

# Gender Discriminatory Taxes, Fairness Perception, and Labor Supply

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# Gender Discriminatory Taxes, Fairness Perception, and Labor Supply

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## Abstract

In this paper, we examine the gender specific impact of discriminatory taxation on fairness perception and individual labor supply decisions. Using the controlled environment of an experimental laboratory, we manipulate both distributional as well as procedural justice of taxation between subjects. We violate distributional fairness through the random application of tax rates, while procedural justice is broken by levying discriminatory tax rates based on taxpayer gender. For both inequality in outcome as well as discrimination, we find strong differences in reactions between male and female participants. Male participants perceived gender discriminatory taxation as unfair in and of itself. Female participants perceived random taxation as well as gender discriminatory taxation to be unfair, as long as they ended up with the higher tax rate. The perceived fairness strongly drove (did not affect) male (female) participants' labor supply. Taken both subgroups together, while mere outcome inequality did not influence labor supply decisions significantly, we find evidence of a negative effect of gender-based discrimination on labor supply.

## Keywords

Tax, labor supply, distributional justice, procedural justice, discrimination

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# 1. Introduction

The call for equality is as old as human rights themselves. Nevertheless, it took until the past century for gender equality to become one of the major political concerns in western industrialized countries. Over the past decades, gender issues with respect to the labor market form the heart of this discussion. European politicians have recently put gender differences in taxation into the spotlight (Gunnarsson et al., 2017). Among other factors, a variety of tax policies in practice such as joint taxation for couples, Earned Income Tax Credits or Working Tax Credits are accused to establish inequalities and to promote disincentives for labor market participation of secondary earners and therefore mostly women (e.g. Blundell, 2000; Eissa and Hoynes, 2004; Gunnarsson et al., 2017). In the course of this discussion, Alesina and Ichino (2007) promoted the idea of gender-based taxation, implementing lower tax rates for women while raising tax rates for men. This idea – while not yet empirically evaluated - also found its way into tax reform suggestions in Italy (Alesina et al., 2011).

Evidence on work incentives for secondary earners, often based on survey data, is growing (recent studies for Germany are for example Triebe, 2013; Chirvi, 2019). While a growing number of socioeconomic factors, such as the division of unpaid work, enter the discussion on gender-based inequalities in taxation (see e.g. Gunnarsson et al., 2017; Schröder and Burow, 2016; Cochard et al, 2018), research regarding perceptual effects of inequalities is lacking. Despite the common conclusion that individuals respond to perceived unfairness in the labor market (for a recent overview see Fehr et al., 2009), so far no empirical study addresses fairness perceptions of inequalities in taxation and the potential fairness effects on labor supply. Given the political relevance and the vast discussion of labor supply responses to tax policies in general (see Killingsworth, 1983, part 6; Keane, 2011), the lack of empirical evidence with respect to the perception and effects of inequality in taxation is astonishing.

We directly investigate the causal link from unfair tax settings across workers via perceived fairness (mediator) to the individual labor supply decision. We address the questions whether market participants actually perceive taxation fairness differently and adjust their labor supply accordingly. To test the proposed causal relations, we conduct a between subjects laboratory experiment. Our analysis differentiates between the distinct domains of tax fairness - distribution and procedure - and captures discrepancies in perceptions and reactions between subjects. Differences in distributional fairness are created by randomly attributing either high or low tax rates to subjects, while the randomization is completely visible to the participants. Gender-based tax rates are levied to introduce a violation of procedural justice. Hereby our experimental design is set up in order to capture both a situation in which female participants suffer from inequality by facing a high tax rate, as well as a

situation in which female participants benefit from facing a low tax rate. Male participants face the corresponding low (high) tax rate in each situation.

The experimental results reveal strong differences with respect to gender. Male participants perceive violations of procedural justice (gender-based tax rates) as unfair, regardless of their resulting financial incentive. In addition, the perceived fairness of the tax system has a positive effect on labor supply by male subjects. On the other hand, fairness perceptions by female participants are driven by their personal outcome. Female subjects in our sample strongly decrease fairness ratings when personally facing a high tax rate. Yet, labor supply by female participants is not affected by fairness.

Our study contributes to the research on taxes and labor supply by being the first to investigate the impact of unfair differential taxation between subjects on individual labor supply in a laboratory experiment. Thereby we pioneer in the analysis of the effects of random and discriminatory inequity in taxation. Using gender as the basis of discrimination, we directly address relevant gender issues of taxation. In addition, we contribute to the literature on comparative net pay among workers, by introducing net pay differences through unequal tax rates. We thus provide further evidence on the effects of comparisons between workers on individual preferences and decisions by investigating the influence of discriminatory (net) wage differences on labor supply in the lab. Finally, by distinctively manipulating the tax rate determination procedure, we contribute to the broader research field on trust in authorities and its effects on individual decision-making.

The remainder of this article is organized as follows. In section 2, a brief review of the related literature and its implications for the current study is presented. In section 3, we derive the hypothesis and describe the experimental design. Results from the empirical analysis are stated and discussed in section 4. Section 5 closes with final remarks.

## **2. Review of the related literature**

### *Violations of fairness: Conceptual framework*

Building on research from social psychology, Wenzel (2003) constructs a conceptual framework of fairness perceptions with respect to taxation. Within the framework, three norms of justice are differentiated: a) distributive justice, b) procedural justice and c) retributive justice. Distributive justice refers to the allocation of the tax burden, the outcome of the allocation process. Procedural justice refers to the means and methods of the allocation process itself. At last retributive justice refers to the treatment and control of norm violations (Wenzel, 2003; Kirchler et al., 2008). As sanctions of norm violations lie outside the scope of our investigation, in the remainder of this article we will focus on pillars a) and b) of this framework.

In the course of the debate on tax compliance, several characteristics of the tax system have been established by prior literature to enhance perceived fairness. Hereby, each of the three norms of justice is evaluated on an individual, group and societal level.<sup>1</sup> In our experimental approach we focus on manipulating distributive justice on the individual level. Building on Adams (1965) prevalent model of inequity in social exchange, the tax literature has adopted the idea that distributive justice on the individual level is achieved if a taxpayer is treated in relation to his personal attributes (merits, effort and needs). Therefore, equality has to be established among comparable individuals (Wenzel, 2003; Kirchler et al., 2008). In our experimental design, we violate this equality norm by visibly levying taxpayer specific tax rates on identical pre-tax piece rates. Procedural justice on the group level is evaluated according to the neutrality of the way different subgroups of individuals are treated by the tax authority. Example criteria are whether one group carries a greater burden than another or an individual is treated disrespectfully based on his/her affiliation to a specific group (Wenzel, 2003; Kirchler et al., 2008). While we manipulate distributive justice on the individual level, we violate procedural justice on the group level by introducing gender-based tax rates.

#### *Perception of fairness: Gender differences*

By violating procedural justice either through the discrimination of the male *or* the female experimental subpopulation, differences in the respective reactions of the two groups are analyzed. Gender differences in fairness perceptions as well as distributional preferences have long been suggested in the literature. Especially gender differences in preferences related to labor market behavior, such as risk taking or social preferences, have been widely discussed and supported by experimental studies (for a recent overview see Azmat and Petrongolo, 2014). Additionally, Pfeifer and Stephan (2018) provide evidence of gender differences in wage fairness perceptions, where women are more willing to regard their wages as fair and subsequently less likely to demand pay raises. Early theories on differences between male and female justice perception suggest that men apply an absolute concept of justice, while female justice perception is more relative (Gilligan, 1982). This idea has found empirical support in economic settings, as women appear to be more sensitive to the decision making context and to have a higher likelihood of switching between fairness principles (Eckel and Grossmann, 1996; Miller and Ubeda, 2012). However, results regarding gender as a moderator of justice effects in varying employment contexts remain inconclusive (for an overview see Dulebohn et al., 2016). Furthermore, Cohen-Charash and Spector (2001) do not find a strong relation between gender and justice perception in their meta-analysis of studies regarding the role of justice in

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<sup>1</sup> In the following we will limit the discussion on the levels relevant to this research. For further information please refer to e.g. Wenzel (2003) or Kirchler et al. (2008).

organizations. In order to directly measure gender specific reactions towards violations of procedural and distributive justice, Dulebohn et al. (2016) record brain activity during decisions in ultimatum games using functional MRI. They report stronger reactions in brain activity for female participants with respect to both procedural as well as distributive justice (Dulebohn et al, 2016). Nevertheless, the identified differences in activation level do not always translate into differences in actions (Dulebohn et al, 2016). Given the ongoing debate on gender differences in labor market reactions, we assured that each experimental treatment group consists of approximately the same number of male and female participants. We did so because we aim at studying the overall market impact of inequalities and accordingly fairness violations of taxation. This design enables us to derive conclusions regarding society as a whole while keeping the relevant gender focus.

#### *Reactions to fairness: Distributive justice and labor supply*

We now turn to the literature on how distributive justice affects labor supply. Despite the widely acknowledged importance of tax system fairness, only one empirical study addresses the effects of perceived unfairness of taxation on labor supply, but with a simplified measure of distributive justice. Using data from the 2005 wave of the German Socioeconomic Panel (SOEP), Cornelißen et al. (2013) show that the belief that “the rich do not pay their fair share in taxes” is associated with a 20% increase in paid absenteeism from work. While the study proposes a link between tax fairness beliefs and individual labor supply, it is exposed to several shortcomings. Claiming a causal relationship between the two phenomena based on the given data is inherently difficult. Furthermore, despite comprehensive modelling, measurement issues regarding the difference between absenteeism due to actual sickness and deliberate reductions in working time as a response to fairness concerns remain.

While existing studies on the effect of taxes on labor supply do not offer evidence regarding comparisons among taxpayers, there is a growing stream of literature concerning the effects of relative pay information on worker behavior. Most studies report findings of (positive and negative) reciprocal behavior in labor effort (e.g. Cohn et al., 2015; Cohn et al., 2014; Fischer and Steiger, 2009; Charness and Kuhn, 2007). However, following Bracha et al. (2015) reciprocity should not determine labor supply decisions as only the employee benefits from accepting, rejecting or renegotiating a given job offer. Using data from a laboratory experiment, they provide evidence of a strong negative effect of relative pay information on the labor supply of comparatively low paid workers (Bracha et al., 2015). Arguably, this result indicates a shift in workers preferences potentially in line with “coherent arbitrariness” (Bracha et al., 2015). In addition to experimental evidence, results by Cornelißen et al. (2011) indicate a negative impact of perceived unfairness of CEO pay on working morale based on data from the 2005 SOEP wave. Card et al. (2012) provide further evidence in this direction by

reporting lower job satisfaction and higher probability of looking for a new job among relatively low paid university staff members with access to co-worker pay information.

#### *Reactions to fairness: Procedural justice and labor supply*

Results on the role of intentions in tax settings emphasize the importance of tax rate determination procedures. Lévy-Garboua et al. (2009) provide evidence that the existence of Laffer curve effects in labor supply is highly dependent on the existence of a tax rate intentionally chosen by a market partner. While randomly applied tax rates rather lead to a linear decline in labor supply, intentionally set tax rates lead to stronger labor supply reductions at the highest possible tax rate in the experiment (79%) and show a non-linear effect on labor supply below that (Lévy-Garboua et al., 2009). Therefore, our experimental design isolates procedural justice by varying the actual tax rate determination process from universal to random to discriminatory. The argument underlying these results is that the perception of being treated unfairly and thus reducing labor supply as an emotional response is highly dependent on the manner in which tax rates are chosen (Lévy-Garboua et al., 2009). Evidence from ultimatum games further supports the role of intentions when it comes to human interactions. Falk et al. (2003), for example, show that the probability of rejecting an uneven (unfair) offer, and thus forgoing own income, significantly increases when the offer is made intentionally compared to a randomly decided split. In a labor market context, these results have been confirmed with regard to the effect of wage offers on exerted effort (e.g. Charness, 2004, Offerman, 2002). Therefore, our experimental design isolates procedural justice by varying the actual tax rate determination process from universal to random to discriminatory.

#### *Reactions to fairness: Gender differences*

Possible differences between genders in their reaction towards perceived justice in the workplace have long been discussed in organizational theory. Regarding the role of distributive justice, early results by Lee and Farh (1999) show that women place more emphasis on distributive justice when deciding on how much they trust their supervisor. However, gender did not affect the relation between distributive nor procedural justice on either pay satisfaction or commitment according to their results (Lee and Farh, 1999). Other studies provide evidence of females reporting higher commitment than men for any given level of distributive justice (Ramamoorthy and Flood, 2004) or stronger decreases in commitment by female workers in response to perceived gender discrimination (Foley et al., 2005). Some studies also conclude that female employees show stronger effects in commitment and intentions to stay in response to perceived procedural justice (Sweeney and McFarlin, 1997; Silva and Caetano, 2014; Hon, 2011). On the other hand, further results provide evidence of greater effects of distributive justice on satisfaction at work and the intention to stay of male employees (Sweeney and McFarlin,

1997, Foley et al., 2005). While Fields et al. (2000) find no gender differences in the relation between distributive or procedural justice perception and organizational outcomes such as the intention to stay, job satisfaction or supervisor evaluation in their study of Hong Kong employees.

Finally, studies regarding the effects of gender-based taxation mainly agree that taxing women at a lower rate than men is effectively in raising women's overall labor supply and can be optimal (e.g. Alesina et al., 2011; Colombino and Narazani, 2018; Colonna and Marcassa, 2015). However, results by Meier and Rainer (2015) suggest that the optimal allocation of a low tax rate to a gender, male or female, strongly depends on the underlying assumptions. While assumptions usually include differing labor supply elasticities between men and women, potentially differing fairness perceptions are neglected so far. However, a significant fraction of taxpayers may perceive gender-based taxation as a violation of both distributive and procedural justice within the tax system.

While the importance of justice in designing tax policies cannot be denied, empirical research regarding the link between the perception of this justice and labor outcomes is lacking. By evaluating the effects of sequential violations of a tax system's distributive and procedural justice on fairness perceptions and its translation into labor supply decisions, our aim is to help to close this gap.

### **3. Hypothesis Development and Experimental Design**

#### **3.1. Hypothesis Development**

Regarding the effects of violations of distributive and procedural justice, we first want to analyze the fairness perception of disadvantageously taxed subjects. Building on the definition of distributive justice established in the tax compliance literature (please refer to section 2), subjects randomly taxed at a high rate are expected to perceive their personal tax burden as being too high relative to others and thus unfair. In comparison subjects universally taxed at a high rate might still perceive a 40% tax rate as being too high in absolute terms, but they cannot perceive a violation of equality between themselves and others. Hypothesis 1a therefore states:

**H 1a:** Violations of distributive justice in taxation reduce perceived fairness of the tax system for disadvantaged subjects.

Combining this negative effect of violating distributive justice towards the individuals disadvantage with the presented evidence on the importance of procedural justice of the tax system, we expect subjects that are being discriminated by the tax system to further reduce their fairness perception of the tax system. Hypothesis 1b therefore states:



**H 1b:** Additional violations of procedural justice in taxation result in further reductions of perceived fairness of the tax system by disadvantageously taxed subjects.

Concerning the fairness perception of those participants that are knowingly taxed at a relatively low rate, we would expect them to perceive their own tax burden as being (too) low as compared to others. A phenomenon not yet discussed in terms of tax system justice evaluation. Following the predictions in Adams' (1965) general model on equality, the perception of an unequal outcome should lead to an adjustment in behavior for both advantageously and disadvantageously treated individuals in order to restore equality and fairness in the workplace. According to the model, we would thus predict a reduction in fairness ratings for advantageously taxed subjects as compared to a universally applied low tax rate. However, regarding the effect of advantageous treatments on preferences, Loewenstein et al. (1989) provide evidence that people care about both disadvantageous as well advantageous inequality but to a different extent. According to their results, the decline in utility following advantageous inequality is weaker as compared to disadvantageous utility. Fehr and Schmidt (1999) incorporate these findings into their utility model and conclude that the resulting utility function fits results in various types of experimental gamers such as ultimatum or market competition. Accordingly, we would expect the decline in fairness perception of advantageously treated subjects to be significantly less pronounced. Additionally, prior evidence on inequality in pay (see section 2) supports a positive fairness effect in the behavior of advantageously treated individuals. For example, participants in an experiment by Blount and Bazerman (1996), show a higher willingness to work under better but unequal pay conditions than marginally lower but equal pay. Based on this evidence we would expect subjects that are randomly taxed at a low rate to experience a feeling of "getting lucky" and thus potentially even increasing fairness ratings. In the tax context, results by e.g. Spicer and Becker (1980) show that advantageously treated individuals evade less income tax are in line with equality restoring behavioral reactions, they contradict the general notion of inequality being perceived as unfair, which should result in increasing tax evasion. In conclusion both a positive as well as a negative effect of advantageous inequality on fairness perception is possible. While additional violations of procedural justice, especially through discrimination, are likely to mitigate the positive effect, it is impossible to assess the relative strength of this mitigation. Accordingly, we formulate Hypothesis 1c undirected.

**H 1c:** Violations of distributive and procedural justice in taxation do not change perceived fairness for advantageously taxed subjects.

Based on widely discussed gender differences in justice evaluations within organizations, we expect female and male fairness perceptions to differ with respect to violations of distributive and procedural justice. Prior evidence by Pfeifer and Stephan (2018) regarding wage evaluations also supports differences in wage fairness perception by gender. However, prior evidence from organizational theory are is not conclusive and direct evidence regarding gender differences in fairness perception with respect to tax system characteristics is missing. Therefore, we formulate Hypothesis 1d negatively:

**H 1d:** Fairness perceptions regarding violations of distributive and procedural justice in taxation do not differ by gender.

Following the previously discussed evidence on the importance of fairness concerns in the labor market (see section 2), we expect all participants to decrease labor supply with decreasing fairness. Hypothesis 2a regarding the overall effect of fairness perception on labor supply thus states:

**H 2a:** Perceived fairness affects labor supply positively.

Based on the broad evidence on differing reactions towards perceived fairness as well as differing labor market behavior of men and women (see section 2 as well as Azmat and Petrongolo, 2014 for a recent overview), we are further interested in potential differences in labor supply with respect to tax fairness perceptions between these two groups. As we cannot assume a clear direction of potential differences in the positive effect of fairness by male and female participants, we again formulate Hypothesis 2b regarding gender differences negatively. Accordingly, Hypothesis 2b states:

**H 2b:** Perceived fairness effects on labor supply do not differ between male and female participants.

### 3.2. Experimental Design

We examine the effects of violations of distributive and procedural justice in taxation using a  $2 \times 3$  between subjects factorial design. Treatment variations constitute of the level of the applied tax rate (low or high) and the determination procedure of the individually applied tax rate (universal, random or discriminatory). An overview of the general sequence of the experiment is shown in Figure 1 (below). Please note that Figure 1 separates treatment groups by the actual treatment information provided during the experiment. Figure 2 below shows the actually resulting six treatment groups used in the empirical evaluation.

The first two groups, namely *Control Low* and *Control High*, form the reference groups for the treatment groups *Random* and *Discriminatory*. The groups *Control Low* and *Control High* represent the case of a universally applied tax rate with no direct fairness violation. Participants assigned to these

groups do not receive any information about any other group. In the *Control Low* (*Control High*) treatment, subjects are solely informed that the general tax rate equals 20% (40%).

Our first treatment groups (*Random*), consisting of the two groups *Random Low* and *Random High*, are designed to manipulate distributive justice on the individual level. By introducing inequity through differing tax rates on the same pre-tax piece rate we hereby violate distributive justice among equivalent and comparable tax payers (horizontal equity). Furthermore, due to the highly transparent *random* application of tax rates we do not violate procedural justice at this point. In the *Random* treatments subjects are informed that the individually applied tax rate equals either 20% (*Random Low*) or 40% (*Random High*) depending on the color of a table tennis ball (orange for low and white for high) drawn before the start of the actual experiment. Accordingly, subjects in both treatments knew that there were other subjects in the room randomly taxed at a different rate.

In our other treatment groups (*Discriminatory*), we did not only manipulate distributive but also procedural justice as compared to the *Random* treatment group. Due to the ongoing debate on existing gender inequalities, we decided to levy gender-based taxes as a violation of procedural justice. For subjects in the last two treatment groups, *Discriminatory High* and *Discriminatory Low*, the individually applied tax rate was determined based on their gender. In order to gain gender robust treatment results for the last groups the treatment information for *Discriminatory High* and *Discriminatory Low* was further divided. For half of the subjects in the groups the discrimination resulted in a high tax rate for men, while for the other half it resulted in a high tax rate for women; and the participants only knew about the discrimination in their subgroup. As a result, the treatment groups *Discriminatory High* and *Discriminatory Low* consist equally of men and women, whereby both feel either disadvantageously or advantageously discriminated respectively.

In order to identify the effects of discriminatory taxes on perceived fairness and labor supply, we conducted a real effort experiment using a contract approach. The contract approach allowed all subjects to decide on the number of tasks they were willing to work on, and accordingly the time they were willing to work for, given the specific contract conditions (Blaufus et al., 2016). By individually determining the duration of the experiment, subjects were given the choice between labor (translating into income available for consumption) and actual leisure time. For the real effort task, we used a modified version of the digit-counting task introduced by Abeler et al. (2011). The task involved counting the number of ones in a  $10 \times 10$  digit table randomly filled with a 50% chance per cell of

containing either a zero or one.<sup>2</sup> The tables were generated at the beginning of each session and did not vary by treatment. One female and one male experimenter supervised all sessions. Each session consisted of one overall period that was divided into seven subsequent stages. Figure 1 provides an overview of these stages.

The experiment was programmed and conducted with the experiment software z-Tree (Fischbacher, 2007). All experimental treatments were randomly applied in all sessions, thus possible effects of time and day were not treatment specific. Using random assignments we ensured an approximately equal distribution of male and female participants per treatment. The probability of being taxed at a high (low) rate equaled 50% for all participants, while the probability of each treatment assignment equaled 16.67% for all participants throughout all sessions.

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<sup>2</sup> The counting task has several advantages. First, it does not require any prior knowledge and previous experiments by Abeler et al. (2011) and Bühren and Kundt (2014) do not show significant learning effects throughout the task. Being boring, artificial and purposeless it also introduces costs of effort for the subjects while ruling out experimenter demand effects (Abeler et al. 2011; Bühren and Kundt 2014).

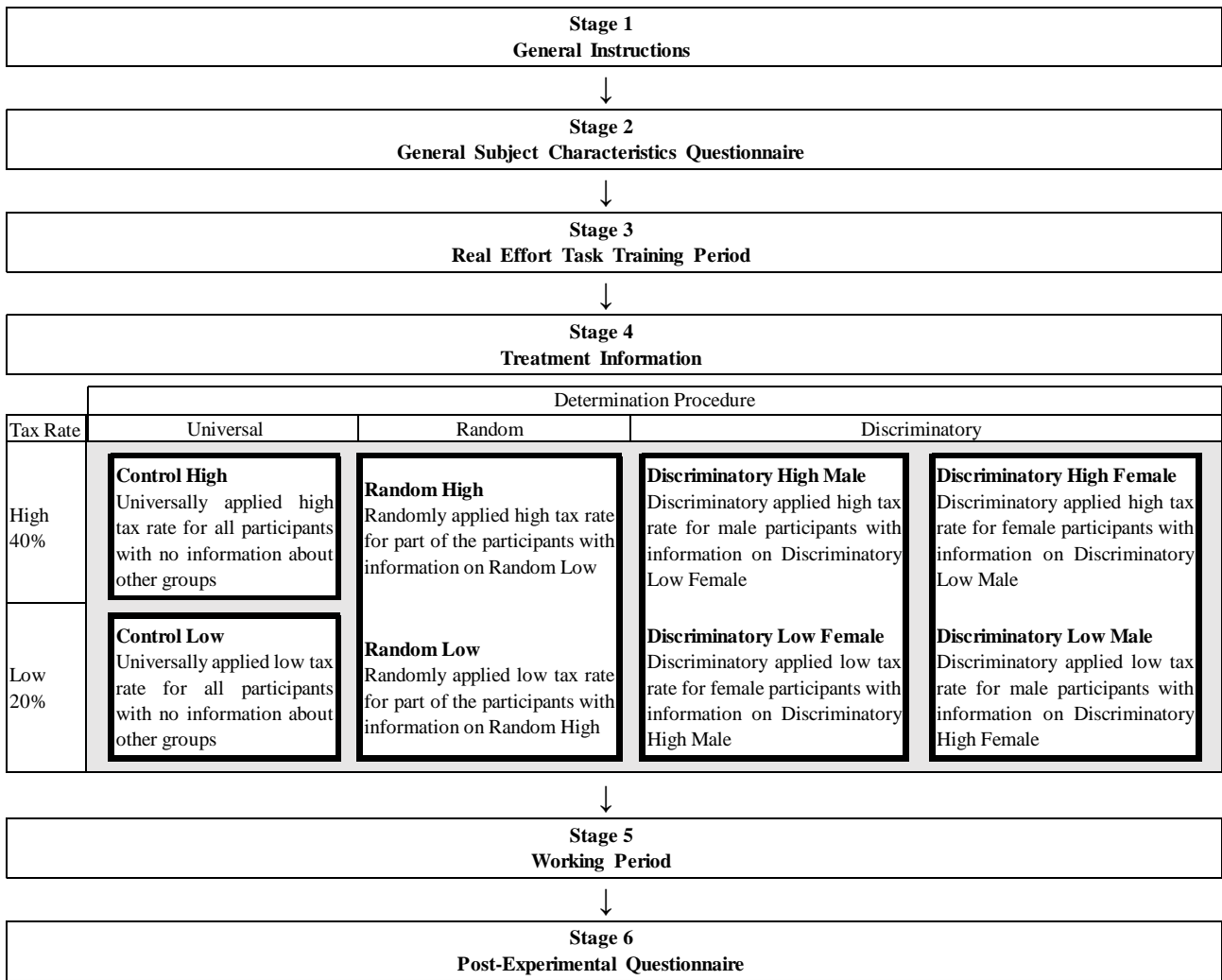


Figure 1. Experimental Procedure (Bold lines display information separation between subjects)

Determination Procedure			
Tax Rate	Universal	Random	Discriminatory
High 40%	<b>Control High</b> Universally applied high tax rate for all participants with no information about other groups	<b>Random High</b> Randomly applied high tax rate for part of the participants with information on Random Low	<b>Discriminatory High</b> <b>Discriminatory High Male</b> Discriminatory applied high tax rate for male participants with information on Discriminatory Low Female & <b>Discriminatory High Female</b> Discriminatory applied high tax rate for female participants with information on Discriminatory Low Male
Low 20%	<b>Control Low</b> Universally applied low tax rate for all participants with no information about other groups	<b>Random Low</b> Randomly applied low tax rate for part of the participants with information on Random High	<b>Discriminatory Low</b> <b>Discriminatory Low Female</b> Discriminatory applied low tax rate for female participants with information on Discriminatory High Male & <b>Discriminatory Low Male</b> Discriminatory applied low tax rate for male participants with information on Discriminatory High Female

Figure 2. Separation of treatment groups for empirical analysis

Before entering a labor contract, all subjects had the chance to familiarize themselves with the real effort task through an unpaid training period. The training period consisted of a maximum of five subsequent tables. During the training period, subjects were shown a countdown per table to enhance individual working time estimates. Furthermore, the training period offers the opportunity to control for possible, however unlikely, differences in individual talent for the task.

At stage four, the actual treatment information was given to the subjects.<sup>3</sup> Throughout all stages of the experiment, all instructions were provided electronically and questions could be posted towards the experimenters quietly at all times.<sup>4</sup> Treatment instructions consisted of the information on the treatment dependent tax system as well as the pre-tax piece rate and the general labor contract conditions. The pre-tax piece rate per correctly counted table equaled 15 Euro Cents for all subjects. In addition, all subjects were informed that all tax payments due were donated by the experimenter to the library of the School of Business & Economics of the Freie Universität Berlin. The donation of tax payments to the school's library was made in order to replicate the purpose of state tax systems to finance public goods while keeping the actual public good at a decent level of abstraction.

At this point, each subject could enter a labor contract on a self-chosen number of tasks (tables) to work on. The number of tables agreed upon in the contract referred to the total number of tables the individual subject had to count, not the number of correctly counted tables. Therefore, subjects were able to make mistakes during the subsequent working period. This provides the additional possibility to compare not only labor supply across treatments but also working effort.<sup>5</sup>

### **3.3. Variable Measurement**

Our main dependent factor of interest is labor supply.<sup>6</sup> Labor supply is defined as the number of tables each subject agreed upon in his labor contract. Every participant could enter a contract in a range between zero and a maximum of 200 tables. The limitation of tables was chosen in order to keep the duration of the experiment at a maximum of four hours while preventing corner solutions at the maximum number of tables.

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<sup>3</sup> A translation of the treatment instructions is provided in Appendix 1.

<sup>4</sup> During the experiment, instructions all were given in German. A translation of the treatment instructions is provided in Appendix 1. The full original instructions as well as translations of the general instructions, task explanations and questionnaires can be requested from the authors.

<sup>5</sup> As the focus of this paper lies on labor supply reactions, we do not include the analyses of working effort in the current version. The respective results will be included in future versions of this paper.

<sup>6</sup> An overview of the main variables of interest and their description is provided in Appendix 2. For a complete overview of all variables, please refer to the Online Appendix.

Drawing on Tan and Chin-Fatt (2000) we further monitored fairness perception during the experiment a) regarding the general tax system and b) the individual personal tax experience. In addition, subjects had to rate procedural fairness and equality of the tax system applied during the experiment. Fairness Perceptions were collected via four statements each measured on a Likert-type 1-to-7-scale, ranging from “I do not agree at all” to “I fully agree”.

Regarding important control variables, participants had to state their initial motivation to earn money during the experiment as well as their change in that motivation due to the treatment information. In the post-experimental questionnaire we further measure individual inequity aversion (fairness preferences). Following Bazart and Bonein (2014), we used the payout distribution task, developed by Bartling et al (2009), to capture aheadness and behindness aversion in a situation where the participant him- and herself is subject to the consequences of his/her decision.<sup>7</sup>

### 3.4. Sample Characteristics

The experiment was conducted in 15 sessions at the computerized experimental laboratory of the Freie Universität Berlin School of Business and Economics during June, November and December 2017. Overall, 179 undergraduate and graduate students from the Freie Universität Berlin participated in the experiment. No student participated in more than one session. All participants were recruited via public announcements using identical invitations. On average seven female and six male students participated in each session. Subjects earned 10.50 € on average for an average duration of 82 minutes. Table 1 provides an overview of the sample characteristics.<sup>8</sup>

**Table 1.** *Participant characteristics*

	N	Mean	Sd	Min	Max
Gender	179	0.54	0.50	0	1
Talent	179	-55.07	27.79	-220.74	0
Age	179	21.79	4.29	17	52
Business & Economics	179	0.52	0.50	0	1
Semester	179	3.77	3.83	1	25
Time Pressure	179	0.23	0.42	0	1
Disposable Income	179	395.04	259.97	0	1600
Observations	179				

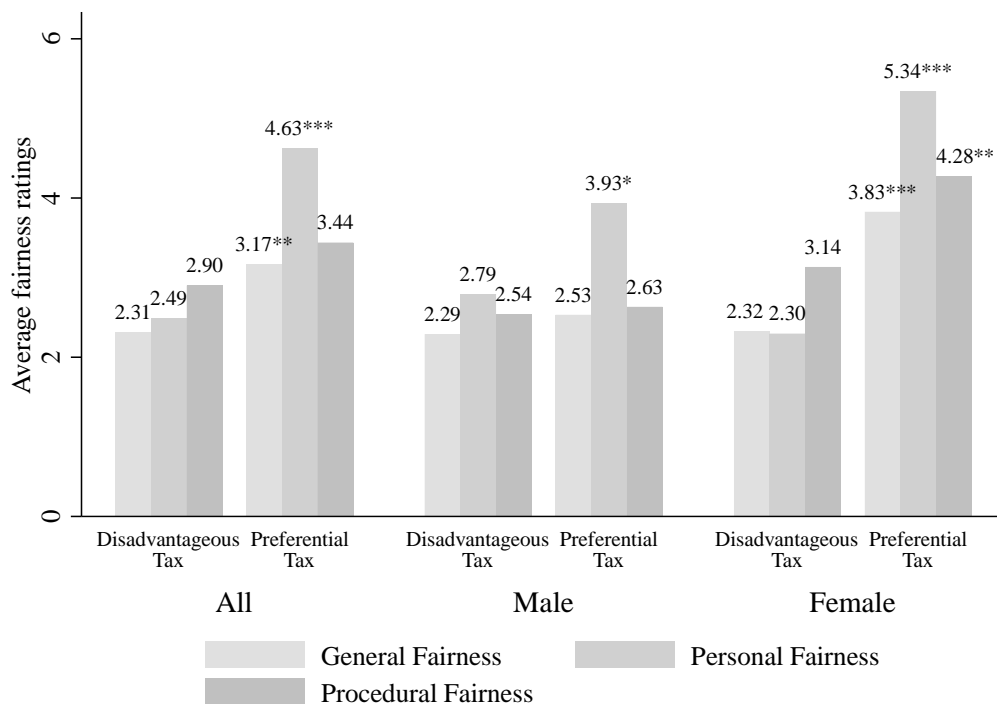
<sup>7</sup> The task was included as hypothetical questions so neither of tasks led to any payment for the participants.

<sup>8</sup> An overview of further sample characteristics regarding potential influential factors such as preferences for equality is provided in the online Appendix.

## 4. Results

### 4.1. Descriptive Statistics

#### 4.1.1. Treatment Effects on Fairness Perceptions



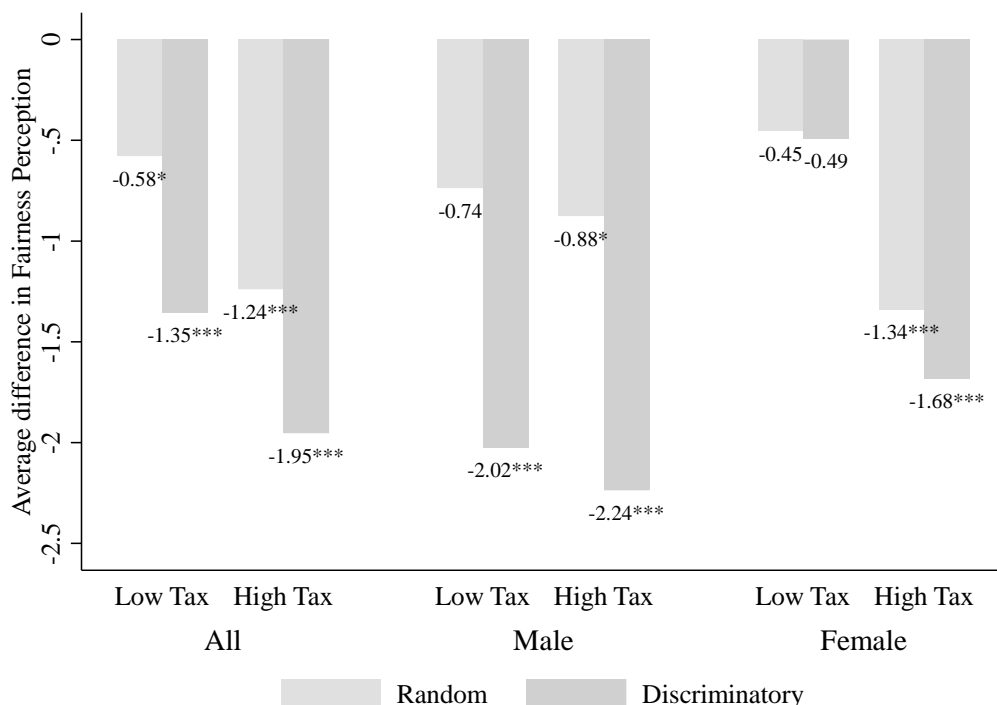
**Figure 3.** Fairness ratings by relative outcome

Regarding the treatment effects on fairness perception (Hypothesis 1a to 1d), we first have a combined look at the effect dependent on whether subjects end up being advantageously taxed as compared to being disadvantageously taxed. In order to get a clear picture of reactions to both sides of inequality, benefit (low tax rate) and suffering (high tax rate), by all, male, and female participants, we combine the results for treatments *Random High* and *Discrimination High* into *Disadvantageous Tax* and those of *Random Low* and *Discrimination Low* into *Preferential Tax* and compare fairness perceptions between those. Differences between treatment groups are based on results from Wilcoxon Rank-Sum Tests.<sup>9</sup> We find a significant increase in fairness ratings with respect to General Fairness and a highly significant increase with respect to Personal Fairness of all participants (Figure 3, left side). Procedural Fairness ratings by all participants do not differ dependent on their personal outcome.

<sup>9</sup> Please note that we do not adjust p-values for multiple hypothesis testing as we cannot find an economic reason why our results would be driven by the existence of more than two treatment groups.



However, looking at fairness perceptions by male and female participants separately, we find surprisingly differing results (Figure 3, middle and right side). We only find evidence of a marginally significant increase in Personal Fairness ratings by male participants when comparing a preferential to a disadvantageous outcome. Ratings of General and Procedural Fairness by male participants do not differ based on a preferential outcome. Fairness ratings by female participants, however, strongly increase in the case of preferential taxation. This effect is largest for the rating of Personal Fairness, considering how they themselves have been treated, but also highly significant in the rating of General Fairness and significant regarding the fairness of the procedure applied to determine the tax rate. These findings based on descriptive statistics indicate the existence of a strong difference in fairness perception between male and female participants with respect to inequalities (Hypothesis 1d).



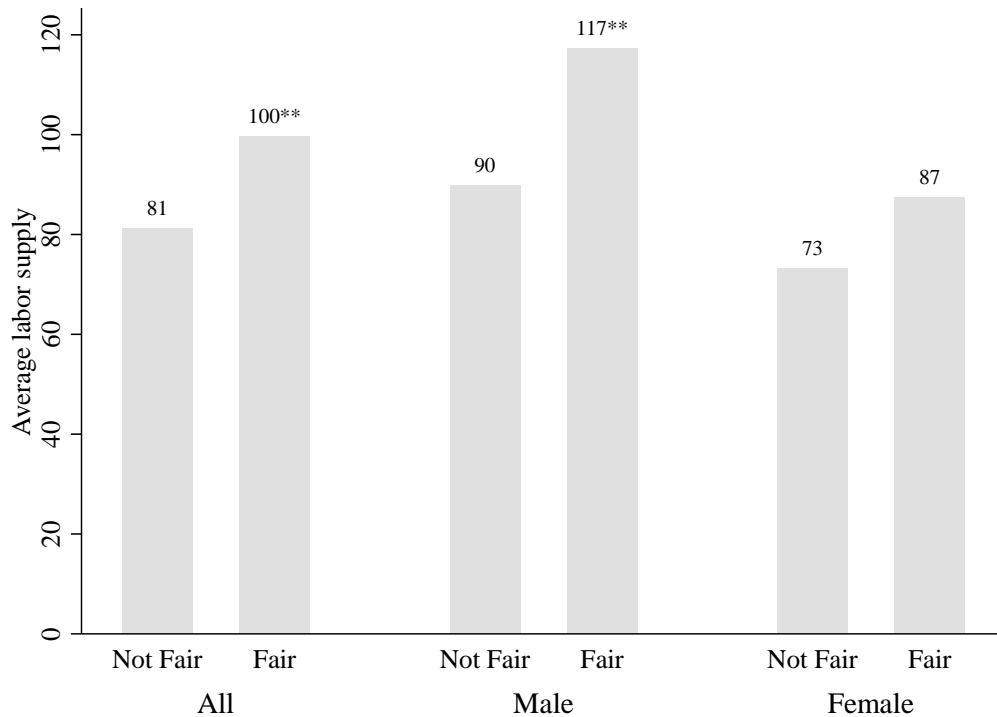
**Figure 4.** *Difference in Fairness Perception in contrast to unitary taxation*

To clarify the suggested relation between violations of distributive and procedural justice (Hypothesis 1a to 1d), we combine all four fairness categories (General Fairness, Personal Fairness, Procedural Fairness and Equality) into one variable: Fairness Perception. We do so by calculating a simple mean of the four individual ratings. Results for all, male, and female participants, are shown in Figure 4. Pairwise comparison of Fairness Perception by treatments dependent on whether the outcome for the individual was a high or a low tax burden, support our hypothesized effects. With respect to Fairness Perception by all participants, we find a highly significant decrease in Fairness Perception of

disadvantageously taxed subjects following violations of distributive and procedural justice. Fairness Perception decreases significantly when comparing *Random High* to *Control High* as well as *Discriminatory High* to *Random High* (Hypothesis 1a and 1b). With respect to advantageously taxed subjects, we can reject Hypothesis 1c of no difference in Fairness Perception following random or discriminatory advantages. Taken together, our results support a weak decrease in fairness evaluations when violations of distributive justice result in advantages, and a strong decrease in fairness evaluations following violations of procedural justice. We find a marginally significant decrease in Fairness Perception when comparing treatment groups *Random Low* and *Control Low*, a significant decrease in Fairness Perception when comparing *Discriminatory Low* to *Random Low* and a highly significant decrease in Fairness Perception comparing *Discriminatory Low* to *Control Low*.

Furthermore, results support strong gender differences in fairness perception by treatment. Male Fairness Perception decreases in case of violations of distributive justice (*Random*) and further decreases in case of additional violations of procedural justice (*Discriminatory*), regardless of their own personal outcome. Fairness Perceptions by Female Participants on the other hand rather change dependent on the personal outcome of the individual subject with Fairness Perceptions dropping in case of facing a high tax rate. The drop in Fairness Perception by female participants more than doubles if they personally face a high tax rate while knowing that others are taxed at a low rate (*Random High* and *Discriminatory High*) as compared to universally applied tax rates. We will further analyze this link within the next section (Table 3 and Table 4). These results regarding gender differences in fairness evaluations are in line with Gilligan's theory of women employing more relative and flexible fairness criteria. Furthermore evidence by Rodriguez-Lara (2015) regarding a dictator game with production suggests that women are indeed more sensitive towards their relative outcome position compared to their counterpart while men are not. During their experiment women's choice of fair allocation was driven by what was most beneficial to themselves while men's allocation decisions did not differ depending on being in an advantageous or disadvantageous position.

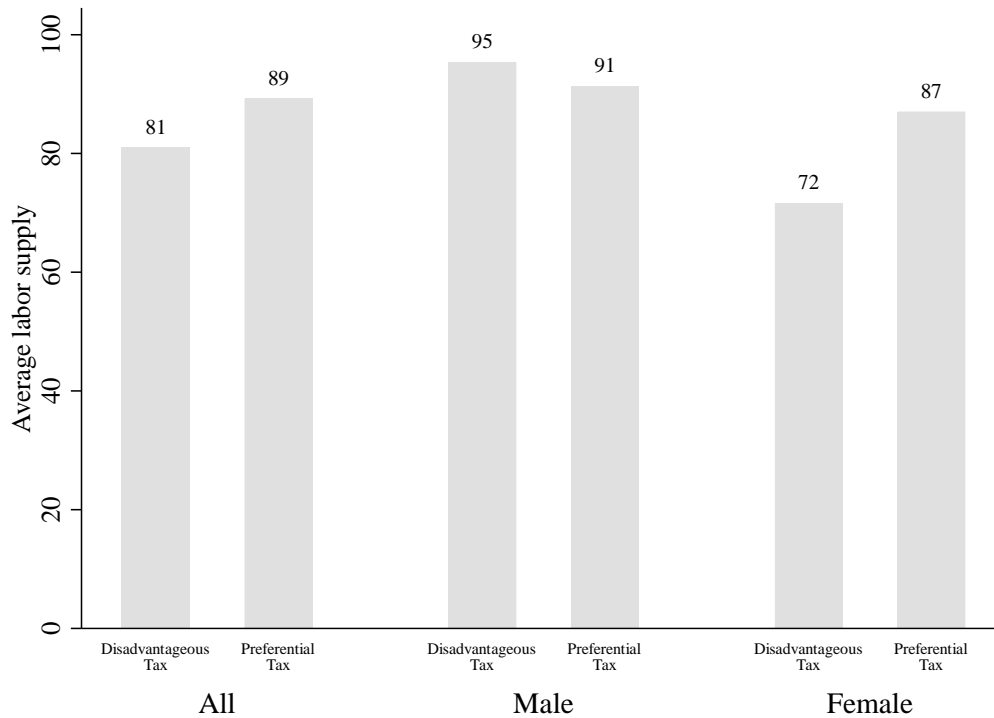
### 4.1.2. Fairness Perceptions and Labor Supply



**Figure 5.** *Fairness Perception and Labor Supply (All participants)*

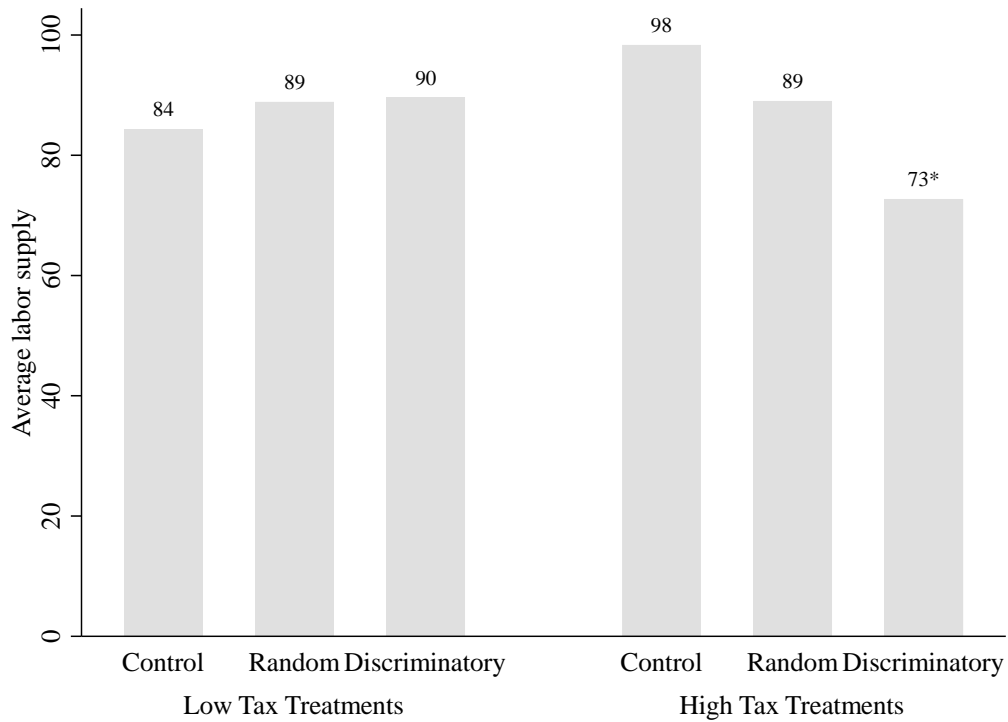
With respect to the hypothesized positive effect of perceived fairness on labor supply decisions (Hypothesis 2a), we first analyze differences in labor supply with respect to the integrated variable Fairness Perception of the experimental tax system. Figure 5 shows the average labor supply dependent on whether the tax system was perceived as Fair (Fairness Perception of 5 or higher) or not for all, male, and female participants separately. Regarding all participants we find a significant increase in labor supply if the tax system is perceived to be fair. Separating labor supply responses by male and female participants indicates that the overall association is driven by male participants.

### 4.1.3. Treatment Effects on Labor Supply



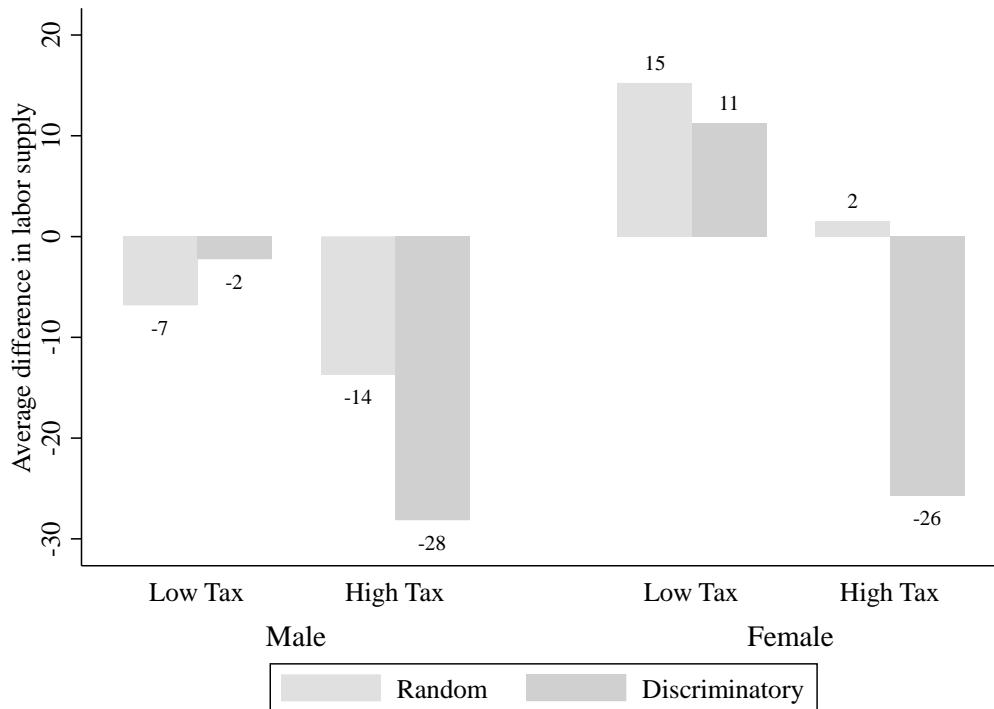
**Figure 6.** *Disadvantageous vs. Preferential Treatments and Labor Supply*

While we are focusing on the effects of our violations of distributive and procedural justice on fairness perceptions and subsequently the relation between fairness perceptions and labor supply, we also want to analyze the direct effect our differing tax regimes (treatments *Random* and *Discriminatory*) on labor supply. We again start our evaluation by first comparing the combined treatment groups *Disadvantageous Tax* and *Preferential Tax* in order to be able to compare labor supply dependent on the outcome of inequality to participant's personal advantage or disadvantage. Average labor supply in the case of *Disadvantageous* and *Preferential Tax* for all, male, and female participants are shown in Figure 6. Evaluations based on the combined treatments support the previously noted trends of differing fairness perceptions and differing labor supply responses by male and female participants. Male labor supply appears not to be driven by their own advantage but is rather steady within inequality. Female labor supply on the other hand sharply increases when female participants benefit from a low tax rate compared to their fellow participants.



**Figure 7. Treatments and Labor Supply**

Results for average labor supply by all six treatments are shown in Figure 7. Individual labor supply is lower under discriminatory high taxation compared to universal high taxation. This difference is marginally significant based on the number of contracted tasks. Among those groups taxed at a low tax rate, average labor supply is the highest in the *Discriminatory Low* treatment. However, the underlying difference between a discriminatory and a randomly applied high tax rate remains insignificant.



**Figure 8.** *Treatments and Labor Supply for Male and Female Participants*

We further investigate labor supply reactions by male and female participants in each of the six treatments. Average labor supply by gender in each treatment is therefore shown in Figure 8. Again the data provides evidence of male and female participants strongly differing in their reactions towards inequalities in taxation. Several trends can be identified from the graph. When comparing the low tax treatments, male labor supply remains approximately steady despite the different determination procedures of the tax rate. Among the inequality treatments when male participants are taxed to their advantage, male labor supply shows a slight (statistically insignificant) decrease in the case of randomly applied tax rates and female discrimination. On the other hand, comparing the isolated effect of the tax rate on male labor supply (*Control Low* versus *Control High*), a strong increase in male labor supply in line with an income effect of taxation is visible. When comparing male reactions to the different violations of justice in the high tax treatments we find growing declines in male labor supply. Male labor supply is drastically lower when men face a high tax rate due to their gender (*Discriminatory High*) compared to a universally high tax rate (*Control High*).

Labor supply by female participants on the other hand slightly increases in inequality when comparing the low tax treatments. Facing low tax rates due to random luck (*Random Low*) or due to male discrimination (*Discriminatory Low*), appears to motivate female subjects to work more. If generalizable, this effect would additionally increase female labor supply in a gender-based taxation

where the male labor force is discriminated, over and above the labor supply elasticity effect (see section 2). However, when drawing conclusions about optimal taxation caution is required. The strong reactions to a) changes in universally applied tax rates from low to high and b) inequality in the high tax treatments by male participants in our sample do neither support lower labor supply elasticities of men nor steady labor supply by men when switching from a universal tax system to one where men are discriminated. Finally, when comparing female labor supply reactions to the different inequality scenarios where female participants face a high tax rate, we also find evidence for a pronounced decrease in female labor supply in case of female discrimination. Overall, we cautiously interpret our results as negative labor supply effects of tax inequality creating for the disadvantaged party. Even more important, this result does not only hold if this party is female but the effect is even stronger if it is male.

Overall our results regarding the effects of violations of distributive and procedural justice on labor supply have recently been confirmed by an independent experimental study regarding discriminatory wages. Gagnon et al. (2020) study the effect of randomly applied wages in comparison to gender discriminatory wage differences on labor supply by workers on an online labor platform. They also find a strong negative effect of gender discriminatory wages on labor supply of disadvantageously paid subjects. Parallel to our results randomly applied differential wages result in weaker declines of labor supply for low paid workers, while advantaged workers do not vary labor supply significantly. Furthermore their results show comparable gender differences in labor supply reactions. However, Gagnon et al. (2020) do not capture fairness perception regarding their experimental payment schemes, which limits comparability in that regard. We will analyse our findings regarding treatment and gender effects on fairness perceptions as well as fairness effects on labor supply based on descriptive statistics further within the next section Multivariate Analysis.

#### **4.2. Multivariate Analysis**

We argue that our treatments affect the latent variable *Fairness* and that this variable as well as the tax rate can drive labor supply. In order to test our hypotheses, we construct a structural equation model using SmartPLS 3 (Ringle et al., 2015). We employ Partial Least Squares Structural Equation Modeling in order to estimate our latent variable *Fairness* and its subsequent effect on labor supply. Our model of the construct *Fairness* is a reflective measurement model including the four factor indicators General Fairness, Personal Fairness, Procedural Fairness and Equality. Results of our model estimation are shown in Table 2-Table 4.

First we evaluate our measurement model of *Fairness*.<sup>10</sup> Based on common criteria, our construct of *Fairness* is reliable as both Cronbach's Alpha (0.85) and Composite Reliability (0.90) are greater than 0.7 with Composite Reliability below 0.95. Indicator reliability is also satisfied as all outer loadings are highly significant and greater than 0.708. Further, convergent validity is established as our construct of *Fairness* explains more than 50% of the underlying indicator variability (Average Variance Extracted equals 0.69). Finally, our construct of *Fairness* is distinct from all other constructs in the model (discriminant validity is achieved based evaluation of the Hetrotrait-Monotrait Ratio).<sup>11</sup>

**Table 2.** *Structural Equation Model (All participants)*

	(1) Fairness	(2) Labor Supply	(3) Labor Supply Total Indirect Effects
Discriminatory Tax	-0.460*** (0.086)		-0.075* (0.039)
Random Tax	-0.249*** (0.080)		-0.041* (0.023)
High Tax	-0.272*** (0.072)		-0.044* (0.025)
High Tax × Discriminatory	-0.087 (0.079)		-0.014 (0.017)
High Tax × Random	-0.092 (0.066)		-0.015 (0.014)
Fairness		0.162** (0.080)	
High Tax		0.027 (0.076)	
Pre-Treatment Motivation		0.179*** (0.066)	
Observations	179	179	179
R-Square	0.241	0.056	
R-Square Adjusted	0.219	0.040	

Note: Standard errors in parentheses. Significance levels are based on Basic Bootstrapping of 1.000 sub-samples. Confidence Interval Method: Bias-Corrected and Accelerated Bootstrap, Two Tailed Test.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Results from the estimation of the structural model for all participants are shown in Table 2. Again, we find strong support of a negative effect of violations of distributive (Random Tax Rate) and procedural justice (Discriminatory Tax Rate) on fairness perceptions. Further, we find a highly

<sup>10</sup> Evaluation based on untabulated results.

<sup>11</sup> Evaluation criteria following Hair et al., 2017.



significant negative effect of facing a high tax rate (High Tax) on Fairness, regardless of being treated unequally as compared to others. This effect is in line with findings based on descriptive statistics. Overall fairness ratings are lower on average for all high taxed subjects, especially in case of female subjects. Further, the strong baseline effect of a high tax rate is in line with stronger declines in fairness perceptions when personally facing a disadvantageous taxation as compared to a preferential taxation, an effect that again is more pronounced in case of female participants (see Figure 4). Also, the negative coefficients for the moderating effect of personally being taxed at a high rate when the tax system includes inequality (High Tax  $\times$  Random and High Tax  $\times$  Discriminatory), are in line with stronger declines in fairness perception when subjects are treated disadvantageously. However, moderating effects remain insignificant. Further, our results support the hypothesized positive effect of Fairness on labor supply (Hypothesis 2a). As participants showed great variation in their motivation to earn money during the experiment (Pre-Treatment Motivation), we control for this in our model of labor supply outcomes. We find subjects motivation to earn money during the experiment to have a highly significant, strong positive effect on their resulting labor supply decisions. We find marginally significant indirect effects of being taxed at a high rate (High Tax), facing violations of distributive justice (Random Tax) and facing violations of both distributive as well as procedural justice (Discriminatory Tax) on labor supply.

In order to analyze previously discussed differences between fairness perceptions and resulting labor supply decisions by male and female participants, we estimate our model for male and female subjects separately. Table 3 and Table 4 show the respective results. First, regarding the measurement model, our construct of Fairness remains reliable and valid with respect to the above mentioned criteria.

**Table 3. Structural Equation Model (Male participants)**

	(1) Fairness	(2) Labor Supply	(3) Labor Supply Total Indirect Effects
Discriminatory Tax	-0.630*** (0.104)		-0.157** (0.070)
Random Tax	-0.224** (0.110)		-0.056 (0.038)
High Tax	-0.084 (0.096)		-0.021 (0.028)
High Tax × Discriminatory	-0.026 (0.099)		-0.007 (0.028)
High Tax × Random	-0.019 (0.094)		-0.005 (0.026)
Fairness		0.250** (0.106)	
High Tax		0.111 (0.107)	
Pre-Treatment Motivation		0.239*** (0.089)	
Observations	82	82	82
R-Square	0.320	0.140	
R-Square Adjusted	0.275	0.107	

Note: Standard errors in parentheses. Significance levels are based on Basic Bootstrapping of 1.000 sub-samples. Confidence Interval Method: Bias-Corrected and Accelerated Bootstrap, Two Tailed Test.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Regarding the estimation results for male participants (Table 3), all results are in line with our findings based on descriptive statistics. We find a significant negative effect of violations of distributive justice (Random Tax) on fairness perception and a much stronger, highly significant effect of additional violations of procedural justice (Discriminatory Tax) on Fairness. Furthermore, personally facing a high tax rate has no significant effect on fairness perceptions by male participants. The positive effect of Fairness on labor supply strengthens for male participants. With respect to indirect effects, we find evidence of a significant negative effect of facing a Discriminatory Tax on labor supply by male participants, while the indirect effects of facing mere violations of distributive justice (Random Tax) or a high tax rate (High Tax) on labor supply remain insignificant. These results further support that male subjects are especially sensitive towards violations of procedural justice.

**Table 4. Structural Equation Model (Female participants)**

	(1) Fairness	(2) Labor Supply	(3) Labor Supply Total Indirect Effects
Discriminatory Tax	-0.260* (0.135)		-0.028 (0.039)
Random Tax	-0.230** (0.113)		-0.025 (0.035)
High Tax	-0.465*** (0.083)		-0.051 (0.064)
High Tax × Discriminatory	-0.165 (0.099)		-0.018 (0.030)
High Tax × Random	-0.129 (0.086)		-0.014 (0.023)
Fairness		0.109 (0.133)	
High Tax		-0.035 (0.120)	
Pre-Treatment Motivation		0.144 (0.089)	
Observations	97	97	97
R-Square	0.305	0.031	
R-Square Adjusted	0.267	0.000	

Note: Standard errors in parentheses. Significance levels are based on Basic Bootstrapping of 1.000 sub-samples. Confidence Interval Method: Bias-Corrected and Accelerated Bootstrap, Two Tailed Test.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Regarding the estimation results for female participants (Table 4), again all results are in line with our findings based on descriptive statistics. Fairness perception by female subjects is strongly influenced by them personally facing a high tax rate. Fairness perception by female participants appears to be driven by distributive justice and moreover there personal outcome, with the effect of random taxation and discriminatory taxation nearly being equal in size. Also, only the effect of facing pure violations of distributive justice has a significant effect on fairness perceptions by female participants. In line with our analysis of descriptive statistics, we also do not find Fairness to have a significant effect on labor supply for female participants. Further, none of the indirect effects on labor supply are significant regarding female participants.

Taken together, the separate analysis of male and female participants offers strong support for gender driven differences in both perceptions of justice violations as well as the reaction towards these. Fairness perceptions in reaction to violations of distributive and procedural justice of taxation as well

as labor supply responses with respect to fairness differ greatly between male and female participants.

### **4.3. Robustness and Discussion**

Despite the strong prior evidence on gender differences in preferences and decision making, we test whether our results might be driven by any other participant characteristic than mere being male or female. First, we find some further differences in personal characteristics of male and female participants. Women in the sample are significantly younger and study in lower semesters than male participants. A higher proportion of the male participants is studying at the School of Business & Economics. Women in the sample also have less job experience, less disposable income and are more interested in politics. They also state to have lower Tax Expertise. Nevertheless, regarding each of these characteristics we do not find a significant influence of any of the characteristics on any of our measures of labor supply or fairness perception. We also fail at finding the same differences in fairness perception and labor supply for gender to be present when dividing the sample by any other characteristic. Here we put a special focus on two alternative explanations, namely differences in preferences for equality and experiences regarding prior discrimination. With respect to preferences for equality, the distribution within the sample contradicts our findings with female participants actually being slightly more aheadness averse than male participants. As aheadness aversion should increase perceived unfairness of advantageous inequality this finding would rather weaken our results than causing them. With respect to prior experiences of discrimination, we do find that women in our sample have a lot more experience with gender discrimination. Nevertheless, these women rather accept inequality due to violations of justice more easily and show less deviation in their fairness perception according to their personal outcome. Again, prior discrimination appears to have weakened rather than caused our results. Furthermore, including additional control variables into our analysis does not change our results.

In order to ensure that our results are robust towards the estimation procedure applied in the multivariate analysis, we replicate our structural equation model using simple Tobit regression models. Results are shown in Appendix 3 (Table 5-Table 7) and Appendix 4 (Table 8-Table 10). In addition to regarding fairness perception based on our integrated measure Fairness Perception (simple mean of General Fairness, Personal Fairness, Procedural Fairness and Equality), we hereby also test treatment effects on the distinct domains of fairness perception. Regarding results for all participants we can confirm a highly significant negative effect of discriminatory tax rates on our simple mean measure of Fairness Perception, as well as all single fairness categories despite Personal Fairness. Random taxation, however, has only a marginally significant negative effect on General Fairness and Equality. Based on regression results the effect of facing a high tax rate and the additional effect of facing a high

tax rate due to discrimination appears to be driving perceptions of Personal Fairness.

Results for male participants regarding treatment effects on fairness perception, strongly confirm that male fairness perception is negatively affected by discrimination in taxation. Therefore, we can conclude that male fairness perception is especially sensitive to violations of procedural justice, with no bias based on the individual outcome. However, female fairness perception is rather responsive in the domain of Personal Fairness, with Personal Fairness being driven by the personal outcome of facing a high tax rate. Again these results support strong differences in Gender specific reactions towards violations of justice.

Regarding the effect of fairness perception on labor supply, we find a significant positive effect of all fairness measures except of procedural fairness on when considering the whole sample. Results for male participants confirm that primarily men show positive labor supply reactions towards perceived fairness of the tax system. However, most interestingly, male participants do not show significant positive labor supply reactions in response to perceived Personal Fairness, while the single category analysis reveals that female labor supply appears to be driven by Personal Fairness.

Overall, our robustness tests confirm our findings, especially with regard to strong gender differences in fairness perception of violations of distributive and procedural justice. While the lack of significant effects of fairness on labor supply of women might be considered good news regarding existing inequalities in taxation, such as negative incentives for secondary earners, one has to be cautious in jumping to conclusions. First, the additional analysis indicates that female labor supply does react towards perceived Personal Fairness, which again is negatively affected by women personally facing high taxes and even declines further when others are facing lower tax burdens. Second, male reactions towards these inequalities potentially lead to welfare losses due to decreasing labor supply by the male workforce when the tax system violates procedural justice. And, at last, the implementation of gender-based taxation in order to increase female labor market participation is very likely to also lead to strong negative effects in male labor supply based on our results.

## **5. Conclusion**

We discuss the effect of violations of distributive and procedural justice in taxation on fairness perception and labor supply. By manipulating the fairness of both the outcome of taxation as well as the determination procedure in a controlled laboratory experiment, we provide evidence of a strong negative effect of random and discriminatory taxation on fairness perception.

We further provide evidence of strong gender differences in fairness perception regarding distributive and procedural justice. While male fairness perception is especially sensitive towards violations of

procedural justice, female participants rather change their fairness perception based on their own outcome of the tax allocation procedure.

Regarding labor supply changes in reaction to perceived fairness of the tax system, again, male and female participants do not appear to be on the same side. While we do provide evidence of a strong positive effect of perceived fairness on labor supply regarding our whole labor market population, the separate analysis of male and female reactions reveals that only men show significant positive reactions towards perceived fairness. Labor supply by female participants on the other hand cannot be explained with fairness perceptions.

Taken together, we can conclude that our male participants considered both outcome inequality as well as procedural unfairness as unfair, independent of being on the winning or losing side, and adjusted their labor supply according to their fairness perceptions. On the contrary, our female participants based their fairness perceptions more on their personal outcome and did not adjust their labor supply according to their fairness perceptions.

These findings have important implications for both existing inequalities within tax policies as well as potential reforms towards gender-based taxation in order to increase female labor market participation. To the best of our knowledge, we are the first to identify the existing gender difference in both fairness perception and resulting consequences in real decisions with regard to tax outcome equality and procedural justice. Being aware of potential shortcomings of the presented results due to the small number of observations, this identification constitutes an important basis for future research.

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# Appendix

## Appendix 1. Treatment information

### Treatment information *Control Low*

Information about the offered employment contract

At this point, you have the possibility to determine the favored amount of work you want to carry out. The employment contract refers to the number of tables you have to work on. You can determine the number of tables in a range from 0 (rejection of the labor contract) to 200 (maximum work effort). The payment depends on the number of correctly counted tables. You receive a gross salary of 15 cents per **correctly** processed table, which corresponds to an expected hourly gross salary of about 13 Euros on average.

The gross salary is subject to a **general** tax rate of **20%**. The obtained tax contributions will be refunded to the community by donating them to the library of the School of Business & Economics.

Note: If you work on less tables than contractually agreed upon, you violate your employment contract, which leads to the total cancellation of your payment. In this case, you will only receive the fixed show up fee of 3 Euros. Accordingly, the tax payment will equal 0 Euros.

Please decide now how many tables you want to process and type the corresponding number in the provided field below. Begin your task by clicking on „Start Working Period“.

Number of tables that you want to process:

### Treatment information *Control High*

Information about the offered employment contract

At this point, you have the possibility to determine the favored amount of work you want to carry out. The employment contract refers to the number of tables you have to work on. You can determine the number of tables in a range from 0 (rejection of the labor contract) to 200 (maximum work effort). The payment depends on the number of correctly counted tables. You receive a gross salary of 15 cents per **correctly** processed table, which corresponds to an expected hourly gross salary of about 13 Euros on average.

The gross salary is subject to a **general** tax rate of **40%**. The obtained tax contributions will be refunded to the community by donating them to the library of the School of Business & Economics.

Note: If you work on less tables than contractually agreed upon, you violate your employment contract, which leads to the total cancellation of your payment. In this case, you will only receive the fixed show up fee of 3 Euros. Accordingly, the tax payment will equal 0 Euros.

Please decide now how many tables you want to process and type the corresponding number in the provided field below. Begin your task by clicking on „Start Working Period“.

Number of tables that you want to process:

## **Treatment information *Random Low and Random High***

### Information about the offered employment contract

At this point, you have the possibility to determine the favored amount of work you want to carry out. The employment contract refers to the number of tables you have to work on. You can determine the number of tables in a range from 0 (rejection of the labor contract) to 200 (maximum work effort). The payment depends on the number of correctly counted tables. You receive a gross salary of 15 cents per **correctly** processed table, which corresponds to an expected hourly gross salary of about 13 Euros on average.

The gross salary is liable for taxation. The applicable tax rate depends on the color of the table tennis ball which you drew at the beginning of the experiment. The applicable tax rate is **20% for participants with an orange ball** and **40% for participants with a white ball**. The obtained tax contributions will be refunded to the community by donating them to the library of the School of Business & Economics.

Note: If you work on less tables than contractually agreed upon, you violate your employment contract, which leads to the total cancellation of your payment. In this case, you will only receive the fixed show up fee of 3 Euros. Accordingly, the tax payment will equal 0 Euros.

Please decide now how many tables you want to process and type the corresponding number in the provided field below. Begin your task by clicking on „Start Working Period“.

Number of tables that you want to process:

### **Treatment information *Discriminatory Low and Discriminatory High* (female discrimination)**

Information about the offered employment contract

At this point, you have the possibility to determine the favored amount of work you want to carry out. The employment contract refers to the number of tables you have to work on. You can determine the number of tables in a range from 0 (rejection of the labor contract) to 200 (maximum work effort). The payment depends on the number of correctly counted tables. You receive a gross salary of 15 cents per **correctly** processed table, which corresponds to an expected hourly gross salary of about 13 Euros on average.

The gross salary is liable for taxation. The applicable tax rate depends on your gender. The applicable tax rate is **20% for male** and **40% for female participants**. The obtained tax contributions will be refunded to the community by donating them to the library of the School of Business & Economics.

Note: If you work on less tables than contractually agreed upon, you violate your employment contract, which leads to the total cancellation of your payment. In this case, you will only receive the fixed show up fee of 3 Euros. Accordingly, the tax payment will equal 0 Euros.

Please decide now how many tables you want to process and type the corresponding number in the provided field below. Begin your task by clicking on „Start Working Period“.

Number of tables that you want to process:

### **Treatment information *Discriminatory Low and Discriminatory High* (male discrimination)**

Information about the offered employment contract

At this point, you have the possibility to determine the favored amount of work you want to carry out. The employment contract refers to the number of tables you have to work on. You can determine the number of tables in a range from 0 (rejection of the labor contract) to 200 (maximum work effort). The payment depends on the number of correctly counted tables. You receive a gross salary of 15 cents per **correctly** processed table, which corresponds to an expected hourly gross salary of about 13 Euros on average.

The gross salary is liable for taxation. The applicable tax rate depends on your gender. The applicable tax rate is **20% for female** and **40% for male participants**. The obtained tax contributions will be refunded to the community by donating them to the library of the School of Business & Economics.

Note: If you work on less tables than contractually agreed upon, you violate your employment contract, which leads to the total cancellation of your payment. In this case, you will only receive the fixed show up fee of 3 Euros. Accordingly, the tax payment will equal 0 Euros.

Please decide now how many tables you want to process and type the corresponding number in the provided field below. Begin your task by clicking on „Start Working Period“.

Number of tables that you want to process:

## Appendix 2. Variable description

Variable	Description
Labor Supply	Number of tasks entered in the labor contract
High Tax	Dummy variable equal to 1 if subject is taxed at the high rate (40%)
Random Tax	Dummy variable equal to 1 if subject is in either <i>Random Low</i> or <i>Random High</i> treatment
Discriminatory Tax	Dummy variable equal to 1 if subject is in either <i>Discriminatory Low</i> or <i>Discriminatory High</i> treatment
High Tax × Random	Interaction variable of High Tax and Random
High Tax × Discriminatory	Interaction variable of High Tax and Discriminatory
General Fairness	Fairness rating on a scale from 1 to 7 concerning the statement “The tax system applied in the experiment was fair in general”
Personal Fairness	Fairness rating on a scale from 1 to 7 concerning the statement “The tax system applied in the experiment was fair for me personal”
Procedural Fairness	Fairness rating on a scale from 1 to 7 concerning the statement “The rules applied to determine the applied tax rate in the experiment were fair”
Equality	Fairness rating on a scale from 1 to 7 concerning the statement “All taxpayers were treated equally by the experimental tax authorities”
Fairness Perception	Simple mean of the values of General Fairness, Personal Fairness, Procedural Fairness and Equality by subject
Fair	Dummy variable equal to 1 if the value of Fairness Perception is 5 or higher
Fairness	Latent variable of fairness perception in structural equation model. Reflective measurement based on the factor indicators General Fairness, Personal Fairness, Procedural Fairness and Equality
Female	Dummy variable equal to 1 if participant is female
Labor Time	Time spent working on the tasks in minutes
Aheadnessaverse	Dummy variable equal to one if subject chooses egalitarian outcomes rather than being ahead
Behindnessaverse	Dummy variable equal to one if subject chooses egalitarian outcome rather than being behind
Egalitarian	Dummy variable equal to one if subject chooses egalitarian outcome over being ahead or behind
Experienced Discrimination	Dummy variable equal to one if participant has been discriminated in his private and/or professional live any time prior to the experiment

### Appendix 3. Treatment effects on Fairness Perception

*Table 5. Fairness Perception by Treatments (All participants)*

	(1) Fairness Perception	(2) General Fairness	(3) Personal Fairness	(4) Procedural Fairness	(5) Equality
Discriminatory Tax	-1.462*** (0.443)	-2.011*** (0.652)	-0.521 (0.632)	-2.192*** (0.739)	-3.789*** (1.031)
Random Tax	-0.584 (0.452)	-1.089* (0.658)	0.522 (0.645)	-0.861 (0.743)	-1.813* (1.007)
High Tax	-0.492 (0.450)	-0.814 (0.649)	-1.370** (0.641)	-0.763 (0.733)	0.707 (0.991)
High Tax × Discriminatory	-1.003 (0.645)	-0.843 (0.953)	-2.231** (0.942)	-0.159 (1.061)	-1.649 (1.466)
High Tax × Random	-0.742 (0.638)	-0.233 (0.928)	-1.246 (0.916)	-0.017 (1.044)	-2.790* (1.438)
Constant	4.546*** (0.311)	4.429*** (0.447)	4.771*** (0.441)	4.638*** (0.509)	4.717*** (0.688)
Observations	179	179	179	179	179
Prob > chi2	0.0000	0.0000	0.0000	0.0007	0.0000
Pseudo R-squared	0.0712	0.0481	0.0765	0.0302	0.0677

Note: All estimations are Tobit regression models censored at one and seven. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 6. Fairness Perception by Treatments (Male Participants)**

	(1) Fairness Perception	(2) General Fairness	(3) Personal Fairness	(4) Procedural Fairness	(5) Equality
Discriminatory Tax	-2.305*** (0.588)	-3.620*** (0.994)	-1.836** (0.869)	-3.269*** (1.071)	-5.484*** (1.655)
Random Tax	-0.843 (0.620)	-1.200 (1.001)	-0.148 (0.918)	-1.357 (1.097)	-2.460 (1.604)
High Tax	-0.232 (0.618)	-0.292 (0.984)	-0.926 (0.911)	-0.692 (1.067)	0.886 (1.539)
High Tax × Discriminatory	-0.571 (0.872)	-0.201 (1.444)	-1.906 (1.317)	0.518 (1.543)	0.154 (2.248)
High Tax × Random	-0.033 (0.938)	-0.083 (1.510)	1.174 (1.391)	0.909 (1.640)	-2.982 (2.440)
Constant	4.385*** (0.424)	4.350*** (0.677)	4.858*** (0.628)	4.114*** (0.736)	4.646*** (1.063)
Observations	82	82	82	82	82
Prob > chi2	0.0000	0.0001	0.0000	0.0079	0.0002
Pseudo R-squared	0.1042	0.0821	0.0929	0.0511	0.0861

Note: All estimations are Tobit regression models censored at one and seven. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



**Table 7. Fairness Perception by Treatments (Female Participants)**

	(1) Fairness Perception	(2) General Fairness	(3) Personal Fairness	(4) Procedural Fairness	(5) Equality
Discriminatory Tax	-0.387 (0.611)	-0.347 (0.816)	1.012 (0.806)	-0.934 (0.962)	-2.195* (1.319)
Random Tax	-0.361 (0.596)	-0.999 (0.800)	1.065 (0.783)	-0.492 (0.937)	-1.379 (1.262)
High Tax	-0.721 (0.593)	-1.251 (0.792)	-1.719** (0.777)	-0.815 (0.931)	0.512 (1.260)
High Tax × Discriminatory	-1.639* (0.869)	-1.597 (1.179)	-2.701** (1.169)	-0.983 (1.364)	-3.310* (1.919)
High Tax × Random	-1.103 (0.816)	-0.111 (1.095)	-2.265** (1.083)	-0.741 (1.278)	-2.774 (1.753)
Constant	4.687*** (0.413)	4.500*** (0.547)	4.688*** (0.534)	5.089*** (0.651)	4.815*** (0.880)
Observations	97	97	97	97	97
Prob > chi2	0.0000	0.0010	0.0000	0.0402	0.0002
Pseudo R-squared	0.0828	0.0540	0.1275	0.0296	0.0660

Note: All estimations are Tobit regression models censored at one and seven. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### Appendix 4. Effects of Fairness Perception on Labor Supply

*Table 8. Labor Supply and Fairness Perception*

	(1)	(2)	(3)	(4)	(5)
	Labor Supply	Labor Supply	Labor Supply	Labor Supply	Labor Supply
Fairness Perception	6.870** (3.082)				
General Fairness		5.873** (2.700)			
Personal Fairness			5.859** (2.769)		
Procedural Fairness				3.443 (2.529)	
Equality					3.896* (2.248)
High Tax	3.535 (10.372)	2.306 (10.257)	8.068 (11.190)	-0.590 (10.191)	-1.184 (10.098)
Pre-Treatment Motivation	8.056** (3.094)	7.941** (3.094)	8.432*** (3.103)	7.930** (3.117)	7.896** (3.110)
Constant	24.728 (20.652)	30.699 (19.317)	22.191 (21.790)	38.780** (19.345)	38.752** (18.393)
Observations	179	179	179	179	179
Prob > chi2	0.0101	0.0113	0.0127	0.0413	0.0246
Pseudo R-squared	0.0063	0.0061	0.0060	0.0046	0.0052

Note: All estimations are Tobit regression models censored at zero and 200. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 9. Labor Supply and Fairness Perception (Male Participants)**

	(1)	(2)	(3)	(4)	(5)
	Labor Supply	Labor Supply	Labor Supply	Labor Supply	Labor Supply
Fairness Perception	11.742** (4.987)				
General Fairness		9.196** (4.173)			
Personal Fairness			3.698 (4.184)		
Procedural Fairness				8.715** (4.254)	
Equality					8.455** (3.619)
High Tax	18.157 (16.227)	16.264 (16.272)	18.866 (17.124)	16.908 (16.332)	13.242 (16.227)
Pre-Treatment Motivation	12.501** (4.858)	12.721** (4.878)	13.564*** (4.978)	12.399** (4.909)	12.732** (4.859)
Constant	-2.267 (29.491)	7.245 (28.107)	16.227 (31.284)	10.047 (27.949)	10.908 (27.245)
Observations	82	82	82	82	82
Prob > chi2	0.0037	0.0050	0.0314	0.0067	0.0038
Pseudo R-squared	0.0169	0.0161	0.0111	0.0153	0.0168

Note: All estimations are Tobit regression models censored at zero and 200. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 10. Labor Supply and Fairness Perception (Female Participants)**

	(1)	(2)	(3)	(4)	(5)
	Labor Supply	Labor Supply	Labor Supply	Labor Supply	Labor Supply
Fairness Perception	3.349 (3.925)				
General Fairness		2.421 (3.541)			
Personal Fairness			7.627** (3.803)		
Procedural Fairness				1.308 (3.148)	
Equality					0.238 (2.745)
High Tax	-6.072 (13.284)	-7.419 (13.057)	8.186 (15.175)	-9.599 (12.446)	-10.625 (12.317)
Pre-Treatment Motivation	5.312 (3.887)	5.094 (3.869)	6.242 (3.852)	5.089 (3.899)	4.884 (3.871)
Constant	43.329 (28.851)	49.216* (26.465)	14.410 (30.785)	53.268* (26.879)	59.192** (24.151)
Observations	97	97	97	97	97
Prob > chi2	0.4112	0.4548	0.1063	0.5084	0.5406
Pseudo R-squared	0.0029	0.0026	0.0061	0.0023	0.0022

Note: All estimations are Tobit regression models censored at zero and 200. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Online Appendix

### Participant characteristics

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	N	Mean	Sd	Min	Max
Gender	179	0.54	0.50	0	1
Talent	179	-55.07	27.79	-220.7382	0
Age	179	21.79	4.29	17	52
Business & Economics	179	0.52	0.50	0	1
Semester	179	3.77	3.83	1	25
Religiosity	179	3.65	2.57	1	10
Disposable Income	179	395.04	259.97	0	1600
Time Pressure	179	0.23	0.42	0	1
Political Orientation	179	4.44	1.62	2	10
Political Interest	179	2.18	0.75	1	4
Pre-Treatment Motivation	179	4.99	1.62	1	7
Job Experience	179	0.53	0.50	0	1
Tax Expertise	179	2.72	1.47	1	7
Optimism 1	179	5.92	1.15	2	7
Optimism 2	179	5.78	1.42	1	7
Aheadness Aversion 1	179	0.80	0.40	0	1
Aheadness Aversion 2	179	0.69	0.46	0	1
Behindness Aversion 1	179	0.78	0.42	0	1
Behindness Aversion 2	179	0.71	0.46	0	1
Observations	179				

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## Variable description

Variable	Description
Labor Supply	Number of tasks entered in the labor contract
High Tax	Dummy variable equal to 1 if subject is taxed at the high rate (40%)
Random Tax	Dummy variable equal to 1 if subject is in either <i>Random Low</i> or <i>Random High</i> treatment
Discriminatory Tax	Dummy variable equal to 1 if subject is in either <i>Discriminatory Low</i> or <i>Discriminatory High</i> treatment
High Tax × Random	Interaction variable of High Tax and Random
High Tax × Discriminatory	Interaction variable of High Tax and Discriminatory
General Fairness	Fairness rating on a scale from 1 to 7 concerning the statement “The tax system applied in the experiment was fair in general”
Personal Fairness	Fairness rating on a scale from 1 to 7 concerning the statement “The tax system applied in the experiment was fair for me personal”
Procedural Fairness	Fairness rating on a scale from 1 to 7 concerning the statement “The rules applied to determine the applied tax rate in the experiment were fair”
Equality	Fairness rating on a scale from 1 to 7 concerning the statement “All taxpayers were treated equally by the experimental tax authorities”
Fairness Perception	Simple mean of the values of General Fairness, Personal Fairness, Procedural Fairness and Equality by subject
Fair	Dummy variable equal to 1 if the value of Fairness Perception is 5 or higher
Fairness	Latent variable of fairness perception in structural equation model. Reflective measurement based on the factor indicators General Fairness, Personal Fairness, Procedural Fairness and Equality
Female	Dummy variable equal to 1 if participant is female
Labor Time	Time spent working on the tasks in minutes
Aheadnessaverse	Dummy variable equal to one if both aheadness aversion 1 and aheadness aversion 2 are equal to one
Behindnessaverse	Dummy variable equal to one if both behindness aversion 1 and behindness aversion 2 are equal to one
Egalitarian	Dummy variable equal to one if all aheadness aversion 1 and 2 and behindness aversion 1 and 2 are equal to one
Experienced Discrimination	Dummy variable equal to one if participant has been discriminated in his private and/or professional live any time prior to the experiment

Pre-Treatment Motivation	Motivation to earn money during the experiment: Rating on a scale from 1 to 7 ranging from “hardly motivated” to “highly motivated” in the pre-experimental questionnaire
Change in Motivation	Change in the motivation to earn money during the experiment due to the labor contract conditions: Rating on a scale from 1 to 7 ranging from “strongly decreased” to “strongly increased” in the post-experimental questionnaire
Post-Treatment Motivation	Level of Motivation to earn money during the experiment calculated as Pre-Treatment Motivation +/- Change in Motivation
Talent	Mean time per table in the training period multiplied by minus one
Age	Age in years
Business & Economics	Dummy variable equal to 1 if participant studies at the School of Business & Economics
Semester	Number of terms the participant is currently studying in
Religiosity	Rating on a scale from 1 to 10 ranging from “not religious at all” to “very religious”
Political Orientation	Rating on a scale from 1 to 10 ranging from “left” to “right”
Political Interest	Rating on a scale from 1 to 4 ranging from “strongly interested” to “not interested at all”
Job Experience	Dummy variable equal to one if participant has experience working in a real job
Tax Expertise	Rating on scale from 1 to 7 ranging from “very bad (no tax knowledge at all)” to “very good (tax expert)”
Disposable Income	Monthly disposable income after rent and fix expenditures in Euro
Time Pressure	Dummy variable equal to 1 if participant stated that he/she has been under time pressure and had a following appointment
Optimism 1	Rating on a scale from 1 to 7 concerning the statement “I always try to make the best of the situation”
Optimism 2	Rating on a scale from 1 to 7 ranging from “half empty” to “half full” concerning the statement “A glass filled to 50% capacity with water is”
Aheadness Aversion 1	Dummy variable equal to 1 if participant chose equal payment distribution (10:10 versus 10:6)
Aheadness Aversion 2	Dummy variable equal to 1 if participant chose equal payment distribution (10:10 versus 16:4)
Behindness Aversion 1	Dummy variable equal to 1 if participant chose equal payment distribution (10:10 versus 10:18)
Behindness Aversion 2	Dummy variable equal to 1 if participant chose equal payment distribution (10:10 versus 11:19)

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