

# Sorting in Experiments with Application to Social Preferences<sup>1</sup>

Edward P. Lazear  
Hoover Institution and  
Graduate School of  
Business  
Stanford University

Ulrike Malmendier  
Stanford University and  
NBER

Roberto A. Weber  
Carnegie Mellon University

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## Abstract

Experiments provide a controlled environment where factors can be isolated and studied more easily than in the real world. But experiments are often challenged on the issue of applicability of results to the real world. A major feature of experiments is that they select subjects randomly. Non-laboratory environments, such as markets, instead allow people to sort to certain activities and away from others based on their preferences, beliefs and skills.

We design an experiment to demonstrate the importance of sorting in the context of social preferences. When individuals are constrained to play a dictator game, 74% of the subjects share. But when the same subjects are allowed to avoid the situation altogether, less than one third share. This dramatic reversal of proportions demonstrates the importance of taking sorting into account when applying experimental results to the real world.

We also show that institutions designed to entice pro-social behavior may actually induce adverse selection. Increasing the total surplus available for sharing induces first those individuals who are least willing to share to sort back into the dictator game. Thus the impact of social preferences remain much lower when sorting is possible than in a mandatory dictator game, even if sharing is subsidized by higher payoffs.

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## **I. Introduction**

Experiments are an important part of every science, including economics. The ability to do experiments in a controlled laboratory environment provides insights into behavior that cannot be studied easily in the real world. The experimental structure allows the scientist to answer the “what ifs” that cannot be answered in the complex, ever-changing, and simultaneous structure of the real world.

The controlled and artificial environment is also a potential drawback. It is unclear how applicable the results of laboratory experiments are in the real world. However, many such criticisms of experiments have been successfully addressed in the past.<sup>2</sup>

The point of this paper is different. A key feature of most experiments is the random nature of the experimental samples. The random assignment of subjects to experimental tasks is a strength of experiments, for example to evaluate treatment effects relative to a baseline setting. But it creates a weakness in terms of real-world applicability. In the laboratory, subjects are locked into the experimental environment and forced to play the game presented to them, but markets operate differently. In markets, individuals sort, based on their preferences, beliefs, and skills. The ability to sort implies that we often cannot draw direct inferences about the relevance of behavioral response to experimental treatments for the real world.

For example, an experiment run on randomly selected individuals might reveal that a large portion of the subjects suffer from acrophobia. But sorting and voluntary selection ensure that those who build skyscrapers are unlikely to be among the sufferers. The wage premium paid in the market reflects the preferences of the marginal individual

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<sup>2</sup> One obvious example is the concern that the stakes are too small in a typical laboratory experiment. However, most experiments reveal very little change in behavior resulting from higher stakes (e.g., Hoffman, McCabe & Smith, 1996; Cameron, 1999; Camerer & Hogarth, 1999; Fehr, Fischbacher & Tougareva, 2002).

employed, not the average individual in the population.<sup>3</sup> If there are a sufficient number of non-acrophobic construction workers, there will be no wage premium at all for working at height. There may be many who demand a very high supply price to work at height, but the upper part of the supply curve may be totally irrelevant because it is never in a range where it intersects demand.

It is equally conceivable that sorting in markets can exacerbate a laboratory phenomenon. Overconfidence, for example, may be a rare feature in the overall population. But those who sign up for a health club membership may be particularly prone to overestimating their future self-control, which would explain the low average rate of attendance of members who pay a high monthly fee.<sup>4</sup> Similarly, those who self-select into environments where skill matters are likely to be those most influenced by overconfidence (see Camerer & Lovallo, 1999).

The above examples illustrate the potential power of sorting. Experiments that do not allow for sorting describe the preferences of the average individual and not the marginal one, whose behavior is relevant for determining prices and outcomes.<sup>5</sup> Whether the results of an experiment overstate or understate what is observed in the market depends on the relation of the marginal individual's preferences to those of the average individual. In this paper, we provide results from an experiment, which show that the importance of a particular phenomenon, namely sharing in environments such as the dictator game, in the absence of sorting is diminished when sorting is permitted.<sup>6</sup> More

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<sup>3</sup> The literature on equalizing wage differentials and hedonic prices, following Rosen (1974), elaborates on this insight.

<sup>4</sup> See Della Vigna and Malmendier (2003), who show using real world data that subscribers to health clubs do not take into account their own behavior to minimize the costs of their subscriptions.

<sup>5</sup> Lazear (1990) argues that the difference between the classic Skinner experiments is that pigeons do not have the right to work for another experimenter if they do not like the environment. Workers, on the other hand, are not forced to remain with firms that do provide distasteful reinforcement schedules.

<sup>6</sup> Selection effects are an important part of the labor literature. Very early on, Gronau (19??) noted that estimates of certain empirical relations, like those involving labor supply, might be biased because those who are observed are not a random sample of the population. Heckman (1976?) provided an econometric technique that allowed researchers to address the selection effects and remove the bias that was otherwise inherent in the estimates. Sometimes, the bias is based on observables and can be remedied more easily. In

precisely, we allow individuals the opportunity to avoid an environment in which they are given an option to share, and find that the frequency of sharing and the total amount shared both decrease substantially.

Three points are made. First we demonstrate that sorting is fundamental. The entire interpretation of experiments and their applicability to market settings may depend on the ability to sort in or out. Although the criticism that sorting affects the validity of experiments is fundamental, it is easily addressed. Experiments rarely give subjects the opportunity to opt out or to choose alternative tasks. If selection is an important force in economic decision-making, then the applicability of experiments without sorting to the real world is not straightforward and requires adjustment for endogenous selection. The analysis below provides an example of how a simple adjustment to an experiment can help account for the potential influence of selection on economic outcomes.

Second, we also address the question of what, fundamentally, drives social behavior such as altruism. Much work in behavioral economics explains sharing in situations like the dictator game by positing that it represents a preference for behaving fairly or kindly. We show that people who would decide to share in a particular environment sort out of that environment, and pay a premium to do so. Thus, our work indicates that much sharing and fair behavior may result from a context-dependent preference for sharing – people share because they feel compelled to in certain situations, but would prefer to avoid those situations altogether.

Finally, our work also suggests that the design of institutions and markets may exacerbate the discrepancy between the behavior of randomly drawn samples in experiments and self-selected samples in markets. Markets may actually select those individuals whose behavior is furthest from that of the average member of the population.

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other cases, the problem is that the sorting is on unobservables. For example, biases in the rates of return to schooling might result because the more able choose to go further in school. Then, the higher wages that are associated with high levels of schooling might be a reflection of unobserved ability of the highly schooled and not of the schooling per se. In most of what follows, we refer to biases that are related to unobservables. Subjects who are not differentiable on the basis of any known characteristic behaved differently because of preferences or talents that cannot be observed ex ante.

And policy interventions or institutions targeting the average individual may affect the individual with the most perverse, or at least the most extreme preferences.

To concretely represent how the above ideas are captured by our work, consider the example of giving money to a beggar on a street corner. Suppose there are two reasons why people give: Individuals may derive utility from giving to others. Alternatively, they may not derive utility from giving, but may derive disutility from not giving when faced with the request to do so. The latter can be avoided by removing oneself from the situation. The first point of our analysis, then, applied to this context, is that experimental subjects who have just generously shared in a dictator game, with no sorting option, may not give any of their experimental earnings to the beggar outside the lab. Rather, they may cross the street to avoid encountering the beggar. Our second point is that those who do not look the other way or cross the street are most likely to be of two extreme types - the most and least compassionate.

The second point above is that such behavior should tell us something about their motivation for sharing in environments where no sorting is possible. Those who enjoy giving pass by the beggar – and give. Those who do not enjoy giving and do not experience disutility from not giving in response to a request also pass by the beggar – and do not give. The third group, who do not want to give, but dislike not giving when faced with the potential beneficiary, cross the street, but also share in the dictator game. Thus, the beggar sees the most compassionate people as well as the least caring.<sup>7</sup> In this case, the market selects in the most extreme types, not the median individual.

Suppose now that policy-makers would like to induce more giving and pay people to pass by the beggar. Sorting, may dramatically reduce the impact of the policy. People who like sharing are giving already. Among the people who are not already giving, the incentives will affect most strongly those who experience the least disutility from not giving. Those people give less than the median person. As a result the policy intervention will be less effective than predicted on the basis of average behavior in the overall population.

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<sup>7</sup> Those who like to give may care about the utility of others, enjoy the praise that giving brings, or for other reasons. Such considerations, although interesting, are not central to our argument.

In economic language, there is a price at which individuals are willing to confront the beggar. Individuals who do so at the lowest price are (1) those who derive the most pleasure from giving and (2) those who suffer the least disutility from not giving money despite being confronted with a request. Those who will not give, but who dislike intensely walking past the beggar and not giving, are most likely to cross the street. To get them to walk by the beggar, the highest payment is required.

*Sharing and Sorting.* To make concrete the importance of selection and heterogeneity, we employ a modified dictator game.<sup>8</sup> In typical dictator games, one of two anonymously matched subjects decides how much of a given surplus should be sent to the other person and how much to keep. The standard result is that a significant proportion of subjects give some positive amount to an anonymous responder, even when their action is not observable by anyone, including the experimenter (see Camerer, 2003; Hoffman, et al., 1994).

Sharing behavior has been largely interpreted as reflecting a taste for fairness among a significant number of economic decision-makers. Several models attempt to explain this behavior as reflecting a stable preference for equitable outcomes or altruism (e.g., Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). We point out that truly other-regarding preferences are not the only reason to share. Alternatively, individuals may simply feel compelled to give upon request but would prefer to avoid the sharing situation in the first place. A taste to avoid giving may reflect shame or guilt at not giving or other forces. We will provide evidence that sheds some light on these distinctions.

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<sup>8</sup> We chose the dictator game for two reasons. First, in order to test the effect of a sorting on a particular kind of behavior, it is helpful to start with the simplest task that captures that behavior (and little else). Thus, if we were interested in studying the influence of sorting on agoraphobia, we would want a task that involves high elevations and as little else as possible. The dictator game is the simplest environment in which to demonstrate and test the prevalence of a propensity to share. Second, results of the dictator game are quite robust to manipulations. Sharing is usually close to 20 percent of the available surplus, and distributions of amount shared differ little between most experiments and treatments (see Camerer 2003).

*The Theory.* We present a theoretical framework that demonstrates our three main points: First, sorting is an important force in determining the importance of sharing. The amount of sharing may decrease significantly if individuals have the option to sort out of the sharing opportunity. Second, sharing will only decrease if a non-trivial proportion of individuals who share in environments where sorting is not possible do so because they feel compelled to give, and not out of a preference for fair outcomes. Third, making the sharing option more attractive may first and foremost attract those individuals who are least willing to share.

Our theoretical framework allows for individuals to have other-regarding preferences. That is, individuals may derive utility not only from their own payoff but also from the payoff others receive. However, we also allow the utility to depend on the environment. In this case, the environment determines whether or not the individual is put in a situation where he can share.

We show that sorting induces some sharers to opt out and reduces the total amount of sharing. Moreover, increasing the total surplus available for sharing while holding the outside option constant is most likely to induce those individuals who are least willing to share to sort back into the dictator game.

The intuition is that people who are not motivated by true other-regarding preferences, but instead by shame or guilt may want to avoid settings in which they have the option to share.<sup>9</sup> On the other hand, people who experience no such shame or guilt but who behave self-interestedly have a higher willingness to play the dictator game, especially when a premium is offered for playing it.<sup>10</sup> Among people who are motivated to share by shame or guilt, a measure of the amount of shame or guilt that they feel is the amount that they give to others when constrained to play the dictator game (shown

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<sup>9</sup> In fact, recent experimental evidence by Dana, Cain and Dawes (2004) provides support for our intuition. They allow dictators to “reverse” their choices before the recipient finds out about them – in which case recipients never learn of the dictator game, and find that almost a third of subjects are willing to pay a small premium to do so.

<sup>10</sup>The distinction between shame and guilt has to do with observability. Shame works only when others see the action taken. Guilt operates even in the absence of observation by others. See Kandel and Lazear (1992) for a theoretical treatment of this subject.

formally below). Thus those who give more in dictator games because they dislike not giving should be more willing to avoid putting themselves in such situations than those who give little. Environments that put individuals in situations where sharing is an option tend to attract people who are least willing to share (i.e., experience the least guilt or shame from not sharing) as well as those who enjoy sharing.

***The Experiment.*** We test these hypotheses in an experiment in which subjects can sort between environments that do and do not allow sharing. The experiment has three stages. In the first stage, individuals play a dictator game with no sorting option, which we use to determine their propensity for sharing. In the second stage, they are offered an alternative between playing the dictator game and “opting out.” If they opt out, no game is played, and the (potential) dictators they simply receive a fixed payment equal to the total amount given to them to allocate in the dictator game. In that case, the (potential) receiver never finds out that a dictator game could have been played. The decision to switch to the new environment distinguishes agents who were initially sharing because they disliked not sharing from those who truly prefer to share. In the third stage, the total surplus of the dictator game increases while the fixed amount in the alternative environment remains constant.

There are two main results. First, sorting significantly reduces the probability of sharing. When subjects are locked into the experimental context and forced to choose between sharing or not, 74% share. But when subjects are given the choice to avoid the situation altogether, effectively not sharing, only about 30% of the subjects share. In other words, without choice most share; with choice most do not. The average percentage shared decreases from 27% to 12%. Overall, 42% of the subjects feel compelled to share if they cannot avoid the situation (as identified by sharing in the first round and then opting out), only 25% have purely self-regarding preferences (as defined by not sharing in the first round), and 33% display a preference to share or implement fair outcomes (as defined by sharing in the first round and in the second round).

Second, allowing choice selects a particular type of player. Those most likely to put themselves in the sharing context come from two extremes. They are the most likely to share and also the most unlikely to share. Among those who share because they

dislike not sharing (as opposed to liking sharing), those most likely to participate when sorting is an option are the most immune to the social pressure of not sharing. Those who feel more inclined to share because they dislike being viewed as unfair, shun the sharing environment altogether and a high premium is required to induce them to return to the sharing context. In fact, as predicted by our model we find that, among individuals who chose to avoid the dictator game in the second round, those who shared most initially will switch back to the dictator game last (i.e., only when the compensation in the dictator game is large). In other words, if shame or guilt are important factors in fair behavior, markets that allow sharing will first and foremost attract people who are less willing to share. Thus, choice induces the “best” and “worst” to play and, in the range in between, it is hardest to get high sharers to play. Results from experiments that randomly choose subjects and lock them into the sharing context camouflage the sorting phenomenon and therefore provide a biased amount of sharing, relative to what we might observe in environments with sorting.

Our paper builds on a considerable body of work on dictator, ultimatum, and trust games (see Camerer, 2003, Chapter 2) revealing that altruistic and fairness-minded behavior is largely robust to several experimental treatments (such as monetary stakes, anonymity, etc.). There is also a small experimental literature suggesting that the dictator game findings may not be driven by mere fairness considerations, but may instead reflect more complex context-dependent considerations (Dana, Weber, and Kuang 2003; Oberholzer-Gee and Eichenberger 2004). Further, a number of experimental papers have been concerned with selection in other experimental contexts such as the prisoner’s dilemma (Bohnet and Kübler 2004), the choice of reward and punishment (Sutter, Kocher, and Haigner 2003), incentive contracts (Eriksson and Villeval, 2004), auctions (Palfrey and Pevnitskaya, 2003), risky choices (Harrison, Lau and Rustrom, 2005), and market entry games (Camerer and Lovallo, 1999).

## II. Model

Consider two individuals who, when put in an environment where sharing is an option, give away  $1/3$  of their endowment to another individual. One individual does so because he genuinely enjoys sharing. The other does so because she feels ashamed of keeping all of the money for herself. Now allow the two to have a choice between putting themselves in the sharing environment and avoiding it at no cost. The first elects to be in the sharing environment and continues to share  $1/3$  of his income. The second chooses to avoid the sharing environment altogether and keeps the full amount for herself. It is clear that two parameters are needed to characterize these preferences. One parameter is identical across the two individuals and determines how much they share when in a sharing environment. The other parameter dictates whether they choose to be in the sharing environment or not.

The model that we propose allows for three types of sharing preferences: Like-sharing, dislike not-sharing, and the boundary case, completely self-regarding. There are a number of reasons why individuals might like sharing. They may feel altruistic toward others. They might feel that a sense of fairness pushes them to share what they have with others. They might enjoy the praise and recognition that comes from doing a good deed. They may take pride in their own generous behavior. Other-regarding individuals are a subset of those who like to share because they would choose to put themselves in an environment where sharing is an option. There are also a number of reasons why individuals might dislike not-sharing. They may feel shame when others know that they had the opportunity to share, but behaved selfishly. Even in the absence of others observing their behavior, they may feel guilty about having been selfish. They may feel neither guilt nor shame, but may simply dislike the dirty looks that the passive agent gives them when they do not share. Or they may dislike the idea of harming someone. They may simply dislike being asked to share what they view as their own. A third group may be viewed as self-regarding, indifferent to the desires or curses of other aspects and coming out exactly neutral on whether or not they like to share. Self-regarding individuals would share nothing.

Our experiment allows us to shed light on some of the specific motives behind the behavior, and the frequencies of the three types. However, we only require that at least some like to share and others dislike not sharing.

The model generates testable predictions about the decision to share and sorting. The agent is endowed with an amount  $w$ , which she has to divide between herself ( $x$ ) and another agent ( $y$ ), as in the classic dictator game.

$$(1) \quad x+y=w$$

Some individuals like to share and others dislike not sharing, so if given the choice, the latter group would pay to avoid the sharing environment, whereas the former group would pay to be in the sharing environment. An individual's willingness to pay can be expressed as a ratio of the wealth that she would have to receive in the sharing environment,  $w'$ , to be just indifferent between being in the sharing environment with wealth  $w'$  and being in the environment that precludes sharing at wealth  $w$ . Thus,

$$w'/w = \lambda^*$$

The value of  $\lambda^*$  is related to the disutility (or utility) an individual receives from being put into a sharing environment. Individuals who have  $\lambda^* < 1$  like to share and would be willing to pay ( $w' < w$ ) for the opportunity to share. Individuals have  $\lambda^* > 1$  dislike not sharing. That is, they share when forced into a sharing environment, but would be willing to pay to avoid that environment altogether. Put differently, they must be compensated with a higher endowed wealth, namely,  $w' > w$ , to choose voluntarily to enter a sharing environment. Individuals who are completely self-regarding share nothing and will not be willing to pay to avoid the sharing environment.

In a particular specification, the following relationships hold. When an individual is in the sharing environment, she allocates  $x$  to herself and  $y$  to the other individual in accordance with

$$(2) \quad x = \alpha w$$

$$(3) \quad y = (1-\alpha) w$$

Higher  $\alpha$  individuals can be thought to be more self-regarding. Additionally,  $\lambda^* = \lambda^{1-\alpha}$  so

$$(4) \quad w'/w = \lambda^{1-\alpha}$$

The value of  $\lambda^*$  is related to the disutility (or utility) an individual receives from being put into a sharing environment. Individuals who have  $\lambda^* < 1$  like to share and would be willing to pay ( $w' < w$ ) for the opportunity to share. Individuals have  $\lambda^* > 1$  dislike not sharing. That is, they share when forced into a sharing environment, but would be willing to pay to avoid that environment altogether. Put differently, they must be compensated with a higher endowed wealth, namely,  $w' > w$ , to choose voluntarily to enter a sharing environment. Individuals who are completely self-regarding share nothing and will not be willing to pay to avoid the sharing environment.

Although the functional forms in (2), (3) and (4) might seem somewhat arbitrary and ad hoc, they are not. They are derived from a standard Cobb-Douglas utility function that is modified to allow for three goods: own consumption, other's consumption, and the environment, where environment means whether the individual is put into a sharing context or not. The full derivation is contained in the appendix.

The Cobb-Douglas specification is unnecessary for two basic propositions. They follow. (All proofs are contained in the appendix.)

**Proposition 1:** When  $w' = w$ , the only individuals who like to share would choose the sharing environment over the non-sharing environment, i.e., they are those for whom  $\lambda^* < 1$ .

Proposition 1 allows us to determine the size of  $\lambda^*$  relative to 1. If agents are given the choice between the sharing environment and the non-sharing environment and have the same total amount available, only those who actually like to share (as opposed to dislike not sharing) choose the sharing environment. Thus, a treatment that gives players choice over environment distinguishes between those who like sharing and those who dislike not sharing.

As will be seen, the majority of subjects who share in the first decision opt out of playing when given the choice. This implies that the majority of subjects who share do so because they dislike not sharing, not because they like to share.

**Proposition 2:** There is (weakly) a larger amount shared when individuals are not given choice over environment than when they are given choice.

Giving individuals the option to leave the sharing environment eliminates all of those who were sharing only because they disliked not sharing. The sharing of those who like to share remains unchanged because the option to leave the sharing environment has no value. To them, the option is an irrelevant alternative. As a result of the departure of those who were sharing only because they disliked not sharing, total sharing declines. This is like allowing pedestrians to cross the street before encountering a beggar. The beggar collects less money when pedestrians have this option because some who would have given simply because they disliked not giving will choose to cross the street instead. Those who choose to walk by give the same amount as they did before.<sup>11</sup>

As will be seen in the results from the experiment, giving subjects the ability to opt out of the dictator game reduces the average amount given to and therefore received by non-dictator subjects.

In addition, under the Cobb-Douglas specification, two additional propositions can be stated. It is presented because the validity of the Cobb-Douglas specification can be ascertained and is found to hold in the data.

**Proposition 3:** In the absence of the option to avoid the sharing environment, the proportion shared measures  $1-\alpha$ .

This proposition means that it is possible to obtain an estimate of an individual's sharing propensity by looking at the amount shared in a treatment that does not offer the

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<sup>11</sup> This ignores any effects that might result because like-to-share types are more sympathetic to beggars when others ignore beggars.

possibility of opting out. Coupled with proposition 1, it is possible to obtain estimates of  $\alpha$  and of the relation of  $\lambda$  to 1.

**Proposition 4:** The  $w'$  at which individuals who dislike not sharing choose to enter the sharing environment decreases in  $\alpha$ .

The implication of proposition 4 is that those who keep the most for themselves in decision 1 (where subjects are forced into the sharing environment) among the dislike-not-sharing types are the ones most likely to choose to play the dictator game at low premiums. This is important because it suggests a kind of adverse selection. Allowing individuals to choose whether or not to enter the sharing environment attracts two types of individuals: those who enjoy sharing as well as the most self-regarding and stingiest of those who have an aversion to the sharing environment. Individuals who do not give much and then opt out are the quickest to re-enter the dictator game as the premium for playing rises. The results of the experiment confirm this proposition consistent with the Cobb-Douglas form. Paying individuals to play the game attracts extreme types: those who like to share and the stingiest of those who dislike not sharing.

We now have a series of propositions that can be borne out or refuted by experimental evidence. First, a round that does not allow any option to avoid sharing will see sharing. There will be sharers of two types: those who like sharing and those who dislike not sharing. The amount shared gives us an estimate of the importance of sharing to them, although not of the reason for the sharing (like to share or dislike not sharing).

It is also possible to distinguish the reason for sharing by offering subjects a choice of environments. In one environment, the dictators have the opportunity to share, but they can avoid that environment if they so choose. The only ones who choose the sharing environment are those for whom  $\lambda^* < 1$ , i.e., those who share because they like to share. Those who were sharing because they disliked not sharing opt out.

Next consider altering the total amount available to share. Recall that  $w$  is the amount given to those who opt to avoid sharing and  $w'$  the amount given to those who choose to put themselves in the sharing environment. When  $w' > w$ , all of those for whom  $\lambda^* < 1$  (like to share) and even some of those who have  $\lambda^* > 1$  (dislike not sharing) will

choose the sharing environment. Under the Cobb-Douglas specification, individuals who are most likely to choose to be in the sharing environment even though they have  $\lambda > 1$  are those with the highest values of  $\alpha$  (i.e., who share the least). This is proposition 4, and it is somewhat ironic, although intuitive. At the extreme, individuals who have  $\alpha = 1$  are completely self-regarding. They will not share even in the sharing environment and may be thought to have the least reason to avoid the sharing environment. Thus, among those who dislike not sharing, those who shared the least when they were not given choice of environment are most likely to enter the sharing environment when given the choice.

Using the beggar example again, consider two individuals, both of whom dislike not sharing. If forced to encounter the beggar, individual A gives the beggar a very small amount, while B gives the beggar a large amount because he feels very bad about walking by without giving money. If given the opportunity to cross the street without cost, both A and B choose to do so because neither likes giving to the beggar, but perhaps feel guilty about not giving. Now suppose that it is costly to cross the street, requiring that the individual wait at the street corner for 5 minutes until the light changes. The one most likely to wait is the one who would have given the beggar the large amount out of money. He has the most to gain from avoiding the guilt-producing environment. Individual A gives the beggar only a small amount and gains less by waiting to crossing the street. Although this is not necessary – even those who do not give to the beggar might be quite anxious to avoid him altogether – it is implied by Cobb-Douglas and is borne out in the results.

### **III. Experimental Design**

Our experiment consists of three parts. In all parts, subjects have the opportunity to play a simple dictator game in which they decide upon an allocation of some amount  $w$  between themselves ( $x$ ) and another participant ( $y$ ). In parts 2 and 3, we introduce the possibility of sorting out of the game (“passing”). In part 2, a potential dictator who sorts out receives a fixed sum (\$10) and the potential recipient never finds out about the game. In part 3, the amount  $w$  available in the dictator game rises while the sum dictators receive after opting out remains constant.

All three parts of our experiment are conducted in two different treatments. These treatments vary in the extent to which dictators are anonymous. In the Anonymity treatment, the identities of dictators who chose to play the game are kept from recipients, meaning that recipients find out how much they receive, but not who sent it. In the No-Anonymity treatment, the identities of dictators who choose to play the game are revealed to the recipients at the end of the experiment, meaning that recipients find out both how much they receive and who sent it. We conducted these two treatments because a) the Anonymity treatment corresponds to how the dictator game is usually implemented in economics experiments (see Camerer, 2003), and b) the No-Anonymity treatment corresponds to many sharing decisions outside the laboratory. Using these two treatments also allows us to explore the robustness of our theory to variations in the anonymity of the potential dictator and also possible differences between guilt and shame, which we discussed previously, as motivations for sharing.

In both treatments, each session consisted of an even number of between 10 and 20 participants and lasted about 30 minutes. Upon arriving at the experiment, subjects were told that they would receive a \$6 payment for their participation in the experiment and that, in addition, they might receive additional money during the experiment. Subjects were then randomly assigned participant numbers and were told that participants with numbers between 11 and 20.<sup>12</sup> While all of the subjects were still in the main room, the experimenter publicly announced that these participants would complete a series of questionnaires for about 20 to 25 minutes and that they would not receive additional money from the experimenter for doing so.

Once participants 11-20 were outside the main room, they received a set of sheets that contained a series of questionnaires. On the front page, subjects were asked to proceed through the questionnaires at their own pace. This took about 20 to 25 minutes. Once they finished, they were told to wait quietly for additional instructions.

Once participants 11-20 had left the room, participants 1-10 received instructions telling them that they would make a series of decisions (5 decisions in the Anonymity

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<sup>12</sup> In sessions with less than 20 participants, participant numbers numbered from 1 to  $n/2$  and 11 to  $10+n/2$ . Thus the instructions always asked participants with numbers between 11 and 20 to exit the room.

treatment, 6 decisions in the No-Anonymity treatment), and that at the end of the experiment one of these decisions would be randomly selected by drawing a number out of a bag. This decision would be the only one that counted and would determine payoffs. Subjects were told that they would make each decision sequentially and that they would receive new instructions and materials for each decision.

### *Decision 1*

In both treatments, Decision 1 consisted of a dictator game without a sorting option. That is, each subject played a \$10 dictator game in which he or she was matched with one of the participants outside the room. Subjects were told that if Decision 1 was selected to count at the end of the experiment, then the participants outside the room would be brought back into the room. The experimenter would describe the dictator game publicly to these participants, and then each of the recipients would find out how much money he or she had been given. The only difference between treatments was in whether the recipient would also find out the identity of the dictator with whom he or she had been matched.

Subjects received an instruction sheet (describing the decision) and an envelope. They were told not to open the envelope until after the instructions were read and questions were answered. Inside the envelope they would find a sheet with a number corresponding to one of the participants who had left the room.<sup>13</sup> They would be matched with this participant for this decision. On the sheet, dictators would write their own participant number and indicate a division of 40 tokens (each worth 25 cents), specifying how much to keep and how much to give to the other subject.<sup>14</sup>

In the Anonymity treatment, if Decision 1 was selected to count, then the recipients would find out only the amount and the participant number of the subject who sent that amount. This was done by having the experimenter show each recipient the sheet filled out by the dictator. In the No Anonymity treatment, the recipients would in

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<sup>13</sup> Random matching in each period was implemented by shuffling the envelopes, distributing them in a different order to dictators, and allowing them to select from the stack that remained.

<sup>14</sup> Subjects were told that if the numbers did not add up to the allocation, then the amount to the recipient would determine the allocation (the dictator would receive the remaining amount). This did not occur.

addition find out the identity of the dictator with whom they had been matched. This was done by having the dictators themselves hand the sheets to the recipients with whom they had been matched.

After receiving the instructions and being given the opportunity to ask questions, dictators were told to open their envelopes for Decision 1, write their participant numbers, and indicate their chosen division. The experimenter then collected the envelopes and placed them aside.

### *Decision 2*

In Decision 2, participants 1-10 had the opportunity to play exactly the same dictator game as in Decision 1, although with a potentially new randomly selected participant. If they chose to play the dictator game, and if Decision 2 was selected to count, then the participant with whom they were matched would be brought back into the room and informed of the game in the same way as would have occurred in Decision 1. If they chose not to play the game, then dictators would receive a payment of \$10 without having to make a choice. In this case, the potential recipient outside the room would be told nothing about the dictator game (in both anonymity and non-anonymity treatments).

Subjects received an instruction sheet and two envelopes, one labeled “Play” and another labeled “Pass.” Subjects were instructed not to open either envelope until after the instructions had been read aloud.

The instructions informed subjects that they would have the opportunity to play exactly the same game as in Decision 1, but that they could also choose not to play the game, by “passing.” If he or she chose to play the game, the subject would open the envelope marked “Play,” see the participant number of the person outside the room with whom he or she was matched, and specify a division of the 40 tokens. If the subject chose to not play the game, then he or she would open the envelope marked “Pass” (which did not contain a participant number) and mark an “X” on the sheet inside.<sup>15</sup> After making either choice, subjects returned the envelopes to the experimenter.

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<sup>15</sup> This was done to ensure that people playing and passing wrote roughly the same amount on the sheets. In this way, looking around to see how much people were writing would not reveal what others were doing.

### *Remaining decisions*

The session then proceeded in sequence through the remaining three (Anonymity) or four (No Anonymity) decisions. Each of these decisions proceeded almost identically to Decision 2, with the exception that the amount of money (tokens) to allocate in the dictator game increased. Table 1 presents the amount that the dictator could receive to allocate – if he or she chose to play the dictator game – for each decision.<sup>16</sup> As in Decision 2, the subject could opt to play the dictator game by opening the envelope labeled “Play.” In this case, if the decision was selected to count, then the subject with whom the dictator was matched would be brought back into the room at the end of the experiment and would receive a description of the game, and would find out how much he or she had received. In the No Anonymity treatment, the recipient would also find out the identity of the dictator. On the other hand, if the potential dictator chose to “Pass” (by opening the corresponding envelope) then, if the decision was selected to count, the potential recipient was excused from the experiment and not told anything about the game.

At the end of each session, the experimenter randomly drew one of the five (Anonymity) or six (No Anonymity) decisions to count. If it was the first decision, then all of the participants were brought in from outside the room. If it was any of the other decisions, then the experimenter brought in only the outside participants who were

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In addition, the experimenter collected the envelopes with the labeled side facing down, so that subjects could not observe what others had done by which envelope they handed to the experimenter first.

<sup>16</sup> There are two reasons why the parameters (number of decisions, allocation) differ between the two treatments. First, we initially conducted Anonymity sessions with the same payoffs and structure as in the No Anonymity sessions. We found that the steeper payoffs (relative to those for Anonymity in the table above), meant that a majority of dictators opted out of the game in Decision 2 (\$10 allocation), but almost all of them opted to play the game by Decision 4 (\$13 allocation). Since part of our goal was to obtain variance in “re-entry” to the game, we modified the payoffs. Second, we also decreased the number of rounds to allow the experiment to run more quickly.

matched with a subject who chose to play the game. The remaining participants were thanked for their participation and paid \$6.<sup>17</sup>

All payment and sorting features are summarized in Table 1. As also reported in Table 1, we conducted six sessions in each treatment, with a total of 94 dictators (46 in the Anonymity treatment, 48 in the No Anonymity treatment).<sup>18</sup> The large majority of subjects were undergraduate students of the University of Pittsburgh. 54% of the dictators were female. Appendix Table 4 contains some summary information on the gender composition of our subjects. Including subjects in the role of potential recipient, we used 188 total subjects.

#### **IV. Empirical Analysis**

A detailed documentation of the behavior of (potential) dictators in all rounds and both treatments is in Appendix-Tables 1 and 2. In this section, we provide a broad overview over the empirical findings and then specifically address the consistency between our results and the theoretical predictions in Propositions 1 through 4.

##### *General results*

The main aggregate results are summarized in Figure 1. Most important is that when dictators are forced to play the game, 67% in the Anonymity treatment and 81% in the No-Anonymity treatment share. But when choice is permitted in decision 2, only

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<sup>17</sup> Both sets of participants received a short information sheet when leaving the experiment. This sheet summarized what their role had been in the experiment without providing any information about the game. For instance, participants 11-20 were told “You were assigned to a passive role in which your decisions did not determine your earnings. You might have been able to receive more money based on factors outside of your control. In some cases, we need participants to be put in this kind of situation in order to re-create situations that occur in the real world.” In addition, all participants were asked not to share details of the experiment with others.

<sup>18</sup> One subject was accidentally allowed to participate twice (both times in the role of dictator). We omitted this subject's second participation from the data analysis. Since subjects' choices were never revealed to anyone else until the end of the experiment, it seems very unlikely that this subject might have contaminated the choices of other dictators in the same (second) session.

25% in the No-Anonymity treatment and 35% in the Anonymity treatment share. Overall, 74% share when forced to play the game, but only 30% share when dictators are given the option to avoid playing altogether. This is strong evidence first that choice matters and second that a large fraction were sharing in decision 1 not because they liked to share, but because they disliked not sharing. If individuals are allowed to sort out of the sharing situation, many choose to do so. Most share when forced into a sharing situation, and most do not share when given the option to avoid the sharing situation altogether. The proportion who opt to play the game rises in latter decisions as the amount given for playing increases relative to the fixed \$10 for not playing.

More detail can be provided in figures 2 (No-Anonymity) and 3 (Anonymity). Each figure presents the average amount that potential dictators shared in each decision (bars and left axis), the percentage of potential dictators who chose to play the game (dashed line and right axis), and the percentage of the pie shared by those who chose to play (solid line and right axis). Note that in the first decision, all potential dictators were required to play the game.

As shown in Figures 2 and 3, there is significant sharing in Decision 1, where all individuals are required to play the game. The average amounts shared are \$2.42 (Anonymity) and \$2.92 (No Anonymity). Consistent with earlier experimental results, when individuals are put in a sharing environment, the vast majority chooses to share something. However, when subjects are given the opportunity to opt out of the game in Decision 2, the picture reverses dramatically. Simply introducing a sorting option, with no premium for the sharing environment (j.e.,  $w = w' = \$10$ ) changes aggregate behavior from most people sharing to most people not sharing. Evidently, most subjects would rather avoid the sharing context altogether as long as there is no cost to doing so. Those who opt to play (and give a positive amount to the recipient) in Decision 2 are those who like to share, either because they are truly other-regarding or have some other motive for wanting to share (e.g., earning the respect of the experimenter).

Following Decision 1, the general pattern is similar between the two treatments. In Decision 2, over half of the participants opt out of playing the game. The total amount shared per potential dictator (indicated by the bars) decreases substantially (to \$1.22 in Anonymity and \$1.17 in No Anonymity). This is a reflection of the fact that most opt out

of playing the game altogether and share nothing. It also means that in environment where there is choice, individuals on average choose to share only about half of what they share when there is no choice. Among those who opt to play the game, the average amount of sharing is slightly higher in decision 2 than in decision 1 (see the solid line in each graph) – not surprising since the players in Decision 2 are choosing to play without a monetary premium offered for playing.<sup>19</sup>

Thus, in comparing only Decisions 1 and 2, it is clear that that choice is a powerful force in both treatments. It changes both the quantitative and qualitative nature of the conclusions about the standard dictator game. It is also clear that individuals who avoid the dictator game in Decision 2 respond to incentives to play the game as the surplus to be allocated ( $w'$ ) increases. As shown in Figures 1a and 1b, the proportion choosing to play rises monotonically as the difference between payment for playing and payment for passing,  $w' - w$ , rises. Even if individuals dislike being in the sharing environment, as the premium for being in that environment rises, more opt to put themselves into this unpleasant situation. All of the entry following Decision 2 reflects the entry of those who dislike not sharing. Those who shared in the first round because they liked sharing should have already chosen to play in round 2, when the payments for playing and passing were the same.

The effective allocation proportion per subject fails to reach the level in Decision 1, even when the value of the dictator game is greater than the \$10 value in the first decision. For instance, in Decision 4 of the No Anonymity treatment, in which the dictator can allocate \$13, the effective average allocation is \$2.07, which is well below the amount allocated in Decision 1 (\$2.92).<sup>20</sup> In the Anonymity treatment, the effective allocation amount in Decision 5, where the dictator game is worth \$12, is \$1.52, which is also below the average allocation in Decision 1 (\$2.42).<sup>21</sup>

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<sup>19</sup>There are some anomalies. In round 2, 28% of those who choose to play give nothing to the other player. They can be labeled “spiteful” because they voluntarily put themselves in the sharing environment and then give nothing to the other player.

<sup>20</sup> This difference is significant at  $p < 0.01$  in a paired t-test ( $t_{47} = 2.73$ ).

<sup>21</sup> This difference is significant at  $p < 0.01$  in a paired t-test ( $t_{45} = 2.73$ ). The above increases are larger in the No Anonymity sessions, which is likely due to the more rapid increases in the total value of the dictator game. For instance, by Decision 5, the entry rate is 90 percent in the No Anonymity sessions and the average allocation per potential dictator is \$3.21. In the Anonymity sessions, however, the corresponding figures for Decision 5 are 76 percent and \$1.52. However, this comparison neglects the fact that the

### *Treatment differences*

Decision 1 differed between the treatments only in the anonymity of the dictator. If the decision was selected to count, then in the Anonymity sessions the recipient would find out only the participant number of the dictator, while in the No Anonymity sessions the recipient would find out the dictator's identity. Comparing Decision 1 in the two treatments we find that, as expected, the lack of anonymity produced slightly more sharing when there was no anonymity (the average allocation was \$2.42 in Anonymity and \$2.92 in No Anonymity). However, this difference is not statistically significant.<sup>22</sup>

General trends in subsequent decisions are also similar between the two treatments. In both treatments, subsequent decisions increased the amount to be allocated in the dictator game. This produces increased entry into the dictator game (indicated by the dotted line) and increased effective sharing (indicated by the bars). Increasing the amount to be allocated in the dictator game produces an increase in the number of subjects choosing to play the game, but this frequency is below 100 percent even for most of the dictator games with greater total value than the outside option of \$10 (i.e.,  $w' > w$ ).

### *Individual behavior and preferences*

Although an analysis of preferences is not central to our mission here, it is important to point out that sorting occurs because some individuals prefer not to be in the sharing environment at all. Sharing that results from individuals disliking not sharing rather than from liking sharing is prevalent. To see that, see Table 2. Note that 58.51% of the dictators choose to opt out in round 2. Among those who shared in decision 1,

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potential allocation amount in the No Anonymity treatment is \$16, while in the Anonymity treatment it is \$12. A better comparison, then, consists of comparing decisions with comparable allocation amounts. For instance, Decision 3 in the No Anonymity treatment and Decision 4 in the Anonymity treatment both offer the opportunity to play an \$11 dictator game. For these decisions, the figures are 58 percent and \$1.51 for No Anonymity and 74 percent and \$1.42 for Anonymity. While the difference in entry rates is marginally significant ( $\chi^2_{(1)} = 2.54$ ), the difference in the effective amount shared by dictators is not ( $t_{92} = .20$ ).

<sup>22</sup> The significance fails to reach 10% either using a t-test ( $t_{92} = 1.17$ ) or a Kolmogorov-Smirnov test ( $D_{46,48} = 0.19$ ). When all rounds are taken together, the results are statistically significant (see tables 3b and 4).

39/70 opted out of playing in decision 2. Despite the fact that these individuals shared when forced to do so, the majority chose to avoid the sharing environment when it was costless to do so. These individuals were not seeking opportunities to share, but instead shared because they dislike not sharing.

Additionally, 25% of the individuals do not share at all, even in round 1. They might be characterized as those with pure self-regarding preferences. Finally some individuals fit the sharing preferences (“like to share”) observed earlier in the literature. A sizeable fraction, 33% (31 of 94) of subjects share initially and continue to play and share in the dictator game in Decision 2. They are individuals who like to share, perhaps because they truly have other-regarding preferences or for some other reason.

The largest group of subjects, 44%, shares initially in Round 1, but sorts out of the dictator game in Round 2. Many share in dictator environments not because they like sharing, but because they dislike not sharing. They have  $\alpha < 1$  and  $\lambda^* > 1$ . From proposition 1, this means that the majority shared in the first decision because they dislike not sharing, not because they like sharing.

Consistent with the specific formulation that gives rise to proposition 4, the subjects share a roughly constant portion of the available surplus, matching rather closely the Cobb-Douglas specification. The evidence on the applicability of the modified Cobb-Douglas utility function can be presented more directly. A regression of share given to other individuals that allows for person effects produces an r-square of .94 and a coefficient of zero on the size of the amount available in the round (see table 3). The F-statistic on the person effects is about 35. Individuals differ in the proportion that they share, but when they opt to play, the proportion that they give remains very stable and is independent of the amount available in the decisions. Person fixed-effects explain almost all of the variation in the share given.

Now consider whether and how the frequency and the amount of sharing are affected by the option to sort out, as introduced in Decision 2. As shown in Figures 2 and 3, allowing for sorting reduces the frequency of sharing from 74% to 33% and the average percentage shared from 27% to 12%. Tables 4a and 4b present the results in a regression framework. Table 4a looks at absolute level of the amount given to the other player for Decisions 1 and 2. The “choice” variable is a dummy equal to 1 when the potential dictator has the ability to opt out of playing, i.e., choice=0 in Decision 1 and 1

in Decision 2. There is evidence that the decrease associated with choice is statistically and economically significant, after controlling for the degree of anonymity, gender, and after clustering by person (column 4).

Table 4b presents an analysis where the dependent variable is the proportion rather than amount shared. All rounds are included. We find a large negative effect of choice on the degree of sharing. If the potential dictator opts against playing, “share” is necessarily zero. The key result is that there is a significant negative coefficient on “choice” in every specification in table 4b. These results provide strong support for proposition 2.

Some additional details from table 4b are worth noting. Subjects give less when they remain anonymous. The coefficient on “anonym,” a dummy equal to 1 when the treatment was Anonymity, is negative. This is consistent if individuals dislike not sharing. They are uncomfortable about the shame of not sharing, which is more intense when individuals must face the potential recipient. Potential dictators are more likely to give when they are forced to face the other subject directly. There is no difference between the effect of choice in the No Anonymity and Anonymity treatments as is seen in the insignificant coefficient on the interaction between choice and anonym. There is some weak evidence that female subjects share less, but the effects are not always significant.

#### *Who Is Least Willing to Play?*

How does the proportion of types vary by round? The logic of the theory section suggests that two types are most likely to play the game: those who like to share and those who have the least distaste for playing the game. From (4), for those individuals who dislike not sharing ( $\lambda > 1$ ) and opt out of playing in round 2 when playing and not playing yield the same amount, the premium that they must be paid to participate in a dictator game rises in  $1 - \alpha$ . Specifically,

$$\frac{W'}{W} = \lambda^{1-\alpha}$$

so

$$(5) \quad \frac{\partial(W^1/W)}{\partial(1-\alpha)} = \lambda^{1-\alpha} \ln(\lambda) > 0 \quad \text{for } \lambda > 1.$$

A direct measure of  $1-\alpha$  is the amount shared in round 1 when the environment does not allow choice. Completely self-regarding individuals have  $1-\alpha = 0$  and share nothing. Those who like to share are individuals who share in round 1 and play (and share) in round 2. []

Figure 4a provides some evidence on the likelihood of playing by type. Three groups are defined. “Stingy” is defined as those who gave 2 or less (out of 40) in decision 1. “Generous” is defined as those who gave at least 19 in decision 1. Figure 4a summarizes the results combined over decisions (rounds) 2-6. Note that the middle group is less likely to play than either of the more extreme types. “Generous” people play presumably because they like to share. “Stingy” people play (when there is a premium) because they are the most easily induced back into the game at a small price. These results support proposition 4. The difference between the probability that the stingy and middle will play is .06 with a standard error of .01. The difference between the probability that the generous and middle will play is .09 with a standard error of .01.

The story is clearer and also consistent with the theory in Figure 4b. In decision 2, only the generous are more likely to play than the middle group. But by decision 3, the pattern has reversed. Because there is a premium associated with playing over passing, the stingy jump back in and at higher proportions than the generous. At very high levels of payment, every subject opts to play.

The pattern of participation is therefore one of extremes. Allowing individuals to opt out of a sharing situation costlessly induces those who do not want to share to leave. But as soon as a premium is paid to put oneself in the unpleasant sharing environment, the stingiest come back first because they derive the least disutility from having to confront the sharing environment. This is a consequence of the Cobb-Douglas utility

form. Although not a general theoretical proposition, this is additional evidence that the Cobb-Douglas form captures behavior well.

We have no evidence to suggest that this pattern generalizes to other situations. But the point that selection may be adverse or extreme, although not new, is relevant in experimental settings as well as in the real world.

Finally, Table 5 yields the result that for those who share because they dislike not sharing (they opt out of decision 2), there is a negative relation of willingness to play to the initial amount that they share in round 1. This is direct confirmation of (5), under Cobb-Douglas. Those who opt out of decision 2 are those for whom  $\lambda > 1$ , that is, those for whom the sharing environment is painful. For these individuals, the larger is  $1-\alpha$ , the more they share in the initial round and the more they are willing to pay to avoid the sharing situation. Our findings confirm our main hypotheses. Sorting significantly affects the extent of sharing and increased incentives to play has the strongest effect on those who are least willing to share. Again, proposition 4 is borne out by the results of the experiment.

## **V. Conclusions**

The research presented in this paper aims at highlighting the effects of sorting in economic environments. Our work is motivated by the observation that in the real world people regularly sort in to and out of different kinds of economic environments such as firms, markets, and institutions, but that in the laboratory these sorting decisions are largely ignored. Instead, subjects are typically placed in one particular kind of situation where they are forced to make a choice that they might avoid making outside the laboratory. The goal of this analysis is to model the sorting decision and to investigate how it affects conclusions in a laboratory environment.

The most important result is that when individuals are forced to play a dictator game, the majority share. But when they are allowed to opt out of the game, the majority do not share. Choosing subjects randomly, and forcing them to play the dictator game,

would lead us to believe that sharing is pervasive in the world. However, allowing people to avoid the sharing situation might lead to the opposite conclusion, namely that a subset of individuals share, but the majority avoid situations where sharing is expected. In markets, it is the preferences of the marginal agents, not the average ones, that determine outcomes. Experiments on randomly chosen subjects provide information about the average individuals, not the players at the relevant margin.

The model allows an additional motivation for sharing than that which is present in most behavioral models. Individuals may share not because they like to share, but because they dislike not sharing. Allowing for preferences of this type yields some counter-intuitive predictions about the effects of sorting. In particular, we predict that sorting will lead some of those who appear to be most fairness-minded in the forced-choice experiments to be more likely to avoid environments where they can act fairly. We conduct an experimental study that allows for sorting and find support for this hypothesis.

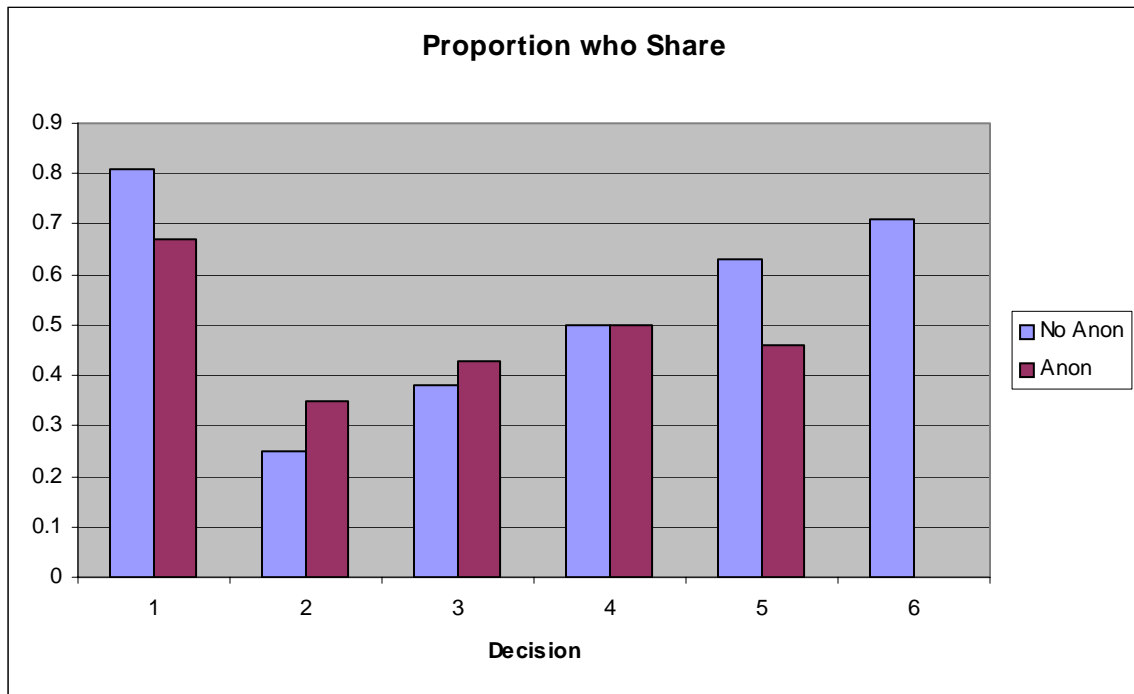
We plan to extend this work to explore the effects of sorting on other kinds of social preferences such as reciprocity and intrinsic motivation. While we expect that sorting might produce outcomes that are less consistent with these preferences, it is worth noting that we do not mean to imply that these preferences do not exist or matter. Instead, we argue that the possibility of sorting might mitigate their impact outside the laboratory.

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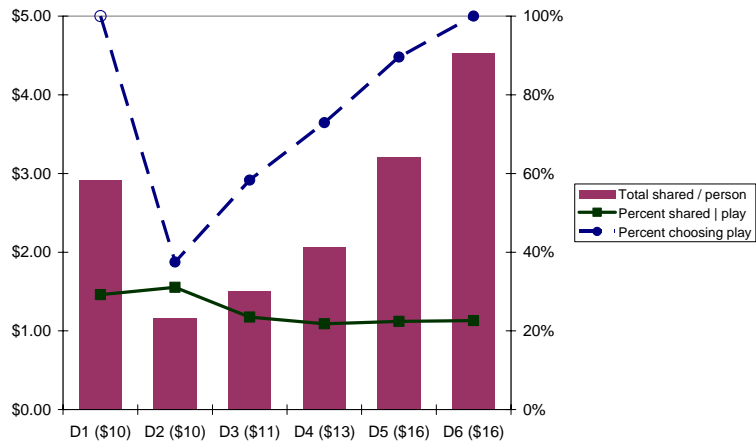
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Figure 1



**Figure 2. No Anonymity (6 sessions; N=48)**



**Figure 3. Anonymity (6 sessions; N=46)**

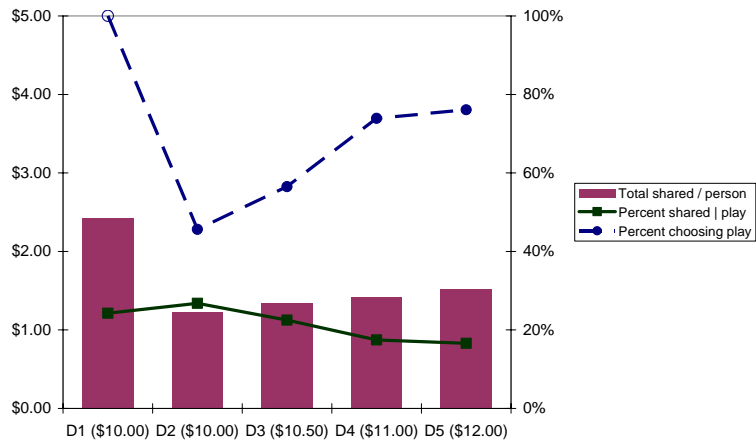


Figure 4a

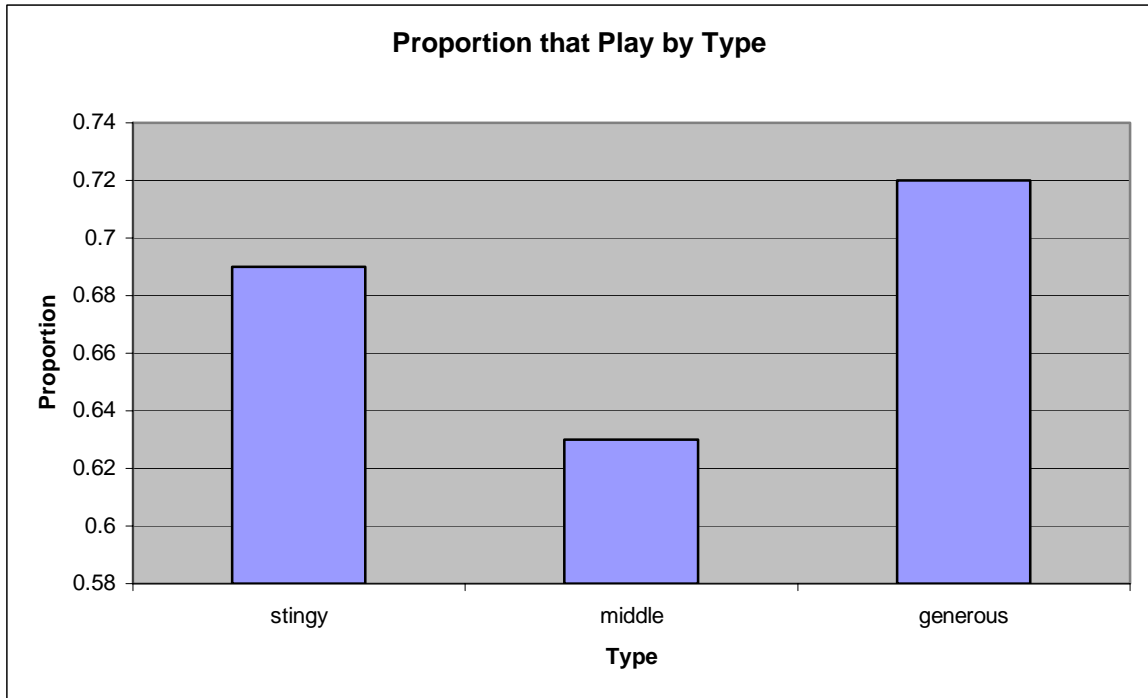
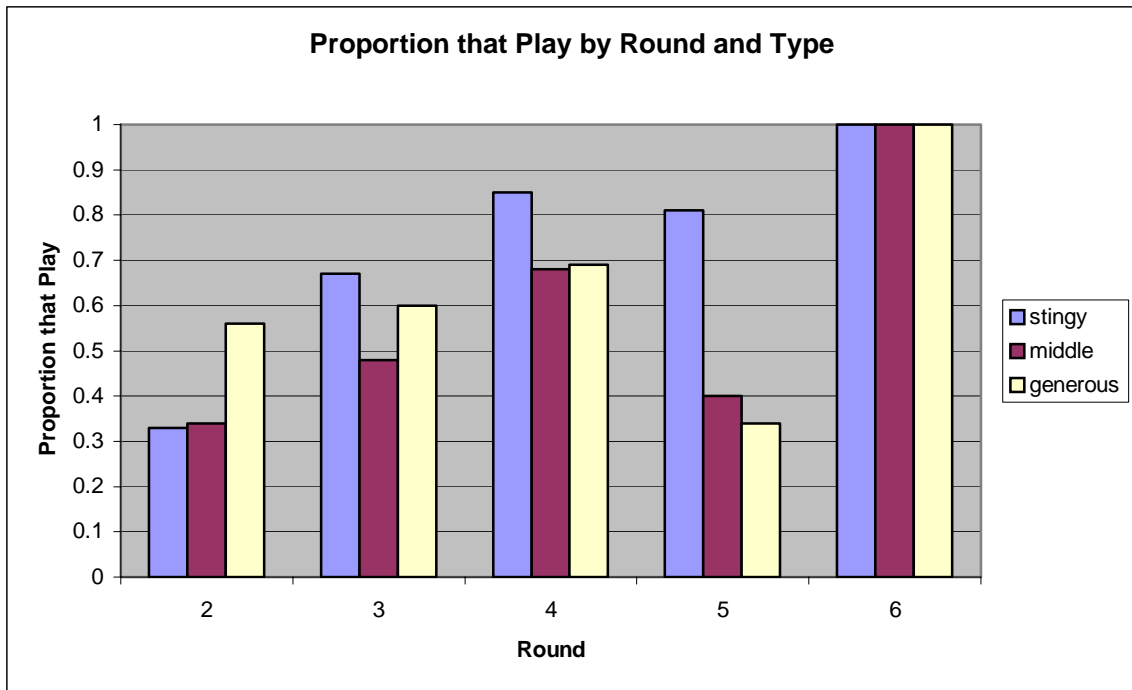


Figure 4b



**Table 1a. Amount allocated in dictator game by decision and treatment**

	<b>Dictator allocation (Anonymity)</b>	<b>Dictator allocation (No Anonymity)</b>	<b>Sorting option (\$10)</b>
Decision 1	\$10.00 (40 tokens)	\$10.00 (40 tokens)	No
Decision 2	\$10.00 (40 tokens)	\$10.00 (40 tokens)	Yes
Decision 3	\$10.50 (42 tokens)	\$11.00 (44 tokens)	Yes
Decision 4	\$11.00 (44 tokens)	\$13.00 (52 tokens)	Yes
Decision 5	\$12.00 (48 tokens)	\$16.00 (64 tokens)	Yes
Decision 6		\$20.00 (80 tokens)	Yes
Number of sessions	6	6	
Number of dictators	46	48	

**Table 2. Sorting Decision in Round 2**

<b>Play</b>	<b>Frequency</b>	<b>Percent</b>	<b>Initial Non-Sharers</b>	<b>Initial Sharers</b>
0	55	58.51	16	39
1	39	41.49	8	31
Total	94	100		

**Table 3**  
**Proportion Shared Fixed Effects (person) Regression**  
**All Rounds; Players Only**

Variable	Coefficient	t
Amount available in decision	-.00015	-.44
Constant	.2289	12.18
r-squared	.94	
Person: F(87, 199)	35.2	

**Table 4a. Amount Shared in Decisions 1 and 2**

The dependent variable is the amount shared.

Choice is a binary variable and equal to 1 in Decision 2. Anonymity is a binary variable and equal to 1 in the Anonymity treatment. We allow for arbitrary within-person correlation in Column 4. The sample is restricted to Decisions 1 and 2.

	Amount (1)	Amount (2)	Amount (3)	Amount (4)
Choice	-5.936 (1.175)	-5.936 (1.177)	-5.936 (1.179)	-5.936 (0.801)
Anonymity	-0.884 (1.176)		-0.874 (1.183)	-0.874 (1.482)
Female		-0.192 (1.181)	-0.115 (1.187)	-0.115 (1.501)
Constants	11.145 (1.011)	10.817 (1.051)	11.203 (1.175)	11.203 (1.327)
Observations	188	188	188	188
R <sup>2</sup>	0.12	0.12	0.12	0.12

Standard errors are in parentheses.

**Table 4b**  
**Proportion Shared with other Player**

	(1)	(2)	(3)	(4)	(5)
	Reg	Reg	Reg	Reg	Tobit
	shar	shar	Shar	Shar	shar
choice	-0.133	-0.133	-0.124	-0.124	-0.249
	(6.00)**	(6.07)**	(4.06)**	(4.07)**	(5.94)**
anonym		-0.064	-0.05	-0.047	-0.126
		(3.94)**	(1.25)	(1.18)	(3.81)**
Anonym*			-0.017	-0.017	
choice			(0.39)	(0.4)	
female				-0.033	-0.049
				(2.03)*	(1.48)
Constant	0.268	0.299	0.292	0.309	0.301
	(13.27)*	(13.95)*	(10.47)*	(10.65)**	(6.88)**
	*	*	*		
Observations	564	564	564	564	564
R-squared	0.06	0.09	0.09	0.09	

Absolute value of t-statistics in parentheses

\* significant at 5% level; \*\* significant at 1% level

**Table 5. Relation between Initial Sharing and Sorting Over Time  
for Initial Sharers that Opt Out in Round 2**

**Dependent Variable: Play = 1**

**Linear Probability Regressions**

	(1)	(2)	(3)	(4)
Initial Share	-0.082 (0.029)	-0.095 (0.032)	-0.112 (0.035)	-0.112 (0.035)
Amount		0.102 (0.023)	0.156 (0.316)	0.155 (0.032)
Anonym			1.840 (0.529)	1.861 (0.537)
Female				-0.112 (0.459)
Constant	1.528 (0.421)	3.631 (1.157)	6.877 (1.669)	-6.779 (1.711)
Observations	141	141	141	141
R <sup>2</sup>	0.05	0.22	0.29	0.29

## Appendix 1. Theoretical Derivation: Modified Cobb Douglas Utility Function

A generalized utility function has the form

$$U = U(D, x, y)$$

where  $D$  is an dummy variable equal to 1 if the environment is one where sharing is possible and 0 if sharing is not possible;  $x$  is own consumption;  $y$  is other consumption. When  $D=0$ ,  $y=0$  because the individual is precluded from sharing. It is possible that even when  $D=1$  so that the opportunity to share is present,  $y=0$ , but this depends on individual choice. The budget constraint is that  $x+y = w$ . The utility function can then be rewritten as

$$U=U(D, x, w-x)$$

The signs of the derivatives are:

$$(A2) \quad U(1, x, w-x) > U(0, w, 0) \text{ for those who like to share}$$

$$U(1, x, w-x) < U(0, w, 0) \text{ for those who dislike not sharing}$$

$$U_2, U_3 > 0$$

$$U_{22}, U_{33}, < 0$$

Additionally, we can think of a premium that the individual would pay to avoid or to ensure being placed in the sharing environment. That premium is given by

$$w' - w$$

which is positive for those who dislike not sharing and negative for those who like sharing. If we define

$$(A2) \quad \lambda^* = w'/w,$$

then  $w'$  and/or  $\lambda^*$  can be defined implicitly as

$$(A4) \quad U(l, x', w' - x') = U(0, w, 0)$$

where  $x'$  is the amount of own consumption chosen in the sharing environment and  $x=w$  when there is no opportunity to share. Alternatively,

$$(A4) \quad U(l, x', \lambda^* w - x') = U(0, w, 0).$$

The parameter  $\lambda^*$  measures the individual's willingness to pay to be placed in or to avoid the sharing environment.

**Proposition 1:** When  $w'=w$ , the only individuals who would choose the sharing environment over the non-sharing environment like to share, i.e., they are those for whom  $\lambda^* < 1$ .

Proof:

Those who dislike not sharing have, by (A2),

$$U(l, x, w-x) < U(0, w, 0)$$

for all who dislike not sharing. Thus, only those who like to share could possibly choose the sharing environment when  $w=w'$ . Further, by (A2), those who like sharing have

$$U(1, x, w-x) > U(0, w, 0)$$

and would therefore prefer the sharing environment. Additionally, from (A4), only if  $\lambda^* < 1$  can

$$U(1, x, w-x) > U(0, w, 0)$$

because  $U_3$  is positive.

**Proposition 2:** There is (weakly) a larger amount shared when individuals are not given choice over environment than when they are given choice.

Proof:

In the absence of choice, all individuals share, except those for whom  $U_2=0$ . Given choice, only those with  $\lambda^* < 1$  choose to share. As a result, the proportion of individuals sharing declines when there is choice over the environment. Further, the amount shared by those who would choose to share voluntarily is identical to that amount shared when the same individuals are “forced” to share because forcing is not a binding constraint. Coupled with the fact that sharing of those who choose to avoid the sharing environment falls to zero, total sharing declines.<sup>2</sup>

Now consider a special case. Assume a modified Cobb-Douglas utility specification, which allows for individuals to have the opportunity to share or not. In this specification  $\lambda^* = \lambda^{1-\alpha}$ . Then,

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<sup>2</sup>It is possible that the conditional mean of sharing among those who choose to play exceeds that in the no choice environment. This depends on the distribution of  $\alpha$  among those with  $\lambda^* < 1$  compared to those with  $\lambda^* > 1$ .

(A5)

$$U(x, y, D) = x^{\alpha[D+(1-D)/\alpha]} [y^{1-\alpha} D + 1 - D]^{1-\alpha} [D + (1 - D)\lambda^{1-\alpha} \alpha^\alpha (1 - \alpha)^{1-\alpha}]$$

This seemingly complex function is actually quite straightforward and captures the tastes of those who like to share, those who dislike not sharing, and those who are self-regarding. Those who like to share have  $\lambda < 1$ . Those who dislike sharing have  $\lambda > 1$ . Consider the two possibilities.

When  $D=1$  so that individuals are in an environment that permits sharing, (A5) becomes

$$(A6) U(x, y) = x^\alpha y^{1-\alpha}$$

which is the standard Cobb-Douglas formulation. The optimum level of  $x$  and  $y$ , given this utility function is  $x = \alpha w$  and  $y = (1 - \alpha)w$  so that (A2) becomes

$$(A6') U(x, y) = [\alpha w]^\alpha [(1 - \alpha)w]^{1-\alpha} \\ = \alpha^\alpha (1 - \alpha)^{1-\alpha} w$$

When  $D=0$ , eq. (A5) becomes

$$(A7) U(x, y) = \lambda^{1-\alpha} \alpha^\alpha (1 - \alpha)^{1-\alpha} x \\ = \lambda^{1-\alpha} \alpha^\alpha (1 - \alpha)^{1-\alpha} w \text{ since all } w \text{ is spent on } x.$$

If  $\lambda < 1$ , then individuals prefer  $D=1$  to  $D=0$ . Those individuals like to share. If  $\lambda > 1$ , then individuals prefer  $D=0$  to  $D=1$ . That is, individuals for whom  $\lambda > 1$ , get more utility from the environment that does not permit sharing. They are those who dislike not sharing because their utility is lower when they are in the sharing environment than when they are not, but they will share given that they are in a sharing environment.

Note further that the allocation of  $W$  to  $X$  and  $Y$  does not depend on  $\lambda$ . Although, those with  $\lambda > 1$  dislike not sharing and those with  $\lambda < 1$  like sharing, both types behave similarly when forced into a sharing environment. When given the opportunity to share, all allocate  $\alpha W$  to  $X$  and  $(1 - \alpha)W$  to  $Y$ . When there is no opportunity to share, both set  $X=W$ .

Even those who dislike not sharing and would shun the sharing environment can be induced to enter the sharing environment at the right price. Comparing (A7) to (A6') reveals that if  $W$  in the sharing environment were equal to  $\lambda^{1-\alpha}$  times the  $W$  in the non-sharing environment, even those who dislike not sharing would be indifferent between the two environments. Thus, the amount necessary to induce an individual to enter a sharing environment voluntarily,  $W'$ , is

$$(A8) \quad w' = \lambda^{(1-\alpha)} w$$

fully compensates for utility lost or gained by being in the sharing environment relative to the non-sharing one.

Irrespective of  $\lambda$ , the amount shared in the sharing environment depends only on  $\alpha$ . Lower levels of  $\alpha$  reflect a desire to share more, either because the individual likes sharing (when  $\lambda < 1$ ) or because the individual dislikes not sharing (when  $\lambda > 1$ ). Purely self-regarding individuals are those for whom  $\alpha = 1$ . Eq. (A6) implies that they do not share, even when they are in the sharing environment.

Given the Cobb-Douglas form, two additional propositions follow.

**Proposition 3:** In the absence of the option to avoid the sharing environment, the proportion shared measures the person-specific  $\alpha$ .

Proof:

This follows directly from (A2), which implies shares of  $\alpha$  and  $(1-\alpha)$  for self and other.

**Proposition 4:** The  $w'$  at which individuals who dislike not sharing choose to enter the sharing environment decreases in  $\alpha$ .

Proof:

Follows directly from (A8).

## **Appendix 2. Sample Instructions**

### **Initial Instructions**

This is an experiment in decision-making. Several research institutions have provided funds for this research. In addition to a \$6 participation bonus, you will be paid any additional amount you accumulate during the experiment privately, in cash, at the end. The exact amount you receive might vary and will be determined during the experiment. If you have any questions during the experiment, please raise your hand and wait for an experimenter to come to you. Please do not talk, exclaim, or try to communicate with other participants during the experiment. Participants intentionally violating the rules may be asked to leave the experiment and may not be paid.

We will now assign everyone in the room a participant number. Please take an envelope from the experimenter. In each of the randomly shuffled envelopes is a card with a number from 1 to 20. The number in your envelope is your participant number for the remainder of the experiment. Your participant number is private and should not be shared with anyone.

We would now like to ask all of you who have participant numbers between 11 and 20 to follow the experimenter to an area outside of this room. These participants will complete a series of short questionnaires for about 25 minutes. They will not be paid any money for doing so.

## **Instructions for Participants 1-10**

Participants with numbers 1 through 10 will now make a series of decisions. There will be a total of 5/6 decisions. At the end of the experiment, we will randomly select one of these decisions and only this decision will count. We will select the decision that counts by randomly drawing a number from 1 to 5/6. Each participant will be paid based only on this decision (in addition to the \$6 participation bonus). Since you do not know which of the decisions this will be, you should treat each decision as if it were the only one that counted –it could end up being so.

For each decision, the experimenter will hand you a set of sheets. Please wait until everyone has their sheets before turning them over. After you are done, the experimenter will collect all of the sheets and we will move on to the next decision.

Are there any questions before we proceed?

### **Decision 1 (Anonymity)**

In the first decision, you will play a game in which you will be matched with one of the participants in the adjacent area (i.e., participants 11-20). The match is anonymous and determined by random draw.

In the game, you will allocate 40 tokens between yourself and the participant with whom you are matched. Each of the tokens is worth \$0.25 cents. This means that the total value of the tokens is \$10.00. Your decision will be to allocate any number of tokens between 0 and 40 to the matched participant and keep the remainder for yourself. For instance, if you keep all 40 tokens then you will receive \$10 at the end of the experiment and the person you are anonymously matched with will receive \$0. Or, if you give all 40 tokens then you will receive \$0 and the person you are matched with will receive \$10.

The participants in the adjacent area have not been told anything about this game. They were given a set of questionnaires and asked to proceed through them at their own pace. However, if this decision is selected as the one that counts, then the experimenter will bring all participants 11-20 into the room at the end of the experiment. The experimenter will then explain the game you have played to them by reading the basic instructions aloud. Each of these participants will then find out how many tokens he or she received from the participant in this room with whom he or she was anonymously matched.

The game will now proceed as follows:

- 1) Each of you has an envelope in front of you. Please do not open this envelope yet. Inside the envelope is the number of the participant you will be matched with and a sheet on which you will indicate your decision.
- 2) Once you open the envelope, you should make sure that the other participant's number is on the sheet. You should then write your participant number in the space where it asks you to do so.
- 3) You should then indicate how you wish to allocate the 40 tokens between yourself and the other participant. The total of the two amounts should sum to exactly 40. If they do not sum to 40, then the other participant will receive whatever sum you specify and you will receive the remainder.
- 4) The experimenter will then collect these sheets from you.

If, at the end of the experiment, this decision is selected to count, then the end of the experiment will proceed as follows:

- 5) The experimenter will bring participants 11-20 back into the room and will briefly explain the game to them. The participant you are matched with will then receive the sheet that you filled out, indicating how many tokens he or she received.

- 6) The experimenter will then anonymously pay participants 11-20 their total earnings, and will then anonymously pay all of you. This will conclude the experiment.

Are there any questions? If not, then please proceed by opening your envelope.

### **Decision 1 (No Anonymity)**

In the first decision, you will play a game in which you will be matched with one of the participants in the adjacent area (i.e., participants 11-20). The match is determined by random draw.

In the game, you will allocate 40 tokens between yourself and the participant with whom you are matched. Each of the tokens is worth \$0.25 cents. This means that the total value of the tokens is \$10.00. Your decision will be to allocate any number of tokens between 0 and 40 to the matched participant and keep the remainder for yourself. For instance, if you keep all 40 tokens then you will receive \$10 at the end of the experiment and the person you are matched with will receive \$0. Or, if you give all 40 tokens then you will receive \$0 and the person you are matched with will receive \$10.

The participants in the adjacent area have not been told anything about this game. They were given a set of questionnaires and asked to proceed through them at their own pace. However, if this decision is selected as the one that counts, then the experimenter will bring all participants 11-20 into the room at the end of the experiment. The experimenter will then explain the game you have played to them by reading the basic instructions aloud. Each of these participants will then find out how many tokens he or she received from the participant in this room with whom he or she was matched, as well as the identity of the person with whom he or she was matched.

The game will now proceed as follows:

- 7) Each of you has an envelope in front of you. Please do not open this envelope yet. Inside the envelope is the number of the participant you will be matched with and a sheet on which you will indicate your decision.
- 8) Once you open the envelope, you should make sure that the other participant's number is on the sheet. You should then write your participant number in the space where it asks you to do so.
- 9) You should then indicate how you wish to allocate the 40 tokens between yourself and the other participant. The total of the two amounts should sum to exactly 40. If they do not sum to 40, then the other participant will receive whatever sum you specify and you will receive the remainder.
- 10) The experimenter will then collect these sheets from you.

If, at the end of the experiment, this decision is selected to count, then the end of the experiment will proceed as follows:

- 11) The experimenter will bring participants 11-20 back into the room and will explain the game to them. You will then hand to the participant with whom you were matched the sheet you filled out, indicating how many tokens he or she received.
- 12) The experimenter will then anonymously pay participants 11-20 their total earnings, and will then anonymously pay all of you. This will conclude the experiment.

Are there any questions? If not, then please proceed by opening your envelope.

## Decision 2 (Anonymity)

In the second decision, you will have the opportunity to play exactly the same game as in Decision 1. Alternatively, you can decide not to play the game (i.e. you can “pass”), in which case you will receive the fixed sum of \$10 (plus the \$6 participation bonus). You now have two envelopes in front of you. One is labeled “play” and the other is labeled “pass.” Please do not open either envelope until we are done reading the instructions.

If you choose to play the game, open the envelope marked “play.” This envelope will have a sheet like the one in Decision 1. If you open this envelope, then you will be matched with the person whose participant number is on the sheet. The participant number may differ from the one in Decision 1 since the envelopes were randomly distributed each time. You should then write your participant number on the sheet and indicate how you wish to allocate the 40 tokens (each worth 25 cents, i.e. \$10 in total). If this decision is selected at the end of the experiment, the matched participant will be brought back into the room and will be told about the game. This matched participant will then receive the sheet you filled out indicating how much he or she received.

If you choose not to play the game, open the envelope marked “pass.” Inside this envelope is a sheet on which you will write your participant number and mark an “X” to indicate that you pass. You will not be matched with one of the participants outside the room and you will not allocate tokens. If this decision is selected at the end of the experiment, you will receive a fixed sum of \$10.

Notice that if you choose to play the game, then you will be matched with one of the participants outside. If you choose to pass, then you will not be matched with any of the participants outside.

If Decision 2 is selected as the one that counts, then at the end of the experiment the experimenter will go to the area with the other participants and ask: “Will the participants with the following numbers please come back into the room?” If you chose to play the game, then the number of the participant with whom you are matched will be read to the participants outside, and this participant will be brought back into the room. The experimenter will explain the game aloud to the participants who are brought back into the room and will then give them the sheets filled out by the participants in this room with whom they were matched. If you chose not to play the game, then the number of the participant with whom you would have been matched will not be read to the participants outside, and this participant will receive the \$6 participation bonus and will leave the experiment without learning anything about the game.

Are there any questions? If not, then please proceed by opening only one of the two envelopes.

### Decision 3 (Anonymity)

The third decision is similar to Decision 2. You again have two envelopes in front of you. Please do not open either envelope until we are done reading the instructions.

Once we are ready to proceed, you will have the opportunity to decide between playing a game like the one in previous decisions and choosing to pass.

The only difference between this decision and Decision 2 is that if you play the game, you will now allocate a total of **42 tokens**, each of which is worth 25 cents. That is, the total amount you will have to allocate will now be \$10.50. Otherwise, this decision will be identical to the one in Decision 2. If you decide not to play the game, you will receive the fixed sum of \$10 (plus the \$6 participation bonus).

If you choose to play the game, open the envelope marked “play.” If you open this envelope, then you will be matched with the person whose participant number is inside. Since the envelopes are randomly distributed for each decision, you could be matched with any of the participants outside the room.

If you choose not to play the game, open the envelope marked “pass,” write down your participant number and mark an “X” on the sheet inside. You will not be matched with one of the participants outside and you will not allocate tokens.

If Decision 3 is selected as the one that counts, then at the end of the experiment the experimenter will call in only those participants outside who are matched with people who chose to play the game. The remaining participants will not be told anything about the game, will receive the \$6 participation bonus, and will leave the experiment.

Are there any questions? If not, then please proceed by opening only one of the two envelopes.

Please write your participant number \_\_\_\_\_

### **Instructions for participants 11-20**

Your role in this experiment will be to complete a series of simple tasks for about 20-25 minutes. You will receive the \$6 participation bonus after doing so.

Before each task, you will see a brief instruction sheet. Please read this instruction sheet carefully before proceeding. In some cases, the instructions will ask you to wait for the experimenter to ask you to proceed. You will not receive additional money based on your answers in these tasks, but we would appreciate you filling them out as best as you can.

In about 20-25 minutes, the experimenter will collect your sheets and will pay you at the same time. If you finish before then, please wait quietly.

Thank you for participating.

**Appendix-Table 1. Actions of (Potential) Dictators in No-Anonymity treatment**  
Sample divided by behavior in first decision.

	<i>Decis. 1</i> <i>(\$10)</i>	<i>Decis. 2</i> <i>(\$10)</i>	<i>Decis. 3</i> <i>(\$11)</i>	<i>Decis. 4</i> <i>(\$13)</i>	<i>Decis. 5</i> <i>(\$16)</i>	<i>Decis. 6</i> <i>(\$20)</i>
<b><i>All potential dictators (N=48)</i></b>						
<b><i>Pass</i></b>		30 (63%)	20 (42%)	13 (27%)	5 (10%)	0 (0%)
<b><i>Share 0%</i></b>	9 (19%)	6 (13%)	10 (21%)	11 (23%)	13 (27%)	14 (29%)
<b><i>Share (0%,50%)</i></b>	22 (46%)	3 (6%)	10 (21%)	17 (35%)	21 (44%)	21 (44%)
<b><i>Share ≥ 50%</i></b>	17 (35%)	9 (19%)	8 (17%)	7 (15%)	9 (19%)	13 (27%)
<b><i>Total shared / subj</i></b>	\$2.92	\$1.17	\$1.51	\$2.07	\$3.21	\$4.53
<b><i>Potential dictators who initially shared 0% (N=9)</i></b>						
<b><i>Pass</i></b>	9 (100%)	6 (67%)	2 (22%)	0 (0%)	0 (0%)	0 (0%)
<b><i>Share 0%</i></b>	0 (0%)	3 (67%)	6 (67%)	9 (100%)	8 (89%)	8 (89%)
<b><i>Share (0%,50%)</i></b>	0 (0%)	0 (0%)	1 (11%)	0 (0%)	1 (11%)	1 (11%)
<b><i>Share ≥ 50%</i></b>	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
<b><i>Total shared / subj</i></b>	\$0.00	\$0.00	\$0.06	\$0.00	\$0.11	\$0.17
<b><i>Potential dictators who initially shared (0%,50%) (N=22)</i></b>						
<b><i>Pass</i></b>	0	17 (77%)	12 (55%)	8 (36%)	4 (18%)	0 (0%)
<b><i>Share 0%</i></b>	0	2 (9%)	3 (14%)	1 (5%)	3 (14%)	3 (14%)
<b><i>Share (0%,50%)</i></b>	22 (100%)	2 (9%)	7 (32%)	13 (59%)	15 (68%)	17 (77%)
<b><i>Share ≥ 50%</i></b>	0	1 (5%)	0 (0%)	0 (0%)	0 (0%)	2 (9%)
<b><i>Total shared / subj</i></b>	\$2.51	\$0.55	\$0.86	\$1.63	\$2.38	\$3.94
<b><i>Potential dictators who initially shared ≥ 50% (N=17)</i></b>						
<b><i>Pass</i></b>		7 (41%)	6 (35%)	5 (29%)	1 (6%)	0 (0%)
<b><i>Share 0%</i></b>	0 (0%)	1 (6%)	1 (6%)	1 (6%)	2 (12%)	3 (18%)
<b><i>Share (0%,50%)</i></b>	0 (0%)	1 (6%)	2 (12%)	4 (24%)	5 (29%)	3 (18%)
<b><i>Share ≥ 50%</i></b>	17 (100%)	8 (47%)	8 (47%)	7 (41%)	9 (53%)	11 (65%)
<b><i>Total shared / subj</i></b>	\$5.00	\$2.59	\$3.12	\$3.74	\$5.94	\$7.59

**Appendix-Table 2. Actions of (Potential) Dictators in Anonymity Treatment**  
Sample divided by behavior in first decision.

	<b>Decis. 1</b> <b>(\$10)</b>	<b>Decis. 2</b> <b>(\$10)</b>	<b>Decis. 3</b> <b>(\$10.50)</b>	<b>Decis. 4</b> <b>(\$11.00)</b>	<b>Decis. 5</b> <b>(\$12.00)</b>
<i>All potential dictators (N=46)</i>					
<i>Pass</i>		25 (54%)	20 (43%)	12 (26%)	11 (24%)
<i>Share 0%</i>	15 (33%)	5 (11%)	6 (13%)	11 (24%)	14 (30%)
<i>Share (0%,50%)</i>	16 (35%)	12 (26%)	14 (30%)	16 (35%)	16 (35%)
<i>Share ≥ 50%</i>	15 (33%)	4 (9%)	6 (13%)	7 (15%)	5 (11%)
<i>Total shared / subj</i>	\$2.42	\$1.22	\$1.34	\$1.42	\$1.52
<i>Potential dictators who initially shared 0% (N=15)</i>					
<i>Pass</i>		10 (67%)	7 (47%)	4 (27%)	4 (27%)
<i>Share 0%</i>	15 (100%)	4 (27%)	5 (33%)	8 (53%)	9 (60%)
<i>Share (0%,50%)</i>	0 (0%)	1 (7%)	3 (20%)	3 (20%)	2 (13%)
<i>Share ≥ 50%</i>	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
<i>Total shared / subj</i>	\$0.00	\$0.27	\$0.33	\$0.40	\$0.40
<i>Potential dictators who initially shared (0%,50%) (N=16)</i>					
<i>Pass</i>		8 (50%)	6 (38%)	3 (19%)	4 (25%)
<i>Share 0%</i>	0 (0%)	1 (6%)	1 (6%)	2 (13%)	2 (13%)
<i>Share (0%,50%)</i>	16 (100%)	7 (44%)	9 (56%)	11 (69%)	9 (56%)
<i>Share ≥ 50%</i>	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (6%)
<i>Total shared / subj</i>	\$2.25	\$1.20	\$1.09	\$0.92	\$1.52
<i>Potential dictators who initially shared ≥ 50% (N=15)</i>					
<i>Pass</i>		7 (47%)	7 (47%)	5 (33%)	3 (20%)
<i>Share 0%</i>	0 (0%)	0 (0%)	0 (0%)	1 (7%)	3 (20%)
<i>Share (0%,50%)</i>	0 (0%)	4 (27%)	2 (13%)	2 (13%)	5 (33%)
<i>Share ≥ 50%</i>	15 (100%)	4 (27%)	6 (40%)	7 (47%)	4 (27%)
<i>Total shared / subj</i>	\$5.03	\$2.20	\$2.60	\$2.97	\$2.63

**Appendix Table 3c. Amount Shared over**

	No Anonymity								Anonymity							
	Amount				Percent				Amount				Percent			
Play	Mean	SD	min	max	Mean	SD	min	max	Mean	SD	min	max	Mean	SD	min	max
Round 1	17.93	3.56	10	20	<b>0.45</b>	0.09	0.25	0.5	15.88	5.91	1	22	<b>0.40</b>	0.15	0.03	0.55
Round 2	14.93	8.07	0	20	<b>0.37</b>	0.20	0	0.5	13.06	6.26	0	22	<b>0.33</b>	0.16	0	0.55
Round 3	16.40	8.72	0	22	<b>0.37</b>	0.20	0	0.5	10.50	8.66	0	22	<b>0.25</b>	0.21	0	0.52
Round 4	19.47	10.01	0	26	<b>0.37</b>	0.19	0	0.5	10.38	9.56	0	22	<b>0.24</b>	0.22	0	0.50
Round 5	22.67	12.53	0	32	<b>0.35</b>	0.20	0	0.5	12.69	9.91	0	30	<b>0.26</b>	0.21	0	0.63
Round 6	28.67	15.99	0	40	<b>0.36</b>	0.20	0	0.5	-	-	-	-	-	-	-	-
<i>N</i>	15				15				16				16			
Give 0																
Round 1	0	0	0	0	<b>0.00</b>	0	0	0	0	0	0	0	<b>0.00</b>	0	0	0
Round 2	0	0	0	0	<b>0.00</b>	0	0	0	1.07	4.13	0	16	<b>0.03</b>	0.10	0	0.40
Round 3	0.22	0.67	0	2	<b>0.01</b>	0.02	0	0.05	1.33	4.12	0	16	<b>0.03</b>	0.10	0	0.38
Round 4	0	0	0	0	<b>0.00</b>	0	0	0	1.60	4.22	0	16	<b>0.04</b>	0.10	0	0.36
Round 5	0.44	1.33	0	4	<b>0.01</b>	0.02	0	0.06	1.60	4.48	0	16	<b>0.03</b>	0.09	0	0.33
Round 6	0.67	2	0	6	<b>0.01</b>	0.03	0	0.08	-	-	-	-	-	-	-	-
<i>N</i>	9				9				15				15			
No Play																
Round 1	12.17	6.00	1	20	<b>0.30</b>	0.15	0.03	0.50	12.80	7.36	2	20	<b>0.32</b>	0.18	0.05	0.5
Round 2	0	0	0	0	<b>0.00</b>	0.00	0	0.00	0	0	0	0	<b>0.00</b>	0	0	0
Round 3	1.75	4.95	0	22	<b>0.04</b>	0.11	0	0.50	3.87	7.41	0	21	<b>0.09</b>	0.18	0	0.5
Round 4	4.38	5.76	0	16	<b>0.08</b>	0.11	0	0.31	4.73	7.69	0	22	<b>0.11</b>	0.17	0	0.5
Round 5	11.38	11.19	0	32	<b>0.18</b>	0.17	0	0.50	3.47	6.39	0	24	<b>0.07</b>	0.13	0	0.5
Round 6	18.04	13.79	0	40	<b>0.23</b>	0.17	0	0.50	-	-	-	-	-	-	-	-
<i>N</i>	24				24				15				15			
Non-perverse players																
Round 1	19.08	1.68	16	20	<b>0.48</b>	0.04	0.40	0.50	16.87	4.53	8	22	<b>0.42</b>	0.11	0.20	0.55
Round 2	18.67	2.61	12	20	<b>0.47</b>	0.07	0.30	0.50	13.93	5.38	4	22	<b>0.35</b>	0.13	0.10	0.55
Round 3	20.50	2.28	16	22	<b>0.47</b>	0.05	0.36	0.50	11.20	8.48	0	22	<b>0.27</b>	0.20	0.00	0.52
Round 4	24.17	2.62	20	26	<b>0.46</b>	0.05	0.38	0.50	11.07	9.47	0	22	<b>0.25</b>	0.22	0.00	0.50
Round 5	28.33	4.96	20	32	<b>0.44</b>	0.08	0.31	0.50	13.53	9.64	0	30	<b>0.28</b>	0.20	0.00	0.63
Round 6	35.83	6.74	20	40	<b>0.45</b>	0.08	0.25	0.50	-	-	-	-	-	-	-	-
<i>N</i>	12				12				15				15			

Definitions: Play= Those who chose to play in round 2; Give 0= those who gave nothing in the first round; No Play = those who chose not to play in round 2; Non-perverse players are those who played in round 2, but did not give zero in round 2 after giving a positive amount in round 1

**Appendix Table 3d Amount Shared among**

		No Anonymity								Anonymity							
		Amount				Percent				Amount				Percent			
		Mean	SD	min	max	Mean	SD	min	max	Mean	SD	min	max	Mean	SD	min	max
<b>Unconditional</b>																	
	Round 1	12.17	6.00	1	20	<b>0.30</b>	0.15	0.03	0.50	12.80	7.36	2	20	<b>0.32</b>	0.18	0.05	0.5
	Round 2	0	0	0	0	<b>0.00</b>	0.00	0	0.00	0	0	0	0	<b>0.00</b>	0	0	0
	Round 3	1.75	4.95	0	22	<b>0.04</b>	0.11	0	0.50	3.87	7.41	0	21	<b>0.09</b>	0.18	0	0.5
	Round 4	4.38	5.76	0	16	<b>0.08</b>	0.11	0	0.31	4.73	7.69	0	22	<b>0.11</b>	0.17	0	0.5
	Round 5	11.38	11.19	0	32	<b>0.18</b>	0.17	0	0.50	3.47	6.39	0	24	<b>0.07</b>	0.13	0	0.5
	Round 6	18.04	13.79	0	40	<b>0.23</b>	0.17	0	0.50	-	-	-	-	-	-	-	-
	<i>N</i>	24				24				15				15			
<b>Conditional on Playing</b>																	
	Round 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Round 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>N</i> = 6	Round 3	7	8.29	0	22	<b>0.16</b>	0.19	0	0.50	9.67	9.31	2	21	<b>0.23</b>	0.22	0.05	0.5 <i>N</i> = 6
<i>N</i> = 11	Round 4	9.55	4.70	1	16	<b>0.18</b>	0.09	0.02	0.31	7.10	8.57	0	22	<b>0.16</b>	0.19	0	0.5 <i>N</i> = 10
<i>N</i> = 19	Round 5	14.37	10.70	0	32	<b>0.22</b>	0.17	0	0.50	4.73	7.11	0	24	<b>0.10</b>	0.15	0	0.5 <i>N</i> = 11
<i>N</i> = 24	Round 6	18.04	13.79	0	40	<b>0.23</b>	0.17	0	0.50								
	<i>N</i>	24				24				15				15			

**Appendix Table 4. Summary Statistics**

	Number	Female	(%)	Male	(%)
Dictators	94	51	0.54	43	0.46
Recipients	94	61	0.65	33	0.35

	Mean	Median	SD	Minimum	Maximum
Number of dictators per session	7.83	8.50	1.95	5	10
Number female dictators per session	4.25	4	1.66	2	8
Percent female dictators per session	0.54	0.50	0.15	0.33	0.80
Number male dictators per session	3.58	3.5	1.38	1	6
Percent male dictators per session	0.46	0.50	0.15	0.20	0.67
Number female recipients per session	5.08	4.5	1.56	3	8
Percent female recipients per session	0.66	0.67	0.13	0.4	0.8