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# How to Protect Entitlements: An Experiment*

**Oren Bar-Gill / Christoph Engel**

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## Abstract

In a full-information, zero transactions costs world, the degree of protection afforded to an entitlement does not affect the likelihood of efficient trade. In reality, imperfect information is often inevitable. Specifically, a party will usually have incomplete information about fairness norms held by the other party – fairness norms that affect the other party's willingness to pay (WTP) or willingness to accept (WTA). Importantly, these fairness norms may depend on how strongly the entitlement is protected. We experimentally test the effect of the degree of protection on the parties' WTP and WTA and on the likelihood of efficient trade by varying the legal remedy for infringing upon the owner's entitlement. We show that our participants can be divided into three groups corresponding to three different fairness norms: negative types whose WTP and WTA are decreasing in the strength of the legal remedy; positive types whose WTP and WTA are increasing in the strength of the legal remedy; and flat types whose WTP and WTA do not depend on the strength of the legal remedy. We find that type is role-dependent, such that a higher WTP and a lower WTA – the combination most conducive to efficient trade – is obtained with a weaker legal remedy.

*JEL:* C78, C91, D12, D63, K11, K12

*Keywords:* property rule, liability rule, damages, compensation, Coase theorem, bargaining, fairness, equality, desert, entitlement, taking

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# I. Introduction

How should entitlements be protected? How should the law respond when Taker infringes upon Owner's entitlement? Should the law grant Owner an injunctive remedy (and perhaps impose a criminal penalty on Taker)? Or should the law only require Taker to pay damages to Owner? And, if so, how much damages? Extending the rational in Coase (1960), Kaplow and Shavell (1996) argued that, as long as transaction costs are low, the type and degree of protection afforded to an entitlement is irrelevant for efficiency. Even if the entitlement were only weakly protected, such that a low-valuation Taker has a credible threat to take from a high-valuation Owner, Coasean bargaining would prevent the inefficient taking. Owner would pay a "bribe" and Taker would go away. On the other hand, how an entitlement is protected has clear distributional implications: stronger protection increases Owner's payoff and decreases Taker's payoff.

These predictions, however, are based on standard rational choice theory. They must be qualified, when real-world behavioral forces are introduced. Preferences for fairness might interfere with Coasean bargaining. A clashing of fairness norms might prevent efficient contracting, as Owner and Taker subscribe to inconsistent notions of what is fair. That fairness norms interfere with Coasean bargaining is, of course, well known. Our contribution is to test how these fairness norms are affected by the type and degree of protection afforded to an entitlement. We thus study the efficiency and distributional implications of the critical policy choice how to protect an entitlement.

We conduct an experiment that randomly matches participants into groups of two, one Owner and one Taker. Owner has to earn one unit of a token good by a laborious real effort task. Her induced valuation for this good is high (48). Taker can take the good. Her valuation for the good is only half as high (24). It therefore is efficient if the good is not taken. The parties are given the opportunity to strike a deal, such that Taker gives up her ability to take the good in exchange for a bribe paid by Owner. We implement ultimatum bargaining. Owner makes an offer that Taker may accept or reject. Our treatments are within subjects. The first treatment captures the essence of a property rule: if Taker takes the good, the experimenter takes it back and returns it to Owner. The remaining six treatments correspond to a liability rule with varying levels of damages: if the good is taken, then Owner is only compensated by a monetary transfer of 30, 24, 18, 12, 6 or 0. (A transfer of 0 is equivalent to granting Taker a property right in the good.)

From a welfare perspective, our results are rather comforting. In the property rule treatment, efficiency is mechanical. We thus focus on the liability rule treatments. On average, in 77.19% of all (liability rule) cases the good stays with Owner, as is efficient. Yet, this efficient outcome can only partially be attributed to successful Coasean bargaining: the parties strike a deal in only 37.89% of the liability cases. In 23.33% of the liability cases Owner does not make an offer in the first place. And, of the 76.66% of cases where Owner makes an offer, in 50.57% the offer, i.e. Owner's willingness to pay (WTP), is below the minimum offer that

Taker is willing to accept (WTA). The relatively good welfare balance is due to the fact that only 36.72% of those participants who have kept the ability to take the good act upon it.

These findings are driven by a clash in fairness norms. In particular, we identify three distinct groups or types of participants:

(1) Negative types: Taker's WTA and Owner's WTP are decreasing in the strength of the legal remedy. This group is *grosso modo* in line with the expectations of standard economic theory. When Owner's entitlement is more strongly protected, Taker's outside option becomes less attractive and thus Taker's WTA decreases. Also, when Owner's entitlement is more strongly protected, Owner's outside option becomes more attractive and thus Owner's WTP decreases.

(2) Flat types: Taker's WTA and Owner's WTP do not vary with the strength of the legal remedy. This group of participants believes in the equality of outcomes. They essentially do not react to our treatment manipulation.

(3) Positive types: Taker's WTA and Owner's WTP increase with the strength of the legal remedy. For these participants, a higher degree of protection reduces the harm to Owner from a taking, such that taking becomes more acceptable. As a result, Taker demands a higher bribe to refrain from taking the entitlement (higher WTA); and Owner is willing to pay a higher bribe to prevent a taking (higher WTP).

This type heterogeneity creates informational asymmetry that explains the relatively low probability of a successful deal. In particular, with such heterogeneity it is more difficult for Owner to predict Taker's WTA and, as a result, more offers are rejected. Finally, our analysis provides guidance to policymakers tasked with determining how entitlements should be protected. Efficiency requires successful bargaining between Owners and Takers. Such bargains are more likely when Takers have lower WTA and Owners have higher WTP. We find that many Takers are positive types, whereas many Owners are negative types. Therefore, surprisingly, a weaker legal remedy can be more conducive to efficient bargaining.

The remainder of the paper is organised as follows. Section 2 presents the design of the experiment. Section 3 places our experiment into the framework of the literature and formulates hypotheses. Section 4 reports results. Section 5 concludes with discussion.

## 2. Design

In the main experiment, participants are randomly assigned to groups of two, one Owner and one Taker. Each of them receives an endowment, $E$, which is large enough to rule out limited liability concerns. The experiment has two stages. In the first stage, one of the two group members, Owner, is given a laborious real effort task (it has for instance been used by Falk and Huffman 2007): Owner has to correctly count the number of 1s in 10 tables of size 10x10 with 1s and 0s. In recompense, she receives a token. The experimenter pledges to buy this token from her at the end of the experiment at price *h*, should she then be in possession of the token.

In the second stage, participants learn that the other group member, Taker, will have the possibility to take this good at the third stage of the experiment. If Taker takes the good, the experimenter buys the good from her at the end of the experiment at price $l < h$. Such a taking, however, will trigger a remedy. Specifically, we test seven different remedies (namely, seven different treatments):

1. Taker may take the good without having to pay damages (d = 0)
2. If she takes the good, she has to pay d = 1/4 * *l*
3. ~ *d = 1/2 * l*
4. ~ *d = 3/4 * l*
5. ~ *d = l*
6. ~ *d = 5/4 * l*
7. She must give the good back.

Using the strategy method (Selten 1967), we ask Owner, for each one of the seven treatments, whether she wishes to make an offer to Taker and, if so, how much she is willing to pay (WTP) to avoid a taking. Also, we ask Taker, for each one of the seven treatments, to report the lowest offer she would be willing to accept (WTA). We also ask him, again separately for each of the seven treatments, whether he wishes to take the good should her counterpart not make an offer, or should the offer be below the cutoff he has set. If an offer is made and accepted, a contract is concluded that will be perfectly enforced by the experimenter. In this contract, Taker gives up the right to take the good for a price (bribe) paid by Owner. This price is the Owner's stated WTP.

At the very end of the experiment, one of the seven treatments is randomly chosen to be payoff relevant. Each situation has the same probability to be chosen. This is common knowledge. If Owner's offer is above or at the cutoff that Taker has set, the deal is struck and executed, and Owner pays the price she has stated. Otherwise the good is given to Taker, if she had (conditionally) decided to take. Then the stipulated remedy applies: the good is given back to the original owner in the first situation, or the owner receives compensation, as applicable. In the experiment we set $E=60, h=48, l=24, d \in \{0,6,12,18,24,30\}$.[1]

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1 The experimental design implements an incentive-compatible elicitation of Taker's WTA, which reflects Taker's reservation price. Taker gains nothing from overstating his WTA. Indeed, if Taker reports a WTA above his true reservation price, he reduces the probability of a payoff-increasing deal without increasing the price that he gets if a deal is struck (this price is determined solely by Owner's offer). The experimental design also implements an incentive-compatible elicitation of Owner's WTP, but this WTP measure merits further clarification: In our design, Owner's WTP does not reflect Owner's reservation price (defined as the maximum amount Owner would be willing to pay, such that Owner would still prefer a deal to her outside option). Indeed, Owner would be expected to offer a price, i.e., state a WTP measure,

To gain insight into the cognitive and motivational effects, after the main experiment but before we give feedback about choices in the main experiment, we elicit beliefs. We ask Takers to postdict how many Owners made an offer, and the size of the offer, for each of the seven situations. We ask Owners to postdict the mean offer that has been accepted. All postdictions are incentivized.[2] We further administer standard tests for risk aversion (Holt and Laury 2002) and ambiguity aversion (Ellsberg 1961), and the short version of the Big5 personality inventory (Rammstedt and John 2007), and ask for demographic information. Before the beginning of the main experiment, participants have to answer control questions. They have to indicate the correct payoffs for both parties and two different regimes, provided a deal is struck, and provided there is no deal and the second participant takes the good.

The experiment was run at the Econ Lab of Hamburg University. The experiment was programmed in zTree (Fischbacher 2007). Participants were invited with hroot (Bock, Baetge et al. 2014). 190 students with various majors participated. 97 (51.05%) were female. Mean age was 24.97. Participants on average earned 13.51 €,[3] 14.21 € for Owners and 12.81 € for Takers.

The experiment is designed to rule out several known reasons why Coasean bargaining does not yield the efficient outcome. We fix transaction costs at zero (cf. King 1994, Shogren 1998, Rhoads and Shogren 1999, Croson and Johnston 2000, Cherry and Shogren 2005). Preferences (valuations) are common knowledge (cf. Prudencio 1982)[4] (Hoffman and Spitzer 1982, Croson and Johnston 2000, Ayres 2005). Participants are not under time pressure (cf. Prudencio 1982, Harrison, Hoffman et al. 1987). Interaction is completely anonymous, and communication is exclusively through the negotiation protocol (cf. Hoffman and Spitzer 1982, Prudencio 1982). There is no shadow of the future, and hence no room for establishing a relationship or for reputational concerns (cf. Hoffman and Spitzer 1982, Harrison and McKee 1985). Contracts are perfectly enforced (cf. Harrison and McKee 1985).

below her reservation price. The lower price reduces the probability of a deal, but increases Owner's payoff if a deal is struck. Owner will balance these two effects, based on her beliefs about Taker's WTA. Accordingly, our design implements an incentive-compatible elicitation of Owner's WTP, as we define it, but not of Owner's reservation price. Note that this is not a limitation of internal validity, given our research question. We do not want to predict reservation prices in the population. We want to learn in which ways different remedies affect the likelihood of the welfare maximizing allocation of the good. The design is also externally valid. In the field, Owner and Taker would not know the true reservation price of their counterpart, and would have to rely on their beliefs. See also Section 4(b) below.

2 For further details about the experimental design, please see the instructions in the Appendix.

3 Which was equivalent to $14.37 on the first day of the experiment.

4 The critique by Norton and Patrick (1985) does not concern this point.

## 3. Hypotheses

### a) Standard Theory

With common knowledge of rationality, participants reason backwards. If no contract hinders her and $d < l$, Taker takes the good; if $d > l$, there is no taking. Moving to the bargaining stage: If $d > l$, Taker's threat to take is not credible, and thus Owner offers nothing. If $d < l$, Taker's threat to take is credible. Taker will accept any offer larger than $l - d$; and Owner who has all the bargaining power will offer $l - d + \varepsilon$. (With $d = l$, the owner is indifferent between making an offer and not making one.) Irrespective of treatment, Coasean bargaining creates efficiency. We predict:

**$H_1$:** a) Irrespective of treatment, Owner keeps the good.
b) If Owner can claim the good back or if $d > l$, there is no contract.
c) If $d < l$, Owner offers Taker $l - d + \varepsilon$ in exchange for giving up the right to take, and Taker accepts.

### b) Behavioral Theory

The predictions from standard theory are qualified by well-known behavioural effects, specifically by the parties' preferences for fairness. Importantly, there are different possible understandings of what is fair in this context.

*Competing Fairness Norms.* We begin with notions of fairness that are independent of our treatments – that do not depend on how the entitlement is protected. First, participants might desire equal outcomes, such that the fair contract price would be: $h/2 = l = 24$. Second, participants might deem it appropriate to split in half the gains from avoiding an inefficient taking, such that the fair contract price would be: $(h-l)/2 = 12$.

Other notions of fairness depend on how the entitlement is protected. For example, participants may consider outside options, as defined by the degree of protection, and define a fair bargain as the cooperative Nash bargaining outcome (Nash 1950). The fair contract price would be: $(h+l)/2 - d$.[5]

5 Writing *o* for the size of the offer, the result can be found by maximizing the following equation wrt *o*: $(h-o-d)(o-l+d)$. The first bracket is the original possessor's payoff if trade occurs, minus her outside option. The second bracket is the potential taker's payoff, minus her outside option.

Table 1 summarizes alternative definitions of fairness, as a function of the seven treatments.

| Damages | Owner's Outside Option | Taker's Outside Option | Nash Bargaining | Equal Payoffs | Equal Gains from Avoiding Inefficient Taking |
|---|---|---|---|---|---|
| *d* | *d, or if d>l: h* | *l-d, or if d>l: 0* | *(h+l)/2 - d* | *h/2* | *(h-l)/2* |
| 0 | 0 | 24 | 36 | 24 | 12 |
| 6 | 6 | 18 | 30 | 24 | 12 |
| 12 | 12 | 12 | 24 | 24 | 12 |
| 18 | 18 | 6 | 18 | 24 | 12 |
| 24 | 24 | 0 | 12 | 24 | 12 |
| 30 | 48 | 0 | 6 | 24 | 12 |
| back | (48) | (0) | (0) | 24 | 12 |

**Table 1: Alternative Notions of Fairness**

Another notion of fairness, not included in Table 1, is the fairness norm of entitlement (on this fairness norm see Hoffman and Spitzer 1985, Kahneman, Knetsch et al. 1986): it is fair that those who had to work hard, or those that have otherwise been singled out as worthy recipients, end up with a larger share of the pie. In the experiment, owners have to work for the good in all treatments, but stronger protection may trigger a stronger sense of entitlement. This implies a positive correlation between WTP and the degree of protection afforded to the entitlement. This fairness norm may also be related to the endowment effect.[6] Moreover, since the design of the experiment empowers Owner to make a take it or leave it offer, she might feel entitled to receive a higher payoff. The original possessor may also consider it normative-

6 See Lewinsohn-Zamir (2001). The endowment effect has been tested in the experiment that is closest to ours (Rachlinski and Jourden 1998). They ask participants to indicate a hypothetical choice in one of two vignettes. The first vignette describes a conflict between neighbors, with the additional flavor of a conflict between environmental protection and profit. The second vignette describes a conflict over the supply of a rare plant, and again introduces a conflict between environmental protection and profit. The law either protects the participant or her opponent, and either uses a property right, high or low damages. The authors are interested in the endowment effect, as a function of the legal remedy. They find a pronounced gap between willingness to accept and willingness to pay if there is a property right, but not with low damages. With high damages, results differ between the two vignettes. Overall, and contrary to the Coase theorem, the good in question is very unlikely to trade. Trade is least likely when the owner enjoys property right protection. But this effect might at least partly be explained by the loaded environmental frame of both vignettes.
Our experiment is deliberately unframed. The good is a mere token. No endowment effect has been found with tokens (Kahneman, Knetsch et al. 1990). Attachment, which is one potential source of the endowment effect, is unlikely to form with tokens (cf. Kelman 1978, Brosnan, Jones et al. 2007). We also avoid talking about property, and simply define the remedy in case the second participant takes the good. This also makes it unlikely that we see an effect of what the behavioral literature calls the expressive function of law (McAdams 2000b, McAdams 2000a, McAdams and Nadler 2005, McAdams 2015). Regret, another potential source of the endowment effect, is also unlikely to be triggered, since the role of Owner is assigned by the experimenter (cf. Gilovich and Medvec 1995). By contrast, loss aversion may be a relevant concern, as the initial allocation of the good alters the reference point against which the first participant evaluates each state of the world (Kahneman, Knetsch et al. 1991, Tversky and Kahneman 1991, Thaler, Tversky et al. 1997, Köszegi and Rabin 2006). Arguably this effect is even more likely since Owner had to work for the good, while Taker just has the technical possibility to seize the good. This might create an imbalance in terms of equity (on this fairness norm see Charness and Haruvy 2002, Beckman, Formby et al. 2004, Balafoutas, Kocher et al. 2013).

ly desirable that she keep the good because this is the efficient outcome (on the efficiency motive as a determinant of behaviour see Charness and Haruvy 2002, Engelmann and Strobel 2004). Yet takers may also be motivated by the fairness norm of entitlement. Since they are given the ability to take the good and since the bargaining protocol gives them the power to veto any offer, Takers might conclude that they are entitled to a large payment, the more so the smaller the compensation.

A final harm-based fairness norm bears emphasis. A higher degree of protection reduces the harm to Owner from a taking and makes a taking more acceptable. As a result, Taker demands a higher bribe to refrain from taking the entitlement (higher WTA); and Owner is willing to pay a higher bribe to prevent a taking (higher WTP). This fairness norm is consistent with Gneezy and Rustichini (2000), where a higher fine (which is equivalent to higher compensation) increased the subjects' willingness to violate the rule.

The different fairness norms can be divided into three groups: (1) fairness norms that imply a negative relationship between the remedy and WTP/WTA (hereinafter: "negative fairness norms"), (2) fairness norms that imply a positive relationship between the remedy and WTP/WTA (hereinafter: "positive fairness norms"), and (3) fairness norms that imply a zero correlation, or flat relationship, between the remedy and WTP/WTA (hereinafter: "flat fairness norms").

The existence of different plausible fairness norms allows for a clash of norms that might prevent an efficient Coasean bargain (Konow 2000). "A party may ask for too much, misconceiving the other's true position" (Kaplow and Shavell 1996: 764). In our setup, the rich set of potential fairness norms makes it particularly difficult to predict the other party's willingness to pay or accept (Bar-Gill and Engel 2016). The problem is exacerbated by the self-serving bias (Loewenstein, Issacharoff et al. 1993, Babcock and Loewenstein 1997), which looms particularly large in ambiguous situations (Haisley and Weber 2010). Different, self-serving fairness interpretations by Owner and Taker might create an obstacle to efficient trade.

*Predicted treatment effects.* With property rule protection, i.e., if the remedy for taking is the enforceable right of Owner to get the good back, efficiency is not at risk. The efficient outcome cannot be thwarted by a clash of fairness norms. These behavioral effects may however be present in the remaining six treatments. (With compensation of 24 or 30, taking the good does not increase Taker's profit. But depending on the strength of her fairness concerns, she may nonetheless take. In anticipation, Owner may nonetheless make an offer.) We thus have (partly) competing hypotheses:

H2: a) In the property rule treatment, Owner keeps the good.
b) In the liability rule treatments, a significant fraction of Owners do not keep the good.
c1) In the liability rule treatments, willingness to pay and willingness to accept decrease in the amount of compensation.

c2) In the liability rule treatments, willingness to pay and willingness to accept increase in the amount of compensation

# 4. Results

## a) Descriptives

Figure 1 summarizes descriptive statistics. Owners very often make an offer. In principle offers are more likely, when the entitlement is weakly protected (i.e., when damages for taking are lower). Except that when the Owner is not protected at all (i.e., when damages are zero), only 58% of Owners make an offer. Interestingly, 55% of Owners make an offer even when taking is pointless since the good is protected by a property rule. By the design of the experiment, Owners only indicate their willingness to pay (WTP) if they make an offer. Therefore, the WTP data is subject to selection. With this caveat in mind, we see that WTP is lower, when the Owner enjoys stronger protection. (In particular, the 58% of Owners who make an offer when damages are zero, make a very large offer.) Except that the 55% of Owners who enjoy the strongest, property rule protection also make high offers.

Turning to Takers, generally a Taker's willingness to accept (WTA) is higher, when Owner is better protected. Except that Takers' WTA is also high when Owner is not protected at all. Quite a few Takers decide to take the good if the Owner's offer is below their willingness to accept. We observe some clearly irrational behavior – 52% of Takers take the good when damages exceed their valuation (d30), and 37% of Takers take the good if a property rule is in place. Overall, contracts are not frequent. When Owner enjoys stronger protection, a contract is less likely.

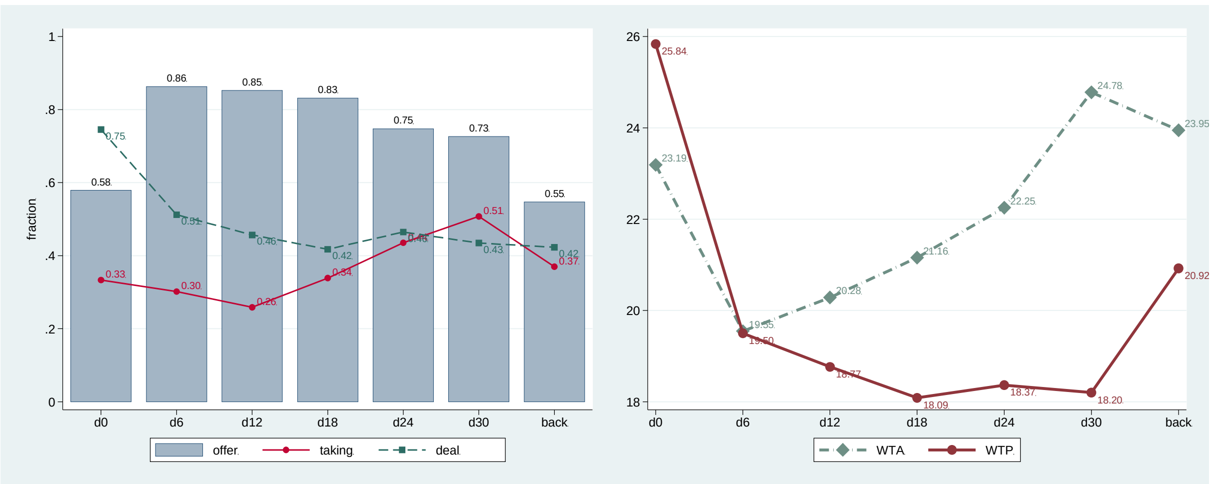


**Figure 1: Descriptive Statistics**
deal: probability of a deal provided Owner has made an offer
taking: percentage of Takers who take if there is no deal

### b) Standard Theory

Our results are, at best, only partially consistent with standard theory as summarized in H1. See Table 2 below. In most cases, the standard theory predictions for both WTA and WTP fall outside the empirical 95% confidence interval generated by our data. In the property rule and d30 regimes, standard theory predicts no bargain. Yet, we obtain positive WTAs and WTPs. In the lower damages regimes, standard theory predicts that Taker's WTA will be $l - d + \varepsilon$. (Table 2 sets $\varepsilon$ at the smallest positive increment available to participants, i.e. 1.) According to standard theory, the maximum amount that Owner would be willing to pay is $h - d + \varepsilon$, based on Owner's outside option (and independent of the parties' relative bargaining power). But since Owner has all the bargaining power, standard theory predicts that Owner will offer $l - d + \varepsilon$, and we call this offer WTP. Indeed, we believe that the instructions (provided in the Appendix), when asking for Owner's WTP, would reasonably be understood as asking how much Owner would offer, given that Owner has all the bargaining power. In any event, standard theory predicts an inverse relationship between the degree of protection (specifically, the level of damages) and both WTA and WTP. While we observe such an inverse relationship for WTP (excluding the property rule regime), on average WTA is actually increasing in the degree of protection (excluding the zero damages regime).

| | Taker's WTA | | | Owner's WTP | | |
|---|---|---|---|---|---|---|
| | Standard Theory | Data | | Standard Theory | Data | |
| | | Point Estimate | Confidence Interval | | Point Estimate | Confidence Interval |
| d0 | 25 | 23.19 | [18, 26] | 25 | 25.84 | [25, 27] |
| d6 | 19 | 19.55 | [16, 21] | 19 | 19.50 | [16, 21] |
| d12 | 13 | 20.28 | [17, 21] | 13 | 18.77 | [15, 19] |
| d18 | 7 | 21.16 | [17, 22] | 7 | 18.09 | [15, 18] |
| d24 | 0 | 22.25 | [19, 24] | 0 | 18.37 | [14, 19] |
| d30 | 0 | 24.78 | [21, 27] | 0 | 18.20 | [14, 19] |
| back | 0 | 23.95 | [21, 26] | 0 | 20.92 | [15, 24] |

**Table 2: Testing the Predictions of the Standard Theory – WTP and WTA**
confidence intervals are from a series of one sample ranksum tests against the null hypothesis that WTP or WTA is x
intervals report the lowest and the highest x that is not rejected at the 5% level

The probability that Owner makes an offer and the probability that a deal is struck are also inconsistent with standard theory. Again, we expect no offer and thus no deal when Taker has no credible threat to take; yet we see a substantial number of offers and deals in these scenarios. When Taker has a credible threat, standard theory predicts a 100% probability of both offers and deals. We see a large, though not 100%, probability of offers, but a much lower probability of deals. See Table 3.

| | Probability that Owner Makes an Offer | | | Probability of a Deal if Owner has Made an Offer | | |
|---|---|---|---|---|---|---|
| | Standard Theory | Data | | Standard Theory | Data | |
| | | Point Estimate | Confidence Interval | | Point Estimate | Confidence Interval |
| d0 | 1 | 0.58 | [.45, .75] | 1 | 0.75 | [.65, .8] |
| d6 | 1 | 0.86 | [.75, .95] | 1 | 0.51 | [.45, .6] |
| d12 | 1 | 0.85 | [.75, .95] | 1 | 0.46 | [.4, .55] |
| d18 | 1 | 0.83 | [.7, .9] | 1 | 0.42 | [.35, .5] |
| d24 | 0 | 0.75 | [.6, .85] | N/A | 0.46 | [.4, .55] |
| d30 | 0 | 0.73 | [.6, .85] | N/A | 0.43 | [.35, .55] |
| back | 0 | 0.55 | [.4, .7] | N/A | 0.42 | [.3, .55] |

**Table 3: Testing the Predictions of Standard Theory – Probability of Offer and Deal**
confidence intervals are from a series of binomial tests against the null hypothesis that WTP or WTA is x
intervals report the lowest and the highest x that is not rejected at the 5% level

Turning to efficiency, standard theory predicts 100% efficiency. While we don't get a 100% efficiency, the probability of efficient outcomes is relatively high across treatments. This rather high degree of efficiency is however not attributed to successful Coasean bargaining. (Recall that the probability of a deal is relatively low across treatments). Rather, the higher degree of efficiency results from the fact that Takers are reluctant to take when Owner's offer is below their WTA, Table 4.

| | Probability of Efficient Outcome | | | Probability of Taking when WTP < WTA | | |
|---|---|---|---|---|---|---|
| | Standard Theory | Data | | Standard Theory[7] | Data | |
| | | Point Estimate | Confidence Interval | | Point Estimate | Confidence Interval |
| d0 | 1 | 0.81 | [.75, .85] | N/A | 0.33 | [.25, .45] |
| d6 | 1 | 0.83 | [.75, .9] | N/A | 0.30 | [.2, .4] |
| d12 | 1 | 0.84 | [.8, .9] | N/A | 0.26 | [.2, .35] |
| d18 | 1 | 0.78 | [.7, .8] | N/A | 0.34 | [.25, .45] |
| d24 | 1 | 0.72 | [.65, .7] | N/A | 0.44 | [.35, .55] |
| d30 | 1 | 0.65 | [.6, .7] | N/A | 0.51 | [.4, .6] |
| back | 1 | 1 | 1 (by design) | N/A | 0.37 | [.3, .45] |

**Table 4: Testing the Predictions of Standard Theory – Probability of Efficient Outcome and of Taking**
confidence intervals are from a series of binomial tests against the null hypothesis that WTP or WTA is x
intervals report the lowest and the highest x that is not rejected at the 5% level

7 Under standard theory, WTP and WTA are irrelevant in treatments back and d30. In all other treatments, WTP is always larger than or equal to WTA (see discussion at the beginning of Section 4.b).

### c) Behavioral Theory

We thus largely reject the predictions from standard theory and turn to the behavioral alternative. Less than 100% efficiency is very common in bargaining experiments. Indeed, the overall percentage of efficient outcomes in our study, 77.19%, is very much in line with the percentage of efficient outcomes obtained in other bargaining experiments (see, e.g., the meta-study by Prante, Thacher et al. (2007) which found that 69% of outcomes were efficient). That WTP and WTA measures differ from standard game-theoretic predictions is also very common in the literature, with the difference attributed to fairness norms (Babcock, Loewenstein et al. 1995, Babcock and Loewenstein 1997, Falk, Fehr et al. 2003, Bereby-Meyer and Niederle 2005).

The most interesting finding, in our study, has to do with the relationship between the remedy for a taking, which represents the strength of the legal protection that Owner enjoys, and the WTP and WTA measures. As explained in Section 3(b), this relationship depends on the relative importance of different fairness norms. In particular, we have seen that there are three groups of fairness norms: (1) negative fairness norms that imply a negative relationship between the remedy and WTP/WTA, (2) positive fairness norms that imply a positive relationship between the remedy and WTP/WTA, and (3) flat fairness norms that imply a zero correlation, or flat relationship, between the remedy and WTP/WTA. Which of these (groups of) fairness norms dominates?

Looking at Figure 1, overall we see a negative relationship between the remedy and WTP, but a positive relationship between the remedy and WTA. As the regressions in Table 5 show, these visual impressions are supported by statistical analysis.

| | WTP | WTA |
|---|---|---|
| remedy | -.504*<br>(.198) | .525**<br>(.197) |
| cons | 22.036***<br>(1.354) | 20.065***<br>(.882) |
| N | 489 | 665 |

**Table 5: Relationship between Damages and WTP/WTA**
linear regressions with individual random effects, Hausman test insignificant on both models
WTP only available for owners who decide to make an offer
WTP: willingness to pay of owner
WTA: willingness to accept of potential taker
remedy: 1 d0, 2 d6, 3 d12, 4 d18, 5 d24, 6 d30, 7 back
standard errors in parentheses
*** $p < .001$, ** $p < .01$, * $p < .05$

Seemingly fairness norms are role-dependent. Overall, Owners subscribe to negative fairness norms, whereas most Takers subscribe to positive fairness norms. Yet as the following analysis shows, averages obscure that, in both roles, we find substantial fractions of participants who can be classified as adhering to either positive, flat or negative fairness norms. In statistical jargon, we find heterogeneous treatment effects.

We focus on the d6, d12, d18, d24 and d30 treatments, and use the slope of the parties' WTA or WTP choices across these treatments to classify each party as a positive type, a flat type or a negative type. (We exclude the back and d0 treatments as outliers.) In the appendix, we show that this measure organizes the data very well. Within each type, there is considerable variance regarding the level of WTA or WTP, but fairly little variance regarding the slope.[8]

Figure 2 depicts Owner's WTP as a function of the remedy, separately for each of the three types. It also reports beliefs. For positive and negative types, beliefs and choices match very well. For flat types, beliefs and choices have the same flat tendency, but not the same size. The match between beliefs and choices makes us confident that types are not spurious, and that positive types do not simply result from confusion, but rather represent participants who interpret a strong position of Owner as a justification for taking.

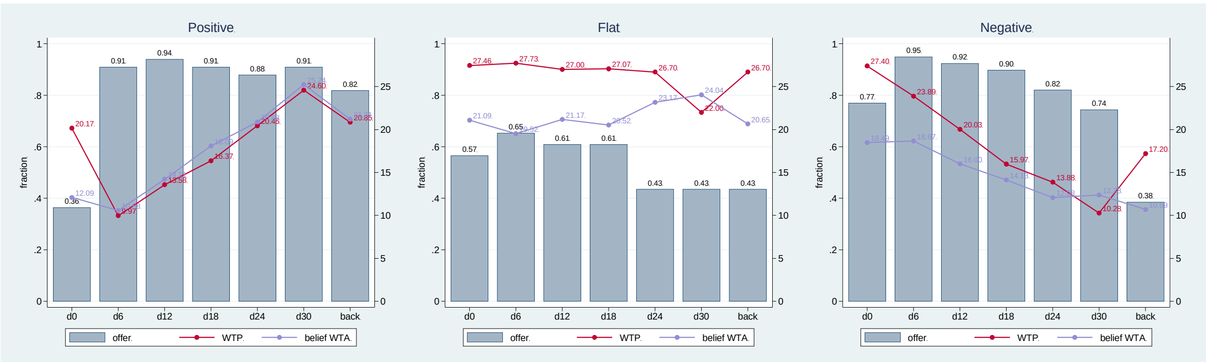


**Figure 2: Three Distinct Types of Owners**

Similarly, Figure 3 depicts Taker's WTA as a function of the remedy separately for each of the three groups. We again find the same three types, and we again find a good match between choices and beliefs. This gives us further confidence that all three types reflect different, characteristic interpretations and normative assessments of the situation, in the light of competing fairness norms.


**Figure 3: Three Distinct Types of Takers**
take: probability that Taker takes if there is no deal

8 The classification algorithm is available from the authors upon request.

The regressions show that the relationship between beliefs and choices is indeed systematic both for WTA and WTP:

| | WTP | WTA |
|---|---|---|
| belief | .453***<br>(.036) | .359***<br>(.039) |
| cons | 11.948***<br>(1.235) | 15.837***<br>(1.339) |
| N | 489 | 665 |

**Table 6: Relationship between Damages and WTP/WTA**
linear regressions with individual random effects, Hausman test insignificant on both models
WTP only available for owners who decide to make an offer
WTP: willingness to pay of owner
WTA: willingness to accept of potential taker
standard errors in parentheses
*** p < .001, ** p < .01, * p < .05

Finally, we compare the relative size of the three groups for subjects that were (randomly) assigned the role of Owner as compared to subjects that were (randomly) assigned the role of Taker. This comparison is depicted in Figure 4 below.

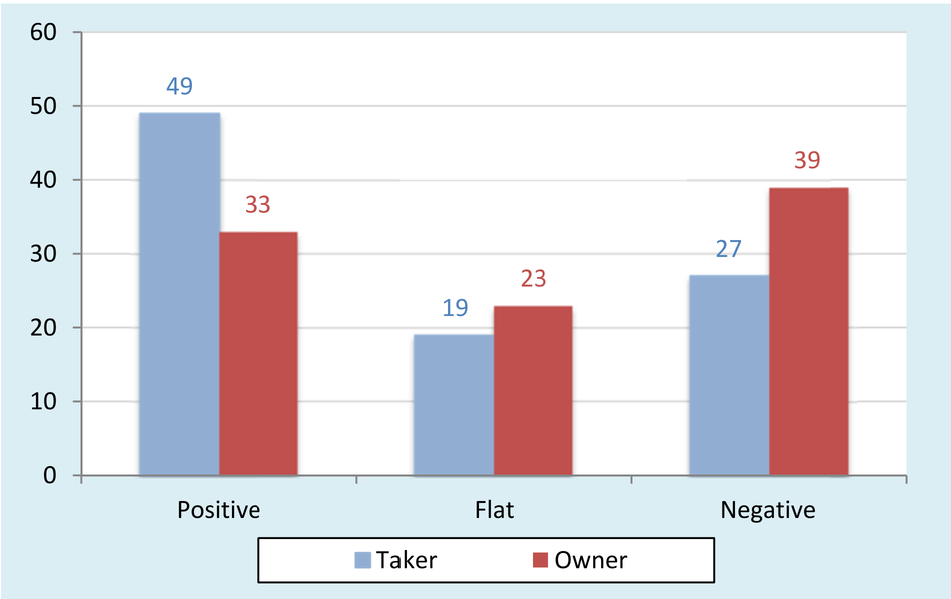


**Figure 4: Role Dependent Types**

We see that, indeed, Owners are more likely to subscribe to negative fairness norms, whereas Takers are more likely to subscribe to positive fairness norms. This relationship is systematic, (chi square (1) = 5.1995, p = .023). Such role-dependent beliefs can be attributed to a self-serving bias. For Owner, stronger remedies readily translate to a lower willingness to pay (as predicted by standard theory). For Taker things are different: Recall that Owner has to earn the good in a laborious task. If Taker takes the good, she violates the fairness norms of entitlement (Owner looses the good) and of desert (the assignment of the good reflects a difference in effort). This makes it difficult for Takers with sensitivity towards fairness to take the good. This hesitance is reflected in the fairly low take rate (Figure 1). If Taker holds positive fairness preferences, she has access to an excuse: if she takes the good and compensation is high, she does not completely deprive Owner of what she deserves. She makes outcomes more equal without grossly violating due respect for entitlement and desert. It is therefore not surprising that more Takers, and fewer Owners, subscribe to this particular fairness norm.[9]

As Figure 2 and Figure 3 show, all participants try to match their WTA/WTP choices with their beliefs about their bargaining partners' WTP/WTA choices. Still, there are relatively few successful deals. Why? The reason is simply that a party's beliefs about her partner's WTP/WTA choices are often wrong. Importantly, a party might hold mistaken beliefs about her partner's WTP/WTA choices, while correctly estimating the partner's type. Indeed, a party who correctly believes that she and her partner are of the same type can even be less likely to strike a deal with that partner. Consider a positive-type Owner and a strong remedy (d30). This Owner will have a high WTP. If Taker is also of positive type, then Taker will have a high WTA; and possibly this WTA will exceed Owner's WTP, resulting in failed negotiations. In contrast, if Taker is of negative type or flat type, then Taker will have a lower WTA and the probability of a successful deal increases. Similarly, consider a negative-type Owner and a weak remedy (d6). This Owner will have a high WTP. If Taker is also of negative type, then Taker will have a high WTA; and possibly this WTA will exceed Owner's WTP, resulting in failed negotiations. In contrast, if Taker is of positive type or flat type, then Taker will have a lower WTA and the probability of a successful deal increases.

## 5. Conclusion

In a complete information environment, standard theory predicts 100% efficiency, independent of remedy. Regardless of whether Owner enjoys strong protection or weak protection, the efficient outcome obtains. When Owner's entitlement is only weakly protected, she will need to pay Taker to prevent a taking. But the inefficient taking will not occur. This happy result does not survive the introduction of well-documented behavioral forces. Fairness concerns pull parties' WTP and WTA away from the predictions of standard theory, and away from each other. And when Taker's WTA exceeds Owner's WTP, Coasean bargaining cannot secure efficient outcomes. This is not surprising: Unobservable fairness concerns introduces information asymmetries, which are known to prevent efficient bargains.

Our experiment tested the effect of the legal remedy – how strong Owner's entitlement is protected – on the parties' fairness concerns, on their WTP and WTA, and on the likelihood of an efficient outcome. We identified three distinct types: (1) positive types whose WTP or WTA

9 We administered a series of post-experimental tests: for social value orientation, for risk aversion, for ambiguity aversion, and for the personality characteristics of the Big5 inventory. None of them explains why certain participants subscribe to certain fairness norms. This suggests that we see a type of fairness norm(s) that is not captured by any of these standard measures, specifically, the notion that taking is more permissible when Owner is more strongly protected.

increases with the strength of the legal remedy, (2) negative types whose WTP or WTA decreases with the strength of the legal remedy, and (3) flat types whose WTP or WTA does not vary with the strength of the legal remedy. The existence of different types reduces the likelihood of a successful trade, since the heterogeneity of types makes it more difficult for Owner to predict Taker's WTA.

Our results offer guidance to a policymaker tasked with determining the strength of the legal remedy. When the policymaker can verify which party attaches a higher value to the asset, she should simply allocate the asset to that party and choose the strongest, property rule remedy, which ensures efficiency without a need for bargaining. When the policymaker does not know which party attaches a higher value to the asset, the choice of remedy becomes more subtle. Specifically, the policymaker may want to choose a remedy that maximizes the probability of a successful deal. We find that more Owners are of negative type, whereas more Takers are positive types. This means that a weak remedy increases Owners' WTP and reduces Takers' WTA. Both effects work to increase the probability of a successful deal. We obtain a surprising result: Efficiency is maximized when entitlements are weakly protected.

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# Appendix
# Individual Choices

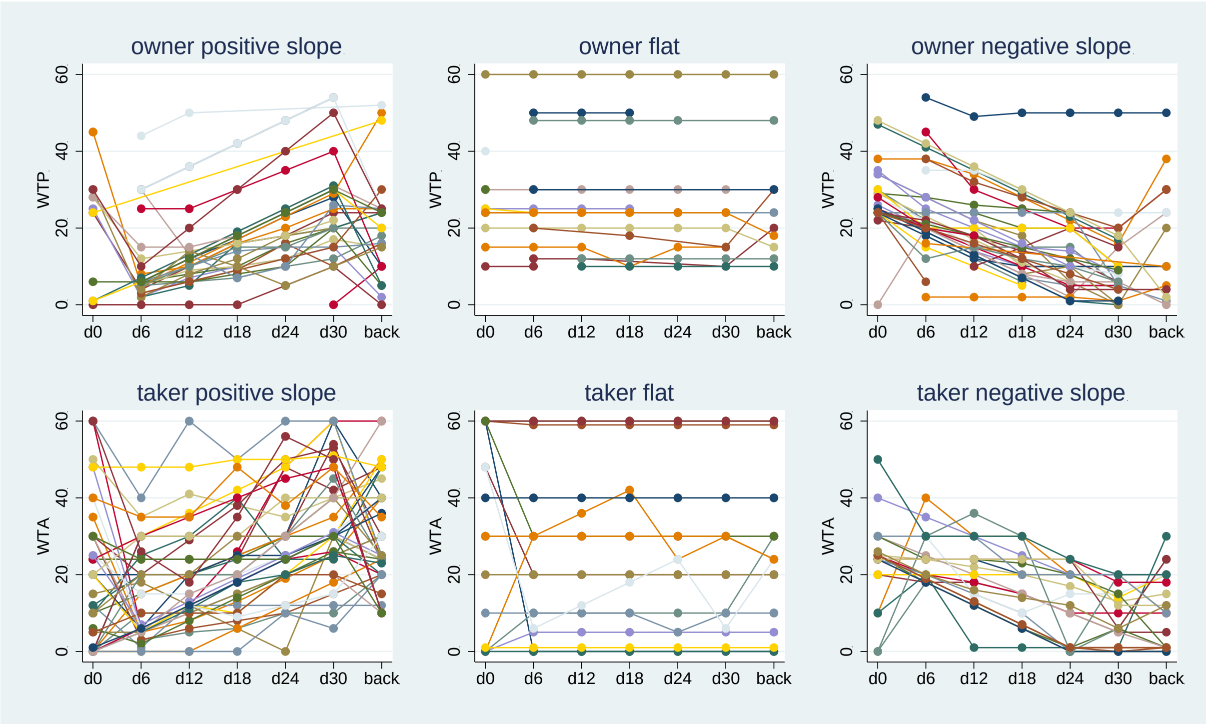


**Figure 5**
**Willingness to Pay and Willingness to Accept from all Participants**

# Instructions
# General Instructions

You are now taking part in an experiment. If you read the following instructions carefully, you can, depending on your decisions, earn a considerable amount of money. It is therefore important that you take your time to understand the instructions.

**Please do not communicate with the other participants during the experiment.** Should you have any questions please ask us.

All your choices remain **completely anonymous**.

The experiment consists of five independent parts. Your decisions in one part of the experiment do not affect your payoffs and decisions in other parts of the experiment. In the following you receive the instructions for part 1. You will receive instructions for the other parts of the experiment before the beginning of the respective part.

You will receive feedback on all parts of the experiment at its very end. It is at this point that we will inform you about your payoff from each part of the experiment.

In the first two parts of the experiment, we calculate your payoff in Experimental Currency Units (ECU). At the end of the experiment, we will convert 1 ECU into 10 Eurocent. Hence 1 € corresponds to 10 ECU.

### [Part 1]

Part 1 of the experiment is only played once and not repeated. You are randomly matched with one other anonymous participant. At the beginning of the experiment, both of you receive an endowment of 60 ECU (Experimental Currency Units). You are - again randomly - assigned a role. One of you will have role A, the other will have role B. There is one unit of a good. If, at the end of this part of the experiment, A is in possession of the good, the experimenter buys the good from her at a price of 24 ECU. If, at the end of this part of the experiment, B is in possession of the good, the experimenter buys the good from her at a price of 48 ECU.

Part 1 of the experiment has 5 stages. At stage 1, B earns this good. To that end, on the computer screen B receives a series of 10x10 tables, filled with 0s and 1s. B must correctly indicate the number of 1s in 10 such tables. The following is an example of the task:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |

At stage 4, A has a chance to take the good from B. At stage 2 and 3, A and B may conclude a binding contract. If a deal is struck, the agreed-upon contract would contain two elements: (i) A would give up the ability to take the good at stage 4, and, in exchange, (ii) B would pay A a sum between 0 and 60 ECU, as stipulated by the contract. A and B decide upon conclusion of a contract according to the following procedure: (1) At stage 2, B is allowed to offer a payment if A commits not to take the good at stage 4. (2) A decides at stage 3 whether she accepts or rejects. If she accepts, the price stated by the contract is transferred from B to A. If A rejects the offer (or if B did not make an offer), at stage 4 A decides whether to take the good from B.

At stage 5 the computer randomly decides which of the following seven regimes applies. Each regime is equally likely to apply. In each regime, B is entitled to the claim as specified in the following table, provided there is no contract and A has taken the good. These effects are automatic.

| regime | If A has taken the good, B may claim that |
|---|---|
| 1 | computer transfers good back to B |
| 2 | computer reduces A's payoff by 30 ECU and transfers them to B |
| 3 | computer reduces A's payoff by 24 ECU and transfers them to B |
| 4 | computer reduces A's payoff by 18 ECU and transfers them to B |
| 5 | computer reduces A's payoff by 12 ECU and transfers them to B |
| 6 | computer reduces A's payoff by 6 ECU and transfers them to B |
| 7 | B has no claim |

The following is a schematic representation of the stages of the experiment:

| stage | A | B |
|---|---|---|
| 1 | - | earns good by correctly solving 10 tables |
| 2 | | may offer contract |
| 3 | may accept contract<br>(if contract has been offered) | |
| 4 | may take good<br>(if no contract has been concluded) | |
| 5 | **at very end of experiment only**<br>computer randomly chooses one of 7 regimes<br>computer executes choices participants have made for this regime<br>computer fulfills B's claim<br>(if A has taken the good and the regime gives B a claim)<br>computer gives feedback on choices and payoffs | |

As has just been stated, the relevant regime will only be defined at the very end of the entire experiment. We therefore ask you to make a choice for each of these seven regimes. Hence at stage 2, participant B will be asked whether she wants to make an offer, and if so which price she offers, for each of the seven regimes. To that end, we will show you a table at the computer screen.

Please indicate, separately for each regime, whether you want to offer A that she commits not to take the good at stage 4, against payment as stipulated:

| regime | If A has taken the good, B may claim that | do you want to make an offer? (yes/no) | if you want to make an offer, which price do you offer? (between 0 and 60 ECU) |
|---|---|---|---|
| 1 | computer transfers good back to B | | |
| 2 | computer reduces A's payoff by 30 ECU and transfers them to B | | |
| 3 | computer reduces A's payoff by 24 ECU and transfers them to B | | |
| 4 | computer reduces A's payoff by 18 ECU and transfers them to B | | |
| 5 | computer reduces A's payoff by 12 ECU and transfers them to B | | |
| 6 | computer reduces A's payoff by 6 ECU and transfers them to B | | |
| 7 | B has no claim | | |

A sees an equivalent table. Separately for each regime, she decides about the minimum offer she would accept. In a further column, she is asked: "If you are offered an amount below your minimum threshold, will you take the good?".

**[Part 2]**

The second part of the experiment builds on the first. If you have had role A in the first part of the experiment, on the computer screen you will learn how many participants, in this session, have held role B (half of the session), and you will be asked to fill in the following table

| regime | If A has taken the good, B may claim that | how many participants with role B have made an offer? | which price have those who have made an offer on average offered? |
|---|---|---|---|
| 1 | computer transfers good back to B | | |
| 2 | computer reduces A's payoff by 30 ECU and transfers them to B | | |
| 3 | computer reduces A's payoff by 24 ECU and transfers them to B | | |
| 4 | computer reduces A's payoff by 18 ECU and transfers them to B | | |
| 5 | computer reduces A's payoff by 12 ECU and transfers them to B | | |
| 6 | computer reduces A's payoff by 6 ECU and transfers them to B | | |
| 7 | B has no claim | | |

You will be remunerated for one randomly selected answer. It will be the answer referring to the regime that the computer decides to be payoff relevant for part 1 of the experiment. With equal probability you will be remunerated for your answer to either of the two questions. If the question regarding the number of offers is payoff relevant, you will receive 3 ECU if you got the number exactly right, and 1 ECU if your answer was one below or above the exact answer. If the question regarding the size of the offer is payoff relevant, you will receive 3 ECU if your answer is exact or no less than one below or above the exact answer. You will receive 1 ECU if your answer is no more than two below or above the exact answer.

If you have held role B in the first part of the experiment, we tell you that participants who held role A were asked to specify the smallest offer that they would still accept. We ask you, separately for each of the 7 regimes, to estimate the smallest acceptable offer specified by the average role A participant (see table below). If the size of the offer you indicate is no further away from the true average than 1 ECU, you receive 3 ECU. If your answer is no further away than 2 ECU from the true average, you receive 1 ECU.

| regime | If A has taken the good, B may claim that | What is the smallest acceptable offer, specified by the average role A participant? |
|---|---|---|
| 1 | computer transfers good back to B | |
| 2 | computer reduces A’s payoff by 30 ECU and transfers them to B | |
| 3 | computer reduces A’s payoff by 24 ECU and transfers them to B | |
| 4 | computer reduces A’s payoff by 18 ECU and transfers them to B | |
| 5 | computer reduces A’s payoff by 12 ECU and transfers them to B | |
| 6 | computer reduces A’s payoff by 6 ECU and transfers them to B | |
| 7 | B has no claim | |