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The Framing Effect of Tax–Transfer Systems

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Abstract: The present study investigates the framing effect of tax–transfer systems on work effort decisions. We devised two theoretically equivalent treatments—the redistributive tax treatment and the redistributive transfer treatment—and studied subjects’ work effort choices in a novel public goods experiment. We found that subjects chose higher effort levels when redistribution took place via transfers than via taxes. Interestingly, the treatment effect was more pronounced among those with lower cognitive abilities and those who judged the tax–transfer system to be unfair. The results have the potential to offer insight on the debate about the extent to which taxes or transfers should be actively used for redistribution.

Keywords: Framing effect, Tax–transfer system, Work effort, Public goods experiment

JEL Classification: C91, H21, H31

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I. Introduction

Governments redistribute income in two ways: by taxing high-income groups relatively more and by making relatively more transfer payments to low-income groups. Redistribution policy tools, taxes, and transfers share the same goal of achieving a more equal distribution of income, but there is currently no consensus regarding which tool should be used more actively to address the widening income gap. The answer rests, in part, on which policy tool is least detrimental to economic efficiency—specifically, work effort. Although many studies have examined the disincentive effects of taxes and transfers on labor supply (Blundell and Macurdy 1999; Blundell and Shephard 2008; Danziger, Haveman, and Plotnik 1981; Meghir and Phillips 2010; Moffitt 2005), none have systematically compared the relative disincentive effects of taxes and transfers.

This gap in the literature is due to both theoretical and empirical reasons. Theoretically, a central assumption in public finance is that rational people perfectly calculate post-redistribution earnings, and thus, there should be no behavioral difference regardless of how a given level of redistribution is achieved. However, a growing body of literature on tax perception and tax salience suggests that the framing of tax systems or compensation schedules may affect people's labor supply. Prior studies have shown that, under the strictly held theoretical equivalence condition, subjects tended to (1) work harder when tax was levied on consumption rather than income (Blumkin, Ruffle, and Ganun 2012); (2) exert higher effort under a higher gross wage rate subjected to higher taxes rather than a lower gross wage rate with lower or no taxes (Fochmann et al. 2013; Hayashi, Nakamura, and Gamage 2013); (3) exhibit stronger preferences for a larger public sector when tax was levied on the employer side rather than the employee side (Weber and Schram 2017); and (4) respond more sensibly to tax changes when they occurred under a simple tax system rather than a complex one (Abeler and Jäger, 2015). Relatedly, people also tended to consume more when the consumption tax was less, rather than more salient (Chetty, Looney, and Kroft 2009; Feldman and Ruffle 2015) and were keener to save a

fiscal bonus when it was labeled as a tax rebate rather than an income increase (Lozza, Carrera, and Bosio 2010).¹

Empirically, the lack of literature on comparing the disincentive effects of taxes and transfers may be due to data limitations in the field. Even though policy change in any given tax/transfer system provides a natural experiment for empirical economists to examine the disincentive effect on work effort, the results could be skewed by changes in the characteristics of the working population and other variables that could affect work incentives.² It is also difficult to control the degree of redistribution in order to compare a tax system and a transfer system on the same basis. In addition, non-linear income tax schedules and opaque benefit-tax linkages for social insurance programs add to the difficulty of comparing taxes and transfers (Chetty, Looney, and Kroft 2009).

To overcome these challenges, we designed two theoretically equivalent but distinctively framed treatments and studied subjects' work effort decisions in a tightly controlled laboratory environment. In the redistributive tax (TAX) treatment, subjects were taxed at a proportional rate, and each subject received an equal transfer payment.³ In the redistributive transfer (TRANSFER) treatment, subjects were taxed a fixed amount, and transfers were distributed to each subject in a "progressive" fashion. Those with higher pre-tax earnings received fewer transfers than those with lower pre-tax earnings. The main feature of the experiment was the theoretical equivalence of the two treatments. The tax–transfer system embedded in both treatments identically altered the distribution of pre-tax earnings. That is, for any pre-tax income distribution, the corresponding income distribution within the tax–transfer system in each treatment was identical. This

¹ Several earlier studies, including Borck, Engelmann, Müller, and Normann (2002), Kachelmeier, Limberg, and Schadeewald (1994), and Ruffle (2005), found support for the tax incidence equivalence in various laboratory settings, in contrast to Kerschbamer and Kirchsteiger (2000), where the equivalence was violated in an ultimatum game. In the study by Sausgruber and Tyran (2005) participants voted which side of the market to tax and often chose too high taxes because they did not foresee the incidence equivalence that turned out to hold in the experiment.

² Other variables that could also affect work incentives include non-earned income, housing tenure, local taxes, disability, and ill health and, among parents, the number and age of dependent children and changes in the working patterns among couples.

³ The TAX treatment builds on the tax experiment that has been widely used in the experimental literature on taxation (Durante, Putterman, and van der Weele 2014; He, Putterman, and Wang 2019).

mathematical feature allowed us to identify the causal relationship between the framing effect of the redistribution policy and work effort.

Our experimental results support the main hypothesis: the framing of tax–transfer systems matters. On average, subjects in the TRANSFER group chose 25.37% higher effort levels than those in the TAX group. To account for the observed treatment effect, we tested two possible explanations: limited cognitive ability and fairness perception. As for the former, deriving from the literature on tax salience and complexity, we conjectured that subjects may have had limited cognitive ability to correctly calculate the post-redistribution earnings they received from their work effort. Thus, those in the TRANSFER group may (wrongly) have felt that they were taxed at a lower rate than those in the TAX group and thereby chose a higher effort level. Consistent with the limited cognitive ability explanation, we found that the difference in chosen effort levels between the TRANSFER and TAX treatments was more pronounced among subjects with lower cognitive ability, as per their scores on the cognitive reflection test (CRT) (Frederick 2005), than among those with higher cognitive ability. As for the fairness perception explanation, we compared subjects’ self-reported fairness perception between the two treatment conditions, but the difference was statistically insignificant. Interestingly, we found that the treatment effect was more pronounced among those who judged the tax–transfer system to be unfair, compared to those who viewed the system as neutral or fair.

The present study relates to at least three strands of literature. First, it joins the literature on taxes/transfers and labor supply. Even though there are a myriad of studies investigating the effect of taxes or the effect of transfers on labor supply, this paper is the first attempt to compare the disincentive effects of taxes and transfers. The experimental results therefore have policy implications for the normative question: which redistribution policy tool—taxes or transfers—should be used more actively to alleviate income inequality? Second, this paper adds to the broader literature on tax salience and further extends its application to redistribution policy. Finally, the paper is broadly related to the literature on procedural fairness (Bolton, Brandts, and Ockenfelds 2005; Karni, Salmon, and Sopher 2008; Ku and Salmon 2012). Prior researchers found that individuals might judge the fairness of a final outcome on the basis of the procedure that generated it, and in our study, the tax–transfer system embedded in the two treatments indicates two different

allocation procedures. Our results suggest that the difference in allocation procedure does not create a discrepancy in perceived fairness. However, the allocation procedure does significantly impact the pro-social decision, measured by effort level, among the individuals who perceive the allocation procedure to be unfair.

The remainder of the paper is organized as follows: Section 2 describes the experimental design, Section 3 reports the results, and Section 4 includes the discussion and conclusion.

II. Experimental Design

We examined the framing effect of tax–transfer systems on work effort in a laboratory setting. Subjects’ work effort was elicited in a one-shot game⁴ described as follows. In the beginning of the experiment, subjects are randomly assigned to groups of four and given an endowment of 10 points. Each subject then decides how to allocate the endowment between working and leisure. For each point allocated to leisure, the subject earns 1 point. For each point allocated to working, the subject earns 1.2 points of wage earnings, which are subject to a tax–transfer system. A subject’s final earnings are the sum of the earnings from leisure and the wage earnings after the tax–transfer system. The variable of interest is the number of points allocated to working, which measured the work effort chosen by the subject.⁵

We employed a between-subject design and manipulated the framing of the tax–transfer system by devising two treatment conditions: TAX and TRANSFER treatments. In the TAX treatment, subjects’ wage earnings are taxed at a rate of 50%. Tax revenue collected is then equally distributed to each group member. Each subject in the same group receives an equal amount of transfer equal to 50% of the group average wage earnings.

⁴ We chose a one-shot setting to avoid any potential confounding effects, such as reciprocity and conditional cooperation, that may arise from a repeated game setting, to interact with the framing effect.

⁵ In our experiment, work effort refers to a subject’s choice in the point allocation decision and not the effort expended by performing a real task. To convey a better sense of the decision on the amount of effort subjects put into work, we framed the instructions of the experiment as allocating points among working and leisure. Many experimental studies in labor economics employ this “chosen effort” or “stated effort” design (for example, Abeler et al. 2010; Falk and Kosfeld 2006; Fehr, Kirchsteiger, and Riedl 1993). In addition, Bruggen and Strobel (2007) compared subjects’ choices in chosen-effort and real-effort tasks and found that subjects reacted similarly to wage offers in a gift-exchange game regardless of the form of effort.

This tax–transfer system causes those with higher wage earnings to pay more taxes than those with lower wage earnings, but each group member receives an equal amount of transfer.

In the TRANSFER treatment, subjects are taxed by a total of 5 points. The tax revenue collected is then “progressively” distributed to each group member. The amount of transfer equals 50% of the difference between the group average wage earnings and the wage earnings of subject i , plus 10. This tax–transfer system causes those with lower wage earnings to receive more transfers than those with higher wage earnings, but each group member pays a fixed and equal amount of taxes.

According to the tax–transfer system in the respective treatments, a TAX subject’s final earnings in terms of the number of points allocated to working (y_i) and the average number of working points contributed by all the subject’s group members ($\bar{y}$) can be expressed as:

$$\pi_i^{TAX}(y_i, \bar{y}) = (10 - y_i) + 1.2y_i(1 - 50\%) + 50\%(1.2\bar{y})$$

whereas a TRANSFER subject’s final earnings equal:

$$\pi_i^{TRANSFER}(y_i, \bar{y}) = (10 - y_i) + 1.2y_i - 5 + 50\%(1.2\bar{y} - 1.2y_i + 10)$$

Simple algebraic operations show that the final earnings in both treatments are identical and equal $10 - 0.4y_i + 0.6\bar{y}$. The theoretical equivalence implies that the framing of the redistribution policy should have no impact on the effort choices of those who only care about monetary payoffs.

The experimental setup resembles that of a linear voluntary contribution mechanism (VCM). Each subject allocates an endowment between two activities: a group/private account in a VCM versus working/leisure in our experiment. The working account is analogous to the group account, while the leisure account functions similarly to how the private account does in a linear VCM. The choices of the parameters in our task also exhibit properties similar to those in VCM. In particular, the marginal private cost of allocating one point to the working account (0.4) is smaller than the marginal social benefit it generates ($4 * 0.15 = 0.6$). Thus, it would be socially efficient if all group members contribute all their points to the working account. However, a purely self-interested agent’s

dominant strategy is to keep all the endowment in the leisure account, because the marginal private cost is higher than the marginal private benefit.⁶

Each session proceeded as follows: After subjects signed the consent form, instructions were given and read aloud by the experimenter. Then, subjects were asked to complete an incentivized comprehension test. In the beginning of the main experiment, subjects were randomly divided into groups of four. After they made the allocation decision, subjects were asked for their feelings about the fairness of the tax–transfer system.⁷ Then, they completed the CRT. Subjects completed a questionnaire at the end of the experiment (please refer to Supplementary Material Sections A–D for experimental details). The experiment was programmed and conducted with z-Tree software (Fischbacher 2007).

III. Results

A total of 104 undergraduate students were recruited from Brown University using an online recruitment system, and each treatment had exactly 52 observations. Each session lasted for roughly 40 minutes, and the average monetary earnings were USD\$16.73, including a guaranteed \$3 participation fee. Payments were made in cash before the subjects left the computer lab. Of the subjects, 43% were male. Half of the subjects considered themselves to be white. Around one-quarter of the subjects majored in economics or had a joint major of economics and a related field (e.g., mathematics). Except for *Semester*⁸, there was no significant difference between the means of all demographic characteristics for the TAX treatment and the TRANSFER treatment, indicating that the random assignment of the treatment conditions was valid *ex post*.⁹ Summary statistics are reported in Supplementary Material Table A.1.

⁶ Admittedly, the corner solution implied by our setup does not reflect that of the real-world tax and transfer systems, which typically entail an interior Nash equilibrium.

⁷ The question was stated as follows: “How fair do you feel the tax–transfer system in the experiment is? Select a number on a scale of 1 (very unfair) to 7 (very fair).” In order to avoid subjects’ self-reported fairness perception being affected by the payoffs relative to other group members, the question about fairness perception was asked immediately after subjects made the allocation decision but before they received feedback on their payoffs in the main task.

⁸ The variable *Semester* is defined as the number of semesters the subject has completed when participating in the study.

⁹ In the 7-item comprehension quiz, the average number of questions answered correctly was 6.08 and 5.98 in the TAX condition and the TRANSFER condition, respectively. The high correct rate and insignificant

Next, we present the main results to answer the question of whether the framing of tax–transfer systems matters. Subjects in the TAX treatment group allocated an average of 5.40 points to working, while subjects in the TRANSFER treatment allocated an average of 6.77 points (p -value = 4.13%, two-sided t -test; p -value = 8.25%, two-sided Mann–Whitney test). The subjects in the TRANSFER treatment group, on average, chose 25.37% higher effort levels than those in the TAX treatment group. This result provides support for the existence of the framing effect: subjects chose different effort levels under two theoretically equivalent tax–transfer systems. The results in both treatments are similar to typical findings in VCM experiments where subjects provide contributions halfway between the socially efficient level (10 points to working in our experiment) and the free-riding level (0 points to working) in one-shot trials and in the initial stages of finitely repeated trials (Ledyard 1995).

Figure 1 displays the distributions of effort levels by treatment. In both treatments, a substantial number of subjects chose to allocate all their endowments to working (21.15% in the TAX treatment and 26.92% in the TRANSFER treatment). Subjects in the TAX treatment group were more likely to choose low effort levels (0–2 points), while subjects in the TRANSFER treatment group tended to choose high effort levels (7–10 points).

Since a substantial number of subjects who chose to allocate either none or all of their endowments to working, we employed Tobit regression models to further investigate possible mechanisms for the framing effect. The dependent variable is the effort level measured by the number of points allocated to working. Since the experiment was a one-shot game and subjects did not know the identities of their group members, all observations were independent.

difference between the two treatments indicate that subjects understood the tax–transfer systems well and that the degree of understanding did not differ between the two treatments.

Figure 1. The Distributions of Effort Level by Treatment. The figure shows the distribution of effort levels by treatment.

Table 1 reports the Tobit regression results. In Column (1), we only include *TRANSFER*, which is a dummy variable equal to 0 if the subject is in the TAX condition and 1 if in the TRANSFER condition. The coefficient captures the difference in the average effort levels between the two treatment groups and is significantly positive at the 5% level. Column (2) includes an added set of demographic controls, and the coefficient of *TRANSFER* remains significantly positive. Additionally, we found that female subjects and those with lower household income, on average, chose a higher level of effort, which is suggestive of a stronger concern for inequality or efficiency. Overall, the results demonstrate that the framing of tax–transfer systems matters. Specifically, for a given level of redistribution, a policy mix tilted toward the tax side is more detrimental to economic efficiency compared to one tilted toward the transfer side.

Table 1: Tobit Estimation of Effort Level

Variable	(1)	(2)	(3)	(4)
<i>TRANSFER</i>	1.3247** (0.6755)	1.4781** (0.7067)	5.6749*** (1.5702)	7.3603*** (1.4040)
<i>Cognitive Ability</i>			-0.0087 (0.4152)	0.4507 (0.5209)
<i>Fairness</i>			1.2699*** (0.3241)	1.5756*** (0.3898)
<i>TRANSFER * Cognitive Ability</i>			-1.0494* (0.5817)	-1.5567** (0.6897)
<i>TRANSFER * Fairness</i>			-0.9909** (0.4748)	-1.5364*** (0.5333)
<i>Male</i>		-1.8493*** (0.7221)		-0.2057 (0.8149)
<i>White</i>		0.1705 (0.7388)		0.3765 (0.7614)
<i>Semester</i>		0.1053 (0.1421)		0.0571 (0.1374)
<i>EconMajor</i>		0.7603 (0.8373)		0.4848 (0.8657)
<i>Household Income</i>		-0.5232** (0.2348)		-0.3798 (0.2385)
Left-censored obs.	15	14	15	14
Right-censored obs.	25	23	25	23
Number of obs.	104	99	104	99
Pseudo R ²	0.0079	0.0321	0.0599	0.0792

Notes: Tobit estimates. Reported results are unconditional marginal effects. Standard errors are reported in parentheses. The dependent variable is the effort level chosen by a subject. *TRANSFER* is the treatment dummy that equals 1 if the subject is the TRANSFER condition and 0 if the subject is the TAX condition. *Cognitive Ability* indicates the number of correct answers in the 3-item CRT. *Fairness* is a self-reported measure on a scale of 1 (very unfair) to 7 (very fair). *Male* is a gender dummy that equals 1 if the subject is male and 0 otherwise. *White* is an ethnic dummy that equals 1 if the subject is white and 0 otherwise. *Semester* is the number of semesters the subject has completed when participating in the study. *EconMajor* is a dummy that equals 1 if the subject majors in economics or a joint major of economics and a related field (e.g., mathematics) and 0 otherwise. *Household Income* is an ordinal variable that equals 0 if the subject reports an annual household income below \$10,000, 1 if between \$10,000 to \$49,999, 2 if between \$50,000 to \$99,999, 3 if between \$100,000 to \$149,999, 4 if between \$150,000 to \$200,000, and 5 if above \$200,000. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

In the remainder of this section, we will explore two possible factors that may account for the observed treatment effect. Our first conjecture relates to people's limited cognitive capacity. Previous studies—including those of Blumkin, Ruffle, and Ganun (2012); Chetty, Looney, and Kroft (2009); Feldman and Ruffle (2015); Finkelstein (2009);

and Sahm, Shapiro, and Slemrod (2012)—have suggested that the visibility and salience of taxes affect individuals’ labor supply and purchasing decisions. Researchers have argued that this cognitive bias of relative inattention to less salient forms of taxation mitigates the negative effects of taxation, such as deterring work incentives and reducing consumption. In the context of our experiment, since the marginal tax rate of 50% in the TAX treatment was more salient than that in the TRANSFER treatment, subjects might have perceived their wage earnings to be taxed on the margin at a zero percent rate in the TRANSFER treatment because they saw the tax itself as fixed and lacked the mental acuity to process the marginal impact of the transfer on post-redistribution earnings. Consistent with our conjecture, subjects in the TRANSFER treatment group chose higher effort levels. Given that we also elicited subjects’ cognitive ability measures in the experiment, we further tested whether the treatment effect was more pronounced among the subjects with lower cognitive ability. Figure 2(a) provides preliminary visual confirmation. Consistent with the limited ability explanation, the treatment effect was larger among those with lower CRT scores than those with higher CRT scores.¹⁰

The second possible factor underlying the framing effect derives from the social preference literature on the effect of perceived fairness. Prior studies have shown that fairness perception induces work effort (Cohn, Ernst, and Lorenz 2015; Cornelissen, Himmeler, and Koenig 2013) and cooperation (Balafoutas et al. 2013). In our experiment, we elicited fairness perception (*Fairness*), a self-reported measure on a scale of 1 (very unfair) to 7 (very fair). We first compared the mean response among the two treatment conditions. However, the difference was statistically insignificant (p -value = 0.85 using the two-sided t -test). Then, we further compared the treatment effect among those who perceived the tax–transfer system to be unfair and those who perceived the tax–transfer system to be neutral or fair. As shown in Figure 2(b), the treatment effect was more pronounced among those who perceived the tax–transfer system to be unfair than it was among those who perceived the system to be neutral or fair.

¹⁰ Hoppe and Kusterer (2011) also found that individuals with lower cognitive abilities tended to be affected more by behavioral biases.

a.

b.

Figure 2. Heterogeneous Treatment Effects. Figure 2(a) illustrates effort level by cognitive ability. Cognitive ability is measured by the 3-item CRT. The median and average number of correct answers are 1 and 1.4, respectively. Low CRT: the number of correct answers is either 0 or 1. High CRT: the number of correct answers is either 2 or 3. Figure 2(b) illustrates effort level by fairness perception. Fairness perception is a self-reported measure on a scale of 1 (very unfair) to 7 (very fair). The median and average are 3 and 3.4, respectively. Unfair: subjects who judged their tax–transfer system to be unfair by reporting 1 to 3 for this survey item. Neutral/Fair: subjects who judged their tax–transfer system to be neutral or fair by reporting 4 to 7 for this survey item.

In our regressions, we include the treatment dummy, cognitive ability, fairness perception, and interaction terms in Column (3) and then control for a set of demographic variables in Column (4). The results show that cognitive ability per se does not significantly affect effort level, but its interaction effect with the treatment dummy is significantly negative, reconfirming the role of limited cognitive ability in driving the framing effect. Consistent with the existing literature, the coefficient of fairness perception is significantly positive. The coefficient of the interaction term between fairness perception and the treatment dummy is significantly negative, indicating that the treatment effect was more pronounced among those who perceived their tax–transfer system to be unfair than those who viewed their system as neutral or fair.

To account for the above findings, we propose an explanation based on loss aversion (Tversky and Kahneman 1991). In the TAX treatment, individuals first “earned” their wage earnings but then half was taken away as taxes, so they might perceive paying taxes as a loss. Conversely, in the TRANSFER treatment, individuals might perceive the transfer that they might have received had they chosen not to work as a potential gain that did not occur. This discrepancy in subjects’ perceptions may cause those in the TAX treatment to find it more painful when they choose to work compared to those in the TRANSFER treatment, especially among those who judged the system to be unfair. As a result, the treatment effect was more pronounced among such individuals.

IV. Discussion and Conclusion

In this paper, we examine the framing effect of redistribution policy on work effort decisions in a laboratory environment. Relying on two theoretically equivalent but distinctively framed treatments, we find evidence that supports the existence of a framing effect: subjects in the redistributive transfer treatment group chose higher effort levels than those in the redistributive tax treatment group. This result contributes to a long-standing discussion in the literature on the disincentive effects of taxes and transfers by making a direct comparison between these two policy tools. Additionally, we provide suggestive evidence on the roles of cognitive ability and fairness perception in accounting for the observed framing effect.

Before we extrapolate policy implications from our results, several limitations must

be discussed. First, we acknowledge the lack of external validity in the study. In particular, the effort levels measured in this research were experimental (rather than naturally occurring) and chosen (rather than actual). We cannot speculate about the generalizability of this research to the field. However, as previously mentioned, it is difficult to examine the framing effect in the real world. A real-effort laboratory experiment or small-scale field experiment may both be viable ways to improve the external validity of the study. The second concern regards feasibility. The two treatments in our experiment are on different sides of the spectrum of redistribution policy: redistribution is either through taxes only or through transfers only. Notably, the lump-sum tax scheme on which the TRANSFER treatment relied has rarely been implemented in the real world (Mankiw, Weinzierl, and Yagan 2009). Finally, although the present study employed a one-shot setting to cleanly identify the framing effect, it is equally important to learn the persistence of the observed effect in a repeated game setting as real-world taxpayers repetitively interact with tax–transfer systems throughout life.

These complications aside, our results indicate that, for a given level of redistribution, using transfers is less detrimental to work effort than using taxes. This implication in turn suggests that the government may recover some efficiency loss from the redistributive system by adopting a less progressive taxation system (such as lowering the marginal income tax rate) coupled with a more progressive transfer system (such as reducing or eliminating benefits to the rich). Furthermore, this finding may offer insight on the justifications for the current design of the U.S. Social Security system. Similar to the tax–transfer system, a social security system is a combination of taxes and benefits: participants pay social security tax on a regular basis and receive benefits when they retire. The current design emphasizes a regressive taxation system (a flat tax rate is applied to annual earnings up to \$110,100; any wages earned above the cap are untaxed) and a progressive benefit system (a redistributive function of average indexed monthly earnings). Based on the results of this study, this design has a smaller disincentive effect than a design with a more progressive tax structure and a less progressive benefit structure.

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