to have control over payoffs per se and the demand for instruments with specific directions of possible adjustments.

Once an offer is accepted, internals may have a propensity to exercise more control and use reward and punishment more often, thereby affecting the payoffs. Such response would be consistent with LOC measuring the execution of control rather (or along with) the perception of having control. These payoff modifications may be small, but willingness to pay for any such modification may be positively associated with internal LOC.

**Hypothesis 2:** responders with more internal LOC are more likely to use rewards and/or punishments upon acceptance of a given offer in treatments R, P, and R&P.

Finally, given the inconsistent findings in previous research, we hypothesize that, once LOC is controlled for, gender will have no significant effect on behavior in our setting.<sup>4</sup>

**Hypothesis 3:** conditional on LOC, there are no gender differences in behavior.

## 3 Results

### 3.1 Data and variables

In each experimental session, subjects made decisions in a series of *rounds* – identical games against different opponents. We use  $i$  to index subjects, and  $t$  to index rounds. For responders, we recorded  $OFFER_{it}$  – the offer responder  $i$  received in round  $t$ ;  $ACCEPT_{it}$  – a binary variable equal 1 if responder  $i$  accepted the offer in round  $t$ , and 0 otherwise;  $REWARD_{it}$  – the amount of reward transferred by responder  $i$  to the proposer in period  $t$  if  $ACCEPT_{it} = 1$  (treatments R and R&P);  $PUNISHMENT_{it}$  – the amount by which responder  $i$  chose to reduce her and the proposer’s payoffs in period  $t$  if  $ACCEPT_{it} = 1$  (treatments P and R&P). We also created binary variables  $REW_{it}$  and  $PUN_{it}$  equal 1 if, conditional on accepting the offer, responder  $i$  chooses a positive reward or punishment, respectively, in round  $t$ , and zero otherwise. Additionally, for all subjects we recorded their gender ( $FEMALE_i = 1$  if subject  $i$  self-identified as a female, and 0 otherwise) and the LOC internal score ( $INTERNAL_i$  from 1 to 6 obtained as described in the next paragraph). These variables are summarized in Table 2.

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<sup>4</sup>Recall that Swope et al. (2008) reported no gender effects in the standard UG when personality differences are accounted for; and without accounting for personality, Eckel and Grossman (2001) and Solnick (2001) identified gender effects whereas Bolton and Katok (1995) did not.

|                   | Treatments     |                |                |                |
|-------------------|----------------|----------------|----------------|----------------|
|                   | B              | R              | P              | R&P            |
| $\Pr(FEMALE = 1)$ | 0.53<br>(0.51) | 0.40<br>(0.50) | 0.44<br>(0.50) | 0.50<br>(0.51) |
| Proposers         | 0.72<br>(0.46) | 0.50<br>(0.51) | 0.53<br>(0.51) | 0.47<br>(0.51) |
| Responders        | 0.33<br>(0.49) | 0.30<br>(0.47) | 0.35<br>(0.49) | 0.53<br>(0.51) |
| <i>INTERNAL</i>   | 3.66<br>(0.52) | 3.65<br>(0.35) | 3.81<br>(0.54) | 3.74<br>(0.48) |
| Proposers         | 3.77<br>(0.61) | 3.60<br>(0.33) | 3.81<br>(0.33) | 3.67<br>(0.46) |
| Responders        | 3.55<br>(0.41) | 3.71<br>(0.36) | 3.81<br>(0.45) | 3.80<br>(0.51) |
| Subjects          | 36             | 40             | 34             | 34             |
| Observations      | 388            | 400            | 298            | 290            |

Table 2: Averages of *FEMALE* and *INTERNAL* by treatment and role (sample standard deviations in parentheses).

The locus of control (LOC) questionnaire consisted of 26 statements introduced by Rotter (1966), see Appendix A. Each statement is classified as either internal or external. The 26 statements were given to subjects in a random order. The order of statements was pre-drawn but unknown to subjects, and it was the same for all subjects in all sessions. For each statement, subjects were asked to indicate their degree of agreement on a six-point scale, from “strongly disagree” (1) to “strongly agree” (6). For internal statements, the subject’s internal score was recorded as reported; for external statements, the subject’s internal score was recorded as  $7 - (\text{reported score})$ . For example, if a subject chose 2 as her answer to an external question, this was recorded as an internal score of 5. The internal scores were then averaged over all 26 statements to form each subject’s *INTERNAL<sub>i</sub>* measure.<sup>5</sup>

### 3.2 Summary statistics

Proposers offered, on average, 202.6 cents, and 81.7% of all offers were accepted by responders. Responders rewarded proposers in 14.8% of cases and punished proposers in 15.5% of cases when the corresponding option was available. The average reward size, conditional on there being some reward, was 28.2 cents, and the average punishment size,

<sup>5</sup>The procedure we used for construction of internal scores is similar to the one employed by Semykina and Linz (2007).

conditional on there being some punishment, was 38.4 cents. There is statistically significant variation in average offers, probabilities and sizes of reward and punishment across treatments. These differences are discussed at length in Pevnitskaya and Ryvkin (2022), and are not the focus of this study.<sup>6</sup>

Table 2 reports the gender composition overall, and separately for proposers and responders, by treatment. As shown in Table 2, 46% of subjects in all sessions combined were female. There were slightly more females in treatments B and R&P, and fewer in treatments R and P, but overall both genders were well represented. By coincidence, a smaller than average percentage of females were responders in all sessions, but the percentage of female responders never fell below 30%.<sup>7</sup> There is no statistically significant difference in the percentage of female responders (and proposers) across treatments.

Table 2 also summarizes LOC. Average LOC did not change across treatments. For all 144 subjects in the experiment, variable *INTERNAL* has mean 3.71 and standard deviation 0.47. In this study, we focus on responders. For 72 responders in the experiment, *INTERNAL* has mean 3.71 and standard deviation 0.44. Figure 1 shows the histogram of *INTERNAL* for responders. As seen from the figure, there is substantial variation in the LOC across subjects, and the distribution is slightly skewed towards more internal LOC.

Responders' behavior can only be fully analyzed in relation to proposers' behavior, i.e., conditional on the offers they receive. In the following sections, we use regression analysis to include offers in the analysis of the role of LOC and gender in acceptance, reward, and punishment decisions.

### 3.3 Probability to accept

We start with the analysis of the role of LOC and gender in responders' probability to accept a given offer using the following binary choice model:

$$ACCEPT_{it} = 1[\beta_0 + \beta \cdot OFFER_{it} + \gamma \cdot FEMALE_i + \delta \cdot INTERNAL_i + \epsilon_{it} > 0]. \quad (1)$$

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<sup>6</sup>Pevnitskaya and Ryvkin (2022) use part of the data from this study to explore the differences in offers and reward and punishment behavior across treatments. They find the average offer to be the highest in treatment R&P and the lowest in treatment R. The ranking of average acceptance rates is consistent with average offer sizes. However, when considered conditional on offer size, the acceptance rate is the lowest in the baseline treatment and the highest in the punishment-only treatment. Pevnitskaya and Ryvkin (2022) conclude that allowing responders to have a more refined control over final payoffs and access to feedback in the form of rewards and/or punishments promotes cooperation.

<sup>7</sup>These numbers are only of relevance from the statistical, not behavioral, perspective, because subjects never knew the gender of their opponents.

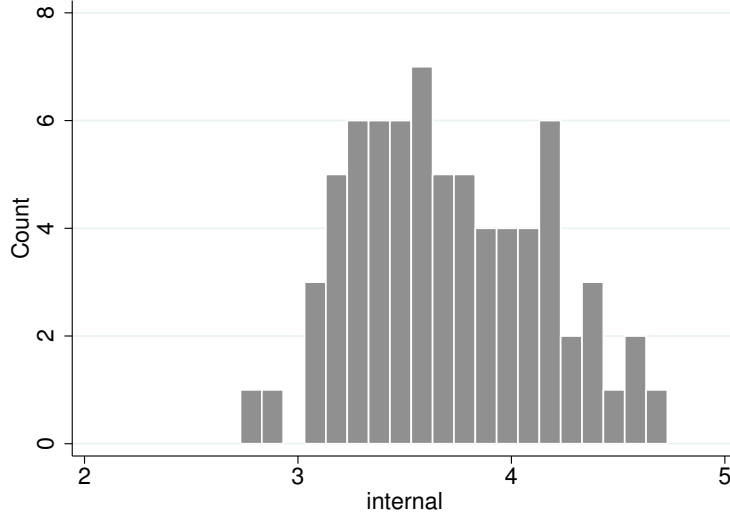


Figure 1: The histogram of *INTERNAL* for responders, all treatments combined,  $N = 72$ , bin width 0.1.

Here,  $1[\cdot]$  is the indicator function equal to one if the condition in brackets is satisfied, and zero otherwise. Assuming normality and the random effects (RE) structure of the error term  $\epsilon_{it}$ , we use the RE probit model to estimate the coefficients in Eq. (1).

The results are presented in Table 3. As expected, *OFFER* affects the likelihood of acceptance decision positively and is highly significant in all treatments. Gender appears to play no role in acceptance, whereas the coefficient estimate on *LOC* is negative and significant in treatment R, and positive and marginally significant in treatment R&P.<sup>8</sup>

**Result 1.** Internal subjects are more likely to accept a given offer in the treatment where both the reward and punishment options are available (R&P), although the effect is only marginally significant. Internal subjects are less likely to accept a given offer in the treatment where only the reward option is available (R).

Consistent with the refinement of Hypothesis 1 in Section 2.3, we find that both, the overall control over payoffs allowed by the available instruments as well as the directions of payoff adjustments, matter for internal LOC subjects. In treatment R&P where both instruments are available upon acceptance, all of the above factors are appealing to in-

<sup>8</sup>As a robustness check, we ran the RE probit regression of  $ACCEPT_{it}$  combining the data from all four treatments. In addition to the variables used in Eq. (1), we included dummy variables for treatments R, P, R&P (with treatment B as the baseline) and interactions of *FEMALE* and *INTERNAL* with those dummies. Consistent with the results in Table 3, the coefficient estimate on the interaction of *INTERNAL* with treatment R came out negative and significant at 5%, whereas the estimate on the interaction of *INTERNAL* with treatment R&P was positive and significant at 10%.

|                 | $\Pr(ACCEPT = 1)$   |                     |                       |                     |
|-----------------|---------------------|---------------------|-----------------------|---------------------|
|                 | B                   | R                   | P                     | R&P                 |
| constant        | -8.63**<br>(4.36)   | 4.66<br>(3.99)      | 0.18<br>(1.69)        | -12.2**<br>(5.1)    |
| <i>OFFER</i>    | 0.058***<br>(0.013) | 0.028***<br>(0.005) | 0.0083***<br>(0.0019) | 0.037***<br>(0.012) |
| <i>FEMALE</i>   | 0.55<br>(0.92)      | -0.95<br>(0.80)     | 0.11<br>(0.39)        | -0.71<br>(0.91)     |
| <i>INTERNAL</i> | -0.27<br>(1.09)     | -2.11**<br>(1.06)   | -0.20<br>(0.42)       | 1.98*<br>(1.06)     |
| Subjects        | 18                  | 20                  | 17                    | 17                  |
| Observations    | 194                 | 200                 | 149                   | 145                 |

Table 3: Coefficient estimates for acceptance probability (robust standard errors in parentheses). The results are obtained by estimating Eq. (1) by random effects probit separately for each treatment. Significance levels: \*\*\* - 1%, \*\* - 5%, \* - 10%.

ternals since it gives the largest range of adjustments and also allows for adjustments of proposers' payoffs towards a 50-50 split, a direction responders are likely to view as fair. The duality of possible directions of adjustments makes the responder's position somewhat similar to the proposer's in a sense of being able to increase or decrease the opponent's payoffs. Unless the offer has exceeded the responder's belief about their fair share, which is not likely from a behavioral perspective, the option to reward is redundant from the direction-of-adjustment aspect of control. In the punishment-only treatment (P), while there is a possibility to adjust the proposer's payoff towards what would have been a 50-50 split, the responders are only given a one-sided option and hence are deprived of two-directional control over opponents' payoffs. Since responders gain access to the instruments only after acceptance, the likelihood to accept the offer reflects the impact of both aspects of control provided by the instruments.

Besides modifying both parties' payoffs, the reward and punishment instruments function as costly feedback mechanisms that allow responders to express their (dis)satisfaction with the offers they receive. In treatment R, the responders are only given an option to express their satisfaction with the offer. They cannot express dissatisfaction with the offer upon acceptance although it is more likely that they would have a desire to do so. Our results indicate that internal LOC subjects do not seek this type of instrument and are more likely to reject a given offer in the R treatment. In treatment R&P, on the other hand, responders have the opportunity to express their displeasure with the offer and also express their appreciation of the offer that exceeded their expectation. The P

treatment appears to be somewhat in between and similar to the baseline in that only negative response (rejection or punishment) is available.

**Result 2.** Controlling for LOC, gender does not affect conditional acceptance probability.

Result 2 is consistent with Hypothesis 3. It is in line with Swope et al. (2008), and suggests that the results of Eckel and Grossman (2001) and Solnick (2001) may not fully account for differences in personality.

### 3.4 Probability to reward and to punish

We further explore the probability for responders to reward or punish a given offer upon acceptance. Thus, in this section we restrict attention to treatments R, P and R&P, and only consider accepted offers. Reward is an option in treatments R and R&P. Using the binary variable  $REW_{it}$  equal 1 if responder  $i$  chose a positive reward in period  $t$ , and zero otherwise, given that  $ACCEPT_{it} = 1$ , we estimated the following model:

$$\begin{aligned} REW_{it} &= 1[\beta_0 + \beta \cdot OFFER_{it} + \gamma \cdot FEMALE_i + \delta \cdot INTERNAL_i + \epsilon_{it} > 0], \\ ACCEPT_{it} &= 1, \quad \text{treatments R, R\&P.} \end{aligned} \tag{2}$$

A similar equation was estimated for punishment in treatments P and R&P (variable  $PUN_{it} = 1[PUNISHMENT_{it} > 0 | ACCEPT_{it} = 1]$ ). The results of RE probit estimation are presented in Table 4.

As expected, the coefficient estimate on *OFFER* is positive for the probability of reward in treatments R and R&P, and negative for the probability of punishment in treatments P and R&P. Thus, larger offers are more likely to be rewarded, and lower offers punished when the corresponding option is available. Of major interest, however, are the coefficients on *FEMALE* and *INTERNAL*. The coefficient estimate on *FEMALE* is positive and statistically significant in treatment P, and not significant in other treatments. The coefficient estimate on *INTERNAL* is positive and marginally significant for the probability of reward in treatment R&P ( $p < 0.1$ ),<sup>9</sup> and positive and significant

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<sup>9</sup>As pointed out by an astute anonymous reviewer, the coefficient estimate on *INTERNAL* in R (1.73) is similar in magnitude to the estimate in R&P (1.75); yet, only the latter is (marginally) statistically significant. Therefore, there is a possibility of a type II error in the claim that *INTERNAL* has no effect on the probability of reward in R. Note, however, that the two estimates have very different standard errors, and the resulting  $p$ -values of 0.232 and 0.079, respectively, are not close, even though the former comes from a treatment with a slightly larger number of independent observations (20 vs. 17). The absence of the effect of *INTERNAL* on rewarding in R is corroborated also by our analysis in Section 3.5 where we find that the *magnitude* of reward in R is unaffected by LOC (see Table 5). Still, the lack

|                 | Pr( <i>REWARD</i> > 0) |                    | Pr( <i>PUNISHMENT</i> > 0) |                      |
|-----------------|------------------------|--------------------|----------------------------|----------------------|
|                 | R                      | R&P                | P                          | R&P                  |
| constant        | -12.6**<br>(5.9)       | -12.9***<br>(4.8)  | -8.58**<br>(3.39)          | 3.73<br>(2.88)       |
| <i>OFFER</i>    | 0.019***<br>(0.005)    | 0.020***<br>(0.07) | -0.0071**<br>(0.0032)      | -0.010***<br>(0.004) |
| <i>FEMALE</i>   | 1.36<br>(1.07)         | -1.43<br>(0.89)    | 1.16**<br>(0.54)           | -1.02<br>(0.71)      |
| <i>INTERNAL</i> | 1.73<br>(1.45)         | 1.75*<br>(1.00)    | 2.15**<br>(0.84)           | -0.62<br>(0.69)      |
| Subjects        | 20                     | 17                 | 17                         | 17                   |
| Observations    | 150                    | 127                | 124                        | 127                  |

Table 4: Coefficient estimates for the probability of reward/punishment use conditional on acceptance (robust standard errors in parentheses). The results are obtained by estimating Eq. (2), and a similar equation for punishment, by random effects probit for the corresponding treatments. Significance levels: \*\*\* - 1%, \*\* - 5%, \* - 10%.

for the probability of punishment in treatment P ( $p < 0.05$ ).<sup>10</sup>

**Result 3.** Conditional on accepting a given offer, females are more likely to apply punishment in the treatment with punishment only (P).

**Result 4.** Conditional on accepting a given offer, internal subjects are more likely to reward in the treatment with reward and punishment (R&P), although the effect is only marginally significant; and are more likely to punish in the treatment with punishment only (P).

of power is a valid concern, and our Result 4 should be interpreted with caution. A study with a much larger number of subjects ( $\sim 275$  per treatment) would be needed to fully address this issue.

<sup>10</sup>As a robustness check, we ran the RE probit regression for the probability of reward combining data from treatments R and R&P, and for the probability of punishment combining data from treatments P and R&P. In addition to the variables used in Eq. (2), we included a dummy variable for treatment R&P (with treatments R and P as baselines for reward and punishment, respectively) and interactions of *FEMALE* and *INTERNAL* with this dummy. For the probability of reward, we found a significant positive joint effect of *INTERNAL* (Wald test,  $\chi^2_2$ ,  $p = 0.0028$ ) but no effect of the interaction of *INTERNAL* and treatment R&P, i.e., no difference in the impact of LOC between treatments R and R&P. We also found a negative and significant coefficient on the interaction of *FEMALE* with treatment R&P indicating that women reward less frequently in R&P compared to R. These results are consistent with those in Table 4. For the probability of punishment, we found a positive effect of *INTERNAL* and a negative effect of the interaction of *INTERNAL* with treatment R&P indicating that people with more internal LOC punish less in R&P compared to P. For gender, we found a positive effect of *FEMALE* and a negative effect of the interaction of *FEMALE* with treatment R&P indicating that women punish less in R&P compared to P. These results are also consistent with the results of the separate regressions reported in Table 4.

Although the presence of punishment in addition to reward in treatment R&P makes acceptance more attractive to internals, they do not exercise punishment more often once they accept; instead, in treatment R&P internals are more likely to reward. At the same time, although internals are as likely to accept offers in P as externals, they are more likely to punish once they accepted. Thus, differences in acceptance behavior do not necessarily translate into differences in rewarding/punishing behavior. The presence of an instrument has an effect on behavior even if this instrument is not used.

In this setting, where rejection means that the respondent thought the amount claimed by the proposer was too high, punishment may be associated with more control and/or power. However, the presence of the reward option affects the use of punishment: when reward is available in addition to punishment, internal LOC is associated with more rewarding behavior. Internal subjects are more likely to punish when punishment is available alone. In the treatment with most (two-sided) control internals are more willing to reach that stage; interestingly, however, conditional on acceptance the reaction of internals is more lenient than that of externals. It appears that the ability to control payoffs brings internals some utility and they do not actually need to exercise it as much even when offers are potentially unfair. This result is consistent with the findings of Miller (1980) who reports that aversive stimuli seem less aversive to a person who has a perception of control over them.

### 3.5 Reward and punishment sizes

Reward or punishment in our setting is also the amount of money the responder is willing to spend to change the proposer’s payoff. Thus, while the presence of a positive reward or punishment indicates the responder’s reaction, the size of reward or punishment measures the strength of that reaction. By construction, rewards and punishments are nonnegative; therefore, for estimation of the dependence of their sizes on the offer, gender, and LOC we use a censored variable model:

$$\begin{aligned} REWARD_{it} &= \max\{0, \beta_0 + \beta \cdot OFFER_{it} + \gamma \cdot FEMALE_i + \delta \cdot INTERNAL_i + \epsilon_{it}\}, \\ ACCEPT_{it} &= 1, \quad \text{treatments R, R\&P,} \end{aligned} \tag{3}$$

for rewards and a similar equation for punishment in treatments P and R&P. Assuming normality and the random effects structure of the error term, we estimate model (3), and a similar equation for punishment, by the RE tobit. The results are shown in Table 5.

As seen from Table 5, the coefficient estimate on *OFFER* is positive and significant

|                 | <i>REWARD</i>      |                      | <i>PUNISHMENT</i>    |                    |
|-----------------|--------------------|----------------------|----------------------|--------------------|
|                 | R                  | R&P                  | P                    | R&P                |
| constant        | -166.2**<br>(76.3) | -537.7***<br>(166.3) | -560.7***<br>(213.4) | 215.5<br>(134.1)   |
| <i>OFFER</i>    | 0.30***<br>(0.07)  | 0.89***<br>(0.16)    | -0.28*<br>(0.17)     | -0.62***<br>(0.19) |
| <i>FEMALE</i>   | 7.27<br>(13.6)     | -76.6**<br>(34.18)   | 71.2**<br>(32.7)     | -60.4*<br>(33.3)   |
| <i>INTERNAL</i> | 19.3<br>(18.6)     | 71.2*<br>(37.2)      | 133.6***<br>(51.9)   | -31.9<br>(32.4)    |
| Subjects        | 20                 | 17                   | 17                   | 17                 |
| Observations    | 150                | 127                  | 124                  | 127                |

Table 5: Coefficient estimates for the size of rewards/punishments conditional on acceptance (robust standard errors in parentheses). The results are obtained by estimating Eq. (3), and a similar equation for punishment, by random effects tobit for the corresponding treatments. Significance levels: \*\*\* - 1%, \*\* - 5%, \* - 10%.

for reward and negative and significant for punishment in the corresponding treatments (in P, only marginally). Thus, subjects tend to reward higher, and punish lower, offers by larger amounts. Conditional on the offer, there are statistically significant effects of gender and LOC in some treatments, as described below.<sup>11</sup>

**Result 5.** In the treatment with reward and punishment (R&P) females apply smaller rewards and punishments, although for punishment the result is only marginally significant. In the treatment with punishment only (P) females punish by larger amounts.

**Result 6.** In the treatment with reward and punishment (R&P) internal subjects reward by larger amounts, although the effect is only marginally significant. In the treatment with punishment only (P) internal subjects punish by larger amounts.

In treatment P, the effect of gender on punishment sizes is consistent with its effect on the likelihood of punishment (Result 3): females punish both more often, and by larger amounts, than males. In treatment R&P, however, females reward and punish by smaller amounts than males. Recall that the likelihood of applying reward or punishment was

<sup>11</sup>As a robustness check, we ran the RE tobit regression for rewards combining data from treatments R and R&P, and for punishments combining data from treatments P and R&P, using the same variables as in the probit regressions discussed in footnote 10. The results on the signs and significance of coefficients are similar to those reported in footnote 10 and are consistent with the results of the separate regressions reported in Table 5.

not significantly different between males and females in R&P. With the interpretation of small rewards and punishments as symbolic feedback, this combination of results suggests that females' responses are more likely to represent such feedback in R&P.

The effect of LOC on the size of rewards and punishments is consistent with the variation in their likelihood in all treatments (Result 4; see, however, the cautionary note in footnote 9). When both instruments are available, allowing for more control over payoffs, responders with internal LOC act nicer, i.e., they reward more than subjects with external LOC, and their punishment behavior is not different. However, when only the punishment instrument is available, internals use it more often, and stronger, than externals. In both of these cases internals engage in exercising more control over the situation than externals, however they shift their response into the positive domain when they have a two-sided response option. Note that there are no differences in reward behavior in the R treatment indicating that the ability to reward alone does not provide a sufficient perception of control, while the presence of the ability to punish does. The results suggest that giving internals more instruments to affect the outcome of bargaining would raise efficiency by facilitating agreement at a low cost since the instruments are rarely used.

## 4 Discussion and concluding remarks

In this paper, we provide insights into the role of personality in bargaining with rewards and punishments. Specifically, we study the effect of LOC and gender on the behavior in an asymmetric bilateral bargaining setting augmented by costly reward and/or punishment options. Asymmetric bargaining situations, represented here by the ultimatum bargaining, often result in efficiency losses caused by the decision of a responder not to accept an offer even though such a decision deviates from payoff-maximizing behavior.<sup>12</sup> Rewards and punishments are the basic mechanisms of incentive provision that could alleviate such deviations, and we investigate whether personality plays a role in responders' use of these instruments and their decision to accept an offer when such instruments are available.

Our study contributes to the literature on several levels. Firstly, it contributes to the literature on the determinants of rewards and punishments in economic and social settings by considering, unlike most of the previous research, the behavior and personality of the person who is in the position to apply rewards or punishments. Secondly, we explore the

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<sup>12</sup>Efficiency losses in asymmetric bargaining depend on proposers' willingness to make larger offers and these offers being accepted by the responders. In this paper we examine whether efficiency can be enhanced by making responders more agreeable, i.e., being more likely to accept a given offer.

interaction between personality and availability of reward and punishment instruments. Thirdly, our study contributes to the literature on locus of control. Recognized as an important personality trait, it was not previously studied neither in relation to bargaining nor as a determinant of rewarding and punishing behavior in any economic game.

We employ a laboratory experiment with four treatments covering all possible combinations of reward and punishment availability: the baseline ultimatum bargaining treatment without rewards and punishments, reward-only, punishment-only, and the reward and punishment treatments. In our design, rewards and punishments have no strategic reinforcement aspects and thus measure the reactions of responders to the ultimatum offers they receive, separating the effect of personality from otherwise possible strategic considerations.

In the previous research, internal LOC was linked to a more proactive position in interactive situations. Boone et al. (1999a, 1999b) find that internals tend to give more feedback and attempt to influence the behavior of others. Internal LOC was also linked to a more competitive and exploitive style of bargaining (Rubin and Brown 1975, Greenhalgh et al. 1985, Spector 1977), indicating that more internal types are likely to avoid “weak,” and seek “strong” bargaining positions. Hansemark (2003) finds that LOC has predictive validity for entrepreneurial activity (starting a new business), however, this holds only for men, and not for women. These previous results suggest that in our setting participants with internal LOC would be more likely to accept an offer to reach the position where they can apply rewards and punishment. Furthermore, internals may use rewards and punishments more as those allow affecting payoffs while still earning a positive amount, and also serve as a feedback device. On the other hand, the findings of Boone et al. (2002) suggest that internals are more likely to behave in a profit-maximizing manner, i.e., in our setting internals should be more likely to accept an offer even in the baseline treatment, and also apply less rewards or punishments when they are available.

Our first major finding is that internal subjects are more likely to accept the offer when both the reward and punishment options are available upon acceptance. This is consistent with the fact that this treatment offers the largest range of possible payoff adjustment to responders, thus giving them greatest control over payoffs. Having the option to affect payoffs in both directions is perceived as a “stronger” position. The range of possible adjustments upon acceptance is twice as large in the treatment with reward and punishment than in treatments with only one instrument. Responders are less likely to accept an offer when only the reward option is available. The responder’s position in the treatment where the only option is to reward is likely perceived as “weaker.”<sup>13</sup> This

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<sup>13</sup>This conjecture is consistent with Pevnitskaya and Rvkin (2022) who find that proposers offer least

perception may be enhanced by the structure of ultimatum bargaining where proposers make offers that responders can accept or reject, and most offers fall below fifty percent of the pie, which could be perceived as unfair by responders. The reward only treatment does not allow them to bring proposer’s payoffs towards fifty percent of the total amount. Internals, therefore, are less willing to be in this position, and, as a consequence, are less likely to accept a given offer.

Our second major finding is that, although internals are more likely to accept a given offer in the treatment with most control over payoffs, they are more likely to reward proposers upon reaching the post-acceptance stage in this treatment (conditional on the offer) and reward by larger amounts. At the same time, in the treatment with punishment only, internals are more likely to punish and they punish by larger amounts. These findings suggest that although internal LOC is linked to willingness to have most (two-sided) control over payoffs, once this control is gained, they appear to be satisfied and rarely exercise it, responding to the proposers in a nicer way. The two main results may indicate that the LOC personality trait measures the perception of control rather than execution of control.

We find that, conditional on LOC, gender has no effect on acceptance decision in all treatments. This result is consistent with the prior research on the role of personality and gender in the ultimatum and dictator games. Gender, however, affects the reward and punishment decisions in some of our treatments, even conditioning on LOC. Specifically, in the treatment with punishment only, women are more likely to apply punishment and punish by larger amounts. At the same time, in the treatment with both reward and punishment, women reward and punish by smaller amounts.

To conclude, we identified a connection between responders’ locus of control and propensity to use rewards and punishments in an ultimatum bargaining setting. The results suggest that internal LOC is linked to the willingness to accept an offer in a situation with most perceived post-acceptance control even if the instruments of control are costly and end up being rarely used. Future work can extend this study to explore the relationship between LOC and the use of rewards and punishments in a setting where rewards and punishments have strategic aspects, such as repeated interaction with reinforcement.

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(even compared to the baseline) in the treatment where responders can only reward.

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## A The LOC questionnaire

The following 26 statements represent the 13 pairs of statements introduced by Rotter (1966) to measure LOC. Within each pair, one statement is classified as internal (int), and one as external (ext).

- 1-ext Many of the unhappy things in people's lives are partly due to bad luck.
- 1-int People's misfortunes result from the mistakes they make.
- 2-ext There will always be wars, no matter how hard people try to prevent them.
- 2-int One of the major reasons why we have wars is because people don't take enough interest in politics.
- 3-ext Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
- 3-int In the long run, people get the respect they deserve in this world.
- 4-int The idea that teachers are unfair to students is nonsense.
- 4-ext Most students don't realize the extent to which their grades are influenced by accidental happenings.
- 5-ext Without the right breaks, one cannot be an effective leader.
- 5-int Capable people who fail to become leaders have not taken advantage of their opportunities.
- 6-ext No matter how hard you try, some people just don't like you.
- 6-int People who can't get others to like them don't understand how to get along with others.
- 7-int Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.
- 7-ext I have often found that what is going to happen will happen.
- 8-int In the case of the well prepared student, there is rarely, if ever, such a thing as an unfair test.
- 8-ext Many times exam questions tend to be so unrelated to course work that studying is really useless.
- 9-ext Getting a good job depends mainly on being in the right place at the right time.
- 9-int Becoming a success is a matter of hard work; luck has little or nothing to do with it.

- 10-int The average citizen can have an influence in government decisions.
- 10-ext This world is run by the few people in power, and there is not much the little guy can do about it.
- 11-ext It is not always wise to plan too far ahead because many things turn out to be a matter of luck anyway.
- 11-int When I make plans, I am almost certain that I can make them work.
- 12-ext Many times we might just as well decide what to do by flipping a coin.
- 12-int In my case, getting what I want has little or nothing to do with luck.
- 13-ext Sometimes I feel that I don't have enough control over the direction my life is taking.
- 13-int What happens to me is my own doing.