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ABSTRACT

Estimating Social Preferences Using Stated Satisfaction: Novel Support for Inequity Aversion

In this paper, we use stated satisfaction to estimate social preferences: subjects report their satisfaction with payment-profiles that hold their own payment constant while varying another subject's payment. This approach yields significant support for the inequity aversion model of Fehr and Schmidt (1999). This model is among the most renowned in behavioral economics, positing a generalized aversion to inequality that is stronger when one's own payoff is lower–rather than higher–than others'; i.e., "envy" is stronger than "guilt." While aggregate-level estimates based on revealed preferences in laboratory games have supported the model, the assumption that guilt is stronger than envy is often violated at the individual level. This paradox may be due to limitations of the revealed-preference approach. An advantage of avoiding games is that eliciting stated satisfaction is relatively easy to implement and is less prone to being confounded with motives like reciprocity; also the absence of tradeoffs between own and others' payoffs is cognitively less demanding for subjects. Our unstructured approach does not limit the expression of social preferences to inequity aversion, yet our methodology yields significant support for it. At the individual level, 86% of subjects exhibit at least as strong envy as guilt, and 76% (65%) of subjects weakly (strongly) adhere to the model. Our individual-level estimates are robust to changing the value of one's own constant payment and to changing the range of the other subject's payments. Methodologically, eliciting satisfaction can be an easy-to-implement complement to choice-based preference-measures in contexts other than social preferences that are of interest to economists.

JEL Classification: C91, D31, D63, I31

Keywords: inequity aversion, social preferences, stated satisfaction, laboratory experiment

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1 Introduction

In this paper, we develop and implement a new methodology for estimating social preferences. Instead of a revealed-preference approach, we directly ask subjects in a laboratory experiment to report their satisfaction with various payment-profiles that hold their own payment constant while varying another randomly-selected subject's payment. For each individual, we then use the stated satisfaction across payment-profiles to estimate how utility changes with the other subject's payment. We find that for the majority of subjects, stated satisfaction is maximized at equality: increasing with the other subject's payment when the other subject's payment is less than the subject's own, and decreasing more sharply with the other subject's payment thereafter. This pattern is strongly supportive of the inequity aversion model of Fehr and Schmidt (1999), hereinafter F&S.

F&S is arguably the most cited paper in the social-preferences literature, and one of the most cited papers in all of behavioral economics.[1] It describes, in a tractable manner, how aversion to unequal outcomes impacts individual utility. The model captures the distaste for one's own payoff being lower than others' with its "envy" parameter, α, and the distaste for one's own payoff being greater than others' with its "guilt" parameter, β. It is assumed that $\alpha \geq \beta \geq 0$: that is, that both disadvantageous and advantageous inequity are utility-diminishing, the former more so than the latter.

Empirical investigations of the F&S model generally use behavior from laboratory games to derive estimates of α and β; often in these experiments the assumption that α and β are greater than zero is imposed by design. The majority of such investigations estimate α and β at the aggregate level—that is, for the entire experimental sample—and generally support that $\alpha \geq \beta$. A small number of papers estimate α and β at the individual level—that is, for each subject—and find that $\beta > \alpha$ for many subjects.

An advantage of our unstructured approach is that it does not impose bounds on α and β, and thus does not limit the expression of social preferences to inequity aversion. For example, subjects who are altruistic or social-surplus maximizers would report satisfaction that increases with the other subject's payment; this would imply $\alpha < 0$ and $\beta > 0$. Subjects with relative-income concerns–for whom disadvantageous inequity is utility-diminishing but for whom advantageous inequity is utility-enhancing–would report satisfaction that decreases with the other subject's payment; this would imply $\alpha > 0$ and $\beta < 0$. Imposing the assumption of both parameters being positive would not allow for the expression of such social preferences.

An advantage of estimating the parameters without games is that stated satisfaction is less prone to being confounded with other motives, like reciprocity, that could affect decision-making and hence bias inequity-aversion parameter estimates. For example, in ultimatum games, the rejection of low offers can be motivated by reciprocity, the behavioral effects of which can be reduced when alternative outlets (discussed below in Section 2.3) are made available. However, the games used to estimate F&S parameters have not included such

[1] In a 2013 economics blog post, Prof. Liam Delaney compiled a list of the most cited behavioral economics papers, according to Google Scholar and Web of Science. Using both databases, F&S ranks fifth overall, with the higher ranked papers on topics other than social preferences (e.g., prospect theory). When restricting to papers published between 1993 and 2013, F&S is ranked first using both databases. http://economicspsychologypolicy.blogspot.com/2013/07/most-cited-papers-in-behavioral.html

alternative outlets.

Lastly, an advantage of varying the other subject's payment while holding the subject's own payment constant is the lightened cognitive load. For example, in standard laboratory games used to estimate F&S parameters, subjects have to weigh tradeoffs between their own and others' payments. With our approach, no such tradeoffs need to be made.

Our methodology yields substantial support for F&S. Using aggregate estimates, we find that α is significantly greater than β, and both are significantly greater than zero. Using individual estimates, we find that for 86% of subjects, α is greater than or equal to β; for 76% of subjects, the maximum stated satisfaction is reported when the other subject's payment equals her own; and for 65% of subjects, both of these conditions hold, indicating that they strongly adhere to F&S. We show that our individual-level estimates are robust to changing the value of one's own constant payment and to changing the range of the other subject's payments.

The remainder of the paper is organized as follows. In Section 2, we discuss the existing literature and our contributions to it. In Section 3, we develop our methodology for deriving F&S parameters from subjects' stated satisfaction over payment-profiles. In Section 4, we formulate our hypotheses and detail our experimental design. In Section 5, we present our results and robustness checks. Finally, Section 6 concludes and discusses directions for further research.

2 Literature Review

2.1 Social Preference Models

Social preferences appear in a wide variety of models. Applications include inequity aversion (Loewenstein, Thompson, & Bazerman, 1989; Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000), reciprocity and the role of others' intentions (Rabin, 1993; Charness & Rabin, 2002; Dufwenberg & Kirchsteiger, 2004; Falk & Fischbacher, 2006; Segal and Sobel, 2007, 2008), efficiency or social-surplus maximization (Charness & Rabin, 2000), and individual types (e.g., whether one faces an altruistic or spiteful opponent (Levine, 1998)).

F&S has gained popularity as a tractable framework consistent with a wide range of behavior observed in competitive settings and games, including ultimatum, gift exchange, trust, and public goods (Fehr & Schmidt, 2006). F&S also describes behavior that extends beyond the laboratory, e.g., peer inequity aversion in the workplace. Specifically, in settings where workers can acquire information about their peers' salary[2], earning less can negatively impact effort (Cullen & Perez-Truglia, 2018; Cohn, Fehr, Herrmann, & Schneider, 2014), output (Cullen & Perez-Truglia, 2018; Breza, Kaur, & Shamdasani, 2018), attendance (Breza et al., 2018), retention (Cullen & Perez-Truglia, 2018; Dube et al., 2019), and job satisfaction (Card, Mas, Moretti, & Saez, 2012).[3]

[2]Studies in this topic include field experiments where part of the intervention consists precisely of providing this information to workers. Dube, Giuliano, and Leonard (2019) use quasi-experimental variation from a rule-based formula for pay raises.

[3]Interestingly, Breza et al. (2018) find that those negative effects vanish when productivity differences are large and observable (justified inequality).

2.2 Fehr & Schmidt (1999) Model

F&S describe individual i's utility function, in an environment of n players, as follows.

$$U_i(x) = x_i - \alpha_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_j - x_i, 0\} - \beta_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_i - x_j, 0\} \quad (1)$$

Where x_i is individual i's monetary payoff and x_j is individual j's monetary payoff for $i \neq j$. This model has two parameters that capture inequity aversion depending on the direction of the payoff difference: disadvantageous inequity is captured by α_i, which can be interpreted as i's envy level. Advantageous inequity is captured by β_i, which can be interpreted as i's guilt level. Evidently, in the absence of payoff differences between i and j, or when $\alpha_i = \beta_i = 0$, utility is entirely determined by an individual's own payoff.

The model posits the following assumptions over the parameters: $\alpha_i \geq \beta_i \geq 0$ and $\beta_i < 1$. The first assumption implies that, while subjects do not enjoy either type of inequity, they suffer more disutility from disadvantageous inequity than from advantageous inequity. The second assumption rules out that individual i would be willing to discard a dollar to reduce disadvantageous inequity.

2.3 Previous Approaches to Estimating F&S Model

Most previous studies have estimated the envy and guilt parameters in F&S at the aggregate level, i.e., by estimating the average for a sample of participants or an aggregate distribution. This type of analysis is a consequence of using either analysis of the sample distribution (Fehr & Schmidt, 1999; Ellingsen & Johannesson, 2004) or a structural model framework (Bellemare, Kröger, & van Soest 2008, 2011; Goeree & Holt, 2000). In both cases, the analysis is based on behavior observed in various games. Eckel and Gintis (2010) consolidate results from experiments estimating F&S parameters at the aggregate level and find that the average coefficient for envy (guilt) varies from 0.31 to 1.89 (0.34 to 0.80). Additionally, these aggregate-level analyses show that the envy parameter is typically larger than the guilt parameter, in line with F&S's assumption.

Our approach most closely tracks Blanco, Engelmann, and Normann (2011) and Yang, Onderstal, and Schram (2016), a set of experiments focused on, instead, estimating F&S parameters at the individual level. Using the strategy method, Blanco et al. (2011) estimate α_i from the decisions made by the responder in an ultimatum game, and β_i from the decisions made in a modified dictator game. Alternatively, Yang et al. (2016) use choice menus presenting different sets of allocations. In both cases intervals for α_i and β_i are inferred from an individual's switching point. (See Appendix A for a more detailed description of these approaches.)

A common practice in previous studies estimating F&S parameters with either the aggregate or individual approach is to do so using standard games, such as the ultimatum and dictator games. Unfortunately, decisions in these games may confound inequity aversion with other motives. In the standard ultimatum game, the decision to reject a proposal may entail both an inequity aversion concern and a simultaneous decision to punish the proposer and/or express negative emotions. When offers are made through a random generator device, low offers are accepted more frequently than in the standard ultimatum game (Blount,

1995; Bellemare et al., 2011). Similarly, when responders are allowed to express their negative emotions through a message (Xiao & Houser, 2005) or take a cooling-off period before making a decision (Grimm & Mengel, 2011), they accept low offers more frequently than in the standard ultimatum game.[4] These experiments highlight the importance of perceived intentions in influencing responders' behavior. A responder concerned with a proposer's intentions may reject an offer if they consider it unfair. In this regard, they demonstrate negative reciprocity by matching a deviation from a social norm with reciprocal behavior. This behavior is indistinguishable from the same rejection triggered by distributional concerns of an inequity averse responder. Therefore, the ultimatum game may overestimate the envy parameter in F&S by combining effects that point in the same direction: inequity aversion and negative reciprocity.[5]

Similarly, the dictator game may overestimate the guilt parameter due to the fact that the dictator meets expectations of reciprocity when adhering to a certain social norm. Hence, dictators send smaller amounts to their counterparts under a double blind procedure (Hoffman, McCabe, & Smith, 1996), or when they must earn their own endowment (Cherry, Frykblom, & Shogren, 2002). Even though there is no direct reciprocity between the dictator and their counterpart, these modifications to the standard dictator game show behavior consistent with procedure-based fairness concerns.

Our approach contributes to the current literature by improving upon previous estimation methods in the following way: we isolate the effect of inequity aversion from other motives related to procedure-based fairness concerns.

2.4 Stated Preferences

We call our instrument the *inequity list*. It is designed to estimate changes to individual utility attained from monetary allocations with different levels of inequality. We use satisfaction as a proxy for utility in our empirical strategy and are interested in how it changes rather than its level, *per se*.

The shortcomings of reported subjective data are well-recognized. They include: susceptibility to the order of the questions; the wording of the questions; and the scales applied (See Krueger and Schkade (2008), Duckworth and Yeager (2015) and Brañas-Garza, Galizzi, and Nieboer (2018) for discussions on this topic). However, recognizing these biases does not impede the use of satisfaction measures. Indeed, it strengthens their effectiveness by allowing for more productive use of subjective survey data, as proposed by Bertrand and Mullainathan (2001) and discussed by Frey and Stutzer (2002).

Perhaps a more important question is whether individuals exert mental effort towards answering such questions. Other problems, like the ones mentioned in the former paragraph,

[4] Another modification of the ultimatum game is known as the cardinal ultimatum game (Bolton & Zwick, 1995), or the ultimatum minigame (Gale, Binmore, & Samuelson, 1995). In this game, senders' choices are reduced to only two possible allocations while receivers maintain the same choice: whether to accept or reject. In this environment Falk, Fehr, and Fischbacher (2003) find that identical offers are rejected more frequently when the proposer has more fair alternatives available to her, as opposed to when more unfair alternatives are available.

[5] Although negative reciprocity is strongly affected by perceived intentions, evidence from simulated labor markets, social dilemma games and trust games finds weak support for intentions-driven *positive* reciprocity (Falk et al., 2003).

can be overcome by design; for example, randomizing question order. However, lack of attention and random answers are sometimes difficult to identify and may deem inference futile. This is of course true in cases where, for some reason, answers cannot be monetarily incentivized. The following question is thus in order: Do subjects read instructions thoroughly and respond truthfully? This is an empirical question, which our experimental design addresses, as shown in Sections 4 and 5. Moreover, wariness toward satisfaction measures should not exceed wariness toward other measures used by economists. Charness and Grosskopf (2001) point out that mainstream economic analyses have typically used self-reported data from unemployment and Census surveys.[6]

Our approach, making use of an *inequity list*, contributes to the large body of research on stated preferences applied both specifically to distributive preferences (Kuziemko, Norton, Saez, & Stantcheva, 2015; Norton & Ariely, 2011), and more broadly to a set of topics as diverse as education (e.g., Czajkowski, Gajderowicz, Giergiczny, Grotkowska, & Sztandar-Sztanderska, 2020), environmental issues (e.g., Hanley et al., 2017, Alberini, 2019), health (e.g., de Bekker-Grob, Ryan, & Gerard, 2012), savings decisions (e.g., Ameriks, Briggs, Caplin, Shapiro, & Tonetti, 2020), and labor market decisions (Doiron & Yoo, 2020).

This study is also related to a growing literature on happiness in economics, in which subjective well-being (SWB) is typically used as a proxy for utility. Benjamin, Heffetz, Kimball, & Rees-Jones (2012, 2014) and Benjamin, Heffetz, Kimball, and Szembrot (2014) found evidence indicating that while SWB is an important argument in the utility function, individuals do not maximize SWB exclusively. Therefore, refining SWB measurement is important, particularly due to the fact that SWB is multidimensional and may weigh differently on utility depending on the type of decision being made. SWB is a better approximation of utility in minor decisions, like the ones we present in this paper, than in important life decisions (Benjamin et al., 2012).

3 Methodology

3.1 Inequity List

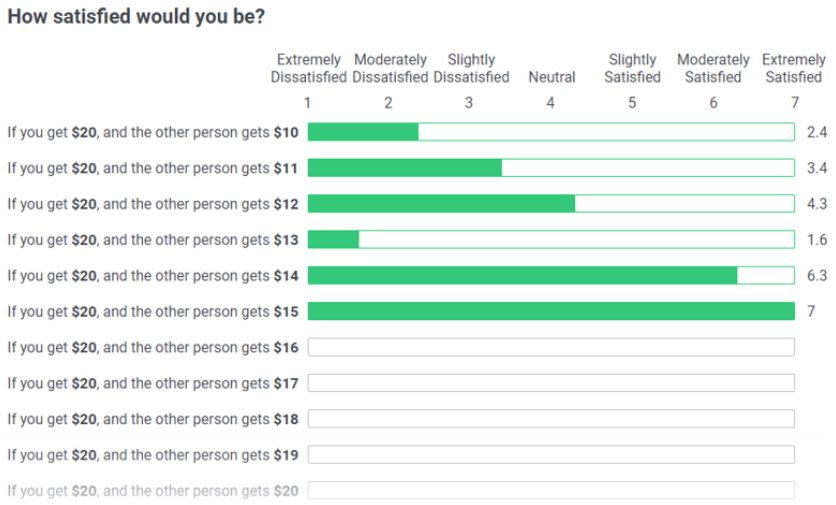
The *inequity list* displays 21 payment profiles for a participant i and an anonymous, randomly-assigned other participant j in the experimental session. The payoff for i is fixed at \$20 for every profile on the list, while the payoff for j ranges from \$10 to \$30 in one dollar increments. Every participant is asked to complete the list in the role of i, indicating their satisfaction level for each profile between i and j on a scale from 1=extremely dissatisfied to 7=extremely satisfied. Any number between 1 and 7 can be chosen, up to one decimal place, by moving the slider with the mouse. Numbers to the right of each slider display the current position of the slider to assist participants in rating their satisfaction accurately. Sliders can be adjusted an unlimited number of times, and the responses to the 21 allocations can be

[6]Examples of research utilizing questions in which people ascertain their general level of satisfaction, or a domain specific level of satisfaction, abound in economics. Domain specific questions are applied to topics as varied as health, financial situation, housing, marriage and work (Van Praag & Ferrer-i-Carbonell, 2004). For example, self-reported measures of job satisfaction and job-related subjective well-being are used as predictors of labor mobility (Green, 2010).

given in any order. There is an 'okay' button at the bottom of the screen. Once participants click that button, they cannot change their responses. Only final responses are recorded. Participants are required to provide an answer for each profile before proceeding.

Figure 1 presents a screenshot of the first ten allocations in the *inequity list*, as shown to participants in the laboratory (See Figure 9 in the Appendix for the entire list). Each slider moves independently and responses are not required to be monotonic. Thus, the computer program allows a response where the fourth profile yields a lower satisfaction level than the third and the fifth, as shown in Figure 1 for illustrative purposes. We emphasize this point to clarify that we are not enforcing consistency with the F&S model by restricting participants' answers in any way. Furthermore, we decided to present profile in the list maintaining an increasing order over j's payoff to reduce the cognitive burden on participants. This does not obviously imply that participants are consistent with F&S, as the sliders function independently from each other, and we emphasize in the instructions that there are no wrong answers.

Figure 1: Screenshot of the top of the *inequity list*



Note: In the experiment, participants can see the entirety of the list by scrolling down with their mouse.

When participants evaluate the profiles in the *inequity list*, they do it from the perspective of i. However, to determine the payments, not all participants can be i. In each pair, one participant is randomly selected to be i and the other is randomly selected to be j. Then, one of the profiles in the list is randomly selected to be implemented for the pair. This means that participant i receives \$20, and participant j receives the corresponding value of the randomly selected profile in the list, e.g., if the selected allocation is the first one on the list, j receives \$10.

It is worth noting that subjects' responses do not affect the probability of selecting certain profiles for payment. In this way, we rule out strategic responses misrepresenting true preferences to increase the probability of certain outcomes. Additionally, the instructions participants see do not include the labels i and j that we use here. From the participants'

perspective, they report their satisfaction levels with each profile in the *inequity list*, and at the end of the experiment two randomizations determine their payment. (See Appendix F for instructions given to participants in the experiment.)

The list includes one profile where both participants receive the same payoff. The remaining profiles are evenly split into profiles where i receives more than j and profiles where j receives more than i. This allows us to elicit the guilt parameter from the first half of the profiles and the envy parameter from the second half.

Our *inequity list* has several advantages. First, it isolates the effect of inequity aversion from alternative other-regarding motives, like reciprocity, which may be confounded with inequity aversion by the use of standard games to estimate individual preferences. Second, as we will show, it is robust to modifications in the list's values. Third, reporting stated satisfactions allows participants to express any social preferences they may have. Fourth, this methodology allows us to find point estimates of the parameters, rather than upper and lower bounds. Fifth, given that the task is easy to explain and understand, it takes a short amount of time to complete and is easy to implement in any experiment as a complementary measure of an individual's preferences. Finally, given that the instrument is straightforward, subjects are likely to provide the answer they actually intend to provide, and not make a "mistake," which facilitates the analysis for researchers.

3.2 Parameter Estimation

The two-player version of the F&S inequity aversion model is characterized by the following equation:

$$U_i(x) = x_i - \alpha_i \max\{x_j - x_i, 0\} - \beta_i \max\{x_i - x_j, 0\} \tag{2}$$

This equation can be represented graphically as shown in Figure 2, where the slopes of the two segments in the graph are the point estimates for α_i and β_i. The data points to the left of and including equality are used to estimate the guilt parameter β_i. Those to the right of and including equality are used to estimate the envy parameter α_i.

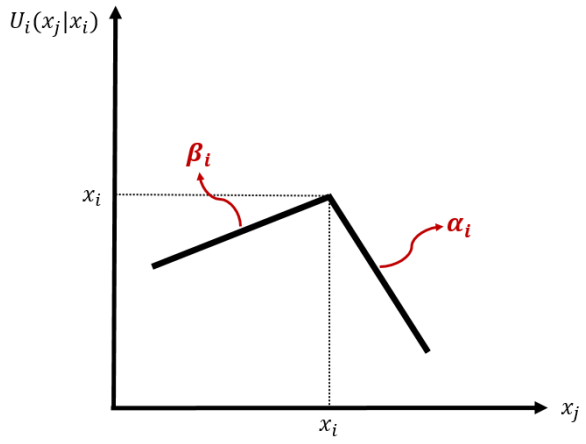
The responses from our *inequity list* allow us to construct Figure 2 for each individual in our sample. Using the data points where $x_i \geq x_j$, we calculate the line of best fit that corresponds to the first segment in Figure 2. Likewise, we calculate the second segment based on the data points where $x_j \geq x_i$. Each segment's slope constitutes one of the model's parameters: guilt for the first segment and envy for the second one.

In practical terms, we estimate Equations (3) and (4) for each participant i using an OLS model, where k indicates the allocation in the list. $\bar{x}$ is an individual i's own payoff; it is fixed at the same level for all allocations k in the list and for all subjects.[7] Hence, the first term in both (3) and (4) is a constant. x_{jk} denotes the other player's payoff for each allocation k.

$$Satisfaction_{ik} = \gamma_i \bar{x} + \beta_i x_{jk} + u_k \quad \text{if} \quad x_j \leq \bar{x} \tag{3}$$

[7]The bar on top of x simply indicates that x_i is the same for all subjects: $\bar{x} = x_i =$ ($20 in List 1).

Figure 2: Graphical representation of Fehr and Schmidt's model



$$Satisfaction_{ik} = \delta_i \bar{x} + \alpha_i x_{jk} + u_k \quad \text{if} \quad x_j \geq \bar{x} \tag{4}$$

Note that estimators in Equations (3) and (4) have a subscript i. The reason is that these equations are estimated for each individual separately. Therefore, the estimation process consists of using an individual's data to estimate β_i from (3), α_i from (4), and then repeating the process for each individual. F&S parameters are calculated as the marginal effects of x_{jk} on $Satisfaction_{ik}$: β_i in equation (3) corresponds to guilt and α_i in equation (4) corresponds to envy. Note that this methodology allows us to find point estimates, unlike previous studies estimating parameters' bounds, e.g., Blanco et al. (2011) and Yang et al. (2016).

4 Hypotheses and Experimental Design

4.1 Hypotheses

We test two hypotheses:

- Hypothesis 1: Participants are inequity averse as described in F&S at both the aggregate and individual levels. Specifically:
  - 1.1 Stated satisfaction is maximized at equality of x_i and x_j.
  - 1.2 As allocations move away from equality, stated satisfaction does not increase, i.e., $\alpha \geq 0$ and $\beta \geq 0$.
  - 1.3 Participants are at least as sensitivity to envy as guilt, i.e., $\alpha \geq \beta$.
  - 1.4 Participants are unwilling to discard own payment in order to reduce advantageous inequity, i.e., $\beta < 1$.
- Hypothesis 2: F&S provides a better explanation of the data than other social-preference models (i.e., social-surplus maximizing and maximin).

4.2 Design and Procedures

We ran seven, 90 minutes long, experimental sessions at the ICES (Interdisciplinary Center for Economic Science) laboratory in George Mason University. The sessions were all conducted on weekdays between September and October 2018. The experiment was programmed in Qualtrics. All decisions were anonymous and participants were paid privately and in cash. On average, participants received $22.90, including a payment of $5 for showing up.

A total of 106 students participated in the experiment, six of whom were graduate students. The remainder were undergraduate students. Participants were recruited by email from a preregistered pool of students willing to receive invitations to attend experiments at George Mason's experimental economics laboratory. We allowed students of all majors and all class years to participate in the experiment.

The experiment consisted of two parts and a demographic questionnaire at the end. In the first part, participants completed five independent tasks. In each task, participants were randomly matched with another participant in the room. They were matched with a different person for each task and their identities remained anonymous. In the second part, participants repeated one of the tasks from the first part with a slight modification. In the following Sections, we describe in detail each part of the experiment.

Participants received general instructions at the beginning of the experiment highlighting the anonymity of their decisions, giving a broad explanation about the payment procedure, and explaining some general rules. They were also instructed on how to interact with the Qualtrics interface.[8] Specific instructions were provided as the experiment proceeded. Participants kept a physical copy of the general instructions throughout the experiment, and read the specific instructions for each task on their screens. To guarantee that they read and understood the instructions, a quiz was administered after some of the tasks to measure their level of understanding. The quiz was graded by the computer and participants were not able to proceed before passing the quiz. Participants were given three attempts at answering the quiz on their own. If they failed after three attempts, the system locked by asking for a password that only experimenters knew. This allowed experimenters to visit participants' computer stations and clarify any questions participants had. Experimenters made sure participants' questions were clarified before unlocking their screens by typing the password.[9]

4.2.1 Lists and Games

This was the first part of the experiment and there were two categories of tasks that participants were asked to complete: lists and games. The category order was randomized at the individual level, while the order of the tasks within the categories was kept equal for all participants. Therefore, there were some general instructions for the lists and some general

[8] Qualtrics provides an intuitive interface that does not require explanation for anyone having a basic knowledge of computers. Thus, we simply warned participants that after clicking an 'okay' button to proceed to the next task, they would not be able to return to the previous task. We also warned them that they may have to scroll down in some cases to complete a task and see the 'okay' button to proceed.

[9] 70.7% participants in our sample needed their screens to be unlocked in either the ultimatum or the modified dictator game.

instructions for the games. 54 participants completed the lists before the games, and 52 completed the games before the lists. We found no significant difference between these two groups.

The first category consisted of three lists (see Appendix C for screenshots of each one of the lists), with the following range of payoffs for x_i and x_j:

- List 1: $x_i = \$20$, $x_j \in [\$10, \$30]$
- List 2: $x_i = \$10$, $x_j \in [\$0, \$20]$
- List 3: $x_i = \$20$, $x_j \in [\$1, \$39]$

List 1 was the *inequity list* presented in the previous Section. Lists 2 and 3 were modifications to List 1 in the spirit of He and Wu (2016). List 2 consisted of a change in the income inequality relative to own payoff by subtracting \$10 from all payoffs in List 1, i.e., a reduction for both individuals (i and j). F&S accounts for absolute inequality, but not for relative inequality. Therefore, the model predicts that if absolute inequality is maintained, a change in relative inequality should not alter the parameters. List 3 extended List 1 to include nine additional allocations at the beginning of the list and nine at the end. If our *inequity list* is an accurate instrument for eliciting the parameters of the model, the inclusion of additional allocations should not alter the measures elicited with the original list.

The second category of tasks consisted of two games: the ultimatum game and a modified dictator game, both using the strategy method. We closely followed the procedure by Blanco et al. (2011), described in Appendix A, except for one difference: they allowed multiple switching points while we only allowed one.[10] When the ultimatum and modified dictator games are implemented using the strategy method, participants make a choice between two columns in each row of a list. Given the options presented to them, participants are expected to begin by choosing one column and switch to the other column at most once or not switch at all. The switching point chosen by the receiver in the ultimatum game corresponds to a range of values within which the envy parameter lies. Similarly, the switching point chosen in the modified dictator game corresponds to a range of values in which the guilt parameter lies. Therefore, to elicit the parameters' ranges, individuals must display transitivity, i.e., a single switching point.[11]

In the ultimatum game, participants made two decisions: how much to send as the first player, and the minimum amount they would be willing to accept as the second player. In the modified dictator game, participants saw a list with two columns displaying different monetary allocations between themselves and another person. The first column consisted of increasing levels of equality, ranging from \$0-\$0 to \$20-\$20. The second column was fixed

[10] We decided to enforce a single switching point to facilitate data analysis. While there is no consensus yet as to whether single switching points should be enforced in experiments, Nielsen and Rehbeck (2019) present suggestive evidence of the advantage of single switching point enforcement. In their experiment, they measure direct preferences over transitivity, and other fundamental axioms. When revealed preferences conflict with stated axiom preferences, they offer participants the possibility of revising their choices over lotteries to make them consistent with the axioms. They find that 80% of subjects who show intransitivities in the form of multiple switching points change their choices to be transitive. Nielsen and Rehbeck conclude that enforcing a single switching point might actually help subjects express their underlying desire for transitivity.

[11] In Blanco et al. (2011) 11 subjects, out of 72, displayed intransitive preferences and were ultimately dropped from the analysis.

at an allocation of \$20 for the decision-maker and \$0 for the other person. The decision participants made as dictators was the minimum equal amount they were willing to accept instead of keeping \$20 for themselves, i.e., in which row to switch from the first column to the second. (See Appendix E for the instructions administered in both games.)

4.2.2 Reliability Check

This was the second part of the experiment. Participants were asked to replicate their answers to List 1 ($x_i = \$20$, $x_j \in [\$10, \$30]$) to test whether their answers to the *inequity list* in the first part of the experiment were random. The logic is that random answers should be more difficult to replicate than answers revealing true preferences. The payment for this task was based on accuracy: for each profile, participants received \$0.25 if their answer in the second part was within 0.5 units from their answer in the first part. Note that participants received instructions for the second part of the experiment only after completing the first part. Therefore, behavior in the first part of the experiment could not be modified in anticipation of the task in the second part of the experiment. Thus, subjects could not act strategically to earn this payment. E.g., answering the same for all the profiles to make it easy to remember.

4.2.3 Questionnaire and Payment

To conclude the experiment, participants completed a questionnaire and were paid. The questionnaire included demographic characteristics, such as gender, age, major, minor, GPA, political views, parents' education, and income (See Appendix G for the complete list of questions). After completing the questionnaire, participants received a \$5 show-up fee and a payoff corresponding to one randomly selected task among the lists and games, plus the reward for all List 1 allocations in which they replicated their answers in the first part of the experiment.

5 Results

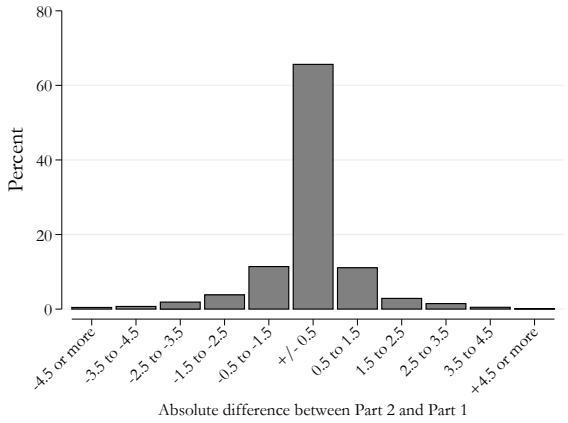
Unless otherwise noted, all the results presented in this Section use data from List 1. Lists were presented in ascending order to all individuals. Therefore, all participants saw List 1 first. Thus, we consider List 1 the cleanest measure of participants' preferences.

5.1 Meaningful Responses to the Inequity List

Figure 3 shows that more than 60% of all answers to List 1 given by participants in the second part of the experiment are within 0.5 units away from the answers provided in the first part of the experiment for the corresponding profile.[12] This level of consistency between the first and the second part gives us confidence that participants completed List 1 conscientiously in the first part of the experiment.

[12]We show an equivalent graph in terms of percentage change in Figure 18 in the Appendix.

Figure 3: Absolute change in List 1 responses



Note: Histogram of the absolute change between the second part and the first part of the experiment, defined as the difference between the stated satisfaction of a profile in List 1 Part 2 and the stated satisfaction of the same profile in List 1 Part 1. This graph includes the 21 profiles in List 1 for all 106 participants, for a total of 2226 observations. Given that the stated satisfaction is measured on a scale from 1 to 7, the maximum possible difference is 6.

To further test whether participants provided reliable answers, we conduct a Monte Carlo simulation, generating random data and comparing it with the answers provided by our participants to List 1, in the first part of the experiment. The responses provided by our participants are statistically significantly different from random values. Please refer to Appendix E for graphs summarizing the results and some specific details related to the simulations.

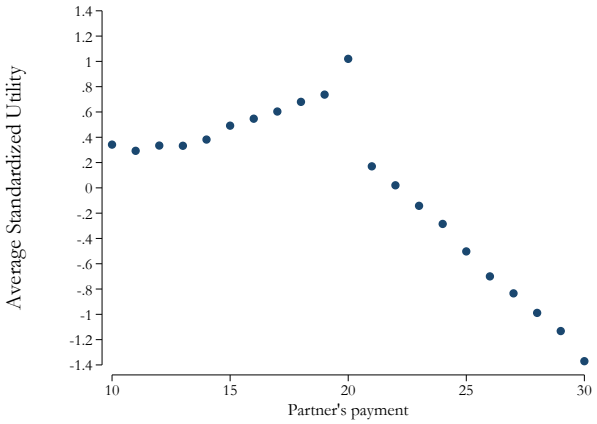
5.2 Aggregate Level Behavior

We find evidence of inequity aversion as described in F&S at the aggregate level. Figure 4 depicts aggregate behavior.[13] Note the strong resemblance between the empirical behavior depicted in Figure 4 and the theoretical prediction of F&S in Figure 2. Aggregate level estimates yield $\alpha = 0.20$ and $\beta = 0.06$.

Supportive of Hypotheses 1.1 and 1.2, participants maximize their stated satisfaction at equality and display decreasing satisfaction as profiles move away from equality; Wald tests that $\alpha = 0$ and $\beta = 0$ are each rejected ($chi2(1) = 73.65$ and $chi2(1) = 34.02$, respectively, and $p = 0.0000$ for both). Supportive of Hypothesis 1.3, participants display greater sensitivity to envy than guilt; a Wald test that $\alpha = \beta$ is rejected ($chi2(1) = 67.97$, $p = 0.0000$). This can be seen in Figure 4 where stated satisfaction from disadvantageous inequity (to the right of \$20) is consistently lower than advantageous inequity (to the left of \$20). Lastly, supportive of Hypothesis 1.4, a Wald test that $\beta = 1$ is rejected ($chi2(1) = 7,569.32$, $p = 0.0000$).

[13]Figures 12 and 13 in the Appendix replicate Figure 4 using Lists 2 and 3 (instead of List 1) and the results are similar.

Figure 4: Aggregate stated satisfaction



N=106, $\alpha = 0.20$, $\beta = 0.06$

Note: Standardized stated satisfaction is measured as $\frac{(U_{ik}-\overline{U_i})}{sd(U_i)}$, where U_{ik} is the stated satisfaction expressed by individual i with regard to profile k. In all K profiles, individual i's payment is fixed, while individual j's payment varies from \$10 to \$30.

5.3 Individual Level Behavior

At the individual level, we also find evidence of inequity aversion: most participants in our sample maximize their stated satisfaction at equality and display greater sensitivity to envy than guilt. We propose the following definitions to guide our analysis.

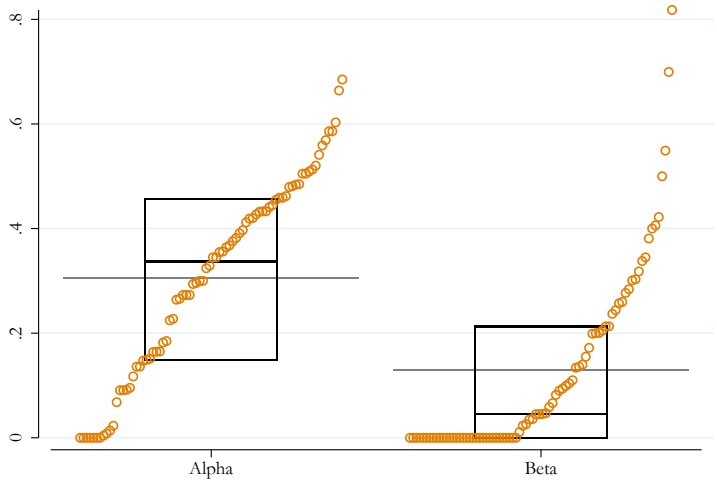
> *Weak adherence to F&S model*: An individual weakly adheres to the F&S model if their maximum level of stated satisfaction is reached at equality, regardless of whether it is also reached at unequal profiles.
>
> *Strong adherence to F&S model*: An individual strongly adheres to the F&S model if they display weak adherence, and $\alpha_i \geq \beta_i \geq 0$ and $\beta_i < 1$.

In accordance with these definitions, we find consistency with the F&S model: 75.5% of participants in our sample (80 participants out of 106) weakly adhere to the F&S model.[14] Thus, Hypothesis 1.1 is supported for most participants in our sample. Similarly, 65% (69 participants) strongly adhere to the F&S model and thus there is evidence supportive of Hypotheses 1.2, 1.3, and 1.4 for most participants in our sample.

Figure 5 summarizes the individual level estimates of α_i and β_i for subjects who weakly adhere to F&S. Supportive of Hypotheses 1.1 and 1.2, Wilcoxon matched-pairs signed-rank tests of equality to zero are rejected for α and β ($p = 0.000$ for each parameter). Supportive of Hypothesis 1.3, a sign test of matched-pairs indicates that alpha is significantly greater than β ($p = 0.000$). Lastly, supportive of Hypothesis 1.4, a Wilcoxon signed-rank test of equality to one is rejected for β ($p = 0.000$). For the remaining subjects, we would need additional assumptions to calculate α_i and β_i. We abstain from making arbitrary assumptions, but

[14] We show individual graphs for the group of weakly consistent participants in Figure 14 of the Appendix.

Figure 5: Individual level results: α_i and β_i



Note: This graph presents results for subjects who weakly adhere to F&S (N=80). Black boxes indicate the upper and lower quartiles, as well as the median. Horizontal gray lines, longer than the boxes, correspond to the mean. Orange dots display quantile plots.

in Section 5.6 we also discuss the behavior of those subjects who do not display behavior consistent with F&S.

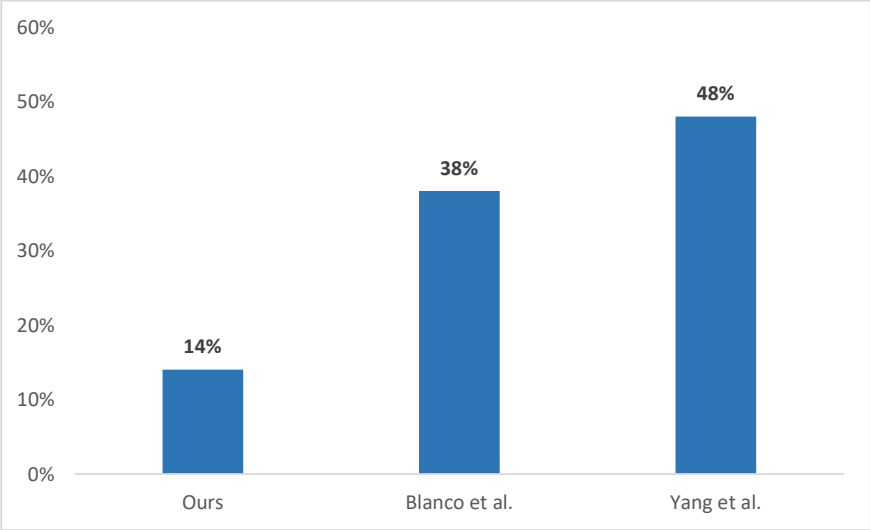
There are 11 participants in our sample that are weakly adherent to F&S, but violate the assumption that $\alpha_i \geq \beta_i$. We call violations of this assumption *reversals*. As Figure 6 shows, we find fewer reversals with our methodology than do previous studies using revealed preferences. Finding fewer reversals is important insofar as it reflects greater consistency with F&S at the individual level. Our finding is in line with Fisman, Kuziemko, and Vannutelli (2020). In their experiment, participants chose between two seven-individual societies with different distributions of income. They found evidence of local disadvantageous inequality, i.e., that subjects select distributions that lower the income of the individual directly above them (i.e., $\alpha_i \geq 0$), while the income of the individual directly below does not have a significant effect on their selections (i.e., $\beta_i = 0$).

5.4 Inequity List versus Games

Our finding of individual level consistency with the F&S model stands in contrast to findings from previous studies using games (Blanco et al., 2011). Comparing the parameters captured by our methodology with those captured by games can help shed light on the basis of the discrepancy. Figure 7 presents this comparison for each parameter. In both cases, using games for the estimation results in larger parameter values. Note that these are distributions for the same group of individuals, who were asked to complete the *inequity list*, as well as the ultimatum and dictator games in the first part of the experiment.

We interpret the differences in results between games and the *inequity list* as differences in

Figure 6: Reversals (instances in which $\beta_i > \alpha_i$)



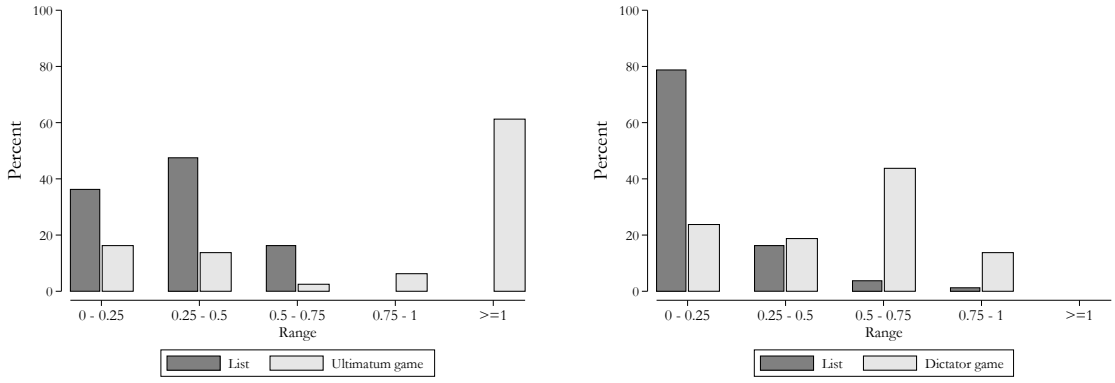
what the estimates are capturing. In both cases, the parameters capture social preferences. However, the *inequity list* only captures inequity aversion, while ultimatum and dictator games may potentially be simultaneously capturing inequity aversion and some type of reciprocity. F&S discuss this matter when they present the model: they indicate that their model does not distinguish the source of the fairness concern; thus, α and β can be interpreted as a concern for equality or as a reduced-form concern for intentions. However, α and β may potentially be capturing both sources of fairness concerns. I.e., if α and β are measured in a context where various motives for social preferences are involved, then the parameters may aggregate these motives quantitatively.

5.5 Alternative Explanations for the Observed Behavior

We now turn to Hypothesis 2, which states that F&S provides a better explanation of the data than other social-preference models. We test this hypothesis, considering maximin preferences and efficiency concerns as alternative explanations to behavior in our experiment.

The first motive we explore relates to maximin preferences. These preferences consist of a desire to maximize the minimal payoff in a group. Maximin preferences are one of the main drivers of behavior in experiments where participants make choices over distributions allocating money among themselves and other participants in a group (Fisman et al., 2020; Engelmann & Strobel, 2004). An individual driven by maximin preferences would show a distinct pattern of response to our *inequity list*: their stated satisfaction would increase as individual j's payoff increases when inequality is advantageous ($x_i > x_j$). It would then be fixed at a maximum point for all other allocations ($x_i \leq x_j$).

Figure 7: Parameters' distributions: List 1 vs. Games



(a) Alpha (envy) (b) Beta (guilt)

Note: This Figure includes participants who weakly adhere to F&S. N=80. 40 participants experienced the lists first and 40 participants experienced the games first (There are no significant differences between these two groups.)

Note that maximin preferences fit our definition of weak adherence to F&S. However, we only observe this pattern in the responses given by three individuals, i.e., 3.7% of all weakly adherent individuals. Therefore, we conclude that maximin preferences are not driving the high rate of adherence to F&S that we observe for individuals in our sample. Figure 16 in the Appendix shows the results for individuals who may have maximin preferences.

The second motive we explore is social-surplus maximization. An individual motivated by such concerns would display an upward trend pattern of response throughout the list. Note that in the *inequity list*, the decision maker's payoff is fixed at \$20, while the other person's payoff changes from row to row. Increasing stated satisfaction in the first part of the list (i.e., $x_j \in [\$10, \$20]$) is consistent with both inequity aversion and social-surplus maximization. The second part of the list (i.e., $x_j \in [\$21, \$30]$) can help us distinguish inequity aversion from social-surplus maximization. An individual whose behavior is driven by social-surplus maximization has an increasing stated satisfaction throughout the entire list, whereas an individual driven by inequity aversion has an increasing stated satisfaction only in the first part of the list. Therefore, social-surplus maximizers do not fit either definition of adherence to F&S, and we can conclude social-surplus maximization is not driving our results, as we observe only three individuals with dominant surplus maximizing behavior in our sample. Figure 17 in the Appendix depicts these subjects' results.[15]

We conclude that F&S fits the behavior displayed by participants in our experiment better than alternative social preference models, supportive of Hypothesis 2. Evidence of the greater importance of inequity aversion in explaining subjects' behavior in our sample contributes to a wider literature that discusses the relative importance of inequity aversion, social-surplus maximization, and maximin preferences (See Andreoni & Miller, 2002; Charness & Rabin, 2002; Güth, Kliemt, & Ockenfels, 2003; Engelmann & Strobel, 2004; Fehr, Naef, & Schmidt,

[15]Social-surplus maximization is indistinguishable from altruism in the *inequity list*.

2006; Daruvala, 2010; Galeotti, Montero, & Poulsen, 2018).[16]

5.6 Non-Adherents to the F&S Model

So far, we have focused on the behavior of weak or strong adherents to the F&S model. However, there is a group of participants that were not categorized as adherents to F&S as they did not maximize their stated satisfaction at equality. What are the motives displayed by these individuals? We observe a general trend of decreasing stated satisfaction on the other person's payment (See Figure 15 on the Appendix). This behavior is in line with relative-income concerns, which we explore in more detail in a separate paper (Ifcher, Zarghamee, Houser, & Diaz, 2020). Consistent with relative-income concerns, 22 of the 26 non-adherents to the F&S model in our sample reported satisfaction consistent with envy or spite according to Kerschbamer's (2015) archetypes. One participant displays a pattern similar to inequity aversion, with the difference that they maximize their stated satisfaction at a profile of \$20 for them and \$21 for the other, rather than at equality. The remaining three participants are the aforementioned subjects who display social-surplus maximizing behavior. Their behavior is considered as either maximin or altruistic according to Kerschbamer's (2015) archetypes.

5.7 Do Social Preferences Vary by Demographic Characteristics?

Fehr et al. (2006) find that women and non-economists/non-business-students choose egalitarian allocations more often than men and economists/business-students, respectively, at the expense of total social surplus. In contrast, they find that political attitudes and age do not affect social preferences for efficiency and equity. This finding is in line with the invariability of local inequality preferences to political affiliation found by Fisman et al. (2020).

In the last part of the experiment, we collect data about subjects' demographic characteristics. We test whether certain characteristics are correlated with an individual's likelihood of displaying inequity aversion. Also, conditional on displaying inequity aversion, we test whether the parameters in F&S are systematically different depending on certain characteristics.

First, we find no significant differences in model adherence across subgroups based on any of the following characteristics: gender, age, parents' education attainment, political views, majoring in Economics, and GPA.[17] Table 3 in the Appendix summarizes results for the probit regressions estimating the likelihood of model adherence depending on the aforementioned subgroups.

Second, using Wilcoxon rank-sum tests to account for the small sample size, we check whether the guilt and envy coefficients differ in magnitude for the aforementioned subgroups.

[16] We provide a systematic and informal analysis of whether the data supports other behavioral models in Appendix D, using data from all the participants in our sample. Formalizing this analysis is outside the current scope of this manuscript.

[17] We ask participants about their income level in two ways: we ask them to report their best estimates of their total expenditures during the school year, and the total income of their parents or guardians during the last year. Since we find a low correlation between these two variables, we decided to refrain from using income as a control variable in our analysis for lack of reliability.

We cannot reject the equality of models parameters across subgroups. Table 4 in the Appendix shows the results. In the case of non-economists versus economists, our results are in line with Daruvala (2010), who also does not find differences between these two groups. This indicates that even though students of economics and business administration might have been taught about the importance of efficiency in their classes, they did not value it more than students in other fields in our sample.

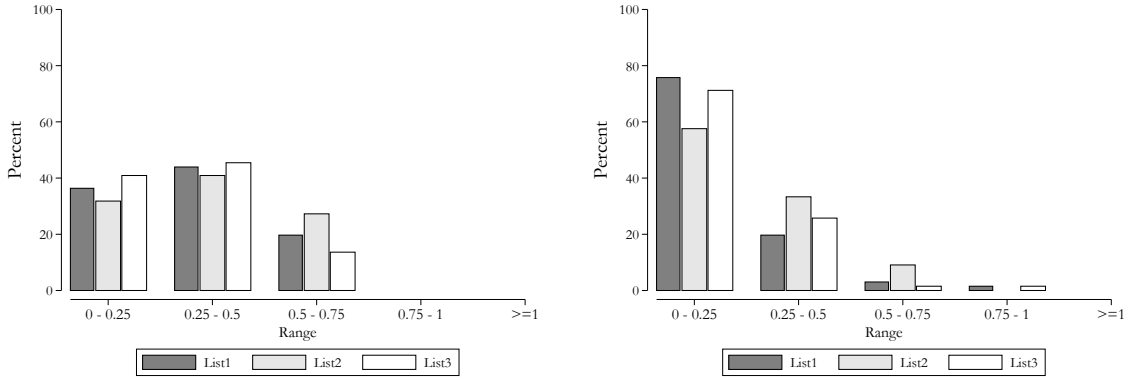
To summarize, we do not find any effect of demographic characteristics on adherence to F&S, nor on the parameters' magnitude. These results should not be taken as conclusive, as our tests may be under-powered due to a small sample size.

5.8 Robustness Checks

We conduct robustness checks to determine whether modifications to the list change the parameters captured by our methodology. Lists 2 and 3 introduce modifications to List 1 in two different ways. List 2 changes the relative inequality of each allocation by subtracting \$10 from every payoff in List 1. List 3 extends List 1 to include allocations with larger inequality in both directions: advantageous and disadvantageous.

At the aggregate level, we obtain similar results with Lists 2 and 3 as with List 1. Figures 12 and 13 in the Appendix replicate Figure 4 (aggregate stated satisfaction for all individuals) using List 2 and List 3 respectively. In each case, we find strong adherence to F&S. At the individual level, 84 participants weakly adhere to F&S using List 2, and 80 using List 3, compared to 80 using List 1. 65 participants strongly adhere to F&S using List 2, and 61 using List 3, compared to 69 using List 1.

Figure 8: Parameters' distributions: Lists 1, 2 and 3



(a) Alpha (envy)

KS p-value List1 vs. List2 = 0.717
KS p-value List1 vs. List3 = 0.435

KS p-value List2 vs. List3 = 0.154

(b) Beta (guilt)

KS p-value List1 vs. List2 = 0.103
KS p-value List1 vs. List3 = 0.852

KS p-value List2 vs. List3 = 0.318

Note: This Figure includes participants displaying weak adherence to F&S when completing all three lists. N=66.

At the individual level, we also find consistency between estimates elicited with the three lists. Figure 8 depicts the distributions of α_i and β_i elicited with each list. The results of

Kolmogorov-Smirnov tests for equality of distributions are presented below each graph. The hypothesis that the distributions are statistically equal is not rejected in any of the paired comparisons.

Although statistical equality of distributions is a good signal of the robustness of the *inequity list*, we are interested in testing the consistency of our measure across lists at the individual level. Therefore, we implement a more stringent test. Consider the following two equations, where m and n correspond to one of the three lists with $m \neq n$.

$$\alpha_{im} = \gamma_0 + \gamma_1 \alpha_{in} + \epsilon \tag{5}$$

$$\beta_{im} = \gamma_0 + \gamma_1 \beta_{in} + \epsilon \tag{6}$$

Equations (5) and (6) describe the relationship between parameters estimated using list m and parameters estimated using list n for the same group of individuals. Note that a scenario in which a parameter estimated using list n is a good predictor of the same parameter using list m implies that $\gamma_0 = 0$ and $\gamma_1 = 1$. Therefore, to test the consistency of our measure across lists, we conduct a two-step process: first, we estimate the regressions described by Equations (5) and (6); second, we conduct a post-estimation test to check whether $\gamma_0 = 0$ and $\gamma_1 = 1$, which corresponds to the following null hypotheses.

$$H_0 : \overline{\alpha}_{im} = \overline{\alpha}_{in} + \epsilon \tag{7}$$

$$H_0 : \overline{\beta}_{im} = \overline{\beta}_{in} + \epsilon \tag{8}$$

These null hypotheses express that, on average, the parameters elicited with list m are statistically not different from the parameters elicited with list n. We use a tobit model when estimating (5) and (6) to consider the left censoring of α_i, and the left and right censoring of β_i. Then, we test the null hypotheses by jointly testing whether $\gamma_0 = 0$ and $\gamma_1 = 1$ using an F-test.

Our results indicate that the null hypotheses are not rejected for $\gamma_1 = 1$ and for certain values of γ_0 close to 0. Table 5 in the Appendix summarizes the range of values for which the null hypotheses are not rejected. Although in some cases the range does not contain $\gamma_0 = 0$, the values are always close to 0. We conclude that variations to List 1, like those presented in Lists 2 and 3, are consistent with List 1. Therefore, the *inequity list* is robust to changes to the list's parameters. This constitutes an improvement upon the methodology proposed by Yang et al. (2016), which is sensitive to changes in the values of their lists, as pointed out by He and Wu (2016). Perhaps the robustness of our measure stems from using several data points to calculate F&S parameters with our methodology, as opposed to only one switching point with Yang et al.'s (2016) methodology.

6 Conclusion

In this study, we propose a new methodology for estimating social preferences at the individual level by eliciting satisfaction with different levels of inequality. Before discussing the results, it should be noted that as a methodological contribution, eliciting satisfaction as a complement to choice-based measures needn't be limited to social preferences, and can also

be applied to other preferences of interest in behavioral economics, like risk and time preferences. Some of the advantages of using stated satisfaction to measure social preferences, e.g., reduced cognitive load, may well apply in measuring other preferences.

We find that participants in our experiment display the behavior described by F&S at both the aggregate and the individual levels, resolving the incongruity between aggregate and individual-level inference found in previous studies. We argue that this is the result of our procedure's ability to isolate inequity aversion from alternative other-regarding concerns. Further, we find that individuals display a greater level of consistency with the model's assumptions than has been previously found. Robustness checks show that the *inequity list* captures the envy and guilt parameters in the F&S model in a consistent way. Therefore, changes in the values of the *inequity list* do not affect our findings.

We explored the role of efficiency motives in explaining some of the behavior we observe. We found no support for social-surplus maximization: only 3% of participants in our sample display behavior consistent with it. This result aligns with Fehr et al. (2006), who showed that, in general, inequity aversion weighs more heavily on individual behavior than social-surplus maximization.[18]

Note that individuals driven by maximin preferences could be identified by our procedure as weakly adherent to F&S, though not strongly. At the same time, not all behavior characterized as weakly consistent with F&S is indistinguishable from maximin preferences. Indeed, only 3% of subjects in our sample displayed behavior consistent with both inequity aversion and maximin preferences. This finding is opposite to Engelmann and Strobel (2004), who found that, for individuals in their sample, a combination of maximin preferences and efficiency concerns can explain behavior better than inequity aversion alone.

[18]Engelmann and Strobel (2004) find that efficiency concerns and maximin preferences rationalize Economics and Business undergraduates behavior better than inequity aversion. Fehr et al. (2006) include students from other disciplines and nonacademic employees. They conclude that the dominance of efficiency concerns over inequity aversion is restricted to Economics and Business students. For non-economists inequity aversion weighs more than efficiency concerns.

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Appendix

A Previous Approaches

Blanco et al. (2011) present the earliest attempt at testing the predictive power of F&S at the individual level. They employ decisions made by the responder in an ultimatum game to elicit α_i, and by the dictator in a modified dictator game to elicit β_i. They use the strategy method in both cases to calculate an approximate point estimate for each parameter based on the switching point from option A to option B for each individual (see table 1).

In their ultimatum game, participants bargain over the allocation of £20. The proposer makes an offer, which is restricted to integer values. The responder states whether they accept or reject every possible offer. The switching point from accepting to rejecting, i.e. moving from option A to option B, indicates the responder i is indifferent between rejecting and accepting an offer $s_i \in [s_i' - 1, s_i']$, s_i' being the lowest offer responder i is willing to accept, and $s_i' - 1$ being the highest offer i rejects. The indifference point revealed by the switching point signifies that $U_i(s_i, 20 - s_i) \equiv s_i - \alpha_i(20 - s_i - s_i) = 0$. Therefore, $\alpha_i = \frac{s_i}{2(10 - s_i)}$, where $s_i = s_i' - 0.5$.

By a similar analysis, in the modified dictator game, Blanco et al. (2011) define $\beta_i = 1 - \frac{\widetilde{x}_i}{20}$, where $\widetilde{x}_i \in [x_i' - 1, x_i']$. In this case, the indifference point is also approximated by the middle point between $x_i' - 1$ and x_i', thus $\widetilde{x}_i = x_i' - 0.5$. Daruvala (2010) uses a similar approach in terms of determining the indifference between equality and an unequal payoff distribution. Unlike Blanco et al.'s, Daruvala's study is not in the context of a modified dictator game, and he studies groups of 11 individuals instead of pairs. Nonetheless, Daruvala (2010) also uses an environment where individuals may also be motivated by reciprocity.

Yang et al. (2016) offer an alternative approach: instead of using standard games, they use a choice menu for each parameter (see Table 2). Individuals are asked to choose between two sets of allocations, either Option A or Option B, in each row of the choice menu. Intervals for α_i and β_i are inferred from the switching point in each menu. Similarly to the way parameters are estimated by Blanco et al. (2011), switching to Option B in row k of Menu 1 means that:

$$\alpha_i \in \Big[\frac{Y_{Bk-1} - Y_{Ak-1}}{(O_{Bk-1} + Y_{Ak-1}) - (Y_{Bk-1} + O_{Ak-1})}, \frac{Y_{Bk} - Y_{Ak}}{(O_{Bk} + Y_{Ak}) - (Y_{Bk} + O_{Ak})}\Big],$$

where Y indicates Yours and O indicates Other's. Likewise, switching to option B in row k of menu 2 means that:

$$\beta_i \in \Big[\frac{Y_{Bk-1} - Y_{Ak-1}}{(Y_{Bk-1} + O_{Ak-1}) - (O_{Bk-1} + Y_{Ak-1})}, \frac{Y_{Bk} - Y_{Ak}}{(Y_{Bk} + O_{Ak}) - (O_{Bk} + Y_{Ak})}\Big]$$

Table 1: Instrument used by Blanco et al. (2011)

(a) Ultimatum

Option A		Option B		α_i
Sender	Responder	Sender	Responder	
20	0	0	0	0.00
19	1	0	0	0.06
18	2	0	0	0.13
17	3	0	0	0.21
16	4	0	0	0.33
15	5	0	0	0.50
14	6	0	0	0.75
13	7	0	0	1.17
12	8	0	0	2.00
11	9	0	0	4.50
10	10	0	0	–
9	11	0	0	–
8	12	0	0	–
7	13	0	0	–
6	14	0	0	–
5	15	0	0	–
4	16	0	0	–
3	17	0	0	–
2	18	0	0	–
1	19	0	0	–
0	20	0	0	–

(b) Modified dictator

Option A		Option B		β_i
Sender	Responder	Sender	Responder	
20	0	0	0	1.00
20	0	1	1	0.95
20	0	2	2	0.90
20	0	3	3	0.85
20	0	4	4	0.80
20	0	5	5	0.75
20	0	6	6	0.70
20	0	7	7	0.65
20	0	8	8	0.60
20	0	9	9	0.55
20	0	10	10	0.50
20	0	11	11	0.45
20	0	12	12	0.40
20	0	13	13	0.35
20	0	14	14	0.30
20	0	15	15	0.25
20	0	16	16	0.20
20	0	17	17	0.15
20	0	18	18	0.10
20	0	19	19	0.05
20	0	20	20	0.00

Table 2: Instrument used by Yang et al. (2016)

(a) Menu 1

Option A		Option B		α_i
Yours	Other's	Yours	Other's	
125	150	100	260	-0.19
115	150	100	260	-0.12
105	150	100	260	-0.04
95	150	100	260	0.05
85	150	100	260	0.16
75	150	100	260	0.29
65	150	100	260	0.47
55	150	100	260	0.69
45	150	100	260	1.00
35	150	100	260	1.44

(b) Menu 2

Option A		Option B		β_i
Yours	Other's	Yours	Other's	
185	90	170	50	-0.60
175	90	170	50	-0.14
165	90	170	50	0.11
155	90	170	50	0.27
145	90	170	50	0.38
135	90	170	50	0.47
125	90	170	50	0.53
115	90	170	50	0.58
105	90	170	50	0.62
95	90	170	50	0.65

B Tables

Table 3: Probit estimation (marginal effects)

DEPENDENT VARIABLE: Dummy=1 if i weakly adheres to the model	List 1	List 2	List 3
Female	0.031	0.055	0.056
	(0.113)	(0.050)	(0.094)
Age	-0.013	-0.003	-0.008
	(0.015)	(0.005)	(0.011)
Mother completed college	0.014	-0.001	0.059
	(0.125)	(0.050)	(0.091)
Father completed college	-0.008	-0.048	0.065
	(0.118)	(0.041)	(0.095)
Conservative political views	0.224	-0.903***	-0.045
	(0.158)	(0.056)	(0.150)
Progressive political views	0.124	-0.971***	-0.197
	(0.162)	(0.027)	(0.182)
Economist	-0.216	-0.302*	-0.129
	(0.193)	(0.160)	(0.158)
GPA	-0.026	0.029	0.156
	(0.143)	(0.053)	(0.120)
N	64	64	64

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: (1) Economist is coded as 1 for Economics and Business majors, including Accounting, Finance, Management and Marketing. (2) Regressions are estimated with a sample size of only 64, even thought 106 subjects participated in the experiment. This is due to missing values, which can be attributed to a lack of willingness of subjects to provide answers to certain questions.

Table 4: Parameters' differences by demographic characteristics

	α		β	
	Average	p-value	Average	p-value
Gender	Females = 0.320 Males = 0.293	0.611	Females = 0.139 Males = 0.119	0.403
Age	18-20 years = 0.343 $>$ 20 years = 0.278	0.126	18-20 years = 0.143 $>$ 20 years = 0.119	0.246
Mother's education*	College = 0.299 Less than college = 0.317	0.126	College = 0.144 Less than college = 0.106	0.862
Father's education*	College = 0.315 Less than college = 0.293	0.702	College = 0.143 Less than college = 0.109	0.341
Economics major	Yes = 0.192 No = 0.318	0.052	Yes = 0.108 No = 0.131	0.421
GPA	$\geq$ 3.5 = 0.314 $<$ 3.5 = 0.300	0.726	$\geq$ 3.5 = 0.111 $<$ 3.5 = 0.142	0.964
Political views:				
Conservative	Yes = 0.318 No = 0.314	0.815	Yes = 0.116 No = 0.108	0.664
Moderate	Yes = 0.319 No = 0.311	0.842	Yes = 0.106 No = 0.113	0.884
Liberal	Yes = 0.308 No = 0.319	0.720	Yes = 0.111 No = 0.108	0.895

†Bonferroni-adjusted critical values correspond to *** p<0.001, ** p<0.005, * p<0.01

Note: * Parents' educational attainment is measured in terms of college attendance in this case: "College" refers to having completed college or more, while "Less than college" refers to attending college but not graduating, or less.

† Critical values are adjusted to take into account multiple hypothesis testing, using Bonferroni correction. Critical values are divided into 9 hypotheses that were tested for each parameter: α and β.

Table 5: Joint significance tests post Tobit estimation of equations (5) and (6)

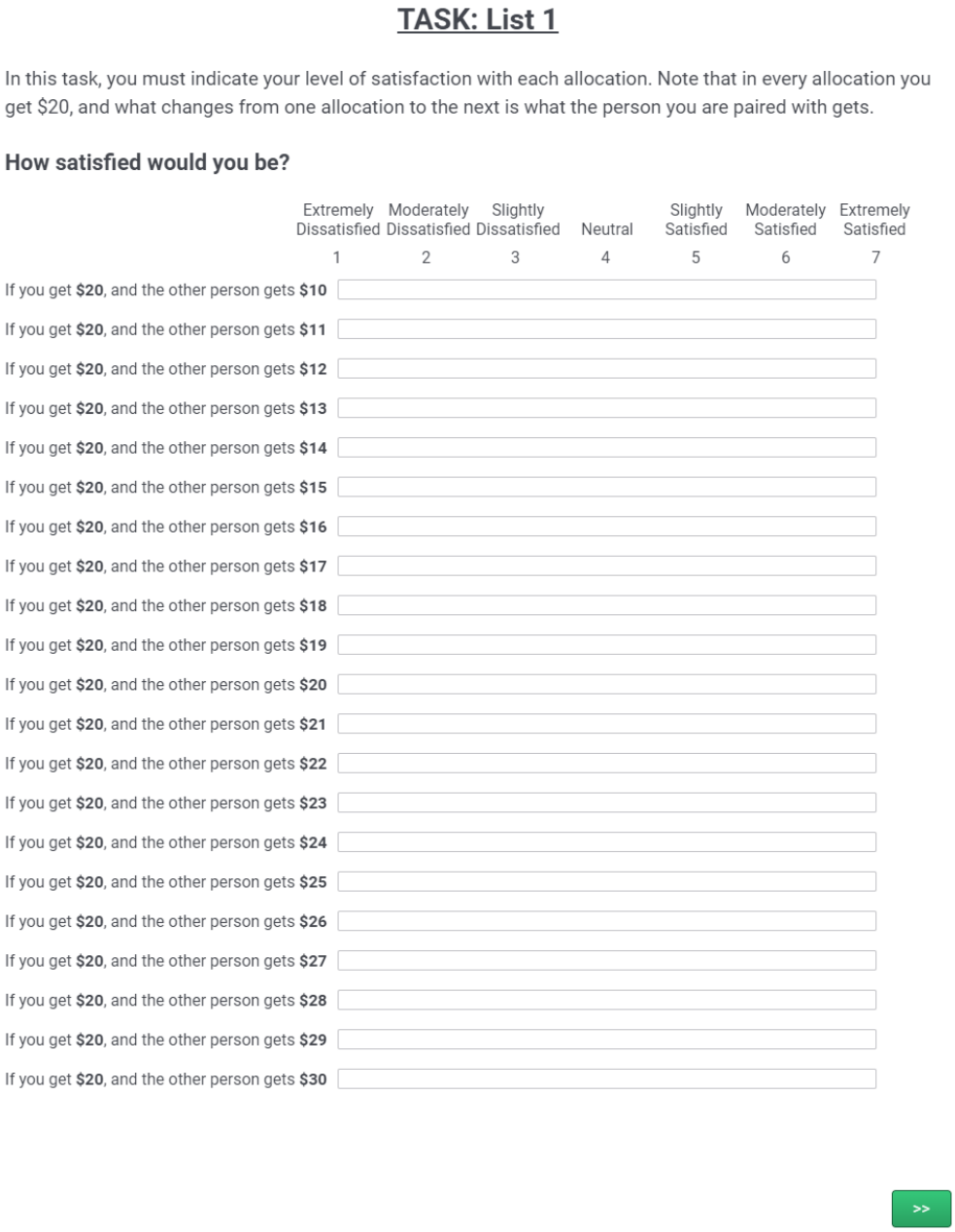
		No rejection values for γ_0 and γ_1
$H_0 : \alpha_{i1} = \alpha_{i2} + \epsilon$	$\gamma_1 = 1,$	$\gamma_0 \in [-0.051, -0.023]^{\dagger}$ $\gamma_0 \in [-0.061, -0.013]^{\dagger\dagger}$
$H_0 : \alpha_{i1} = \alpha_{i3} + \epsilon$	$\gamma_1 = 1,$	$\gamma_0 \in [-0.018, +0.046]^{\dagger}$ $\gamma_0 \in [-0.024, +0.052]^{\dagger\dagger}$
$H_0 : \alpha_{i2} = \alpha_{i3} + \epsilon$	$\gamma_1 = 1,$	$\gamma_0 \in [+0.015, +0.070]^{\dagger}$ $\gamma_0 \in [+0.006, +0.078]^{\dagger\dagger}$
$H_0 : \beta_{i1} = \beta_{i2} + \epsilon$	$\gamma_1 = 1,$	$\gamma_0 \in [-0.175, -0.125]^{\dagger}$ $\gamma_0 \in [-0.192, -0.107]^{\dagger\dagger}$
$H_0 : \beta_{i1} = \beta_{i3} + \epsilon$	$\gamma_1 = 1,$	$\gamma_0 \in [-0.138, -0.038]^{\dagger}$ $\gamma_0 \in [-0.148, -0.029]^{\dagger\dagger}$
$H_0 : \beta_{i2} = \beta_{i3} + \epsilon$	$\gamma_1 = 1,$	$\gamma_0 \in [-0.034, +0.063]^{\dagger}$ $\gamma_0 \in [-0.041, +0.070]^{\dagger\dagger}$

†† $p \geq 0.05$, † $p \geq 0.1$

Note: This table reports significance in a reversed way. We are showing the range of values for γ_0 such that each null hypothesis is not rejected at 5% †† and 10% † significance levels.

C Figures

Figure 9: List 1

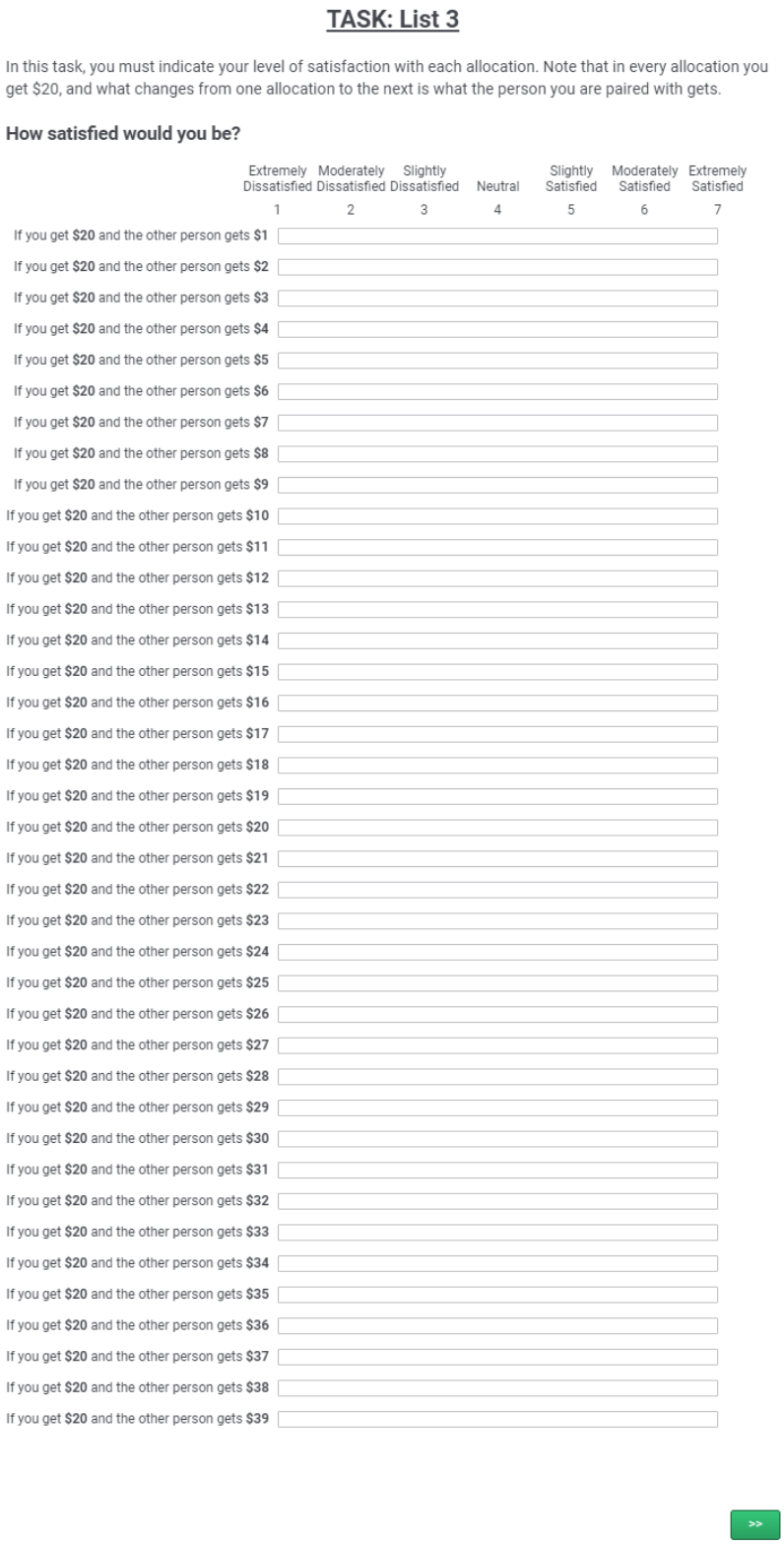


Note: In the experiment participants receive instructions before completing Lists 1, 2 and 3. These instructions apply to all three lists and explain the payment procedure.

Figure 10: List 2

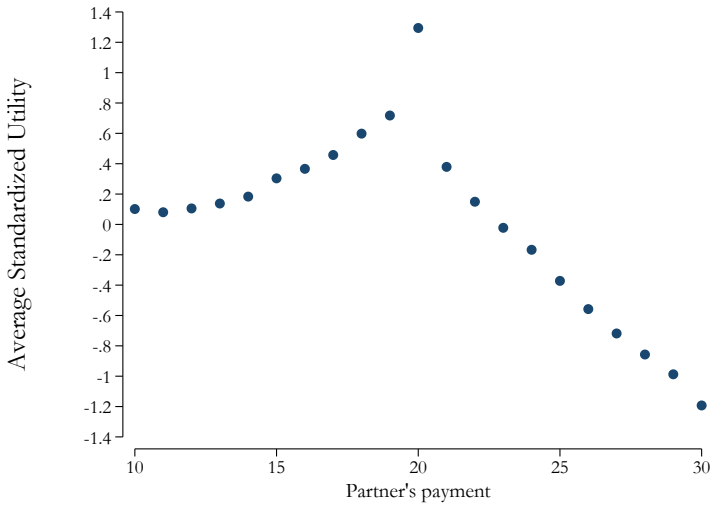
Note: In the experiment participants receive instructions before completing Lists 1, 2 and 3. These instructions apply to all three lists and explain the payment procedure.

Figure 11: List 3



Note: In the experiment participants receive instructions before completing Lists 1, 2 and 3. These instructions apply to all three lists and explain the payment procedure.

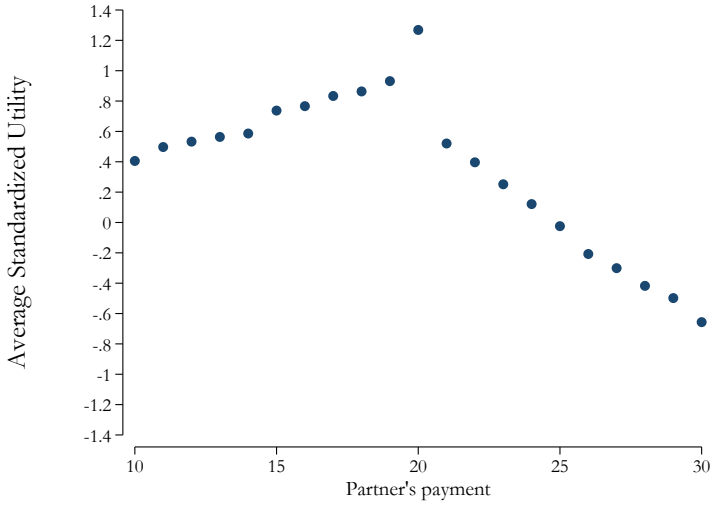
Figure 12: Aggregate utility List 2



N=106, $\alpha = 0.20$, $\beta = 0.09$

Note: Standardized utility is measured as $\frac{(U_{ik} - \overline{U_i})}{sd(U_i)}$, where U_{ik} is the utility expressed by individual i with regard to allocation k.

Figure 13: Aggregate utility List 3



N=106, $\alpha = 0.16$, $\beta = 0.07$

Note: Standardized utility is measured as $\frac{(U_{ik} - \overline{U_i})}{sd(U_i)}$, where U_{ik} is the utility expressed by individual i with regard to allocation k.

Figure 14: Weak adherents to Fehr and Schmidt's model

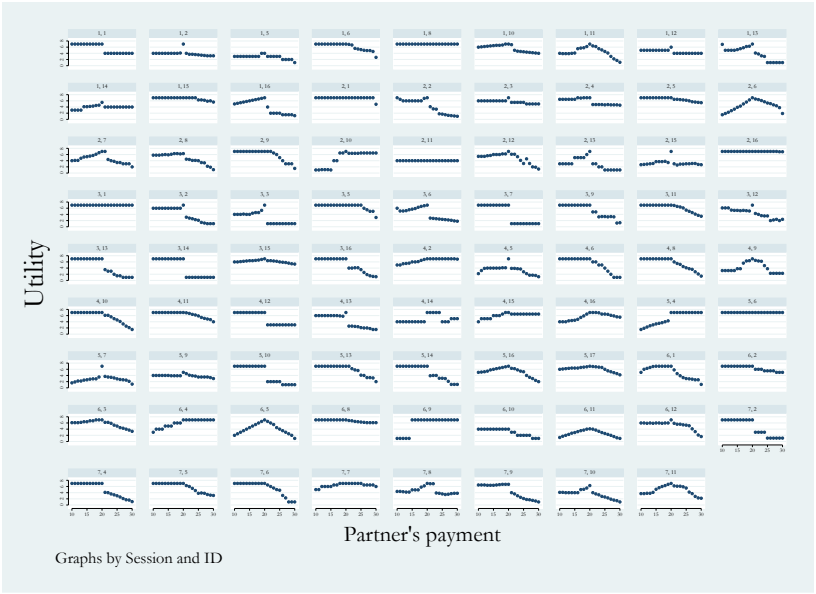


Figure 15: Non-adherents to Fehr and Schmidt's model

Figure 16: Individuals displaying maximin preferences

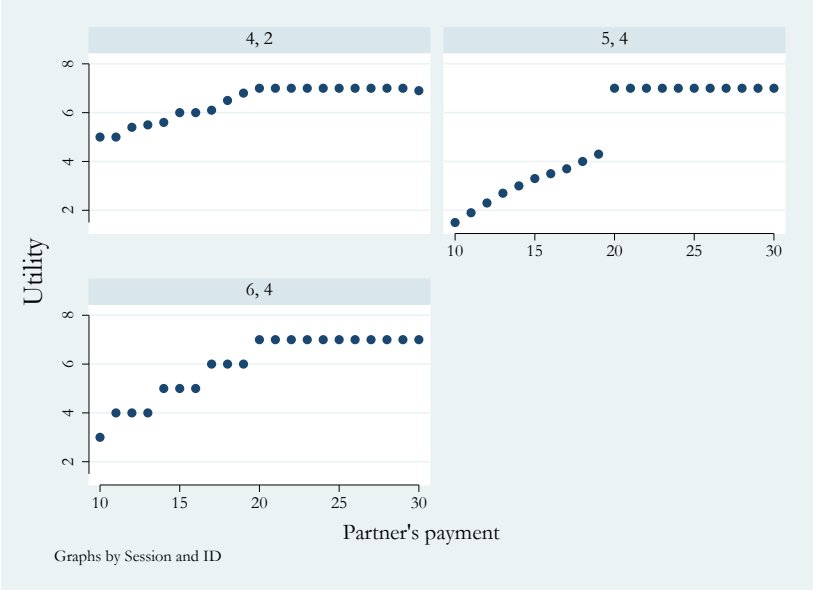


Figure 17: Individuals displaying efficiency concerns

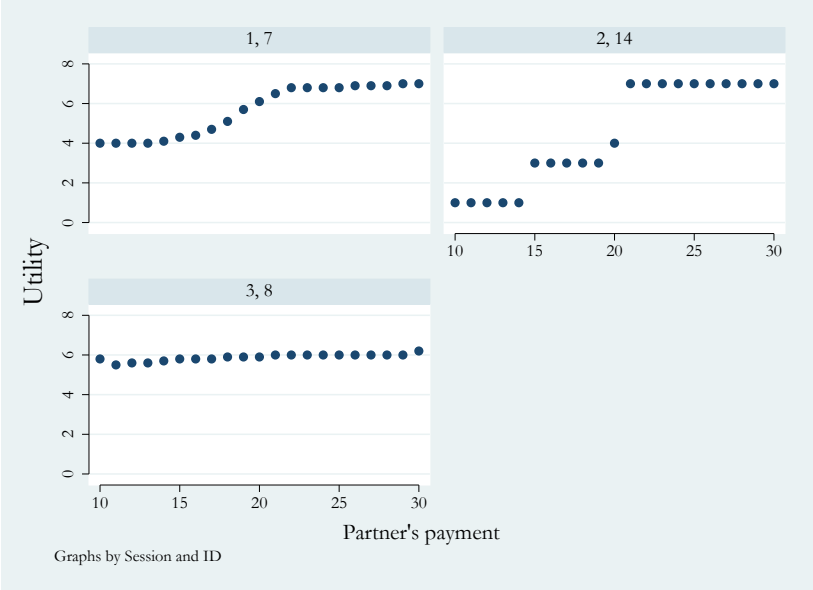
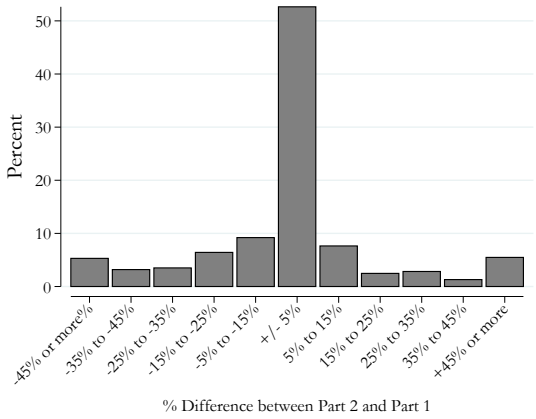


Figure 18: Percentage change in List 1 responses



Note: Histogram of the percentage change between the second part and the first part of the experiment, defined as the difference between the utility of an allocation in List 1 Part 2 and the utility of the same allocation in List 1 Part 1, divided by the utility in List 1 Part 1. This graph includes the 21 allocations in List 1 for all 106 participants, for a total of 2226 observations.

D Alternative Behavioral Models

Although in principle the *inequity list* was designed to test F&S, there are other behavioral models that can be displayed when answering the list. This is an advantage of the *inequity list*, as individuals' answers are unconstrained and thus are able to reveal their true preferences, beyond inequity aversion.

The possible behavioral models that individuals can display when answering the *inequity list* are summarized in Figure 19. The nine models studied here constitute the different configurations of preferences with equality as a pivotal point. There are three possible shapes the utility function takes for allocations to the left of equality (i.e. where individual i has a higher payoff than individual j): increasing, decreasing, and constant. Similarly, to the right of equality the utility function can take the same three shapes: increasing, decreasing, and constant. The combination of the possible shapes to the left and right of equality results in the nine possibilities depicted in Figure 19. Note that the only assumptions imposed for these models are continuity and local monotonicity, namely preferences are monotonic for disadvantageous inequality allocations and monotonic for advantageous inequality allocations, although not necessarily globally monotonic.

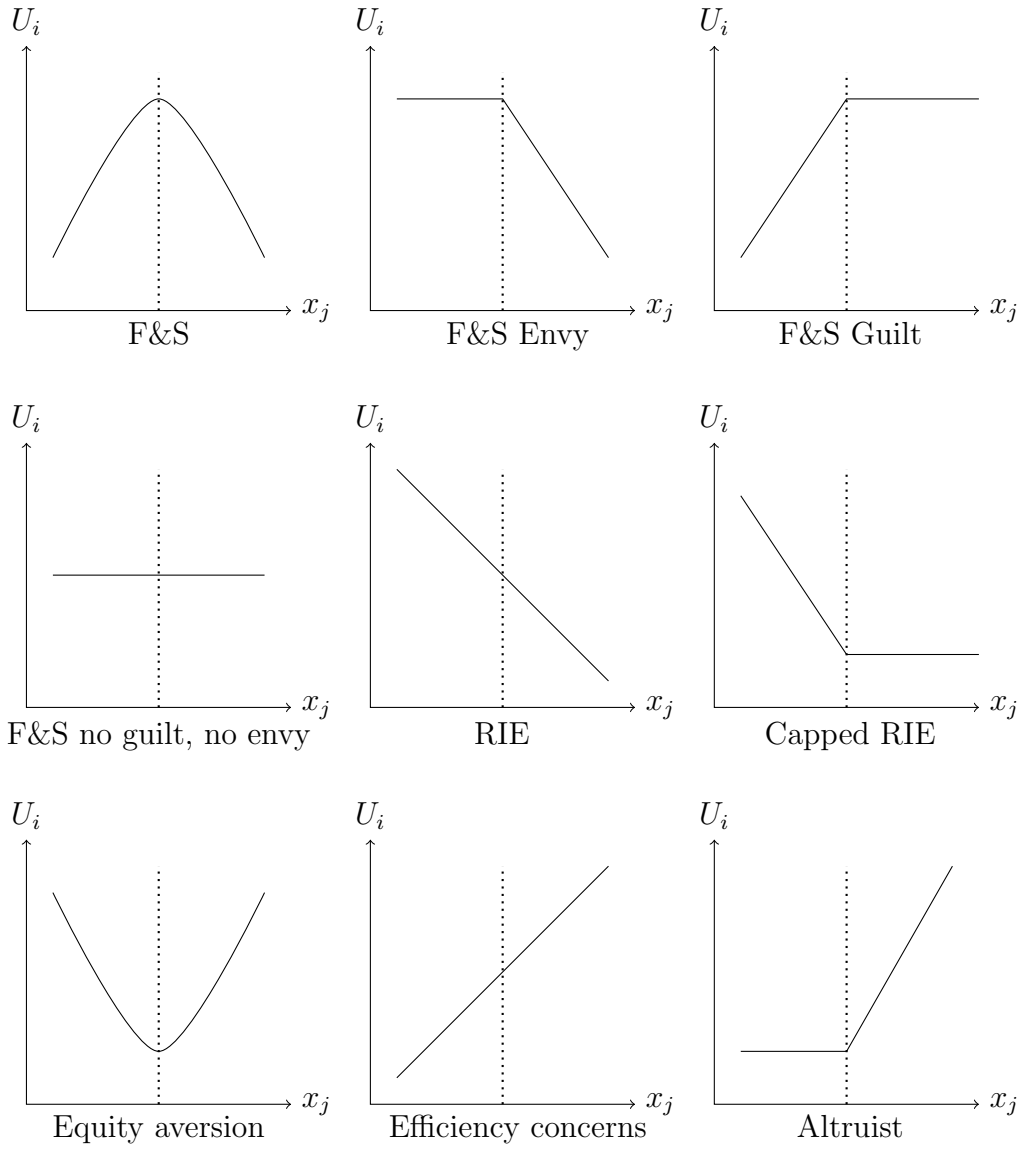
We discuss each behavioral model considered here, in the order it appears in Figure 19. Each model in Figure 19 is shown from the perspective of an individual i, in the space of another person's payoff x_j and i's utility U_i. For all the different levels of x_j, individual i's own payoff is fixed at $\overline{x_i}$. Dotted lines indicate equality of payoffs: $\overline{x_i} = x_j$

- The first three models depicted in Figure 19 display different forms of inequity aversion, in the way proposed by Fehr and Schmidt (1999). Their model extends the self-regarding model incorporating a distaste for inequity in two directions: disadvantageous inequity (envy), and advantageous inequity (guilt). The first model in Figure 19 is the most strict depiction of F&S, in which an individual suffers from both guilt and envy. In the second one, an individual suffers only from envy and is indifferent to different levels of advantageous inequity. By contrast, in the third model an individual suffers from guilt only and is indifferent to disadvantageous inequity. The third model also corresponds to the maximin model, in which utility increases as the minimum payoff among the two subjects increases.

- The fourth model is the canonical self-regarding model according to which individuals maximize their own utility with regard to their own monetary payoff exclusively. This model is also classified here as a version of F&S, given that F&S's model is also consistent with self-regarding individuals if their model parameters take the values of $\alpha_i = 0$ and $\beta_i = 0$.

- The fifth model is the Relative Income Effect (RIE), where subjective well-being decreases with other's income. These type of preferences have been accounted for in other behavioral models as spiteful (Levine, 1998), or competitive preferences (Charness & Rabin, 2002). Similarly, capped RIE embodies status seeking preferences but only to the point of equality. After equality, individual i's utility is fixed at its lowest level for any level of disadvantageous inequality.

Figure 19: Possible behavioral models in the *inequity list*



Note: Dotted lines indicate equality of payoffs: $x_i = x_j$

- Equity aversion (Fershtman, Gneezy, & List, 2012) is the opposite of F&S's strict version of inequity aversion. Another way to name this model is as a preference for inequity. It is expressed when individuals reach their lowest utility at equality and their highest at the maximum levels of inequality. Houser and Xiao (2010) find evidence of inequality-seeking punishment using dictator games in the laboratory.

- The next model is efficiency concerns (Engelmann & Strobel, 2004), also called surplus maximization or social welfare preferences (Charness & Rabin, 2002), where individuals display a preference for Pareto improvements. In this case, as i's payoff is fixed, they increase their utility as j's payoff increases. The theoretical basis for this model is founded on the utilitarian ideas by Bentham and J. S. Mill.

- The last model describes individuals who experience a low level of utility when their own monetary payoff is greater than that of other individual, while their utility increases with the other person's payoff once the other person gets at least the same amount. Altruistic preferences are studied in the model proposed by Levine (1998).

The next step, after defining the possible behavioral models displayed with the *inequity list*, is to determine the model that fits each individual's behavior best. The approach we propose here is a scoring procedure that uses each allocation in the list as a single observation. The first observation is used as baseline and does not count towards the final score. For the second allocation, the utility an individual reports can be larger, smaller or the same as the first one. If the second allocation is larger than the first one, a unit is added toward the score of all the models increasing before equality (F&S, F&S Guilt, and efficiency concerns). If the second allocation is smaller than the first one, a unit is added toward the score of all the models decreasing before equality (RIE, capped RIE, and equity aversion). If the second allocation is the same as the first one, a unit is added toward the score of all the models that remain constant before equality (F&S Envy, F&S no guilt, no envy, and altruist). This process is repeated for each allocation in the list using as a reference the preceding allocation. Since the shape of most models changes after equality, the rules on how points are added adjust to the corresponding shape. For instance, after equality points are added towards F&S only if the utility reported for a given allocation is lower than for the preceding one.

After calculating the scores reached by a given individual for each model, we define the model of best fit for their preferences as the one with most points. The *inequity list* is composed of 21 allocations. Given that the first allocation is used as a baseline, the maximum score for certain model is 20 points. 13 individuals in our sample have a perfect fit reaching a score of 20 points as the maximum among all models, and only two individuals have nine points as the score for their best fit model. Tables 7 and 8 present the raw scoring results for each individual in our sample.

Among the possible behavioral models, there were two that did not qualify as a model of best fit for any individual in our sample: F&S Guilt and Equity aversion. Table 6 summarizes the results for the rest of the models. The model that fits the majority of subjects (35.6%) is F&S Envy. The most important result is that on the aggregate, F&S is the model that best describes the behavior in our experiment: F&S envy, F&S no guilt, no envy, and F&S in its strict version account for the behavior of 84.7% of the subjects in our sample.

Previous studies have embarked on the task to discover the best behavioral models to rationalize behavior in economic environments. We briefly compare our results with previous results with the caveat that it is unfeasible to make a perfect comparison. First, the set of actions available varies according to the environment studied, i.e. there are preferences we are able to observe with our list that we would not be able to observe in a dictator game. Second, as a consequence of the first reason, the set of behavioral models studied varies depending on the methodology, e.g., similarly to our study, Kerschbamer (2015) proposes a test that classifies individuals into nine preference types, however only seven of our behavioral models overlap with Kerschbamer's.

Andreoni and Miller (2002) found that 22.7% of subjects in a modified dictator game behave perfectly selfishly and 14.2% display Leontief preferences, the equivalent of what we denominate F&S guilt. These findings are in contrast with our findings, as we do not find

evidence of F&S guilt. Similarly, only 6.8% of participants in our sample display efficiency concerns, while Charness and Rabin (2002) find that efficiency concerns play a bigger role than inequity aversion for their sample. Engelmann and Strobel (2004) find that efficiency concerns, maximin preferences, and self-regarding preferences rationalize most of their data.

Our results indicate that F&S outperforms other models in describing individual preferences over monetary allocations. However, the inequity aversion displayed by individuals in our sample concentrates on envy rather than guilt. In fact, the vast majority of subjects do not display guilt as an important part of their preferences.

Table 6: Model of best fit for each participant

Model	Frequency	Percentage
F&S Envy	42	35.6%
F&S no guilt, no envy	36	30.5%
F&S	22	18.6%
Efficiency concerns	8	6.8%
RIE	7	5.9%
Altruist	2	1.7%
Capped RIE	1	0.8%
Total	118	

Note: Although the number of subjects who participated in the experiment is 106, some subjects had a tie between models. The following is the list of ties: Three ties between Envy and RIE. A tie between F&S and Maxi-min. Five ties between F&S and Envy. A tie between capped RIE and Self-regarding. Two ties between Envy and Self-regarding

Table 7: Scoring results by individual: Part 1

Subject	F&S	F&S Guilt	F&S Envy	F&S no guilt, no envy	RIE	Capped RIE	Equality aversion	Efficiency concerns	Altruist
1	1	9	11	**19**	1	9	0	0	10
2	9	5	**15**	11	7	3	0	2	8
3	11	1	**16**	6	13	3	3	1	6
4	5	2	**10**	7	**10**	7	8	3	8
5	4	8	12	**16**	3	7	0	1	9
6	9	1	**19**	11	9	1	0	0	10
7	7	**13**	3	9	0	6	4	11	7
8	0	10	10	**20**	0	10	0	0	10
9	11	1	11	1	**18**	8	8	1	1
10	**18**	8	12	2	10	0	0	8	2
11	**17**	7	12	2	11	1	1	7	2
12	2	10	10	**18**	1	9	0	1	9
13	**11**	**11**	8	8	6	6	1	6	3
14	7	**15**	5	13	1	9	0	6	4
15	4	5	14	**15**	4	5	1	1	11
16	14	**16**	4	6	4	6	0	10	0
17	1	9	11	**19**	1	9	0	0	10
18	12	2	**16**	6	12	2	2	2	6
19	3	9	11	**17**	2	8	0	1	9
20	6	7	11	**12**	5	6	2	3	8
21	9	1	**19**	11	9	1	0	0	10
22	**20**	10	10	0	10	0	0	10	0
23	**15**	13	7	5	6	4	0	9	1
24	**14**	6	12	4	11	3	2	5	3
25	6	4	**16**	14	6	4	0	0	10
26	5	12	6	**13**	2	9	2	5	6
27	0	10	10	**20**	0	10	0	0	10
28	**13**	6	**13**	6	8	1	1	6	6
29	6	10	10	**14**	3	7	0	3	7
30	2	11	8	**17**	0	9	1	3	9
31	**11**	10	6	5	5	4	4	10	5
32	1	9	11	**19**	1	9	0	0	10
33	0	10	10	**20**	0	10	0	0	10
34	9	3	**17**	11	8	2	0	1	9
35	6	**14**	5	13	2	10	1	5	4
36	4	5	9	**10**	9	**10**	6	1	6
37	4	6	14	**16**	4	6	0	0	10
38	**18**	8	11	1	11	1	1	8	1
39	1	9	11	**19**	1	9	0	0	10
40	4	12	5	**13**	1	9	3	6	7
41	5	2	**15**	12	5	2	3	3	13
42	6	4	**15**	13	7	5	1	0	9
43	10	0	**20**	10	10	0	0	0	10
44	8	3	9	4	**11**	6	8	5	6
45	5	5	**15**	**15**	5	5	0	0	10
46	1	9	11	**19**	1	9	0	0	10
47	**17**	9	11	3	9	1	0	8	2
48	7	2	**17**	12	7	2	1	1	11
49	2	8	11	**17**	3	9	1	0	9
50	9	**17**	3	11	1	9	0	8	2
51	9	1	**18**	10	10	2	1	0	9
52	1	4	10	13	2	5	6	5	**14**

Table 8: Scoring results by individual: Part 2

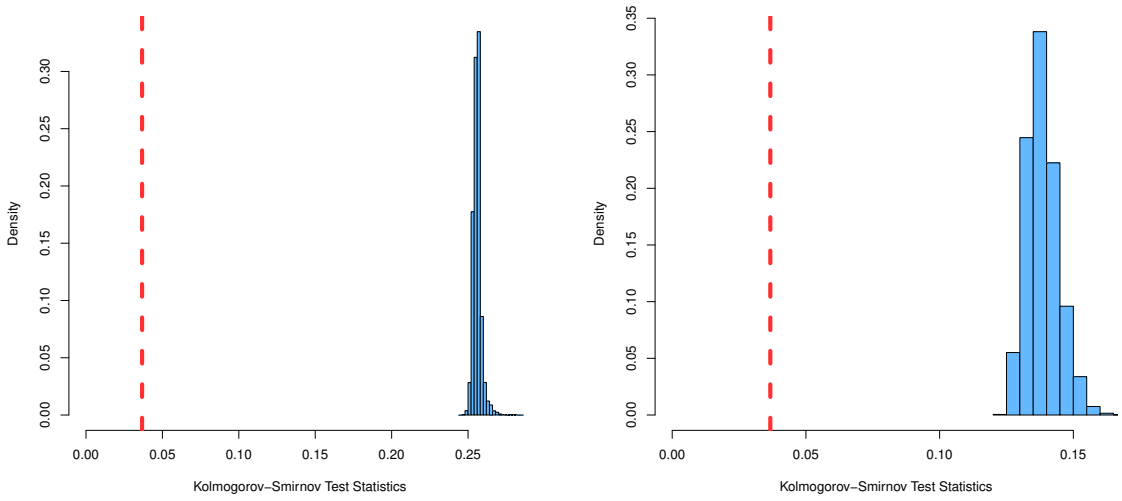
Subject	F&S	F&S Guilt	F&S Envy	F&S no guilt, no envy	RIE	Capped RIE	Equality aversion	Efficiency concerns	Altruist
53	**13**	7	**13**	7	8	2	0	5	5
54	6	4	**16**	14	6	4	0	0	10
55	6	4	**12**	10	10	8	4	0	6
56	10	0	**20**	10	10	0	0	0	10
57	**11**	9	**11**	9	6	4	0	5	5
58	9	1	**19**	11	9	1	0	0	10
59	10	0	**20**	10	10	0	0	0	10
60	1	9	11	**19**	1	9	0	0	10
61	8	4	**14**	10	9	5	2	1	7
62	2	9	10	**17**	1	8	1	2	10
63	5	13	7	**15**	1	9	0	4	6
64	**15**	11	9	5	7	3	0	8	2
65	11	2	**15**	6	11	2	3	3	7
66	9	1	12	4	**16**	8	7	0	3
67	0	10	8	**18**	2	12	2	0	8
68	10	**20**	0	10	0	10	0	10	0
69	10	0	**15**	5	**15**	5	5	0	5
70	0	10	10	**20**	0	10	0	0	10
71	**18**	8	12	2	10	0	0	8	2
72	3	3	10	10	6	6	7	4	**11**
73	8	4	**15**	11	8	4	1	1	8
74	2	8	12	**18**	2	8	0	0	10
75	5	5	**13**	**13**	7	7	2	0	8
76	8	2	**13**	7	**13**	7	5	0	5
77	8	2	**18**	12	8	2	0	0	10
78	5	4	**15**	14	5	4	1	1	11
79	9	**11**	5	7	5	7	4	8	4
80	**20**	10	10	0	10	0	0	10	0
81	**18**	8	12	2	10	0	0	8	2
82	6	4	**15**	13	7	5	1	0	9
83	**14**	6	**14**	6	9	1	0	5	5
84	3	7	13	**17**	3	7	0	0	10
85	13	5	**15**	7	9	1	0	4	6
86	4	14	6	**16**	0	10	0	4	6
87	**20**	10	10	0	10	0	0	10	0
88	6	4	**15**	13	7	5	1	0	9
89	3	8	7	**12**	6	11	5	2	6
90	7	3	**17**	13	7	3	0	0	10
91	1	11	9	**19**	0	10	0	1	9
92	3	7	13	**17**	3	7	0	0	10
93	**20**	10	10	0	10	0	0	10	0
94	**13**	5	12	4	12	4	3	4	3
95	10	0	**19**	9	11	1	1	0	9
96	2	8	12	**18**	2	8	0	0	10
97	0	10	9	**19**	1	11	1	0	9
98	10	0	**20**	10	10	0	0	0	10
99	9	0	**19**	10	9	0	1	1	11
100	8	2	**18**	12	8	2	0	0	10
101	5	11	9	**15**	2	8	0	3	7
102	**9**	6	**9**	6	7	4	5	7	7
103	13	3	**16**	6	11	1	1	3	6
104	14	4	**15**	5	11	1	1	4	5
105	**17**	9	11	3	9	1	0	8	2
106	7	3	7	3	**17**	13	10	0	0

E Monte Carlo Simulation

The purpose of the Monte Carlo simulations is to compare the responses provided by our participants to the *inequity list* with randomly generated values. We test the null hypothesis that the distribution of responses provided by participants in our sample and the distribution of random responses are equal. This test is replicated one million times, using a Kolmogorov-Smirnov test, with a different set of randomly generated data each time. Every iteration compares List 1 (Part 1) with the simulated random data.

Figure 20 summarizes the results from the million tests for two types of random simulated data. On the left, Figure 20a shows a distribution of the test statistics generated in each iteration of the test when the random values are drawn from an uniform distribution over the support [1,7], corresponding to the range of values in which utility is expressed. On the right, Figure 20b shows the distribution of test statistics when the random values are generated from a normal distribution with the same mean and standard deviation as the distribution of responses provided by participants in our sample. In both cases, the dashed red line indicates the Kolmogorov-Smirnov critical value for $\alpha = 0.05$. Regardless of the underlying distribution of the random generated data, the null hypothesis is always rejected. Therefore, we conclude that the responses provided by participants in our sample to List 1 (Part 1) are statistically significantly different from random answers.

Figure 20: Distribution for 1 million tests



(a) r.v. $\sim U(1,7)$ (b) r.v. $\sim N(\mu = 4.86, \sigma = 1.96)$

Note: Red line indicates Kolmogorov-Smirnov critical value for $\alpha = 0.05$

F Instructions

General instructions lists 1, 2 and 3

The following three tasks consist of lists of different allocations of money between you and the person with which you are paired. In each task you will be paired with a different person.

In these tasks you are asked to indicate your level of satisfaction with different allocations of money, on a scale of 1 to 7, where 1 corresponds to 'extremely dissatisfied,' and 7 corresponds to 'extremely satisfied.' Move the slider to the position that best represents your level of satisfaction with the corresponding allocation. The satisfaction value that corresponds to the slider's position can be viewed to the right of the scale, in order to assist you in rating your satisfaction accurately.

There are no wrong answers. Please answer carefully and do your best to indicate your exact level of satisfaction. You can move all the sliders as many times as you want before clicking the green button at the end of the page to proceed.

Payment:

At the end of the experiment, if one of the lists in the following three tasks is randomly selected for payment, one of the allocations on the list will be randomly chosen to determine the payments for you and the person with which you are paired. For example: if the first allocation on List 1 ("you get $20 and the other person gets $10") is randomly chosen to determine the payments in your pair, then either you or the person you are paired with will get $20, and the other person will get $10. You are equally likely to get $20 or $10.

It warrants mention that the position of the sliders in the following three tasks have no implication whatsoever on the final payment, should one of these tasks be chosen for final payment.

Ultimatum instructions

Your answers in the following two tasks may affect the final payment, should one of these tasks be chosen for final payment.

TASK: Triangle

You will make two decisions in this task. In the first decision, you are endowed with $20, and you decide how much to send to another participant (you have the option to send any whole dollar amount, $0 and $20 included.) That participant can either accept or reject your offer. If they accept, they keep the sent amount, and you keep the remaining endowment ($20 minus the amount sent.) However, if they reject your offer, you both get $0.

In the second decision, the roles are inverted and you decide the minimum amount you are willing to accept from another participant.

Payment:

At the end of the experiment, if this task is chosen for payment, one of the decisions you made will be randomly chosen to be implemented along with that of another participant. So, for instance, if your first decision was to send an amount $X, and that is larger than the minimum amount the other participant decided they were willing to accept, they get $X and you get $20 - $X. Otherwise, you both get zero.

Note that your second decision can also be randomly chosen for payment. In that case, the decision chosen for the other participant will be the first one.

You will go over two examples before making any decision.

Example 1:

Suppose your first decision is to send $2 to the other participant, and your second decision is to accept at least $1. Suppose the other participant makes the exact same decisions.

If this task is chosen for payment and your first decision is randomly assigned to be implemented for the payment:

How much money do you receive for this task at the end of the experiment?
(Do not include the $5 show up fee)

How much money does the other participant receive for this task at the end of the experiment?
(Do not include the $5 show up fee)

Example 2:

Suppose your first decision is to send $18 to the other participant, and your second decision is to accept at least $15. Suppose the other participant sends $10 as their first decision, and accepts at least $13 as their second decision.

If this task is chosen for payment and your second decision is randomly assigned to be implemented for the payment:

How much money do you receive for this task at the end of the experiment?
(Do not include the $5 show up fee)

How much money does the other participant receive for this task at the end of the experiment?
(Do not include the $5 show up fee)

>>

Sender's decision in Ultimatum

Now that you have practiced with the examples, please submit below your answers for the Triangle task. For your reference, you will find a copy of the task instructions at the bottom.

First decision:

How much do you want to send to another participant?

0

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

Receiver's decision in Ultimatum

Second decision:

What is the minimum amount you are willing to accept?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20

Dictator instructions

TASK: Diamond

This task has two players, one active and the other passive; player A makes decisions while player B does not. You will make decisions as player A, and later, a random draw will determine whether you are assigned the outcome of player A or player B.

Player A decides between either keeping $20 for him/herself while leaving player B with $0 (zero), or an equal payment for both players that varies from $0-$0 to $20-$20 as indicated in the table below, under the second column: 'Option B.'

As player A, you must first decide between keeping the $20 for yourself or splitting the payment. If you decide to split the payment, you must indicate the minimum amount you are willing to accept as an equal payment instead of keeping $20 for yourself. By indicating the minimum equal amount you are willing to accept, you are indicating you prefer option B for that amount and all higher equal split amounts, and you prefer option A for all lower equal split amounts.

For example, using the table below, if someone chooses option A for the entire table, they are not willing to split the payment. If someone chooses option A for rows 0-5 and then option B for rows 6-20, they are indicating that he or she is not willing to split up until a $6 payment for each player, at which point they are willing to split through row 20.

Row	Option A	Option B
0	Player A: $20, Player B: $0	Player A: $0, Player B:$0
1	Player A: $20, Player B: $0	Player A: $1, Player B:$1
2	Player A: $20, Player B: $0	Player A: $2, Player B:$2
3	Player A: $20, Player B: $0	Player A: $3, Player B:$3
4	Player A: $20, Player B: $0	Player A: $4, Player B:$4
5	Player A: $20, Player B: $0	Player A: $5, Player B:$5
6	Player A: $20, Player B: $0	Player A: $6, Player B:$6
7	Player A: $20, Player B: $0	Player A: $7, Player B:$7
8	Player A: $20, Player B: $0	Player A: $8, Player B:$8
9	Player A: $20, Player B: $0	Player A: $9, Player B:$9
10	Player A: $20, Player B: $0	Player A: $10, Player B:$10
11	Player A: $20, Player B: $0	Player A: $11, Player B:$11
12	Player A: $20, Player B: $0	Player A: $12, Player B:$12
13	Player A: $20, Player B: $0	Player A: $13, Player B:$13
14	Player A: $20, Player B: $0	Player A: $14, Player B:$14
15	Player A: $20, Player B: $0	Player A: $15, Player B:$15
16	Player A: $20, Player B: $0	Player A: $16, Player B:$16
17	Player A: $20, Player B: $0	Player A: $17, Player B:$17
18	Player A: $20, Player B: $0	Player A: $18, Player B:$18
19	Player A: $20, Player B: $0	Player A: $19, Player B:$19
20	Player A: $20, Player B: $0	Player A: $20, Player B:$20

Payment:

At the end of the experiment, if this task is chosen for payment, you and the person you are paired with will be randomly assigned to the roles of player A and player B. One person in the pair will be A, the other person will be B. Then ONE row will be randomly selected and player A's choice for that row will be implemented.

You will go over two examples before making any decision.

Example 1:

Suppose as player A you choose row 3 as the minimum amount you are willing to accept of an equal payment instead of keeping $20 for yourself, and the person you are paired with chooses row 19.

Suppose this task is chosen for payment. Also, suppose you are randomly assigned the role of player A for the payment and the randomly chosen row is 3:

How much money do you receive for this task at the end of the experiment? (Do not include the $5 show up fee)

How much money does the person you are paired with receive for this task at the end of the experiment? (Do not include the $5 show up fee)

Example 2:

Suppose as player A you choose row 15 as the minimum amount you are willing to accept of an equal payment instead of keeping $20 for yourself, and the person you are paired with chooses row 5.

Suppose this task is chosen for payment. Also, suppose you are randomly assigned the role of player B for the payment and the randomly chosen row is 4:

How much money do you receive for this task at the end of the experiment? (Do not include the $5 show up fee)

How much money does the person you are paired with receive for this task at the end of the experiment? (Do not include the $5 show up fee)

>>

Dictator's decision

Now that you have practiced with the examples, please submit below your answers for the Diamond task. For your reference, you will find a copy of the task instructions at the bottom.

As player A, the minimum amount you choose as equal split instead of $20 for you and $0 for player B is:

In other words, you choose Option B over Option A starting in row:

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- I choose option A for the entire table

G Questionnaire

What is your gender?

- Female
- Male
- Other, please specify
- Prefer not to answer

What is your age? _____ You can write "prefer not to answer" if that is the case.
What is your nationality? __ You can write "prefer not to answer" if that is the case.
Are you a citizen or permanent resident of the United States?

- Yes
- No
- Prefer not to answer

Rate your English:

- Native
- Fluent
- Proficient
- Less than proficient
- Prefer not to answer

What race/ethnicity do you identify yourself as:

- White (having origins in any of the original peoples of Europe, the Middle East, or North Africa)
- Black or African (having origins in any of the Black racial groups of Africa)
- Hispanic (having origins in Mexico, Central or South America)
- American Indian and Alaska Native (having origins in any of the original peoples of North, Central, or South America and maintaining tribal affiliation or community attachment)
- Asian (having origins in any of the original people of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam; or Pacific including nations such as Myanmar, Bhutan, Nepal, Sri Lanka, and Indonesia.)
- Native Hawaiian and Other Pacific Islander (having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands)
- Some other race, please specify
- Prefer not to answer

What religion do you consider yourself?

- Atheist / Agnostic
- Buddhist
- Christian (including Catholic, Protestant, and all other Christian denominations)
- Hindu
- Jewish
- Muslim
- Other
- Prefer not to answer

How would you characterize your political views?

- Conservative
- Moderate
- Progressive
- Prefer not to answer

What is your class standing?

- First year undergraduate student
- Second year undergraduate student
- Third year undergraduate student
- Fourth year undergraduate student
- Graduate student
- Other

Please carefully write your college GPA: _____ You can write "Prefer not to answer" if that is the case.

Have you declared a major?

- Yes, please carefully enter your major(s) below _____
- No, please carefully enter your intended major(s) below _____
- Prefer not to answer

Have you declared a minor or intend to do so?

- Yes, please carefully enter your minor(s) below _____
- No
- Prefer not to answer

What is your best estimate of your total expenditures this school year? Please consider all expenses, even if some are covered by financial aid or grants, including tuition, housing, food, clothing, transportation, entertainment, etc. Indicate in whole dollars: _____ $ for the school year. You can write "Prefer not to answer" if that is the case.

What is the total (gross) income last year of your parents or guardians (or spouse, if married)? Exclude your own earnings. Please choose a single response, even if it is a guess:

- $0 to less than $25,000
- $25,000 to less than $50,000
- $50,000 to less than $75,000
- $75,000 to less than $100,000
- $100,000 to less than $125,000
- $125,000 to less than $150,000
- $150,000 or more
- Prefer not to answer

What is your father's highest level of education?

- No high school
- Some high school
- Completed high school
- Some college
- Completed college
- Some grad/professional school
- Completed grad/professional school
- Prefer not to answer

What is your mother's highest level of education?

- No high school
- Some high school
- Completed high school
- Some college
- Completed college
- Some grad/professional school
- Completed grad/professional school
- Prefer not to answer

Some people feel they have complete free choice and control over their lives, while others feel their choices have no real effect on what happens to them. Please use the scale below to indicate how much freedom of choice and control you feel you have over the way your life turns out:

1. None at all

2.
3.
4.
5.
6.
7.
8.
9.
10. A great deal
11. Prefer not to answer

When indicating your satisfaction in the list tasks, did you answer as if the difference between one level of satisfaction and the next was always the same? i.e. the increment from 2 (Moderately dissatisfied) to 3 (Slightly dissatisfied) was equivalent to you, in terms of absolute satisfaction, to an increment from 6 (Moderately satisfied) to 7 (Extremely satisfied)?

- Yes
- No, please explain:

When indicating your satisfaction in the list tasks, did you take into consideration the combined payment amount that you and the person you were paired would be paid? Please explain your answer.

- Yes
- No

Finally, in the space provided below, please try to describe what you believe to be the purpose of the study: _____

You have reached the end of the experiment, please wait quietly at your seat. You will be called to the room next door to get your payment in a few minutes.

Thank you!