

Fiscal decentralization, income inequality and tax evasion. An experimental study.

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very preliminary version

This is a draft paper, please use only for the purposes of SIDE 2023 conference.

Abstract

This paper addresses the issue of fiscal decentralization, with the aim of verifying whether, in a tax evasion game, tax compliance varies with changes in i) the income level of taxpayers and ii) the share of tax revenue retained at the local level (where taxes were paid) rather than redistributed globally. We find that with a high level of tax revenue redistribution (with the revenue collected from wealthier taxpayers predominantly funding a global public good compared to the funding derived from poorer taxpayers), it reduces the level of tax compliance, a phenomenon (likely) linked to the role of expectations that both poorer and wealthier taxpayers have regarding the contributions of the other group.

JEL Classification: H26; H41; H71; C93; D63.

Keywords: Tax evasion; Fiscal decentralization, Public Goods Games, Income inequality.

1. Introduction

Forms of fiscal decentralization are prevalent in many economies, although there are significant variations in their specific implementation (IMF's Fiscal Decentralization Dataset 2020). Extensive evidence exists regarding the impact of fiscal decentralization on important economic and social factors, such as education and health outcomes (Diaz-Serrano and Meix-Llop, 2019; Elacqua et al., 2021; Nakatani et al., 2022), governance quality (Altunbaş & Thornton, 2012), efficiency of public service delivery (Sow & Razafimahefa, 2015), and growth and inequality (Martinez-Vazquez, 2019).

However, there is limited and conflicting evidence regarding the relationship between fiscal decentralization, tax compliance, and tax morale. For instance, Brueckner (2000) employs a theoretical model to demonstrate that corruption and tax evasion restrict the benefits of fiscal decentralization. Tolgler and Werner (2005) find that greater fiscal autonomy leads to higher tax morale. Vincent (2023) reveals that assigning taxing rights on tax administration to subnational governments decreases compliance tendencies. Güth et al. (2005), using an experiment based on a tax game and public goods games, discover that fiscal decentralization positively influences tax morale.

Insights from experimental research on multilevel public goods can also provide valuable information: although not directly related to the analysis of tax compliance in the context of fiscal decentralization, these studies examine the determinants of willingness to cooperate in local vs. supralocal public goods. They reveal a general preference for contributing to local public groups (parochialism). However, for instance, Blackwell and McKee (2003) show that when the average per capita return to society from the global public good exceeds

that of the group public good, contributions to the global good increase without reducing contributions to the group public good. Similar results are obtained by Gallier et al. (2017) in an artefactual field experiment with local group members who are citizens residing in the same area. Fellner and Lünser (2014) observe that a higher social return in the global group attracts more contributions in the short run and can be sustained if the contributions of global group members are common knowledge. Lange et al. (2020) investigate the impact of inequality in endowments and find that individuals with high endowments contribute less to both the global and local public goods compared to those with low endowments. They also note that inequality in endowments reduces contributions to the global public good. Individuals with high endowments tend to reallocate their contributions to their private accounts, while those with low endowments reallocate to their local public account.

This study aims to contribute to the existing literature by conducting an experiment that investigates the impact of income differences among groups and alternative policies for the redistribution of tax revenues on tax compliance in the presence of fiscal decentralization.

2. The Experiment

The experiment is designed as a repeated tax game, where participants make decisions in each round regarding the declaration of their income, which is subject to a fixed tax rate. Participants are divided into *multiple Local Groups (LG)* consisting of four members each, with two *LGs* forming a *Global Group (GG)*. The tax revenue collected is utilized to finance both *Local Public Goods (LPG)* and *Global Public Goods (GPG)*. Figure 1 provides a visual representation of the main setup of the experiment.

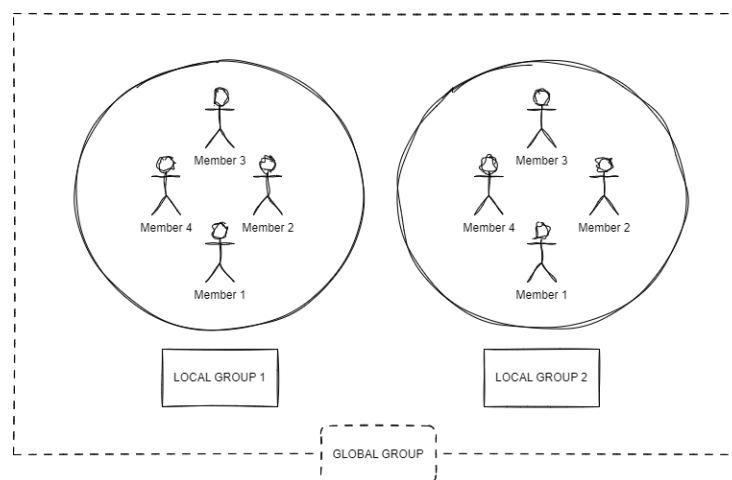


Figure 1. Local and Global groups formation

The experiment comprises of three different treatments. In the baseline condition, named *Equality*, participants are initially given an equal income and are required to make decisions regarding their level of compliance while being aware of the tax rate, audit probability, and the financial consequences in case of detected evasion (if audited and found to have contributed less than the required amount, participants must pay their full tax liability along with an additional fine). A portion of the revenue collected within the local group ($\beta=0.40$) is allocated to finance the corresponding *LPG*, which is shared among the four members of the local group. The remaining portion ($1-\beta$) represents the contribution of the same local group to the *GPG*, which will be redistributed among the eight members of the global group.

The payoff for the i -th participant in a single round is computed as follows:

$$\pi_i = E_i - C_i + \alpha_{LG} \sum_{j=1}^4 \beta \cdot C_j + \alpha_{GG} \sum_{k=1}^8 (1 - \beta) \cdot C_k - I_i \cdot (TD_i - C_i) - Y_i \cdot F$$

With

- E_i : the initial endowment (in *Equality*, the same amount for each participant, $E_i = 100$),
- C_i : the paid taxes according to the declared endowment (E_i^d) and a tax rate $t = 20\%$ ($C_i = t \cdot E_i^d$)
- α_{LG} : individual return to each *LPG*, $\alpha_{LG} = 0.40$,
- β : share of individual contribution used to finance the *LPG* ($\beta = 0.40$ for both local groups),
- α_{GG} : individual return to the *GPG*, $\alpha_{GG} = 0.40$,
- I_i : the indicator function for the occurrence of an audit,
- $(TD_i - C_i)$: tax contribution gap (given by the tax due ($TD_i = t \cdot E_i$) minus the paid taxes,
- Y_i : the indicator function for the occurrence of detected evasion,
- F : fine for having evaded the taxes (F is set equal to the tax contribution gap).

The second treatment, *Inequality*, follows the same structure as the *Equality* treatment. However, in this case, half of the local groups are assigned a high endowment ($E_i^H = 200$), while the remaining groups receive a low endowment ($E_i^l = 100$); all the other parameters remain the same.

The third treatment, *Redistribution*, builds upon the *Inequality* treatment. In this case, the proportion of the local contribution retained by each group is inversely related to the endowment of that group. Local groups with low endowments now retain a larger share of the *LPG*, which, assuming full compliance, compensates for the initial income difference. Specifically, the shares for high-income groups and low-income groups are $\beta^H = 0.10$ and $\beta^l = 0.40$, respectively.

Table 1 provides a summary of the key characteristics for each treatment.

	Equality		Inequality		Redistribution	
	Endowment	Share for LPG	Endowment	Share for LPG	Endowment	Share for LPG
Local Group 1	$E = 100$	$\beta = 0.40$	$E^l = 100$	$\beta = 0.40$	$E^l = 100$	$\beta^l = 0.40$
Local Group 2	$E = 100$	$\beta = 0.40$	$E^H = 200$	$\beta = 0.40$	$E^H = 200$	$\beta^H = 0.10$

Table 1. Experimental condition summary

Under neoclassical assumptions and assuming individual risk-neutrality, the individual dominant strategy remains the same across all treatments and groups: evasion prevails over contribution.

In the case of the *Equality* treatment, we expect an increase in tax evasion when inequality is introduced. Existing literature on public goods games suggests that income inequality reduces contributions (Hargreaves Heap et al., 2016). Similar evidence is found in experimental studies on tax evasion, where it has been observed that evasion rises when income is heterogeneous, particularly among participants with the lowest income (Engel et al., 2020). In addition, the tax evasion literature has been often found that equity concerns affect the compliance decision, but fairness concerns are, usually, related to the progressiveness of the tax system rather

than the redistribution of tax revenue (see, for instance, Spicer and Becker, 1980; Moser et al., 1995; Fortin et al., 2007, and Casal et al., 2019).

In the *Redistribution* treatment, however, we expect that the implemented redistribution mechanism will offset the negative impact of income inequality.

2.1 Experimental Procedures

The experiment was recently (May 2023) conducted at the Cognitive and Experimental Economics Laboratory (CEEL) at the University of Trento (Italy) using o-Tree (Chen et al., 2016). A total of 96 participants were recruited for three sessions (32 subjects in each treatment) through the CEEL mailing list and enrollment system. All sessions were conducted online, with participants and experimenters connected via Zoom: subjects were identified in the Zoom session with a unique alphanumeric label.

Instructions¹ were read aloud by the experimenter: it is important to underline how, before revealing to the subjects the actual interaction rule they would have been subjected to, in each session, the instructions related to each possible treatment were read. This means that all participants were aware of the interaction rules for treatments *Equality*, *Inequality*, and *Redistribution*.² Once all instructions were read, and just before the start of the first round, the subjects were informed about the treatment they were assigned to, and consequently, the actual rules.

As explained above, in each round subjects received an endowment (in ECU) and got a final (round) payoff depending on the decisions taken by the members of the LG and GG. Groups formation remained the same through all the rounds (15): the total earning was equal to the sum of the individual result in each round.³

The average payment for participants was €15.32, including a €3 show-up fee, for an average session duration of 45 min.

3. Preliminary results

Table 2 reports the average compliance rate in the 15 rounds of the experiment and Figure 2 reports the dynamics of average compliance rate.

With a cautious approach due to the limited number of independent observations available, we can observe some trends. In the *Equality* treatment, the average compliance rate appears to be lower compared to the *Inequality* treatment (please refer to Figure 3 for the boxplots depicting the distribution of the round average contribution of groups across the three treatments): a MWW test confirms this intuition ($p\text{-value} = 3.201e-08$). Furthermore, in the *Inequality* treatment, it is noticeable that both types of individuals (wealthy and less wealthy) tend to declare significantly more income compared to individuals *Equality*; with wealthier declaring less than poorer (see Figure 4; MWW $p\text{-value} = 0.000477$). However, this income disparity is not observed in the *Redistribution* treatment.

¹ Reported in Appendix A (translated from Italian).

² To avoid framing effects, in the instructions provided to the subjects, the names of the treatments were replaced with the generic names such as Scenario 1, 2, and 3.

³ The alternative of paying one round outcome at random is not viable for two reasons: on the one hand risk preferences may have an effect on compliance decisions; on the other hand the pay-one-at-random protocol is suitable for independent decisions, while paying repeatedly taxes entails intertwined choices.

Round	Equality	Inequality			Redistribution		
	All	E^l	E^H	All	E^l	E^H	
1	0.667	0.820	0.882	0.758	0.707	0.729	0.684
2	0.556	0.702	0.704	0.699	0.542	0.610	0.474
3	0.645	0.764	0.809	0.719	0.624	0.662	0.586
4	0.669	0.684	0.756	0.612	0.611	0.607	0.615
5	0.656	0.662	0.809	0.514	0.582	0.498	0.666
6	0.556	0.750	0.823	0.678	0.639	0.691	0.586
7	0.594	0.708	0.784	0.632	0.559	0.552	0.566
8	0.580	0.713	0.784	0.641	0.560	0.556	0.564
9	0.496	0.724	0.826	0.622	0.525	0.508	0.542
10	0.603	0.747	0.819	0.675	0.474	0.540	0.409
11	0.407	0.794	0.766	0.822	0.503	0.388	0.619
12	0.502	0.713	0.828	0.597	0.479	0.493	0.465
13	0.508	0.696	0.800	0.593	0.408	0.433	0.384
14	0.473	0.783	0.813	0.752	0.443	0.423	0.463
15	0.408	0.750	0.763	0.738	0.532	0.498	0.567
Mean	0.555	0.734	0.798	0.670	0.546	0.546	0.546
SD	0.09	0.04	0.04	0.08	0.08	0.10	0.09

Table 2. Average compliance rate by round and by treatment

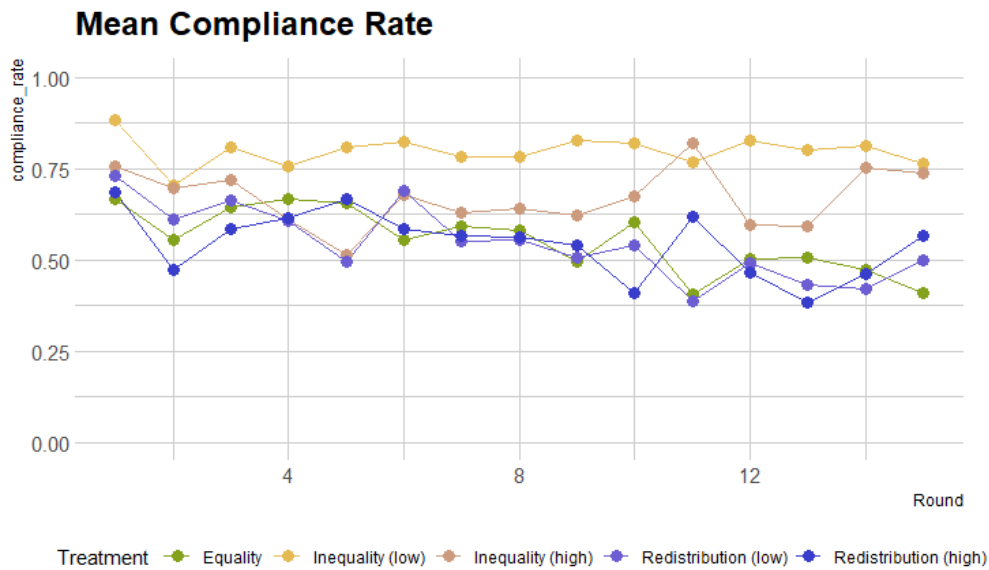


Figure 2. Dynamics of compliance rate by Treatments

So, contrary to what was hypothesized, the *Inequality* treatment appears to be the one that drives compliance to higher levels. Although this result may initially seem "puzzling," it could actually be justified by the role of expectations (both first and second order). For example, Engel et al. (2020) found that when there are income differences among taxpayers, tax compliance is influenced by the expectations that taxpayers have regarding the contributions of others (a phenomenon more pronounced for taxpayers with lower incomes)..

If this mechanism were at play in our setting, it is thus plausible to expect that the higher compliance rate in the *Inequality* treatment (when compared to our baseline *Equality*) is also fueled by the expectations that subjects with low endowment have regarding the contributions of subjects with high endowments. Perhaps the former anticipates that, since the wealthy have been fortunate to receive more, they will also contribute more.

The same reasoning may have been applied by the latter, resulting in both groups increasing their tax contributions.

Conversely, in the *Redistribution* treatment, the poorer may have anticipated a decline in compliance among the wealthier, since, for them, little of their tax revenue remains at the local level. Expectations of greater evasion by the wealthier, therefore, lead to increased evasion by the poorer as well.

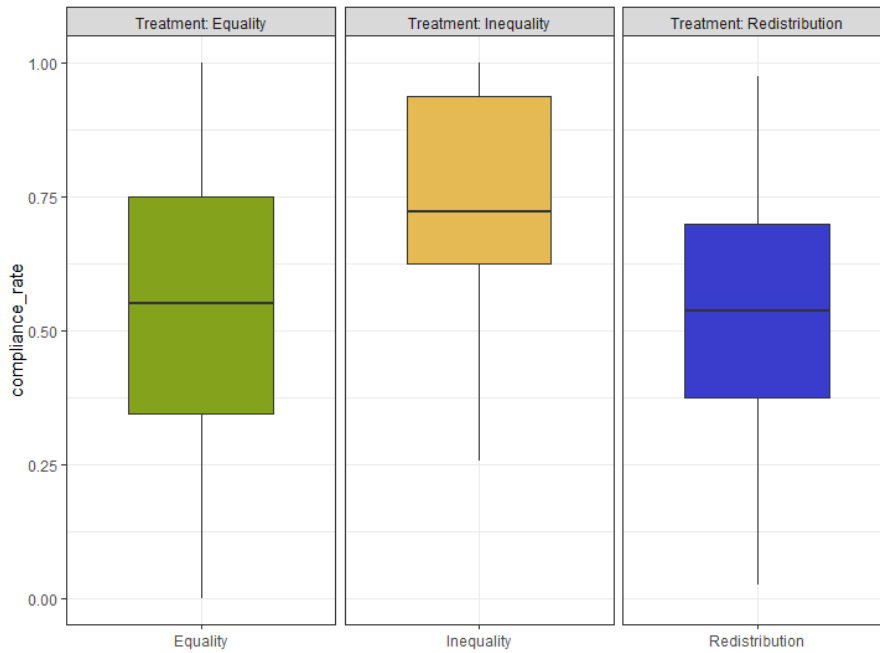


Figure 3. Distribution of groups compliance rate registered in the 15 rounds by treatment

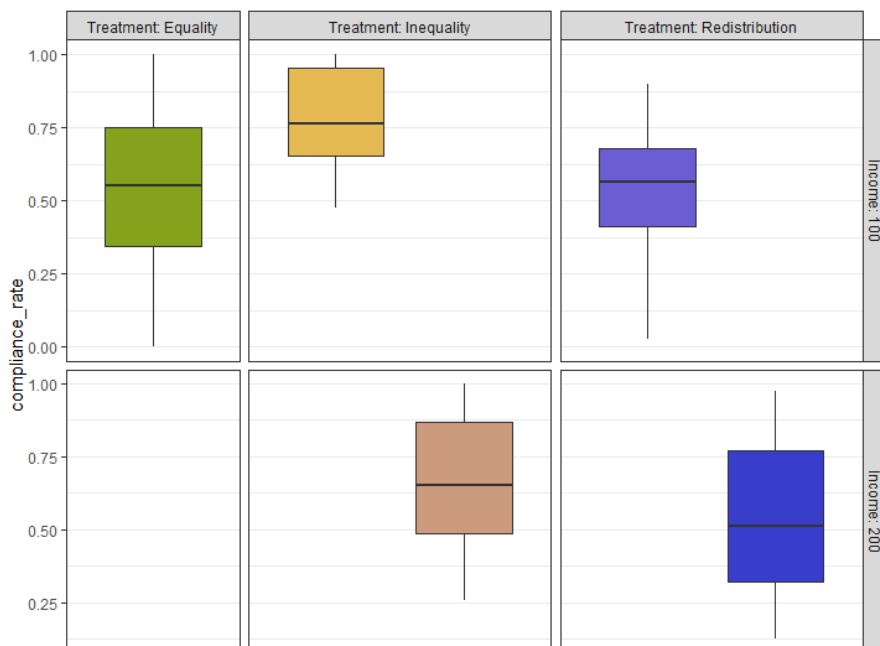


Figure 4. Distribution of groups compliance rate registered in the 15 rounds by treatment and by income

The results of the non-parametric analysis are corroborated by the regressions presented in Table 3 and Table 4. Table 3 assesses the impact on compliance driven by the presence of rich and poor taxpayers compared to the scenario with homogeneous incomes; thus, it narrows the analysis down to only the *Inequality* and *Equality* treatments. The treatment effect is captured by the *Inequality* dummy (in both models 1 and 2); their coefficients identify the difference in compliance rate as compared to omitted condition *Equality*. Column 2 control for socio-demographic variables. Random effects at the individual and group level allow us to control for potential dependence in the data due to repeated choices of the same individual.

Compliance rate ~	Model 1	Model 2
<i>Inequality</i>	0.179** (0.0867)	0.187** (0.0843)
<i>Female</i>		0.00953 (0.0878)
<i>Age</i>		0.00813 (0.00835)
<i>Num_experiments</i>		-0.00190 (0.00643)
<i>Economics</i>		-0.0585 (0.0883)
<i>Constant</i>	0.555*** (0.0676)	0.405* (0.236)
Observations	960	960
Number of n	64	64

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

Female is a gender dummy, *Age* records the age of the subject (in years), *Num_experiments* is the individual declaration on the number of experiments the subject has participated in the past, *Economics* is a faculty dummy, which takes value 1 if the subjects is a students of the Department of Economics and Management (0 otherwise).

Table 3. Effect of income heterogeneity

Table 4 focuses on the presence of a more pronounced tax revenue redistribution system and its interaction with the level of endowment; thus, it considers only the treatments *Inequality* (omitted condition in the table) and *Redistribution*. As before, random effects at the individual and group level are introduced.

4. Brief Discussion

We would stress that data collection is still ongoing and with our few collected observations, of course, this is a kind of speculative exercise. Our plan is to increase the number of observations for presenting, perhaps already at the conference, something more robust (statistically speaking).

Furthermore, unfortunately, in the first three sessions, we did not elicit subjects' beliefs. Therefore, the explanation put forth in the previous section is solely based on the application of others' findings to our data. While plausible, in order to establish with certainty that these are the ongoing phenomena and to draw scientifically sound conclusions, it is not only necessary to increase the number of observations but also to introduce the elicitation of first and second-order beliefs.

Compliance rate ~	Model 1	Model 2	Model 3
<i>Redistribution</i>	-0.188** (0.0801)	-0.178** (0.0837)	-0.204** (0.0865)
<i>High</i>	-0.0211 (0.0201)	-0.0211 (0.0201)	-0.0475 (0.0332)
<i>Female</i>		0.0175 (0.0984)	0.0173 (0.0983)
<i>Age</i>		0.00236 (0.00516)	0.00237 (0.00517)
<i>Num_experiments</i>		-0.00321 (0.00659)	-0.00320 (0.00659)
<i>Economics</i>		-0.167** (0.0779)	-0.167** (0.0778)
<i>Redistribution*High</i>			0.0527 (0.0379)
<i>Constant</i>	0.744*** (0.0549)	0.812*** (0.235)	0.825*** (0.237)
Observations	960	960	960
Number of n	64	64	64

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

High is a dummy which takes value 1 if subject has been assigned to the high income (0 otherwise), Female is a gender dummy, Age records the age of the subject (in years), Num_experiments is the individual declaration on the number of experiments the subject has participated in the past, Economics is a faculty dummy, which takes value 1 if the subjects is a students of the Department of Economics and Management (0 otherwise).

Table 4. The effect of revenue redistribution.

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Appendix (Instructions, translated from Italian)

Welcome!

Thank you for agreeing to participate in the experiment.

For your participation, you will receive 3 euros, to which an additional amount will be added based on the decisions made by you and the other participants during the experiment.

All information and decisions made will remain anonymous and confidential. The data collected will not be traceable to individual participants in any way and will be used solely for aggregated purposes for scientific research.

Instructions will be read aloud and will appear on your computer screen. Please follow the instructions carefully, as your earnings will depend on your choices during the experiment. It is therefore in your best interest to have a thorough understanding of what we are about to explain.

If anything is unclear to you, please contact us via Zoom, and we will address your questions privately.

During the experiment, you will accumulate Experimental Currency Units (ECU); the total amount in ECU will be converted into euros using the exchange rate: 200 ECU = 1 EUR.

At the end of the experiment, you will be able to see your total earnings (including the initial 3 euros for participation) on your computer screen.

Payment will be made subsequently via bank transfer, so it is necessary for you to have a bank account. You will receive email forms to complete with the necessary information to process the payment.⁴

Participants in this experiment (all those who will take part in this experiment, not just you at this moment) must make decisions in one of three possible scenarios. Before proceeding with the experiment, we will explain the rules that characterize each scenario. At the end of the instructions, you will discover which scenario has been randomly assigned to you, along with the rules that govern interactions between you and the other participants.

****SCENARIO 1****

The software will randomly form groups of four participants. A group of four participants is defined as a Local Group. Similarly, the software will randomly pair two Local Groups to form a Global Group. Participants will interact for 15 rounds. You will never be aware of the identities of the members of your Local Group and your Global Group. You only know that the compositions of both groups will remain unchanged throughout the entire experiment.

Each participant in the experiment will receive 100 ECU in each round and must declare the amount of this income, knowing that 20% of what is declared will be withheld as income tax.

A portion of the paid taxes will go towards financing a local public good, meaning it will be redistributed within the Local Group. The remaining portion will go towards financing a global public good, meaning it will be redistributed within the Global Group.

Specifically:

- 40% of the taxes collected locally (i.e., 40% of the sum of taxes paid by the 4 members of the Local Group) will be multiplied by 1.60 and then evenly redistributed among the 4 members of the Local Group.
- 60% of the taxes collected locally (i.e., 60% of the sum of taxes paid by the 4 members of the Local Group) will be multiplied by 3.20 and then evenly redistributed among the 8 members of the Global Group.

Therefore, the result in each round for each participant depends on:

- how much income you declare.
- how much income the other 3 members of your Local Group declare.
- how much income the 4 members of the second Local Group, which, along with yours, forms your Global Group, declare.

WARNING: Your earnings in each round may also depend on whether your declaration is audited. With a 2% probability, your declaration will be audited by the software. If it turns out that you paid less tax than required (because you declared lower income) during the audit, the system will automatically deduct an amount equal

⁴ This part was managed by the CEEL lab manager and the University administration.

to twice the evaded tax from your earnings for that round. In other words, if you evade tax and are audited (with a 2% probability), you will have to pay (the software will automatically do this for you):

- the amount of evaded taxes,
- an equal amount as a penalty for evasion.

At the end of each round, there will be a summary screen that summarizes everything that happened in the round: your declaration, taxes collected at the Local Group and Global Group levels, whether your declaration was audited or not, and the earnings obtained in the round.

****SCENARIO 2****

The rules are very similar to those of SCENARIO 1. In this scenario, the software will form Local Groups and Global Groups following the same rules as described above. However, in this scenario, not all participants receive the same ECU amount. In each Global Group, the 4 participants from one Local Group will receive 100 ECU each round, while the 4 members of the second Local Group will receive 200 ECU each round.

Nothing else changes compared to SCENARIO 1; all participants must declare the amount of their income, knowing that 20% of what is declared will be withheld as income tax. The distribution of taxes for financing public goods at the local and global levels remains the same.

With a 2% probability, the software will audit declarations in this scenario as well, and if tax evasion is detected, the participant will have to pay twice the amount of evaded taxes, just like in SCENARIO 1.

At the end of each round, there will be a summary screen that summarizes everything that happened in the round, as in SCENARIO 1.

****SCENARIO 3****

In this scenario, the rules are very similar to those of SCENARIO 1 and SCENARIO 2. Once again, the software will form Local Groups and Global Groups following the same rules as described above. However, unlike the other two scenarios, in this scenario, the Local Group with lower incomes continues to finance its local public good with 40% of the sum of taxes paid by the 4 members of the Local Group (and therefore finances the global public good with 60% of the sum of taxes paid by the 4 members of the Local Group). Conversely, the Local Group with higher incomes finances its local public good with only 10% of the sum of taxes paid by the 4 members of the Local Group, while it finances the global public good with the remaining 90%.

In SCENARIO 3, just like the other scenarios, there is a 2% probability that the software will audit declarations, and if tax evasion is detected, the participant will have to pay twice the amount of evaded taxes, as explained in SCENARIO 1.

At the end of each round, there will be a summary screen that summarizes everything that happened in the round, as in the other scenarios.

After these, subjects discovered the selected SCENARIO and before starting the first round, they had to answer (correctly) these three control questions:

- A. The global group consists of 3 local groups.

True

False

- B. If you declared an income lower than the actual one, your global group will receive fewer resources.

True

False

- C. Your local group will receive 60% of the sum obtained by multiplying the taxes paid by your local group by 1.6.

True

False