

PREFERENCES FOR REDISTRIBUTION AND PERCEPTION OF FAIRNESS: AN EXPERIMENTAL STUDY

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Abstract

We conduct a laboratory experiment to study how demand for redistribution of income depends on self-interest, insurance motives, and social concerns relating to inequality and efficiency. Our choice environments feature large groups of subjects and real-world framing, and differ with respect to the source of inequality (earned or arbitrary), the cost of taxation to the decision maker, the dead-weight loss of taxation, uncertainty about own pretax income, and whether the decision maker is affected by redistribution. We estimate utility weights for the different sources of demand for redistribution, with the potential to inform modeling in macroeconomics and political economy (JEL: D31, P16, H24, C91)

1. Introduction

Redistribution of income through taxes and transfers has long been normal practice in advanced democracies. Numbers taken by Milanovic (2000) from the Luxembourg Income Study on 17 OECD countries for the early 1990s indicate that the income share of the bottom 40% of households was, on average, 14.1 percentage points higher when measured on a post-tax-and-transfer than on a pre-tax-and-transfer basis. Even

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in the United States, the least redistributive of the countries surveyed, this share was 7.6 percentage points higher in the post- than in the pre-tax-and-transfer distribution.

Three main factors can explain support for redistribution in democracies: (1) income maximization, (2) risk aversion, and (3) social preferences. First, with right-skewed income distributions, a majority of voters can potentially benefit from redistributing from the richest towards themselves. Second, if there is some degree of uncertainty about agents' future income and if tax regimes are sufficiently persistent, risk-averse individuals may support redistribution as a form of insurance against negative shocks. Third, individuals may favor redistribution to reduce inequalities that they judge to be unfair, while concerns for efficiency losses arising from taxation may reduce the demand for redistribution. Although there is an active debate on the relative importance of each of these factors for real-world redistributive outcomes (see for instance Alesina and Giuliano 2010; Bénabou and Tirole 2006), it is generally difficult to address this question using aggregate data or field evidence.

In this paper we elicit demands for redistribution from a large number of subjects under a variety of experimental conditions in the lab. This allows us to control for various potential confounds and analyze the impact of different motives for redistribution. While we build on a large experimental literature on social preferences (Fehr and Schmidt 1999; Charness and Rabin 2002), our design has features that resemble the macroeconomy (Ackert, Martinez-Vazquez, and Rider 2007; Krawczyk 2010), and our findings are potentially informative for modeling in public finance and macroeconomics.

Each experimental session involves a group of 21 subjects who are assigned unequal initial earnings calibrated to proportionally reproduce the actual US pretax income distribution. Subjects are asked to choose a proportional tax rate—0%, 10%, ..., 100%—to be applied to the initial earnings distribution with equal division of the proceeds. There is no voting: each subject knows that, at the end of the experiment, her tax choice could be randomly selected and implemented.

We elicit subjects' tax choices under various conditions: (1) different direct cost (ranging from 0% to approximately 5% of average experimental income), (2) different dead-weight losses (0% to 25% of tax revenue), (3) different methods to assign pretax earnings (randomly, based on income of the place of origin, based on performance on a quiz, or in a game of skill), and (4) different degrees of involvement and information of the decision maker (as an unaffected observer, as an affected party uncertain of her pretax income, as an affected party certain about her pretax income).

We find that each of the three motives for redistribution matters in our experiment. First, in line with income maximization, we find that a higher direct tax cost and a higher expected pretax income depress demand for redistribution. Furthermore, when uncertainty about income is resolved, subjects show a strong tendency to select the level of redistribution that maximizes their own post-tax earnings, although social concerns continue to matter. Second, we find that subjects who are more confident about their performance, thus facing a lower (perceived) income risk, specify a lower tax rate. Third, we find that social concerns matter: an increase in the efficiency loss

reduces average tax rates, even for a disinterested observer, and most subjects are willing to pay to reduce income inequality among others.

Utility estimates of the underlying motives of the subjects mirror these results. These estimates put about 81% weight on own income level, 15% weight on the standard deviation of own income, 3% weight on distributive fairness (represented by the income of the lowest earner), and 1% weight on efficiency (as represented by aggregate earnings). If only decisions about redistribution of “arbitrarily” determined incomes are considered, the weight on own income is a smaller 73% and that on distributive fairness rises to 10%. On the basis of the utility function, we calculate that our average subject is willing to trade about 0.4% of his own expected payoff for a 10% reduction in inequality (defined as the difference between the lowest and the average income), 2% for a 10% reduction in the standard deviation of her own expected income, slightly over 2% for a 10% increase in the group’s aggregate earnings, and to accept a 1.8% decrease in aggregate earnings in exchange for a 10% decrease in inequality. Overall, our subjects redistribute 45% of pretax income, reducing the distribution’s Gini coefficient from 0.51 to 0.28.

Assuming that our subjects’ preferences resemble those of citizens of real world industrialized democracies, our results suggest that self-interest, risk-avoidance, and social concerns, including both concern for fairness and dislike of inefficiency, all play nonnegligible roles in supporting mildly redistributive public policies. These findings extend the results of a small but growing number of incentivized lab experiments on redistribution and taxation. Studies in this literature universally find an important role for self-interest, and some show that risk aversion is an important motive for redistribution (Beck 1994; Schildberg-Hörisch 2010). There is less consensus about preferences for equality, with some studies finding support for such preferences (Tyran and Sausgruber 2006; Ackert, Martinez-Vazquez, and Rider 2007; Schildberg-Hörisch 2010), while others do not (Beck 1994; Beckman, Formby, and Smith 2004; Krawczyk 2010). With respect to efficiency motives, Krawczyk (2010) and Beckman, Formby, and Smith (2004) find evidence for small efficiency concerns in a leaky-bucket set-up. Krawczyk (2010) and Fong and Luttmer (2011) also find the source of inequality (deserved or not) to be important. Our experiment shows that all of these concerns play a significant role in large groups featuring “real world” income inequalities.

In the broader debate on the nature of social preferences, our finding that people care about the poor but are also willing to make modest sacrifices for the sake of efficiency is in line with Charness and Rabin (2002) and Engelmann and Strobel (2004). Indeed, one of our main contributions is to show that social preference models like Charness and Rabin’s are applicable to more complex and larger-scale settings.

The remainder of the paper is organized as follows. Section 2 describes the design and rationale of our experiments. Section 3 provides a theoretical framework for predicting and interpreting the results. In Section 4 we illustrate and discuss our main results. Section 5 concludes and discusses the application of the results.

2. Experimental Design

Experimental sessions were conducted in a computer lab at Brown University. Each session involved 21 subjects and lasted about 90 minutes. Overall, we conducted 16 sessions involving a total of 336 undergraduate students from a wide range of disciplines. Sessions began with a set of instructions that appeared on participants' computer screen and were simultaneously read aloud by the experimenter. Subjects were informed they would receive a \$5 show-up fee plus an additional payoff that would depend on the outcome of the experiment. The core of the experiment consisted of two parts, which we will refer to as "Part 1" and "Part 2". In each part, participants chose four tax rates that could affect their own and others' payoffs. Near the end of the experiment, one of the two parts was randomly selected for payment. If Part 2 was selected, subjects were invited to reconsider their decisions, generating a third set of tax choices we call "Part 3".

We started by telling subjects that each of them would be assigned one of 20 possible provisional payoffs, ranging from \$0.11 to \$100, that proportionally reproduced the pretax income distribution in the United States. Online Appendix Table S.1 (where throughout the paper the prefix S. refers to material in the Online Appendix), shown on subjects' computer screens, illustrated the distribution of experimental payoffs and income vigintiles.¹ We then explained that provisional earnings could be assigned to subjects in four possible ways: (1) randomly, (2) in proportion to their socioeconomic background (proxied by the average income of the area where their family resided during high-school²), (3) on the basis of their relative performance in a general knowledge quiz, or (4) in a computer-based skill game (Tetris). Which method would actually be used to assign payoffs to subjects would be determined by a random draw at the end of the session. The four methods (which we will henceforth refer to respectively as "Random", "Where From", "Quiz", and "Tetris") were designed to mimic various determinants of economic success in real life (i.e. luck, family background, acquired knowledge, ability) with the purpose of assessing differences in agents' attitude toward redistribution relative to their perception of entitlement. We told subjects they would be able to alter the initial distribution by taxing earnings and redistributing the proceeds equally among all; in particular they would be asked to choose a proportional tax rate ranging from 0% to 100% in increments of 10%. We illustrated the effect of taxation on earnings verbally, graphically, by means of a formula and of a table so that both more

1. Table S.1's reference to income distribution in the United States was partly intended as a framing device, to give decisions a real world macro-economic reference. However, we attempted to steer a middle course, never telling subjects, for example, that "this is an experiment to study your views about the distribution of income", never using words like "just" or "fair". Compare, for example, Frohlich and Oppenheimer (1992) or Johansson-Stenman, Carlsson, and Daruvala (2002).

2. Information on the zip code of subjects' area of origin was collected in the sign-in procedure before subjects had learned anything about the experiment. For non-US students we use the average income of their country of origin (source: World Bank 2001) since assembling income data for small jurisdictions for a large set of countries was impracticable.

and less mathematically inclined subjects could understand. The table is reproduced in Table S.2.

In Part 1, subjects had the role of a “disinterested” decision maker. Each subject chose a tax rate for each income determination method knowing that, at the end of the session, one randomly chosen “decisive” subject’s choice would be applied to the pretax earnings distribution of the other 20 subjects to determine their final payoff. The payoff of the decisive individual would be randomly drawn from the interval \$19.80–\$21.80 and would not be directly affected by the redistributive process.³ We also informed subjects that, when making their tax choices, they would face two additional parameters: a “tax cost”, which measured the direct cost of each additional 10% tax to the decisive individual (similar to Andreoni and Miller 2008), and an “efficiency loss” which measured the percentage loss in total tax revenue associated with each additional 10% tax (in line with Okun (1975)’s “leaky bucket” argument). These treatment variables, which varied only across sessions, were designed to assess subjects’ willingness to pay for a more equal distribution and their concern for aggregate efficiency.⁴

Formally, letting y_i^0 be the pretax payoff of a nondecisive individual i , t the tax rate, and e the efficiency loss parameter, i ’s post-tax earnings in Part 1 can be written as

$$y_i = (1 - t)y_i^0 + t(1 - e) \frac{1}{20} \sum_{j=1}^{20} y_j^0. \quad (1)$$

Similarly, letting c be the tax cost parameter and $y_d^0 \sim U(19.8, 21.8)$ the decisive individual d ’s base payoff, d ’s Part 1 post-tax earnings can be written as $y_d = y_d^0 - (c \times 10 \times t)$.

Once the first set of instructions was completed, subjects were invited to ask questions and performed a brief comprehension test before proceeding to the actual decision stage. The purpose of Part 1 was to elicit subjects’ preferences about redistribution in the micro community of participants under a condition that mirrors Adam Smith’s “impartial observer” who, in the interpretation of Konow (2009), “is not now and has no expectation of ever being implicated in the situation being evaluated”.

3. We adopted a random payoff to prevent subjects from learning if they were chosen as “decisive individual” at their session’s conclusion, and the potential associated social discomfort. The expected payoff is close to but slightly above the average (\$19.80) so as to balance potential feelings of jealousy (with respect to high earners), feelings of guilt (with respect to low earners), and resentment of assignment to the decision-maker role. How successful our design choice was in this regard cannot be determined without additional experiments which lie beyond the scope of the paper.

4. The tax cost parameter could take one of four values: \$0, \$0.25, \$0.5 or \$1 per 10% tax. A \$1 tax cost means that specifying a 100% tax rate costs \$10, or about half the earnings of an average subject. The efficiency loss parameter could take one of three values: 0%, 12.5%, and 25% per 10% tax. We varied tax cost and efficiency loss across rather than within sessions out of concern that, combined with the tasks and the wide range of conditions already proposed to subjects, exposure to additional sources of within-session variation would increase the probability of less well-considered choices.

After subjects had submitted their preferred Part 1 tax rate for each of the four methods, instructions for Part 2 were spelled out. We now explained that Part 2 would be analogous to Part 1 except that the earnings of the randomly selected decisive individual would be affected by her chosen tax and would be determined in the same way as those of the other subjects. Thus, the decisive individual's post-tax payoff in Part 2 can be written formally as

$$y_d = (1 - t)y_i^0 + t(1 - e)\frac{1}{20}\sum_{j=1}^{20}y_j^0 - (c \times 10 \times t). \quad (2)$$

In Part 2, one of the 20 nondecisive subjects would be randomly chosen to receive an amount between \$19.80 and \$21.80 unaffected by the chosen tax rate. Tax cost and efficiency loss parameters were held constant in a given session, so the same applied to Part 1 and Part 2. At the end of the instructions, subjects completed a comprehension test and were asked to predict their relative ranking (in one of seven ranges⁵) in each of the three nonrandom methods. In addition subjects indicated whether they were "very confident", "somewhat confident", or "not confident at all" about their predictions.

Subjects then submitted their four Part 2 tax choices, after which they moved on to perform the Quiz and the Tetris tasks. Part 2—which we will refer as the "involved decision maker" scenario—was designed to put each subject in the position of a hypothetical decision maker behind a veil of ignorance (Harsanyi 1979) with imperfect or no information about her future position in the earnings distribution.

Once the Quiz and Tetris tasks were completed, the experimenter publicly tossed a coin to determine whether Part 1 or Part 2 would determine earnings. If Part 1 was selected, the core of the experiment ended. If instead Part 2 was selected, subjects were told their ranking in each of the four earnings determination methods and were offered the opportunity to revise any or all of their Part 2 tax choices. Hence, without prior announcement, Part 2 decisions were rendered nonbinding and each subject made an additional tax choice for each method in the position of an "involved decision maker" without uncertainty (we will refer to this scenario as "Part 3").⁶ The same tax cost and efficiency loss parameter would apply to Part 3 as well.

After subjects had revised their tax choices, one method was selected to determine pretax earnings. Participants were then invited to participate in an incentivized task consisting of five choices between a certain payment and a lottery (described in Table

5. Ranges grouped together ranks 1–2, 3–5, 6–8, 9–11, 12–14, 15–17, 18–20.

6. In sessions where earnings depended on Part 1 choices, letting subjects revise their decisions after knowing their pretax earnings rank could inadvertently reveal to a subject her identity as decisive individual (for instance a subject whose rank would have yielded her \$0.11 with 0% tax rate and who, choosing 0% tax rate, had instead received \$19.80, would know she had been selected as the decisive individual). Not only did we not want others to be able to identify the decisive individual at the end of the session, but we also wanted no subject to be certain of her own status, to make sure that tax choices were not made with immediate social discomfort at the session's end in mind.

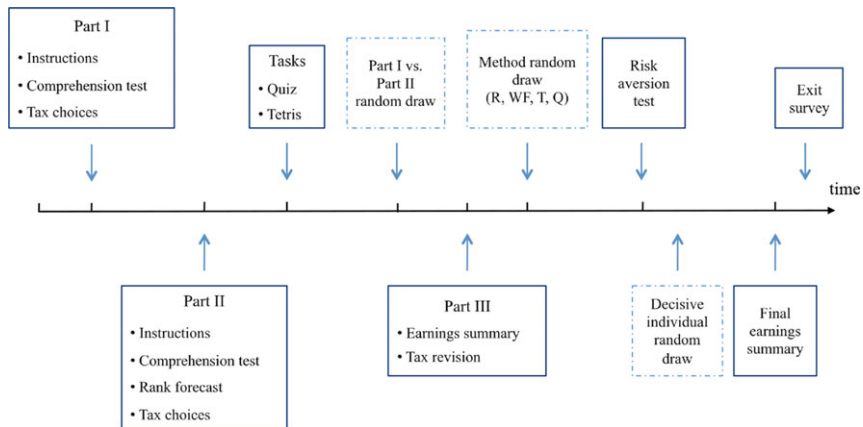


FIGURE 1. Sequence of the experimental session. The dashed boxes indicate the randomization in the determination of payoffs.

S.3) designed to elicit risk attitudes using the “multiple price list” method introduced by Harrison and Rutström (2008), and to answer a background survey including a series of questions on personal characteristics and attitudes. Finally, one subject was randomly selected to be the decisive individual, her preferred tax rate for the relevant part and method was announced, and final payoffs were computed and delivered to participants in closed envelopes. The identity of the decisive individual was never revealed to subjects. Figure 1 summarizes the timing of the experimental session, while Table 1 reports a summary of the treatment variables with indication of the respective source of variation (between- or within-subject) and a preview of the main qualitative results. All the instructions are available at: www.brown.edu/Research/IDE/walkthrough.

The order in which our subjects made their disinterested tax choices and their interested tax choices with and without uncertainty was governed by several considerations. It seemed to us that subjects would think most clearly about the disinterested choice before the prospect of making a similar choice as an involved party had been mentioned to them, so we placed that decision first. In the interested condition, there were obvious reasons to start with the uncertain choices, and then lift uncertainty.⁷ Unfortunately, we cannot rule out order effects. For example, subjects who gave weight to their social convictions in the disinterested condition may have tried to appear consistent when self-interest dictated otherwise in the interested ones; or subjects may have felt more free to choose selfishly after first demonstrating some altruism or social concern, which might have the opposite effect. This should be kept in mind when comparing results from different parts of the experiment.

7. In principle, for the Random, Tetris, and Quiz methods, order could be reversed if a new random draw were made and a new quiz and Tetris game played, but uncertainty would be attenuated for the latter methods by experience.

TABLE 1. Description of treatment variables.

Treatment variable	Description	Values	Source of variation	Main findings
Tax cost	Cost of a 10% tax increase to the decisive individual (DI)	\$0, \$0.25, \$0.5, \$1	Between-subject	Tax rate decreases as tax cost goes up
Efficiency loss	Share of tax revenue lost	0%, 12.5%, 25%	Between-subject	Tax rate decreases as efficiency loss goes up
Income determination method	Method used to assign individuals to pretax payoffs	Random, WF, Tetris, Quiz	Within-subject	Lower tax rate for methods involving effort/ability
Involvement	DI's position as affected or unaffected party in redistributive decision	Part 1: unaffected Parts 2 and 3: affected	Within-subject	Higher tax rate when DI is affected by taxes and redistribution
Uncertainty	DI's information on own position in pretax payoff distribution when choosing tax	Part 2: uncertain Part 3: certain	Within-subject	Own payoff influences tax choice more when uncertainty is resolved; regression evidence of risk aversion

Notes: All income determination methods and involvement conditions were implemented in all experimental sessions (16 sessions involving 335 subjects). While the uncertainty condition was implemented in all experimental sessions, only in seven randomly selected sessions (involving 147 subjects) were participants given the possibility to choose a tax rate after learning their ranking in the pretax distribution. Finally, different experimental sessions were characterized by a different combination of "tax cost" and "efficiency loss": efficiency loss 0%, two sessions for each of the four tax costs (8 sessions, 168 subjects); efficiency loss 12.5%, one session for each of the four tax costs (4 sessions, 83 subjects); efficiency loss 25%, one session for each of the four tax costs (4 sessions, 84 subjects).

Overall, participants appeared to have no difficulty understanding the instructions and answering the comprehension questions. All subjects made tax choices for each of the four methods both in Part 1 and 2 as well as in Part 3 when this occurred (in 7 out of 16 sessions), and all but one also completed the risk aversion test and the background survey. The subject pool was fairly representative of the overall student population with regard to gender, ethnic background, socioeconomic status, political ideology, and area of study. The distribution of participants by personal characteristics is reported in Table S.4.

3. Hypotheses and Predictions

This paper aims to investigate the impact of social motivations on redistributive decisions. Political economy models of redistribution do not provide much guidance in this endeavor since they focus on the self-interest motive and typically abstract from concerns for fairness or equality (Meltzer and Richard 1981). By contrast, the literature on social preferences has produced several models that rationalize “other regarding” behavior in laboratory experiments. In this section we apply this kind of model to our experiment and bridge these two streams of literature.

The most cited social preference models are due to Fehr and Schmidt (1999, henceforth FS) and Charness and Rabin (2002, henceforth CR). The FS model assumes that agents are inequality averse, and as a consequence place negative weight on the payoffs of those who have more than they do, and positive weight on the payoffs of those who have less. The CR model assumes less structure on the weight placed on the payoffs of other people. Specifically, it allows for the possibility that agents may care positively about the payoffs of those who have more than they do, consistent with a preference for aggregate payoffs or efficiency, which have been found to be important in redistribution problems (CR; Engelmann and Strobel 2004). In addition, the multiplayer version of CR (outlined in the appendix of their paper) allows for concerns for inequality amongst people other than the decision maker, which have no place in the FS model. For these reasons, we concentrate on the CR multiplayer model. We discuss the application of the FS model to our experiment in the Online Appendix, where we also provide estimates of its parameters.

The original CR model does not incorporate risk considerations; this aspect limits its direct applicability to our analysis since uncertainty and risk play an important role in Part 2 of our experiment. To address this issue, while keeping the model simple and easy to interpret, we augment the model with a preference over the riskiness of income. The resulting utility function is

$$V_i = (1 - \lambda)[(1 - \gamma)Ey_i + \gamma(-\sigma_{y_i})] + \lambda \left[\delta y^{\min} + (1 - \delta) \sum_j y_j \right], \quad (3)$$

where y denotes the post-tax income. The model includes four variables referring to different aspects of the post-tax payoffs; parameters λ , γ , and δ denote the utility weights on these variables.

The first two variables are the expectation of own income Ey_i , and its standard deviation σ_{y_i} ; together they form the “self-interested” component of the utility function, and have a joint relative weight of $1 - \lambda$. The parameter γ can be interpreted as the importance of income risk relative to the level of income. The last two variables represent the “other-regarding” (or social) component of the utility function and λ their corresponding weight relative to the self-interested component. The term y^{\min} indicates the lowest income in the group and is a measure of inequality, whereas the variable

$\sum_j y_j$ refers to the group's aggregate payoff and thus captures overall efficiency.⁸ The parameter δ measures the relative importance of inequality and efficiency concerns. In Section 4 we produce estimates for these parameters.

Thus, the modified CR model incorporates all three motivations for redistribution that we mentioned in the Introduction: (1) income maximization, (2) risk aversion, and (3) social preferences. On the basis of these three motivations, we can generate testable predictions for our experiment (the derivations are shown in Online Appendix, Part C).⁹ First, for subjects who care about their expected income ($\lambda, \gamma < 1$), the utility from redistribution decreases with (expected or announced) income in Parts 2 and 3 of the experiment. The reason is that the gains (losses) from redistribution are lower (higher) for a subject with higher pretax earnings. Similarly, a higher personal cost of taxation c to the decision maker raises the price of redistribution and reduces demand.

HYPOTHESIS 1.

(a) *In Parts 2 and 3, the average tax rate decreases with own (expected or actual) pretax income.*

(b) *In all Parts (1, 2, and 3), the average tax rate declines with the tax cost.*

Second, in Part 2, where there is uncertainty about pretax income and the decision maker is affected by redistribution, higher taxes reduce the post-redistribution standard deviation of income, increasing utility for risk-averse decision makers ($\gamma > 0$). Thus the model predicts the following hypothesis.

HYPOTHESIS 2. *In Part 2, the average tax rate increases with the (perceived) standard deviation of own pretax income.*¹⁰

Note that if we model risk aversion as a separate weight on the standard deviation of income (in addition to γ), the optimal tax rate in Part 2 increases for agents with higher risk aversion.

Finally, an increase in the efficiency loss reduces utility from redistribution for individuals with social concerns ($\lambda > 0$), since taxes reduce aggregate income and are less effective at raising the income of the poorest. In addition, the model predicts that those who care enough about the minimum payoff (i.e. with a high δ and λ) are

8. Whether the concern motivating a preference for redistribution in the real world is better captured by a Rawlsian formulation or by a more general measure of the variation of incomes is an important question but must remain beyond our scope.

9. Note that since the model is linear in the tax rate, it predicts that individuals will only choose corner solutions ($t = 0$ or $t = 1$). Since observed decisions are not in fact bunched at 0% and 100%, the model can make predictions on the average tax rate but not necessarily on an individual level. In addition, the comparative statics depend on the assumption that there exist marginal individuals, which is satisfied if there is sufficient heterogeneity in the preference parameters λ , γ , and δ .

10. The perceived standard deviation is higher, for instance, when one's pretax income is determined randomly, and is also higher for those who are less confident in predicting their rankings on the nonrandom criteria.

willing to pay a positive tax cost in the role of disinterested observer in order to reduce inequality in the population.

HYPOTHESIS 3.

- (a) *In all Parts (1, 2, and 3), the average tax rate declines with the efficiency loss.*
- (b) *In Part 1, the average tax rate is positive even when the tax cost is positive.*

The model does not include a process-based theory of fairness, so it cannot provide hypotheses regarding the impact of different income determination methods. One could, however, let the model's parameters vary depending on the source of the original inequalities. If one conjectures that inequality concerns δ will be stronger under "arbitrary" pretax income assignment (Random and Where-From) than under "earned" pretax income assignment (Tetris and Quiz), this implies higher optimal tax rates under the former methods. In the following section we test these predictions.

4. Results

In this section, we first investigate the effect of our experimental manipulations and range of individual attributes on the distribution of tax choices. Second, we estimate the parameters of the structural model of Section 3, in order to uncover the motivations underlying redistributive decisions.

4.1. Treatment Effects and Subject Characteristics

We first discuss the impact of the treatments and subjects' characteristics in each of the three parts of the experiment: (i) disinterested decision maker (Part 1), (ii) interested decision maker with uncertainty (Part 2), (iii) interested decision maker without uncertainty (Part 3).

Part 1. Figure 2 reports subjects' average tax choice. For each part of the experiment, average tax choices are grouped by tax cost (top panel) and efficiency loss (bottom panel). The first notable finding is that subjects tend to support fairly high levels of redistribution, although they are not affected by it and despite the direct cost of taxation to themselves. In fact, considering all sessions together, subjects chose a positive tax in 76.4%, a tax of 50% or higher in 44.2%, and full equalization of earnings in 14% of Part 1 tax choices. Even focusing only on sessions with positive tax cost (12 out of 16), we see that in line with Hypothesis 3(b), subjects choose a positive tax rate in 75.4% of the cases. On average, the subjects in these sessions sacrifice \$2.25—just over 10% of their expected payoff—to reduce inequality among others by 41.4%.

While support for redistribution is relatively unresponsive to the direct cost of taxation for values of \$0, \$0.25, and \$0.50 per 10% (with average tax rates of 45.3%, 45.7%, and 44.8% respectively), average tax drops significantly when tax cost is \$1 per 10% (33.7%), consistent with subjects' demand curve for redistribution being

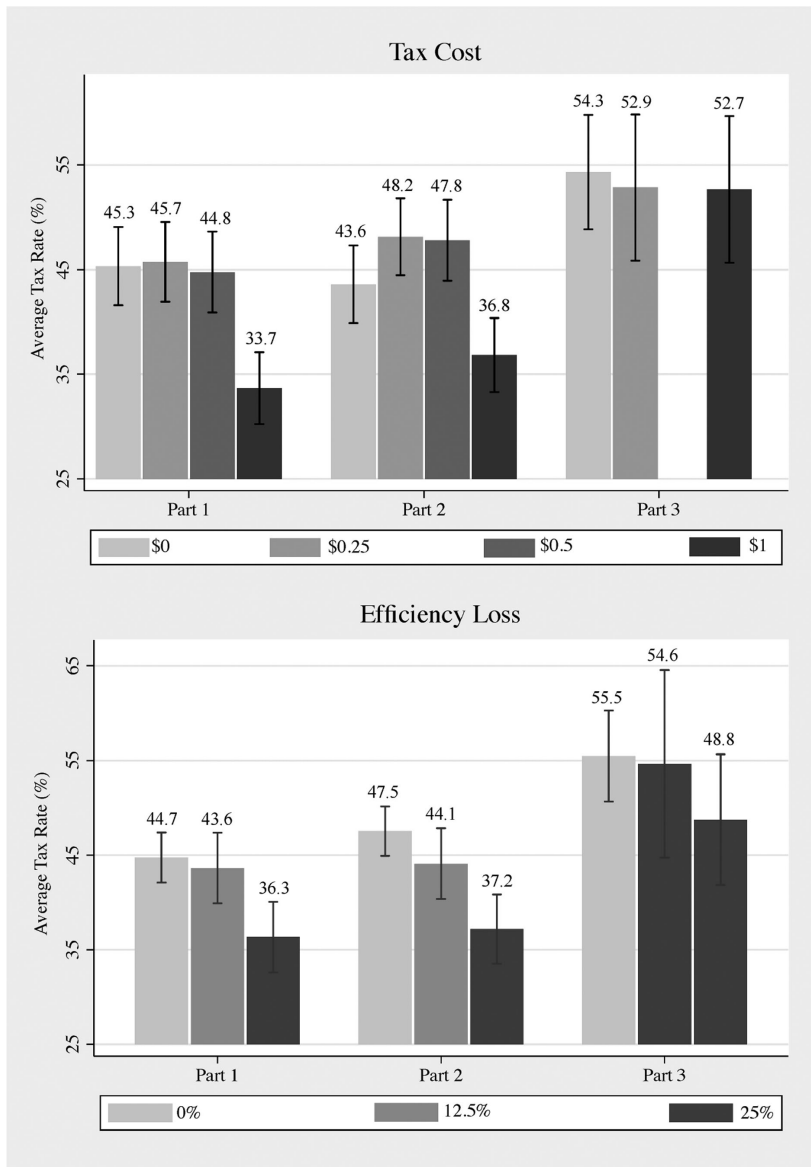


FIGURE 2. Average tax choice by tax cost and efficiency loss. The figure reports the average tax rate (and 95% confidence interval) chosen by subjects under each of the three conditions—“disinterested decision maker” (Part 1), “interested decision maker with uncertainty” (Part 2), “interested decision maker without uncertainty” (Part 3)—for different values of the Tax Cost and Efficiency Loss treatment variables. While Tax Cost represents the direct cost to the decision maker of an additional 10% tax, Efficiency Loss represents the percentage loss in total earnings associated with taxation. Part 3 was implemented only when Part 2 was randomly selected to determine payoffs, which occurred in 7 out of 16 experimental sessions; since none of these sessions was characterized by a \$0.5 tax cost, no observation is available for this value for Part 3.

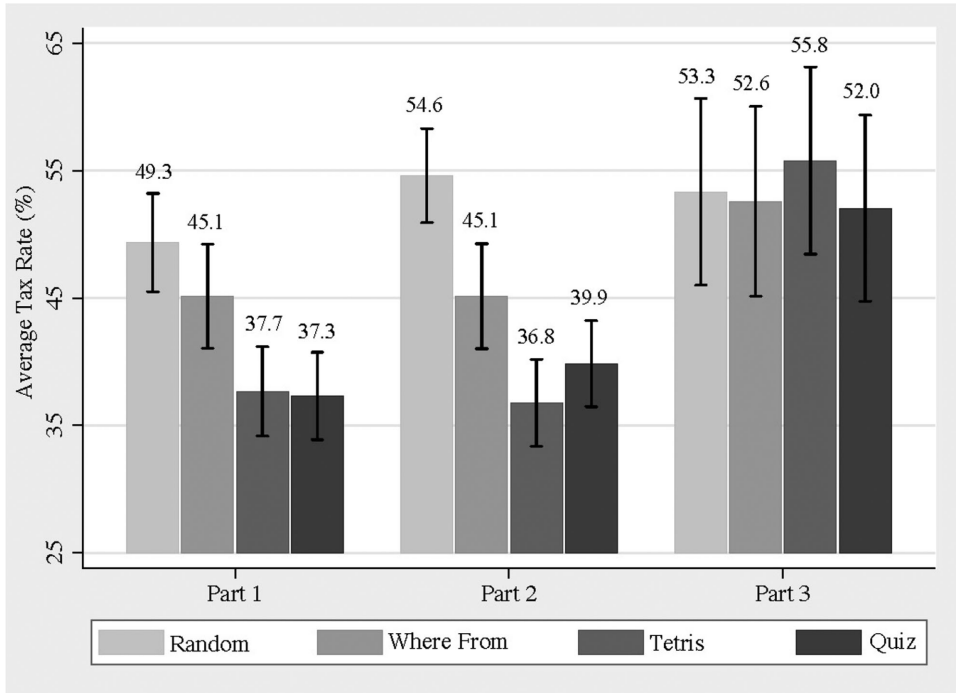


FIGURE 3. Average tax choice by method. The figure reports the average tax rate (and 95% confidence interval) chosen by subjects under each of the three conditions—“disinterested decision maker” (Part 1), “interested decision maker with uncertainty” (Part 2), “interested decision maker without uncertainty” (Part 3)—for each of the four income determination methods: Random, Where From, Quiz, and Tetris. The last three methods are meant to reflect socioeconomic background, knowledge, and skill, respectively.

downward sloping. A series of Mann–Whitney tests finds the distributions of tax choices to be significantly different at \$1 tax cost than at lower levels (all significant at the 5% level), confirming the rather nonlinear nature of the relationship.¹¹

A similar pattern is observed with respect to efficiency loss: while the average Part 1 tax rate is similar in sessions with 0% and 12.5% efficiency loss (44.7% and 43.6% respectively), subjects chose significantly lower tax rates in sessions in which redistribution is associated with a 25% loss in tax revenue (36.3%). A series of Mann–Whitney tests confirms this finding, showing no significant difference between the distribution of preferred tax between sessions with 0% and 12.5% efficiency loss. In line with Hypothesis 3(a) however, there is a significant difference in the distribution of tax choices in sessions with 25% efficiency loss compared to sessions with 12.5% and 0% efficiency loss (significant at the 5% and 10% level respectively). Since efficiency loss has no impact on the earnings of the decision maker, this result suggests

11. Since exploring the nature of this nonlinearity goes beyond the scope of our investigation, in the econometric analysis that follows we opt for a linear specification in both tax cost and efficiency loss.

the existence of a trade-off between concerns for equality and concern for others' aggregate earnings.

With regard to the determinants of pretax earnings, Figure 3 reports the average tax rate for each of the four income determination methods in Parts 1, 2, and 3 (while Table S.5 reports the complete distribution of tax choices for the three parts, for all methods combined and separately for each method). Looking at Part 1, we see that subjects tend to support more redistribution when initial earnings are "arbitrary"—Random (49.3%) and Where From (45.1%)—than when they are "earned"—Tetris (37.7%) and Quiz (37.3%). This pattern is confirmed by a series of Wilcoxon matched pair tests for within-subject comparisons: subjects choose higher taxes under the Random than under the Where From method (significant at the 5% level), higher taxes under the Random and Where From methods than under the Quiz and Tetris ones (all four comparisons yield significance at the 1% level), while there is no evidence of significant differences between tax choices under the Tetris and the Quiz method (p -value: 0.276).¹²

To further test the impact of tax cost, efficiency loss, and income determination methods on redistributive choices in the disinterested decision-maker condition, in Table 2 we estimate a set of multivariate regressions with Part 1 tax as dependent variable. We use Tobit regressions censored at 0 and 1 to address the possibility that, if allowed, some subjects would have chosen a tax rate lower than 0% or higher than 100%.¹³ In column (1) we regress Part 1 tax choices on the tax cost and efficiency loss parameters. Both variables display a negative and significant coefficient, confirming the pattern observed in Figure 2. With regard to the magnitude of the marginal effects, a one standard deviation increase in tax cost corresponds to a 4.5 percentage point decrease in preferred tax, while a one standard deviation increase in efficiency loss corresponds to a 3.3 percentage point decrease in preferred tax (in both cases evaluated around the mean of both dependent and independent variables).

These results remain largely unchanged in column (2) when the following individual controls are included in the regression: gender, ethnic dummies, self-reported political ideology (from less to more liberal), average income of the place of origin (log), risk aversion index (1–5), and number of economics courses taken.¹⁴ To test how tax choices respond to the perceived causes of inequality, the specification

12. Interestingly, the sensitivity of the demand for redistribution to income determination methods turns out to be stronger for men than for women. In Part 1, male subjects tend to choose significantly higher tax rates for the Random and Where From methods (47.5% and 40.3% respectively) than for Tetris and Quiz methods (29.9% and 28.9% respectively). This difference is much less pronounced for female subjects (51.6% for Random, 51.0% for Where From, 47.1% for Tetris, and 47.5% for Quiz).

13. We also estimate all regressions using ordinary least squares (OLS) obtaining very similar results. In what follows we report the Tobit results.

14. With regard to the effect of personal characteristics on support for redistribution, the coefficients on the individual controls—not reported in Table 2 to save space, but shown in Online Appendix Table S.6—suggest that female subjects and subjects with more liberal views tend to choose significantly higher taxes. Both these effects are quite large: the female dummy displays an 11.3 percentage point marginal effect, while a one standard deviation change in the Conservative–Liberal ideological scale corresponds to a 4.6 percentage point increase in preferred tax. In contrast, ethnicity, home area income and risk aversion appear to have no significant impact.

TABLE 2. Tobit regressions for Part 1 (disinterested decision maker), Part 2 (involved decision maker with uncertainty), and Part 3 (involved decision maker without uncertainty). Dependent variable: Tax choice (0–1).

	Part 1 All (1)	Part 2 All (3)	Part 2 All (4)	Part 2 Nonrandom (5)	Part 3 All (6)	Part 3 All (7)	Part 3 All (8)
Tax Cost	-0.122*** (0.039)	-0.088** (0.038)	-0.093** (0.037)	-0.083** (0.038)			
Efficiency Loss	-0.319** (0.153)	-0.413*** (0.134)	-0.359*** (0.131)	-0.302** (0.137)	0.028 (0.215)	0.059 (0.219)	0.106 (0.216)
Where From	-0.042** (0.021)	-0.103*** (0.024)	-0.103*** (0.024)	-0.103*** (0.024)		0.008 (0.048)	0.029 (0.049)
Tetris	-0.116*** (0.018)	-0.182*** (0.020)	-0.182*** (0.020)	-0.067*** (0.021)		0.035 (0.045)	0.076 (0.047)
Quiz	-0.114*** (0.019)	-0.146*** (0.020)	-0.146*** (0.020)	-0.042** (0.021)		0.008 (0.046)	0.048 (0.048)
Expected rank (1–20)				0.034*** (0.004)			
Confidence level (low/high)				-0.179*** (0.053)			
Confidence × Expected rank				0.012* (0.006)			
Rank-specific tax cost					-0.224*** (0.041)	-0.222*** (0.041)	-0.222*** (0.039)
Part 1 tax choice (0–1)							0.344*** (0.070)
Individual controls	NO 1,340	YES 1,340	YES 1,340	YES 1,005	NO 588	YES 588	YES 588
Uncensored observations	837	868	868	651	149	149	149
Left-censored observations	316	281	281	237	197	197	197
Right-censored observations	187	191	191	117	242	242	242
Log-likelihood	-1,159	-1,128	-1,051	-645.2	-486.6	-480.7	-465.2
Pseudo- <i>R</i> ²	0.0140	0.0135	0.0806	0.231	0.233	0.242	0.267

Notes: Individual controls include: gender, ethnic background dummies (Caucasian, Asian, African-American, Hispanic, Other), home area income (log), risk aversion index, self-reported political ideology, and the number of economics courses taken. An extended version of the table reporting the coefficients on the individual controls is included in the Online Appendix. The Random income determination method is the baseline in all columns except in column (5) where only observations for nonrandom methods are used and the baseline is the “Where From” method. “Rank-specific tax cost” includes the direct tax cost of taxation (as in Parts 1 and 2) as well as the cost (or benefit) of taxation to the decision maker given his/her pretax earnings rank under the income determination method in question. “Part 1 Tax (0–1)” represents the tax rate (between 0 and 1) chosen by the same individual under the same income determination method in the “disinterested decision maker” condition. Coefficients shown are marginal effects. Robust standard errors clustered by individual in parentheses.

*** Significant at 1%; ** significant at 5%; * significant at 10%.

shown in column (2) also includes a dummy variable for each income determination method (Random being the omitted category). While the Where From dummy has a negative marginal effect of 4.2 percentage points (significant at the 5% level), the Tetris and the Quiz dummy display negative marginal effects of 11.6 and 11.4 percentage points respectively (both significant at the 1% level). These results confirm the considerable impact of the perception of fairness and entitlement on subjects' redistributive attitudes.

Part 2. In Part 2, subjects knew they would be affected by redistribution but were uncertain about their relative position in the pretax distribution. As displayed in the first panel of Figure 2, Part 2 tax choices were similar to Part 1, although the average tax was somewhat higher. As in Part 1, subjects tended to choose lower tax rates for higher levels of both tax cost and efficiency loss; a partial exception is represented by sessions with \$0 tax cost which display a *lower* average tax rate than sessions with \$0.25 and \$0.5: 43.6% compared to 48.2% (p -value: 0.044) and 47.8% (p -value: 0.061) respectively. As shown in Figure 3, Part 2 and Part 1 tax choices also display similar differences with regard to income determination methods—significantly higher for Random and WF than for Tetris and Quiz methods—the main difference being the higher tax rate for the Random method in Part 2, about 5 percentage points higher than in Part 1 (p -value: 0.027). This last difference is consistent with risk aversion and the insurance motive playing a role when the decision maker will occupy one of the twenty income ranks but is uncertain which it will be. The similarities with Part 1 are confirmed by the regression results presented in columns (3) and (4) of Table 2 in which Part 2 tax choices for all methods are pooled together.

To test Hypothesis 1(a), we investigate how subjects' expectations about their position in the pretax distribution affect their tax choices in Part 2. To do so, we use information on subjects' self-reported expectation of how they will rank in each of the three nonrandom methods, and their self-reported level of confidence in their own guess. The first two panels of Figure 4 report the average tax rate separately for each of seven expected rank ranges (1st–2nd, 3rd–5th, 6–8th, 9th–11th, 12th–14th, 15th–17th, 18th–20th), and two levels of confidence (where “Confidence level (high/low)” is a dummy variable which is 1 for subjects who reported being very confident in their guess and 0 otherwise).¹⁵ In line with Hypothesis 1(a), subjects expecting to be ranked better supported lower taxes for any level of confidence (ranging from 3.3% for subjects expecting to be ranked 1st or 2nd to 76.4% for those expecting to be ranked 18th to 20th). Furthermore, tax choices are more polarized for high-confidence subjects (ranging from 1.6% to 81.9%) than for low-confidence ones (ranging from 6.19% to 65.4%).¹⁶

15. Higher rank categories correspond to lower pretax payoff with subjects selecting 1st–2nd expecting to receive the highest pretax payoff and subjects selecting 18th–20th the lowest.

16. Interestingly, even when very confident about their prediction, most subjects expecting to be ranked high (low) refrained from choosing zero (full) redistribution, perhaps due to a lingering concern for the unlikely possibility of ending up in the low (high) part of the payoff distribution.

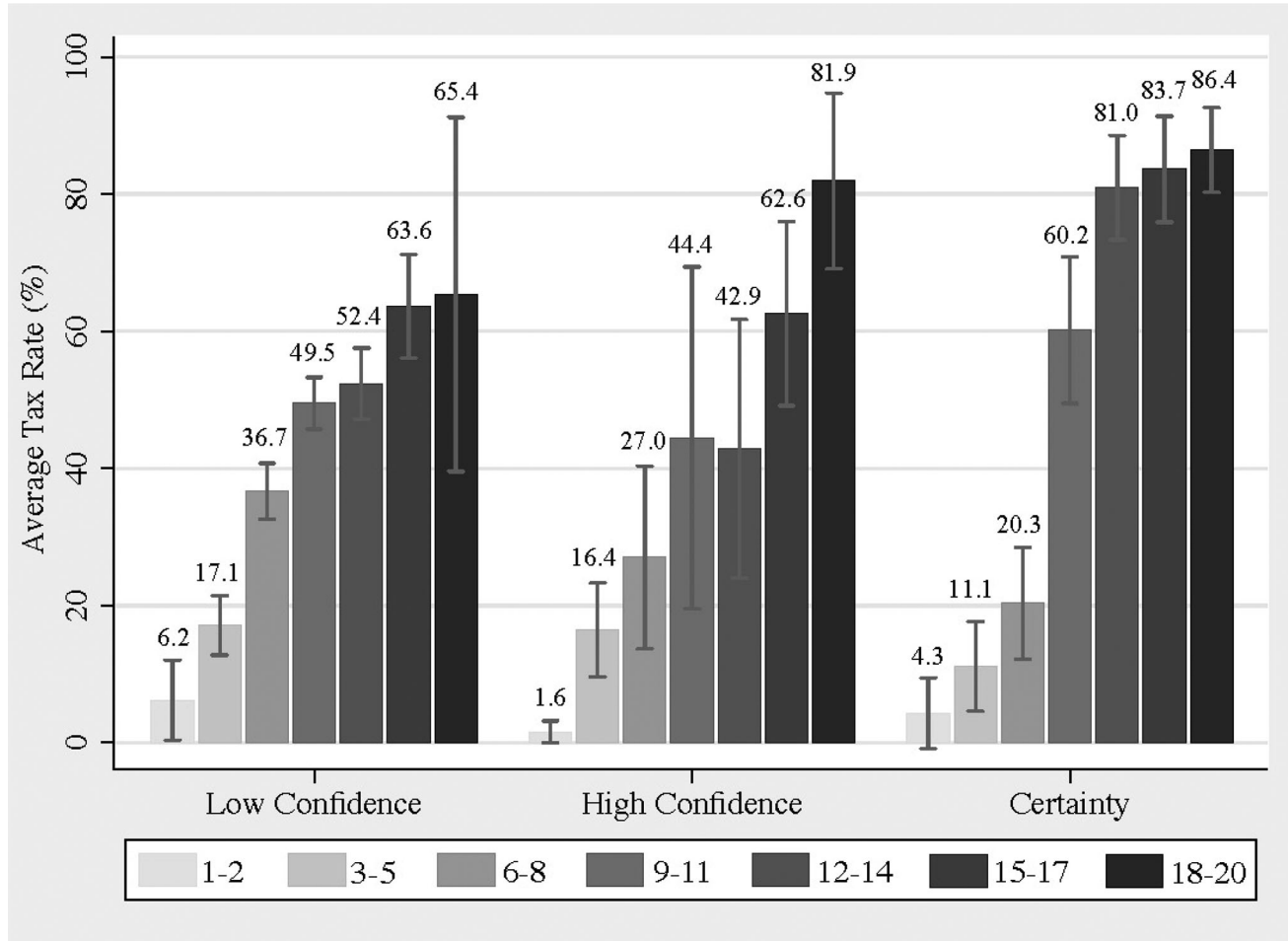


FIGURE 4. Average tax choice by rank category and confidence level under the “interested decision maker” condition (Parts 2 and 3). The figure reports the average tax rate (and 95% confidence interval) chosen by subjects under the “interested decision maker” condition with and without uncertainty (Parts 2 and 3) separately by rank category in the pretax payoff distribution (expected in Part 2 and actual in Part 3), and by the degree of uncertainty (low and high confidence in Part 2, certainty in Part 3).

To further corroborate these findings, in column (5) of Table 2 we focus on the nonrandom methods and extend the base specification to include the expected rank variable, the confidence level, and the interaction between the two. Both expected rank and its interaction with the confidence level display a positive coefficient significant at the 1% and 10% levels respectively, indicating that the more certain subjects are of a high (low) income, the lower (higher) the chosen tax rate.¹⁷ Both effects are rather sizeable: a one rank class change in expectation (e.g. from 1st–2nd to 3rd–5th) corresponds to a 3.4 percentage point increase in tax rate, which rises to 4.6 percentage point for subjects very confident in their prediction.

The sum of the coefficients of “Confidence Level” and “Confidence Level \times Expected Rank” measures the effect of confidence and provides confirmative evidence for Hypothesis 2. Note that a direct test of this hypothesis is difficult since it involves changing the riskiness of income while holding expected income constant. It seems reasonable to assume that a decrease in confidence by subjects who expect to be in the middle of the income distribution reflects a higher perceived income risk without a large shift in expected income. From the estimates in column (5) it is easy to compute that for all those who expect to have a rank from 5 to 15, higher confidence translates into a lower demand for redistribution, in line with Hypothesis 2. The fact that average chosen tax rates are highest under the Random method, which is likely to have the highest perceived income risk, provides further support for Hypothesis 2.

Finally, note that if subjects were self-interested and accurate in their expectations of their pretax ranks, Part 2 tax choices should have exceeded those of Part 3 assuming risk aversion, due to the uncertainty in Part 2. The fact that this is not the case (see what follows), suggests a tendency towards overconfidence in the formation of expectations. A check of the data confirms this conjecture. The expected range of pretax income ranks selected by subjects before making their Part 2 tax choice was too optimistic in 49.5% of cases, too pessimistic in 30.5% of cases and correct in 20% of cases. On average, expectations were 1.5 (out of 20) ranks too optimistic. Such overconfidence is a general finding (Moore and Healy 2008), and may go some way to explaining why the average chosen tax level is lower in Part 2 than in Part 3.¹⁸

Part 3. In Part 3, subjects learned their rank in the distribution of pretax payoffs and were given the opportunity to revise their chosen tax rates. As is evident from Figure 2,

17. When including these variables in the regression, the Pseudo- R^2 rises to 0.231 from 0.092 of an analogous regression on the sample of tax choices for nonrandom methods only.

18. To corroborate this conjecture, we pool observations for Parts 2 and 3 for the set of subjects having performed tax choices in both parts, and focus on the nonrandom income determination methods, for which expected rank in Part 2 was elicited (882 observations: 147 subjects \times 3 methods \times 2 parts). On this sample we first estimate a Tobit regression of tax rate on a dummy variable for Part 3—including all the controls used in our baseline specification, and clustering standard errors at the individual level—and find that the Part 3 dummy displays a positive and significant coefficient (marginal effect: 0.135 significant at the 1% level), consistent with the difference in average tax between Part 3 and Part 2 depicted in Figure 2. However, when including in the specification a variable rank (equal to expected rank for Part 2 and to actual rank for Part 3), the coefficient on the Part 3 dummy becomes much smaller (marginal effect: 0.045) and statistically insignificant.

subjects tend to choose considerably higher tax rates in Part 3 than in Parts 1 and 2. The tax cost parameter seems to have little effect on tax choices, which is not so surprising given that it is generally smaller than the direct loss (or benefit) from redistribution for most pretax income levels. In line with the results from Parts 1 and 2, high efficiency loss is associated with lower tax choices in Part 3 (with a drop of about 6 percentage points in sessions with 25% efficiency loss relative to sessions with lower values).

The absence of uncertainty in Part 3 implies that insurance motives should play no role, and one would expect a greater tendency for subjects to select the tax rate that maximizes their post-tax earnings. A look at the distribution of Part 3 tax choices by rank class (right panel of Figure 4) supports this conjecture: the resolution of uncertainty leads to a greater polarization in tax choices between high- and low-ranked subjects than in Part 2, with an average tax rate of 20.7% for subjects ranked in the top ten positions and of 83.1% for the others.

In light of the relevance of self-interest considerations, one may wonder whether other factors—that is, perception of entitlement, social preferences for redistribution—had any impact on Part 3 tax choices. With regard to the perception of entitlement, unlike in Parts 1 and 2, we observe no systematic difference in average tax rates between “earned” and “unearned” income determination methods in Part 3 (Figure 3). Turning to the role of a subject’s social preferences, one can assume that they are reflected in the tax rate chosen in the “disinterested decision maker” condition (Part 1), which can be used as a proxy. Therefore, in Figure 5 we report the average tax rate by rank separately for subjects having chosen above- and below-median tax rate in Part 1 for the same income determination method. The figure shows that those who specified a high tax rate in Part 1 also choose higher taxes in Part 3 (p -value: 0.000). This can be interpreted as a sign that social preferences continue to matter in Part 3. Another indicator of the relevance of social preferences is that of the subjects whose income maximizing tax rate was 0%, roughly a third (31.5%) selected a positive tax rate.

In the last three columns of Table 2 we investigate the determinants of Part 3 tax choices more systematically. In column (6) we regress Part 3 tax choices on efficiency loss and rank-specific tax cost; the latter captures the cost of a 10% tax increase both in terms of foregone earnings given the subject’s rank and the session-specific tax cost parameter. The rank-specific tax cost displays a negative, large and highly significant coefficient, further corroborating Hypothesis 1(a). In contrast, efficiency loss has virtually no effect. Since the rank-specific tax cost also accounts for the effect of efficiency loss on the gain (loss) from redistribution, this result suggests that subjects’ concern for aggregate efficiency may have been dominated by other considerations in Part 3.

In column (7) we include the baseline individual controls and dummies for the various income determination methods; the latter do not display any significant effect (see column (4) of Table S.6).¹⁹ Finally, in column (8), we also include Part 1 tax choice in the specification. In line with the graphical evidence presented in Figure 5, Part 1

19. The only exception is the number of economics courses taken; its initially counter-intuitive positive sign may simply reflect more self-interested choices, since 100% tax maximized own payoff for a majority

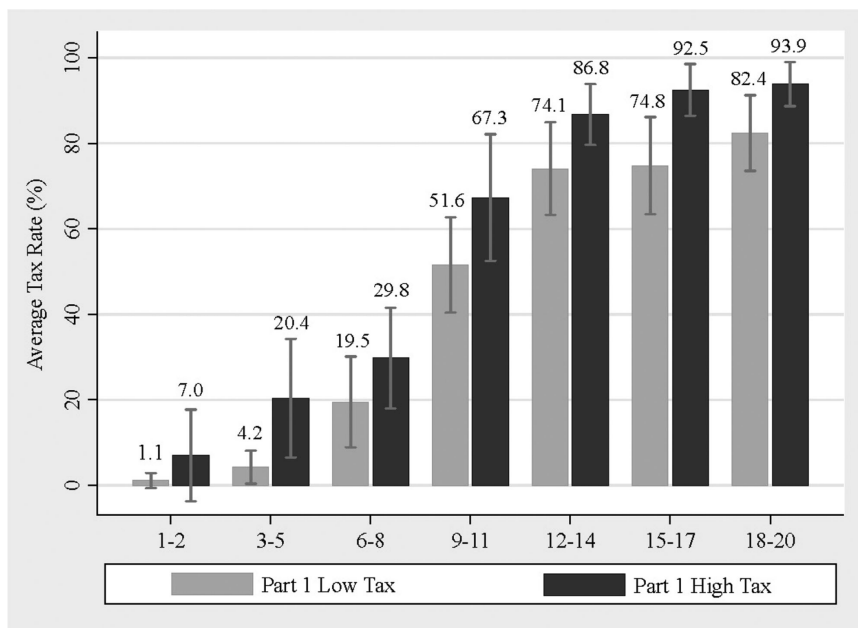


FIGURE 5. Average tax choice under the “interested decision maker without uncertainty” condition (Part 3) by rank category and Part 1 tax choice. The figure reports the average tax rate (and 95% confidence interval) chosen in the “interested decision maker without uncertainty” condition (Part 3) by subjects with different rank in the pretax payoff distribution. We distinguish between those subjects who chose a high and a low tax rate in Part 1 (the “disinterested decision maker” condition). A subject’s Part 1 tax choice for a given pretax income determination method is considered low (high) if it is below or equal to (above) the median Part 1 tax choice for that method in sessions with the same Tax Cost and Efficiency Loss parameters.

tax displays a positive and highly significant coefficient suggesting that those subjects that preferred higher redistribution in the “disinterested decision maker” scenario did so also when acting as “interested decision maker” with full information. Note that the effect is rather small, and explained variance rises by only 2% when the variable is included in the regression.

In sum, the data are supportive of the hypotheses in Section 3. We see that a higher (expected) own income and tax cost decrease the chosen tax rate. A higher perceived income risk increases the chosen tax rate in Part 2. The negative effect of the efficiency loss on tax rates in Part 1 and 2 of the experiment indicates a concern for aggregate income. The willingness to pay for redistribution in Part 1 as well as in the higher demand for redistribution in the “arbitrary” income methods indicates a concern for equality.

of subjects. Indeed, when estimating the same specification on the sample of subjects that benefit from 100% tax (318 out of 588 observations), the coefficient on “Number of Economics Courses Taken” is larger and more significant than for the overall sample (marginal effect 0.037, significant at the 1% level versus 0.020 significant at the 5% level).

4.2. Motives for Redistribution

To understand the motives behind redistribution, we estimate the parameters of the structural model discussed in Section 3. In the Online Appendix we conduct a similar exercise for the parameters of the Fehr–Schmidt model.

Estimation Method. To obtain the structural estimates, we follow the methodology used in CR and employ McFadden’s conditional logit model (McFadden 1973). This model assumes that people make choices to maximize a utility function, but do so with error. If the errors satisfy a particular (type I extreme value) distribution, it can be shown that the probability of choosing a certain tax rate $\tau \in \{0, 0.1, \dots, 1\}$ is given by

$$P(t_i = \tau) = \frac{e^{u_{i\tau}}}{\sum_{k=0}^1 e^{u_{ik}}} \quad (4)$$

where the utility function u_{it} is given by 3, and is estimated as

$$u_{it} = \beta_1 E y_{it} + \beta_2 \sigma_{y_{it}} + \beta_3 y_{it}^{\min} + \beta_4 \sum_j y_{jt}. \quad (5)$$

This model is used to construct a likelihood function, which in turn is maximized with respect to the parameters β_1, \dots, β_4 . These parameters can then be transformed into the CR utility weights, given in equation (3).

In our estimation we pool the data for Part 1, 2, and 3 and cluster standard errors for each individual. For each tax rate and individual we compute the associated post-redistribution value of each term in the utility function.²⁰ Here, the expected own payoff $E y_{it}$ is simply the expected payoff (in Part 1), the payoff associated with the subject’s expected rank in the income distribution (in Part 2), or the subject’s actual payoff (Part 3). The standard deviation $\sigma_{y_{it}}$ is simply the standard deviation of after-tax payoffs. The minimum $y_{it}^{\min} = \min\{y_{1t}, y_{2t}, \dots, y_{20t}\}$ is the after-tax payoff of the lowest-earning subject and the aggregate income $\sum_j y_{jt}$ is the after-tax total group payoff, taking into account the efficiency loss in the calculation of both variables.²¹ Note that the estimated parameters represent broad patterns in the data, but do not reflect the degree of heterogeneity between subjects. In the Online Appendix, we use the individual answers to the exit questions to incorporate heterogeneity in the estimates.

20. The estimation method entails constructing an observation for each possible tax rate $\{0, 0.1, \dots, 1\}$ for each individual and income determination method, rather than using as an observation only the tax rate which the subject selected.

21. The minimum and aggregate income do not vary between individuals in the same session, but do vary between individuals in different sessions who may face different values of the efficiency loss. In the calculations of the sum, we abstract from income of the 21st subject who is randomly selected to get an income in the range of \$19.80–\$21.80 and whose income is not affected by the tax rate. In Part 1, by construction, this leaves the income of the decision maker out of the sum.

TABLE 3. Estimates of utility function parameters.

	(1)	(2)	(3)	(4)	(5)	(6)
	All methods	Random-WF	Tetris-Quiz	All methods	Random-WF	Tetris-Quiz
Expected income	0.223*** (0.018)	0.233*** (0.023)	0.230*** (0.021)	0.227*** (0.018)	0.239*** (0.024)	0.230*** (0.020)
St. dev. of income	-0.006 (0.005)	-0.029*** (0.007)	0.017** (0.007)			
Perceived st. dev. of income				-0.041*** (0.007)	-0.052*** (0.008)	0.022 (0.013)
Minimum income	0.019* (0.011)	0.039*** (0.012)	0.000 (0.012)	0.010 (0.011)	0.034*** (0.012)	-0.002 (0.012)
Aggregate income	0.002 (0.003)	0.002 (0.004)	0.003 (0.003)	0.003 (0.003)	0.002 (0.004)	0.003 (0.003)
λ	0.084* (.047)	0.134*** (0.042)	0.015 (0.063)	0.044 (0.043)	0.110*** (0.040)	0.003 (0.067)
γ	0.027 (0.023)	0.110*** (0.023)	-0.080** (0.035)	0.153*** (0.024)	0.179*** (0.023)	-0.103 (0.069)
δ	0.881*** (0.106)	0.958*** (0.078)	0.093 (3.203)	0.785*** (0.174)	0.952*** (0.086)	-4.000 (111.4)
Observations	3,268	1,634	1,634	3,268	1,634	1,634

Notes: Standard errors clustered by individual reported in parentheses. Standard errors for the parameters in the lower part of the table are obtained by employing the delta method.

***Significant at 1%; **significant at 5%; *significant at 10%.

Results. We present our estimates in Table 3, with the upper part showing the coefficients of equation (5) and the lower parts the parameters of the modified CR utility function given by equation (3).²² We present estimates based on the data for all income methods together (All Methods), and estimates for the data of the “arbitrary” (Random-WF (Where From)) and “earned” (Tetris-Quiz) pretax income determination methods taken separately.

Looking at the first three columns of Table 3, we see that the coefficient on “expected income” is positive and highly significant in all cases, that the coefficient on “standard deviation of income” has varying signs and is most significant in column (2). The coefficient on “minimum income” is positive and highly significant for the observations from the arbitrary methods (column (2)), insignificant and small for those from the earned methods (column (3)), and positive and marginally significant

22. The CR parameters are calculated from the estimated coefficients as follows:

$$\lambda = \frac{\beta_3 + \beta_4}{\beta_1 + \beta_2 + \beta_3 + \beta_4}, \gamma = \frac{\beta_2}{\beta_1 + \beta_2}, \text{ and } \delta = \frac{\beta_3}{\beta_3 + \beta_4}.$$

We report both the β and the CR parameters because information about the sign of the β coefficients may get lost in this conversion. Note that where the coefficients have a sign that is different than anticipated in equation (3), the utility parameters need not be between zero and one and lose their interpretation as relative weights. This is occurs for example for the estimate of δ in column (6).

for the pooled data (column (1)). The coefficient on ‘aggregate income’ is consistently positive but insignificant and small. The small coefficients can be explained partly by the fact that changes in the aggregate income of 20 subjects across tax rates and treatments are large (in absolute terms) relative to changes in the individual-level variables, so even a small coefficient may reflect a nonnegligible impact of aggregate income on choice behavior.

The results for the parameters of equation (5) map into estimates of the utility parameters. The social concern, λ , is highly significant for the arbitrary method observations, marginally significant for the pooled specification, and not significant for the earned income methods, indicating a greater focus on own payoffs for those methods.²³ For both the combined and the arbitrary method data, we find significant estimates of δ , indicating that subjects show more concern about the lowest earner’s income than about the aggregate earnings of all subjects. The weight on the standard deviation of income, γ , is significant in columns (2) and (3), although in column (3), somewhat surprisingly, it implies risk loving.

In the estimates discussed thus far, we assumed that subjects perceive the standard deviation of their income in Part 2 to be the same regardless of the confidence in their guess of their income rank under the various income methods. However, consider a subject who is unsure of her comparative performance on an as-yet-unseen general knowledge quiz, but quite sure that her family’s location or her own game playing skill will yield either a high or low income rank. Such a subject would perceive a greater income risk under the Quiz than under the Where From or Tetris methods, and greater risk still under the Random method. Such differences in perception can be expected to affect the choice of risk-reducing taxes. To address this issue and obtain more precise estimates of the concern subjects have with the standard deviation of own income, we make use of each subject’s self-reported confidence in own guess of income rank. We construct $Uncertain_{im} = (4 - c_{im})/4$, where $c_{im} \in \{1, 2, 3\}$ indicates i ’s self-reported confidence in her guess of the pretax income rank under method m .²⁴ $Uncertain_{im}$ ranges from 0.25 for those most sure of their standing on a given method to 0.75 for those least sure. For the Random income determination method we set $Uncertain_{im}$ to 1. We then perform new estimates where we replace the $\sigma_{y_{it}}$ of the previous estimates with “Perceived st. dev. of income”, calculated as $Uncertain_{im} \sigma_{y_{it}}$.

The resulting estimates, reported in columns (4)–(6) of Table 3, yield more significant coefficients for the standard deviation in the overall sample, now more strongly suggestive of risk aversion, with the positive coefficient for the earned methods observations becoming insignificant. Estimates are roughly similar with

23. These results are confirmed by a Wald test of the hypothesis that coefficients of both the aggregate and the minimum income are equal to zero. The test yields a clear rejection ($\chi^2 = 11.70$, $p = 0.003$) for the arbitrary income methods (column (2)), while we cannot reject it for the combined ($\chi^2 = 3.01$, $p = 0.222$) and earned income methods ($\chi^2 = 1.01$, $p = 0.605$).

24. We set $c_{im} = 1$ if the subject answered the question: “How confident do you feel about your estimate?” by “Not confident at all”. We set $c_{im} = 2$ if the subject answered “Somewhat confident” and $c_{im} = 3$ if she answered “Very confident”.

respect to the remaining three variables, except that the coefficient indicating concern for the minimum earner loses its significance in the pooled estimate (column (4)) and becomes negative (but insignificant) for the earned methods estimate. These changes are reflected in the structural parameters, shown in the lower portion of columns (4)–(6); estimated utility functions now accord significant weight to lowering the standard deviations of their income in all but the earned methods estimate (column (6)).

Comparison to Charness and Rabin and Marginal Rates of Substitution. The comparison of our utility parameter estimates to those of CR is complicated by the fact that their estimates refer to a two-player model. However, we can provide some approximate quantitative comparisons. In the appendix to their paper, CR show that one can convert the parameters of the multiplayer model to the two-player model used in the main text of the paper, if the former is applied to a two-player setting (CR, p. 852). Thus, if we assume that the utility weights of our model continue to be relevant in a two-player setting, we can forge a comparison with the relevant estimates in CR, which are obtained from the bottom row of table VI (CR, p. 840). The first is $\rho = 0.424$, which measures the utility weight of the richest player on the income of the poorest player. The second is $\sigma = 0.023$, which measures the utility weight of the poorest player on the income of the richest player.

The conversion of our estimates yields values of $\rho' = 0.044$ and $\sigma' = 0.009$ for all income methods (column (4)) and $\rho' = 0.109$ and $\sigma' = 0.005$ for the arbitrary income methods (column (5)). Thus, as CR, our estimates of both equality and efficiency concerns have a positive sign. However, we find lower values for both utility weights, where the absolute difference with CR is largest for ρ , the weight on the income of the poorest group member. This is perhaps not so surprising, since the poorest group member is likely to be a more salient figure in a two-player game than in a group of 21.

We can also make comparisons by calculating marginal rates of substitution between the different sources of utility. Based on the utility estimates in columns (4)–(6) of Table 3, Table 4 shows the resulting willingness to give up own income to reduce the standard deviation of income, raise the aggregate payoff, or reduce inequality (which is measured as the difference between the minimum and the average income). The numbers in parentheses indicate the willingness to pay as a percentage of expected income in the experiment, which was \$19.80. We can perform a comparison of these numbers with CR, by calculating from their estimates the marginal rates of substitution akin to those just reported. First, the richest player's willingness to pay to raise the payoff of the poorest in CR can be compared to the average subject's willingness to pay to raise the minimum income in our experiment. Similarly, the poorest player's willingness to pay to raise the income of the richest player in CR can be compared to the average subject's willingness to pay for aggregate payoffs in our experiment.²⁵ The results, given in the final column of Table 4, show that the

25. In the calculation of the willingness to pay in the CR model, we assumed that reciprocity plays no role—that is, $q = 0$. Thus, the entry in the first column is computed as $\rho/(1 - \rho)$, and that in the second column as $\sigma/(1 - \sigma)$.

TABLE 4. Willingness to pay to increase minimum income, aggregate payoffs, and the standard deviation of income.

Willingness to pay to:	All methods	Random-WF	Tetris-Quiz	CR
reduce st. dev. of income by \$1	\$ 0.180 (0.91%)	\$ 0.218 (1.10%)	-\$ 0.093 (-0.47%)	
reduce st. dev. of income by 10%	\$ 0.404 (2.04%)	\$ 0.489 (2.47%)	-\$ 0.209 (-1.06%)	
raise the minimum income by \$1	\$ 0.043 (0.22%)	\$ 0.143 (0.73%)	-\$ 0.011 (-0.05%)	\$0.74 (3.73%)
lower inequality by 10%	\$ 0.084 (0.43%)	\$ 0.282 (1.42%)	-\$ 0.022 (-0.11%)	
raise aggregate income by \$1	\$ 0.012 (0.06%)	\$ 0.007 (0.04%)	\$ 0.013 (0.07%)	\$0.024 (0.12%)
raise aggregate income by 10%	\$ 0.458 (2.31%)	\$ 0.281 (1.42%)	\$ 0.535 (2.68%)	

Notes: Willingness to pay is based on the estimates in columns (4)–(6) of Table 3. Numbers in parentheses express the willingness to pay as a percentage of average expected pretax own income in this experiment (\$19.80). In the second row, the 10% reduction in the standard deviation of pretax income is taken in the random treatment, where the standard deviation of pretax income is 22.47. In the fourth row, inequality is defined as the difference between the pretax income of the poorest (\$0.11) and the pretax average income (\$19.80). In the final row, the 10% increase of aggregate income is taken over aggregate group income, which equals 396.

willingness to pay to raise the aggregate and the minimum payoff are both higher in CR, with the difference being larger for the minimum payoff.

In sum, we find that people are concerned about their own income and its riskiness, but also care about helping those who are less well off when income inequality results from an arbitrary process.²⁶ As in CR, we find that subjects seem to be willing to make modest sacrifices to raise aggregate payoffs.²⁷ Furthermore, the structural estimates of the FS model, provided in the Online Appendix, show no evidence that people are envious and use taxes to reduce the payoffs of those who have more than they do.

5. Conclusions

We identified three likely determinants of public demands to redistribute income from richer to poorer citizens: the general self-interest of those in lower income brackets,

26. Although not shown for reasons of space, we performed separate structural estimates using only the male and only the female subject observations. The resulting estimates show that the utility weight on the minimum income is higher for women than for men, while the reverse is true for the weights on own income and aggregate payoffs.

27. Although the coefficients on aggregate payoffs in our Table 3 are not statistically significant, we do not view this as decisive evidence against the existence of efficiency concerns. These coefficients are somewhat imprecisely estimated, because the only treatment variation in aggregate income stems from the efficiency loss, which affects both the minimum and the aggregate income. We view the highly significant effect of efficiency loss on tax choice in our earlier Tobit regressions and the consistent positive signs on aggregate income in Table 2 as indicative of an efficiency concern.

the insurance motive, and social preferences. The latter can be divided into assistance to the poor or dislike of undeserved inequalities, and reluctance to shrink the social pie.

To investigate the relative importance of these potentially competing factors, we conducted 16 experimental sessions in each of which 21 subjects were confronted with an array of earnings mirroring the US pretax income distribution. Subjects had to state their preferred tax rates in a linear tax-and-transfer scheme, facing both earned and unearned inequality, from the standpoint of a disinterested observer as well as an interested observer, the latter both under the veil of ignorance and after the resolution of uncertainty. Our experiment is distinctive in its “realistic” features such as large groups, macro framing, decision making under multiple conditions, and variation of both direct cost to decision maker and efficiency cost of redistribution.

Not surprisingly, self-interest stands out as the dominant motive in the involved conditions. However, self-interest cannot explain the willingness of a large majority of subjects to sacrifice some earnings to increase equality of earnings among others in the disinterested decision-maker condition, nor can it explain greater reluctance to redistribute when aggregate earnings must be sacrificed, and likewise sensitivity to whether pretax incomes are “arbitrary” or “earned”. Moreover, our best-fitting estimates of a modified Charness–Rabin social preference model suggest that social concerns matter, and that laboratory results on fairness and social preferences “scale up” to settings with larger groups, and perhaps even to the macroeconomic realm. The concern for the poorest subject seems to be somewhat smaller than in typical experiments on social preferences, but this strikes us as plausible given the large-group setup.

Assuming that the decisions taken by our subjects reflect the views that influence political decisions in industrialized countries, our utility estimates can be used by scholars in the field of macroeconomics and political economy to construct more realistic utility and social welfare functions. Combined with a model of taxes and transfer payments, this may improve estimations of the socially optimal tax rate. For instance, if citizens care about the income of the least well-off, a standard model with selfish agents will underestimate the welfare benefits of redistributive policies. The weight placed on efficiency, on the other hand, will lower optimal redistribution to the extent that there is an efficiency loss associated with taxation.

It is important to remember that the utility weights are estimated for the average subject. There are indications of considerable variation in preferences, with more politically liberal subjects favoring more redistribution, and with female subjects tending to make less distinction between “arbitrary” and “earned” pretax incomes. Such heterogeneity within our subject pool may well extend to cross-country differences. Specifically, greater concern for the poorest under the “arbitrary” methods, in our data, is consistent with theories suggesting that redistribution varies among countries due to different perceptions of the role played by luck versus effort in determining economic outcomes (Alesina and Angeletos 2005). Conducting experiments like ours using different country subject pools would be a valuable next step.

There are many reasons for caution in extrapolating our results to the real-world economy. These include that our experimental stakes were a small fraction of annual incomes, that decisions made for a population of 20 may or may not translate well into decisions made for millions, that subjects do not learn the redistribution attitudes of others, that we abstract from incentive effects and do not consider pretax income differences due to different effort/leisure choices or willingness to take risks. On the other hand, alternative data sources have their own drawbacks: field experiments where actual incomes are altered are costly and difficult to design, answers to hypothetical scenario questions raise cheap-talk concerns, and polling data cannot provide us with such a large set of costly decisions in such diverse conditions. Therefore, we believe our results should at least be drawn upon as a complement to inferences obtained by other methods.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Supplementary Online Appendix