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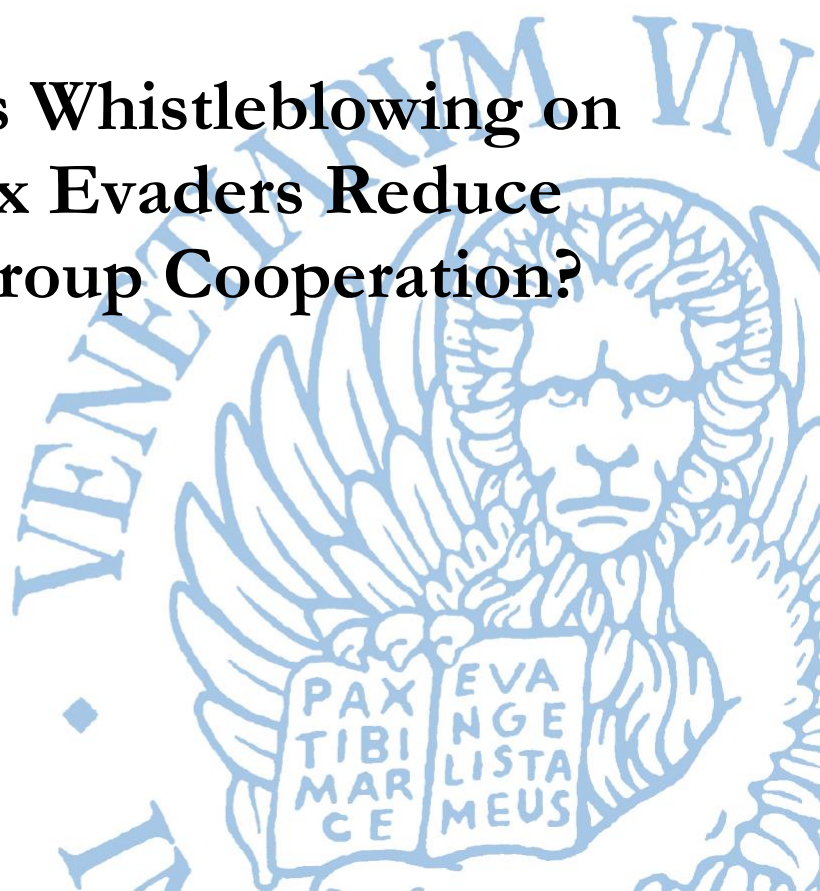
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Does Whistleblowing on Tax Evaders Reduce Ingroup Cooperation?

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Abstract. Whistleblowing is a powerful and rather inexpensive instrument to deter tax evasion. Despite the deterrent effects on tax evasion, whistleblowing can reduce trust and undermine agents' attitude to cooperate with group members. Yet, no study has investigated the potential spillover effects of whistleblowing on ingroup cooperation. This paper reports results of a laboratory experiment in which subjects participate in two consecutive phases in unchanging groups: a tax evasion game, followed by a generalized gift exchange game. Two dimensions are manipulated in our experiment: the inclusion of a whistleblowing stage in which, after observing others' declared incomes, subjects can signal other group members to the tax authority, and the provision of information about the content of the second phase before the tax evasion game is played. Our results show that whistleblowing is effective in both curbing tax evasion and improving the precision of tax auditing. Moreover, we detect no statistically significant spillover effects of whistleblowing on ingroup cooperation in the subsequent generalized gift exchange game, with this result being unaffected by the provision of information about the experimental task in the second phase. Finally, the provision of information does not significantly alter subjects' (tax and whistleblowing) choices in the tax evasion game: thus, knowledge about perspective ingroup cooperation did not alter attitude towards whistleblowing.

Keywords: Tax evasion, whistleblowing, ingroup cooperation, spillover effects, laboratory experiment.

JEL classification: H26, C90, D02.

PsychoINFO classification: 2900, 4200.

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1. Introduction

Tax evasion and tax fraud represent a major concern all over the world,[1] subtracting fiscal resources that are needed to finance public goods and questioning the effectiveness and fairness of tax systems.

Whistleblowing by citizens has recently gained increased attention as an effective and viable strategy to contrast tax evasion. For instance, according to the IRS Whistleblower Office, between 2007 and 2016, information submitted by whistleblowers has helped the US government to recover $3.4 billion of tax revenue.[2]

Despite the potential fiscal benefits of whistleblowing, the number of studies analyzing its determinants and socio-economic consequences is still limited. In this respect, while there is evidence showing that trust in the government represents an important determinant of the decision to blow the whistle on tax evaders (Antinyan, Corazzini, and Pavesi 2020) a research question that remains unexplored is whether whistleblowing can undermine the quality of social interactions within communities. As numerous studies have been shown, those who dare to report the norm violation or crime committed by their own group members are indeed under risk of being stigmatized by their communities (Woldoff and Weiss 2010). Ostracism of snitchers goes far beyond socially vulnerable groups (such as ethnic minorities, prisons, or districts with high crime rate), including school classes (Morris 2010) and police departments. Apart from the potential retaliation of the norm violator, whistleblowers also risk to be victim of actions of other members of their reference group, who usually prefer not to work with them (Reuben and Stephenson 2013). In particular, even when anonymity is fully assured, the whistleblower's actions might be perceived as undermining ingroup trust (Wallmeier 2019), so that whistleblowing could negatively affect future group cooperation.

In this paper, we report results of a laboratory experiment aimed at (i) investigating the effects of whistleblowing on tax evasion and (ii) assessing its potential consequences on ingroup trust and cooperation.

Our experiment includes two consecutive phases. In the first phase, we implement a simple tax evasion game in which participants, randomly assigned to group of five members according to a fixed matching protocol, have to decide the amount of their income they want to report to the central authority in order to pay taxes. In case of auditing, if the declared

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[1] According to the most recent US Internal Revenue Service tax gap report (IRS Research, 2019), the average annual gross tax gap was of $441 billion in tax years 2011–13 (slightly over 16 percent of total tax liability). In 2016, the VAT gap in Europe was estimated to be equal to EUR 147.1 billion, 12.3% of the total expected VAT revenue (Internal Revenue Service 2019)

[2] 2016 Annual Report to the Congress of the Internal Revenue Service (https://www.irs.gov/pub/whistleblower/fy16 _ wo _ annual _ report _ final.pdf), retrieved on November 2, 2018.

income is lower than the actual one, the individual has to pay the back taxes on the undeclared income plus a fine.

In the second phase, participants play a generalized gift exchange game. In particular, subjects simoultaneously decide how much of their endowment to send to other group members, knowing that the amount sent will be doubled by the experimenter.

We manipulate two main dimensions of our experimental design: the presence of a whistleblowing mechanism and the provision of information at the beginning of the first phase about the content of the experimental task in the second phase. Concerning the first dimension, we distinguish between *Whistleblowing* and *NoWhistleblowing* treatments. In the *Whistleblowing* treatments, after all income declaration choices have been made, each subject is given the possibility to blow the whistle on others so to increase their probability of being audited by the tax authority. Moving to the second manipulated dimension, in the *Information* treatment, information about the content of the experimental task in the second part is provided at the beginning of the experiment, while in the *NoInformation* treatment subjects learn about the second phase only at the end of the tax evasion game. Thus, the information manipulation allows us to investigate whether being aware about the forthcoming cooperative task in the second phase strategically affects the efficacy of whistleblowing and tax evasion in the first phase, making group subjects more reluctant to blow the whistle on other group members.

Our results are summarized as follows. First, whistleblowing is effective in reducing tax evasion as well as in improving the precision of tax auditing. Indeed, participants blow the whistle on ingroup members who misreport their income and the risk of being signaled to the tax authority increases the overall level of tax compliance. Second, we detect no statistically significant spillover effects of whistleblowing on ingroup cooperation in the subsequent generalized gift exchange game, with this result being unaffected by subjects' information about the experimental task in the second part.

The rest of the paper is organized as follows. Section 2 summarizes the related literature while in Section 3 we introduce our experimental design and the experimental procedures implemented. In Section 5 we present our results and discuss possible explanations. Section 7 concludes and suggests directions for future research.

2. Literature review

In this study we investigate the existence and sign of cross-contexts spillover effects of whistleblowing on ingroup trust. Near and Micely (1985, page 4) define whistle-blowing as

"the disclosure by organizational members (former or current) of illegal, immoral, or illegitimate practices under the control of their employers, to persons or organizations that may be able to effect action". This widely used definition refers to the hierarchical type of relations where the reported hold structurally more powerful positions than those who report (Loyens 2013). The main focus of this paper is instead peer reporting whistleblowing, defined as "a lateral control attempts that occur when an in-group member discloses a peer's wrongdoing to higher authorities outside the group" (Trevino and Victor 1992). In the rest of the paper we will use the terms 'whistleblowing and 'peer reporting' interchangeably.

Our paper relates to the recent and flourishing literature that investigates the within- or across-context spillovers of policy interventions, which focuses mostly on how they might affect prosocial norms and social preferences beyond those behaviors directly targeted by the institutions (Peysakhovich and Rand 2016; dAdda, Capraro, and Tavoni 2017; Galbiati, Henry, and Jacquemet 2018; Ghesla, Grieder, and Schmitz 2019). In the laboratory experiment by Engl et al. (2020), participants sequentially play two identical public good games, such that cooperation is institutionally enforced only in the first one. They find evidence of significant positive spillover effects of the institution, meaning that it increases cooperation also in the unregulated game, affecting preferences and beliefs about others' attitude to cooperate. Furthermore, Galeotti et al. (2021) show how policy interventions can exert unintended behavioral effects that go beyond their original scope. More specifically, in their quasi-experiment, both fraudsters and non-fraudsters in public transport when exposed to ticket inspections were more likely to misappropriate money in a different unrelated context, providing evidence of negative spillover effects of deterrence institutions on intrinsic honesty.

Whether, and under which conditions, whistleblowing represents an effective instrument to curb tax evasion is an intriguing research question that is gaining increasing attention in recent years. Breuer (2013) experimentally investigates whether incentivization of whistleblowing is effective for fostering tax compliance and shows that whistleblowing is successful in limiting tax evasion, even without monetary incentives. Bazart et al. (2020) experimentally study the impact of a whistleblowing-based audit scheme upon taxpayers' reporting decisions. They design an experiment aiming at comparing the relative efficiency of whistleblowing opportunities compared to a standard random-based audit scheme, keeping operating costs constant for the tax administration (neither rewards nor denunciation costs are considered). Their findings confirm that whistleblowing-based audit scheme decreases the monetary amount of evasion, improves the targeting of evaders and

raises the tax levy. In their experimental study, Masclet et al. (2019) investigate the effect of whistleblowing programs on tax evasion providing information to participants on the use of the tax revenues in three dynamic treatments: i) a baseline treatment where tax evaders are obliged to pay taxes on the undeclared income and a penalty if audited , ii) an information treatment in which participants are also informed about the income declaration rates of all other group members and iii) a denunciation treatment in which each participant has the possibility to blow the whistle on others. They find that monitoring alone does not increase the declared income while allowing for blowing the whistle decreases tax evasion; moreover, informing participants that the tax revenue was used to finance an environmental public good has no significant impact on either tax compliance or peer reporting. However, the role of information about other tax payers seems to affect the tax compliance rate according to a non-trivial relationship (see the corresponding section of the metastudy examining main factors affecting tax evasion (Alm 2019)). On the one hand, if an individual knows that his neighbours are cheating with taxes, he will be more likely to evade taxes as well (Alm, Bloomquist, and McKee 2017). On the other hand, the threat of public disclosure of tax evaders' identity may serve as an effective deterrrent: the cross-cultural study run by Alm et al. (2017) reveals indeed that when the photos of tax evaders were shown to the rest of the group, full compliance raised from 38% to 57%.

Nyreröd and Spagnolo (2021) investigate the effects of introducing economic incentives to stimulate whistleblowing and show that rewarding whistleblowers is associated with a reduction in misbehaviors. Amir, Lazar and Levi (2018) extends the analysis to the indirect effects of the introduction of a whistleblowing program in 2013 in Israel to combat tax evasion. Their findings support the hypothesis that, despite the limited direct effect on tax collection, whistleblowing indirectly increases tax revenues through deterrence.

The effect of whistleblowing programs is not limited only to the tax evasion schemes. They are also proved to have a strong deterrent effect as an antitrust measure (Hinloopen and Soetevent 2008; Apesteguia, Dufwenberg, and Selten 2007). The way a whistleblowing scheme is designed to fight against cartels is usually different from what is observed in tax compliance because, in contrast to the individual crime of tax evasion, the creation of a cartel implies a collusion between group members. Thus, a law maker has to show leniency towards whistleblowers, whose degree affects the effectiveness of the program (Z. Chen and Rey 2013), something which also depends on the intrinsic motives of the whistleblower (Heyes and Kapur 2009). Buckenmaier et al. (2020) show that introducing the possibility to blow the whistle on others both reduces the probability that subjects collude and accept

bribes and increases tax compliance. More importantly, they also document strong spillover effects of leniency programs, with a strong time persistence of the effects of the whistleblowing program after its removal. Our experimental study is aimed at shedding light on another potential spillover effect of whistleblowing. Indeed, as long as whistleblowing is interpreted as a non-cooperative institution that is mainly intended to punish other group members, institutionalizing the possibility of individuals to denounce each other's wrongdoing might finally result in an erosion of ingroup trust, making coordination and cooperation for mutual benefit more difficult to achieve. Ingroup trust is indeed a necessary component of group cohesion (Fonseca, Lukosch, and Brazier 2019), which in turn affects a group's ability to successfully participate in cooperation and coordination games (Gächter, Starmer, and Tufano 2017). When an individual makes a decision about peer reporting, he might undermine this loyalty, lowering other members' willingness to cooperate. However, the relations between group loyalty and norm violation are complex. On the one hand, loyalty can decrease norm violations within groups (Hildreth, Gino, and Bazerman 2016) while, on the other hand, people tend to perceive loyal but dishonest actions as more ethical than disloyal but honest ones (Hildreth and Anderson 2018).

Whistleblowing has been also investigated in different contexts, including corruption and the work environment. In particular, depending on the level of interdependency of work tasks, the work environment represents a further important context in which ingroup trust and whistleblowing institutions are strongly related to each other (Lau and Liden 2008). Concerning how whistleblowing affects, and is affected by, awareness about future interactions in the workplace, there are important papers that are close to ours. In a hierarchical framework, Wallmeier (2019) investigates the emergence of fraudulent whistleblowing. More specifically, in his laboratory experiment, a manager and an employee play a modified version of a trust game. Before interacting with the employee, the manager can engage in embezzlement, which in turn exerts a negative externality on a third party. The employee observes possible misbehavior and may report it to an external authority. He finds that both introducing an incentivized and an anonymous reporting mechanism increases fraudulent whistleblowing and discourages subsequent group cooperation. Finally, Reuben and Stephenson (2013) investigate a situation in which individuals have the opportunity to blow the whistle on those who lie for personal advantage and found that whistleblowers are indeed ostracized. However, differently from these papers, anonymity of the whistleblower is fully assured in our study, which in turn removes the possibility of ostracism and direct retaliation. In this respect, beside its deterrence effects, our

experimental design is aimed at assessing the indirect effects exerted by whistleblowing in the tax evasion game of the first phase on the level of ingroup trust and cooperation in the different, generalized gift exchange context subjects participate in the second phase.

3. Experimental design

The experiment consists of 2 consecutive phases. In the first phase of the experiment, individuals participate in 10 rounds of a tax evasion game, while in the second phase they play a generalized gift exchange game for 5 rounds. In both phases, subjects always interact with the same group members. Indeed, at the beginning of the experiment, groups of 5 subjects are randomly formed and their composition is kept constant throughout the two phases.

In each round of the first phase of the experiment, each individual is assigned with a gross income expressed in ECUs (Experimental Currency Units). In particular, the gross income of each subject is an integer number that is randomly drawn from a uniform distribution between 100 and 240. Given her gross income, each subject chooses how much to declare to the central tax authority for tax payments, knowing that, on the declared amount, she will pay a flat tax rate of 30%. In each period, the declared income of one of the five group members is randomly selected (thus corresponding to a probability of 20%) and audited by the tax authority to verify its conformity with the gross income. If the subject under-declares her gross income, then, in addition to the due taxes on the gross income, she will pay a fine that is set equal to the evaded taxes (namely, the 30% of the difference between the gross and the declared income). If the subject fully declares her gross income, then the audit mechanism does not produce any further effect on her payoffs. Once the declaration choice is submitted, information about others' gross and declared incomes is provided. Finally, at the end of every period, each subject is informed about her payoffs and whether her choice has been selected for auditing.

With respect to the *NoWhistleblowing* treatment, in the *Whistleblowing* treatment the only difference is that once all declaration choices are submitted and information about others' gross and declared incomes is provided, each subject can blow the whistle on other group members. In particular, each subject is given the possibility to signal one of the four remaining group members to the tax authority. Then, the computer randomly selects one whistleblower. If the whistleblower effectively blew the whistle on one group member, then her choice is implemented, and the declared income of the signaled subject is audited. On the other hand, if the whistleblower decided not to blow the whistle on anybody, then, as in

the *NoWhistleblowing* treatment, one of the group members is randomly selected and her declared income audited. Finally, no information is given to the audited subject on whether audit was due to random selection or to whistleblowing by other group members.

While most real-life leniency programs provide whistle-blowers with some indulgence for their own violations, our experimental design does not entail any bonuses in monetary or non-monetary form for those denouncing other tax evaders. This non-incentivized whistleblowing design is standard in tax evasion experiments (see, for instance, Bazart (2020)), representing a conservative test to measure individuals' propensity for blowing the whistle: if we observe peer reporting without extra motives, we expect such a behaviour to occur even with a higher frequency when individuals are positively incentivized to do so. In a similar vein, in our experiment the tax revenues plus the fines are not returned back to the common pool. Masclet et al. (2019) experimentally compared peer-reporting (whistleblowing) treatments with and without positive externalities and found no difference in whistleblowing frequency when participants were informed that collected taxes were used to purchase carbon credits.

In the second phase of the experiment, participants play the generalized gift exchange game. In each of the five periods of the second phase, each subject receives an endowment of 100 ECUs and chooses how much to send to the remaining group members. Whatever she sends is doubled by the experimenter and distributed equally among the remaining four group members. Therefore, social welfare is maximized if everyone sends the maximum amount to peers. This game is a variation of the standard public good game where an individual share of investment to a public good is not returned to the initial investor. Unlike a strain of the experimental literature that uses the sequential gift exchange game (Charness 1996; Charness and Haruvy 2002), in our experiment participants have to make their choices simultaneously. Additionally, instead of providing a gift to one single member of their group (Kanitsar 2019), in our design each individual provides a gift to all other group members. Besides allowing for very simple and short instructions, our choice to implement a generalized gift exchange game characterized by simoultaneous decisions was driven by our research objective, namely to investigate whether having experienced a tax evasion game with or without the possibility to blow the whistle on other group members affect the individual's beliefs about the overall level of cooperation of other players, and the individual decision to give as a consequence.

Apart from the inclusion of a whistleblowing stage, our experimental design also manipulates the provision of information about the content of the second phase before the tax evasion

game is played. While in the *NoInformation* treatments, participants are informed about the second phase of the experiment only after completing the tax evasion game, in the *Information* treatments all participants learn, since the beginning of the experimental session, the content and instructions of the generalized gift exchange game of the second phase. The purpose of the information manipulation is to investigate whether tax evasion and attitude to blow the whistle are affected by subjects' awareness about the fact that, in the subsequent phase, they will participate with their group members in game in which results strongly depend on the level of ingroup trust. Even if anonymity is fully assured, whistleblowing might indeed undermine ingroup trust, making cooperation in the generalized gift exchange game more difficult to achieve. By anticipating these considerations, individuals might therefore be more reluctant to blow the whistle on others, nullifying the effectiveness of whistleblowing in curbing tax evasion. The combination of the two manipulated dimensions generates results in a 2x2 design, and henceforth we will refer to the four treatments with the following labels: *NoWhistle_NoInfo*, *Whistle_NoInfo*, *NoWhistle_Info* and *Whistle_Info*.

3.1. Experimental procedures

The experiment was run between September and December 2019 at the CERME (Centre for Experimental Research in Management and Economics) laboratory, in Ca' Foscari University of Venice (Italy). 240 subjects (59% female), recruited through ORSEE (Greiner, 2015), participated in the experiment. Totally, we run 12 experimental sessions, with 60 subjects per treatment. Most of participants were undergraduate students (75.4%), enrolled in Economics (72.5%). Sessions were randomly assigned to treatments so that all participants within the same session were assigned to the same treatment and none participated in more than one treatment.[3]

The experiment was computerized by using o-Tree (D. L. Chen, Schonger, and Wickens 2016). Each session lasted around 75 minutes (including time for reading the instructions aloud, answering private questions, and paying) and the average payment was 13.5 euro, including a show-up fee of 3 euro. Although subjects participated in 15 rounds, to avoid wealth effects, only one of the 15 rounds was effectively used to determine final payments. Specifically, at the end of the experiment, the experimenter first selected one of two phases

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[3] In Table A3 in the Appendix we report the per-treatment main socio-demographic characteristics of our sample.

by tossing a coin. Then, given the phase, the experimenter randomly picked one of the corresponding rounds.

4. Results

In this section, we present our results. Given the partner-matching protocol of our experiment, we perform both (i) two-sample Mann–Whitney tests (MW) and (ii) Somers' D median difference tests (Newson 2002) at the group level, and we report results of (i) only unless the two tests give different results.[4]

4.1. Tax evasion game

First, we describe the effect of whistleblowing on tax evasion.

In Figure 1, we show the proportions of gross incomes declared by subjects in the four treatments, both over the 10 periods of the first phase (left-handed Panel) and by period (right-handed Panel). Our data confirm that blowing the whistle is indeed effective in increasing the average proportion of reported income, being equal to 0.65 in the treatments in which subjects cannot signal others' choices to the tax authority (*NoWhistle_NoInfo* and *NoWhistle_Info*) and equal to 0.80 in the treatments including the whistleblowing stage (*Whistle_NoInfo* and *Whistle_Info*), with this difference being highly significant (p=0.001, MW). The same result is observed when making a pairwise comparison between *Whistle_Info* and *NoWhistle_Info* (p=0.038, MW; p=0.158, Somers' D), as well as between *Whistle_NoInfo* and *NoWhistle_NoInfo* (p=0.021, MW). Additionally, the decrease in the proportion of the reported income across periods is starker in absence of the deterrence mechanism than in treatments including the whistleblowing stage.

Finally, we see no effect of the information manipulation on the effectiveness of whistleblowing (*Whistle_Info* vs. *Whistle_NoInfo*, p=0.862, MW).

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[4] When performing the Mann–Whitney U-test, we average data at the group level and treat each group as an independent observation. The rank-order statistics Somers' D looks at the individuals' choices accounting for the presence of clusters at the group level (each experimental session included groups) in the data.

Figure 1. Proportions of gross incomes declared by subjects in the tax evasion game, by treatment (left-handed Panel) e by treatment and period (right-handed Panel), N=240. Error bars, mean ± SEM.
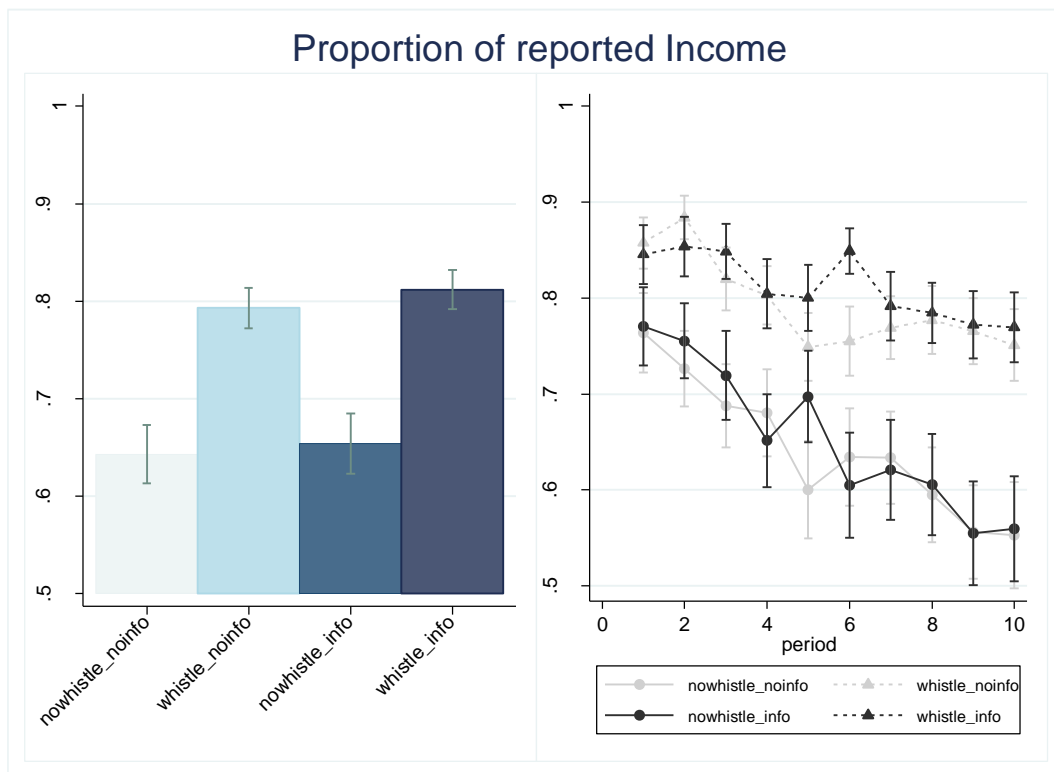
Figure 2 provides a more detailed picture of the frequencies of the relative reported share of income in each treatment. We observe that individuals are more likely to report an income equals to zero when whistleblowing is not allowed than in the *Whistle_NoInfo* and *Whistle_Info* treatments.

As it can be seen in Table 1, where we report the proportion of full compliers, intermediary compliers and full non-compliers, the most striking difference across treatments is indeed the substantial fall of full non-compliers as soon as the possibility to blow the whistle on others is introduced (from 11% and 18% respectively in the *NoWhistle_NoInfo and NoWhistle_Info* treatments to 2.8% and 3.5% in the *Whistle_NoInfo* and *Whistle_Info* treatments).

Figure 2. Frequency of proportion of reported income per treatment.
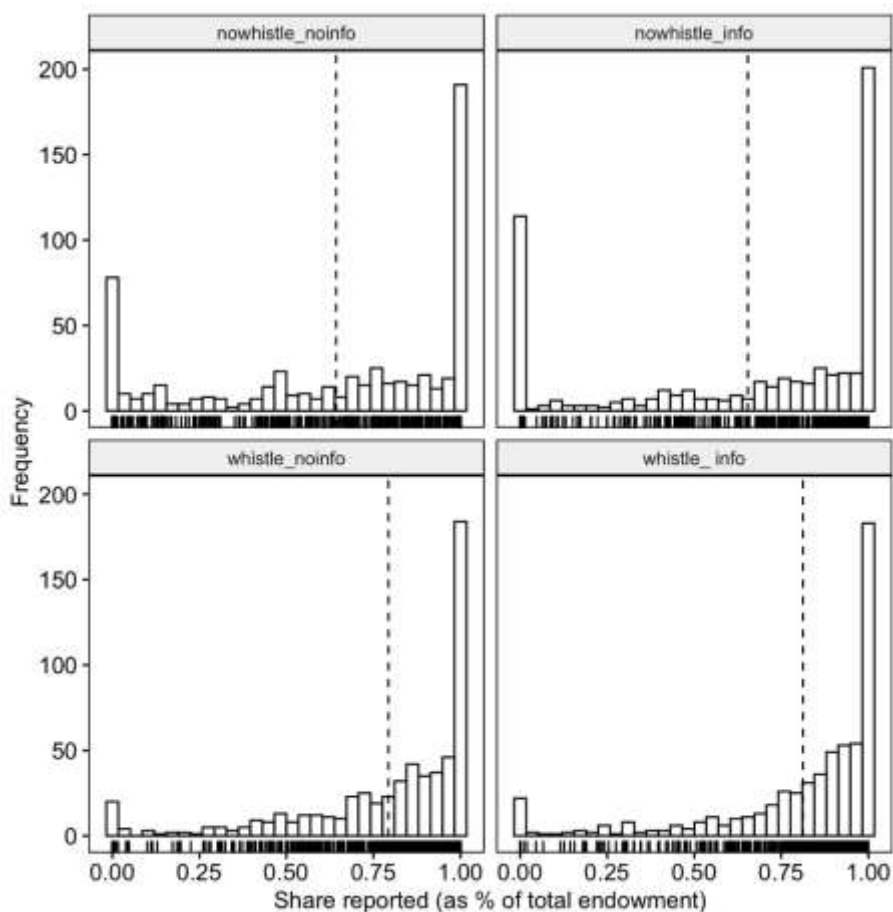
Table 1. Proportion of full compliers, intermediary and full non-compliers per treatment.

Treatment	Full compliers	Intermediary compliers	Full non-compliers
nowhistle_noinfo	29.3%	59.3%	11.3%
nowhistle_info	32.7%	49.3%	18.0%
whistle_noinfo	27.8%	69.3%	2.8%
whistle_ info	27.0%	69.5%	3.5%

In Table 2, we report parametric results from a series of Multilevel models, with standard errors that are clustered at both the group and subject level, using the proportion of gross incomes declared by subjects in each of the 10 rounds of the first phase as dependent variable.[5]

In Model 1, *Endowment* takes a value from 100 to 240 (in integer numbers). *Info* is equal to one in the treatments in which information about the second phase of the experiment was

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[5] See Table A.1 in the Appendix B for the results of a series of Tobit models (with left and right censoring at 0 and 1, respectively) with errors clustered at the group level. Results remain virtually unchanged across specifications.

provided prior to the beginning of the first phase and 0 otherwise. Similarly, *Whistleblowing* takes a value of 1 in the treatments in which participants were allowed to blow the whistle on other ingroup members in the tax evasion game of the first part of the experiment, and 0 otherwise. *Period* is a time counter, and it is introduced in the regressions to account for the effect of experience in the tax evasion game. Model 2 is augmented by adding the interaction term *InfoXWhistleblowing*.

Model 3 includes participants' gender and information about the previous period. In particular, *Proportion_report_prev_period* stands for the individual proportion of income reported in the previous period, while *Audited_prev_period* consists in a binary variable indicating whether, in the previous period, the participant was audited or not.

Finally, in Model 4, we add *Economics*, which takes a value of 1 if the participants' field of study is Economics and 0 otherwise, as well as a series of categorical variables extracted from the post experimental questionnaire.[6] Previous studies (Jackson and Milliron 1986; Richardson 2006) have indeed shown how both "demographic (i.e. gender), "economic" (such as income level and marginal tax rates) and "behavioural" (such as fairness and tax morale) characteristics can motive tax evasion so we controlled these factors through a series of independent variables. More specifically, to take into consideration that members of high income families might be more likely to evade taxes as well as the effects of increasing marginal tax rates on income declarations, we include *Income_family*, *Relative_wealth* and *Perceived_tax* in our regression. Both *Income_family* and *Relative_wealth* take a value from 1 (very low) to 10 (very high) and define the participant's perception of the income of her own family as well as her perception of the relative position of the family's income with respect to the average Italian family, respectively, while *Perceived_tax* takes a value from 1 to 12 and expresses the perceived tax rate paid by the participant, in 5% income brackets (with 1 being "less than 10%" and 12 being "above 60%"). On the same vein, *High_tax* measure the strength of the subject's belief on whether the tax rate affects individual willingness to pay taxes.

Given the negative relationship with fairness and tax evasion (Richardson 2006), we also add *Fair_tax*, which indicates which tax rate would be considered as fair. Attitude towards risk might affect tax evasion when in presence of audit schemes and penalties, the variable *Risk_level* thus measures individual risk aversion and takes a value from 0 to 10, with higher numbers expressing lower levels of risk aversion. In order to control for the subject's attitude towards tax evasion, we include *Risk_audit, Reciprocal_evasion* and *Ineff_gov* as

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[6] The questionnaire (originally written in Italian) is reported in the Appendix B.

covariates in the regression. The three variables indicate how strongly the subject agrees on a 10-point scale (with 1 indicating complete disagreement and 10 complete agreement) with the statement that citizens do not pay taxes if they perceive that the audit risk is low, other citizens do not pay taxes, and collected taxes are inefficiently implemented, respectively. Expecting tax morale to possibly negatively affect tax evasion (Torgler 2003) we include as regressor *Tax_morality, which* measures the strength of the subject's belief on whether morality affects individual willingness to pay taxes, while we also control for the level of perceived trust (*Trust*) and concern about helping others as a moral duty (*Help_others*).

Table 2. The determinants of the proportion of income reported in the tax evasion game: Multilevel models, with standard errors clustered at both at the group and at the subject level.

Independent variables	Model 1	Model 2	Model 3	Model 4	Whistle	NoWhistle
Info	0.015	0.010	0.011	0.025	0.021	0.042
	(0.040)	(0.057)	(0.052)	(0.050)	(0.049)	(0.048)
Whistleblowing	0.155***	0.150***	0.138***	0.137***		
	(0.040)	(0.057)	(0.052)	(0.050)		
Endowment	-0.000**	0.000	0.000	0.000	-0.000	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Period	-0.017***	-0.017***	-0.015***	-0.015***	-0.009***	-0.020***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
InfoXWhistleblowing		0.010	0.012	0.001		
		(0.080)	(0.073)	(0.070)		
Female			0.111***	0.061**	0.003	0.072
			(0.026)	(0.027)	(0.024)	(0.044)
Proportion_report_prev_period			0.105***	0.104***	0.190***	0.099***
			(0.022)	(0.022)	(0.032)	(0.031)
prev_audited			-0.054***	-0.053***	0.047***	-0.149***
			(0.013)	(0.013)	(0.015)	(0.022)
Economics				-0.058**	-0.010	-0.091*
				(0.028)	(0.022)	(0.047)
Income_family				0.007	0.001	0.016
				(0.011)	(0.009)	(0.020)
Relative_wealth				0.003	0.009	-0.002
				(0.012)	(0.010)	(0.019)
Perceived_tax				-0.012*	0.011**	-0.038***
				(0.007)	(0.006)	(0.012)
Fair_tax				0.020**	0.000	0.046***
				(0.009)	(0.008)	(0.015)
Risk_audit				0.001	0.005	-0.002

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
				(0.006)	(0.005)	(0.010)
Risk_level				-0.019***	-0.019***	-0.027***
				(0.005)	(0.004)	(0.009)
Reciprocal_evasion				-0.008	-0.001	-0.024**
				(0.007)	(0.006)	(0.011)
Tax_Morality				-0.004	-0.005	-0.007
				(0.005)	(0.004)	(0.009)
Ineff_gov				0.006	-0.005	0.006
				(0.006)	(0.005)	(0.011)
High_tax				-0.005	-0.011**	-0.000
				(0.006)	(0.005)	(0.011)
Trust					0.003	-0.026**
					(0.006)	(0.011)
Help_others					0.029***	0.011
					(0.007)	(0.011)
Constant	0.787***	0.790***	0.656***	0.835***	0.558***	1.197***
	(0.041)	(0.046)	(0.049)	(0.090)	(0.083)	(0.175)
Observations	2400	2400	2160	2160	1080	1080
Log likelihood	-141.753	-141.746	-131.309	-117.171	257.351	-218.791
Wald chi2	133.505	133.523	169.087	211.584	161.056	170.058
p	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Table 2 reports estimates of a series of Multilevel regression models. The dependent variable is the reported proportion of income in each period of the tax evasion game. Clustered standard errors at the group level and at the individual level appear in parentheses. ***, ** and * indicate significance at the 1% level, 5% level and 10% level, respectively.

From Model 1, whistleblowing significantly increases the proportion of reported income and, therefore, represents a valid instrument to limit tax evasion.[7] Differently, the effect of providing information about the second phase of the experiment before letting subjects to declare their income in the tax evasion game does not affect the amount of evaded taxes. Looking at Models 2 to 4, the interaction term between Whistleblowing and Info never reaches significance, meaning that the proportion of income reported by participants when they are allowed to blow the whistle is not affected by being aware about the gift exchange game in the second phase of the experiment. Although the coefficient of the endowment is significant at the 5% level in Model 1, it presents a small magnitude, suggesting that it exerts only limited effects on participants' decision to evade taxes.

As participants gain experience in the tax evasion game, they are less likely to fully report their income, as shown by the significant and negative coefficient of the time trend in all models.

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[7] In Table A4 in the Appendix we provide a more detailed analysis of the whistleblowing behaviour, defined as the per period number of whistleblower's signals (from 0 to 4) on a group member as a function of her relative proportion of reported income within the group.

Model 3 further analyses the dynamic pattern followed by choices in the tax evasion game. The proportion of reported income is positively correlated across periods and being audited in the previous period decreases the amount evaded in the current one. As expected, the level of risk aversion is significant and negatively correlated with tax evasion: an increase of one unit in risk propensity decreases the proportion of reported income by about 0.02.

In order to better investigate the effects of being audited on the subsequent choices in the tax evasion game, the last two columns of Table 1 focus on the sessions with and without whistleblowing, separately. We find evidence of the bomb-crater effect of tax audits (Mittone, Panebianco, and Santoro 2017) only in the *NoWhistleblowing* treatments while, as expected, in the Whistleblowing sessions being audited in the previous period significantly increases the proportion of income reported in the current period, as it suggests participants that other in-group members might have blown the whistle on them. Interestingly, as shown by the coefficient of *Help_others* in the model focusing on the sessions with Whistleblowing, the more individuals think that helping others represents a moral duty, the higher the proportion of income reported, underlying the importance of moral values in determining tax evasion.

4.2. Generalized gift exchange game

Our aim is to identify whether allowing individuals to blow the whistle on others in the tax evasion game and the information about the subsequent phase of the experiment exerted any effect on their contribution decisions in the generalized gift exchange game in the second phase. On average, participants contributed 24.75 tokens in the *Whistleblowing* treatments and 33.13 tokens in the *NoWhistleblowing* treatments. Thus, whistleblowing tends to reduce cooperation in the subsequent game, though this effect is not significant (p=0.143, MW; p=0.058, Somers' D test, 48 clusters).

In Figure 3, we report the average contribution in the *Whistleblowing* and *NoWhistleblowing* treatments, respectively. Allowing individuals to blow the whistle on others results in a slight reduction of contributions in the second phase of the experiment, in particular in the setting in which subjects receive information about the generalized gift exchange game before making their tax evasion choices (p=0.133, MW; p=0.078, Somers' D). Instead, we document no significant effects in the setting in which the information about the task in the second phase is provided only at the end of the tax evasion game (p=0.453, MW).

Figure 3. Average contributions in the Generalized Gift Exchange Game by treatment (left-handed Panel) e by treatment and period (right-handed Panel). Error bars, mean $\pm$ SEM.
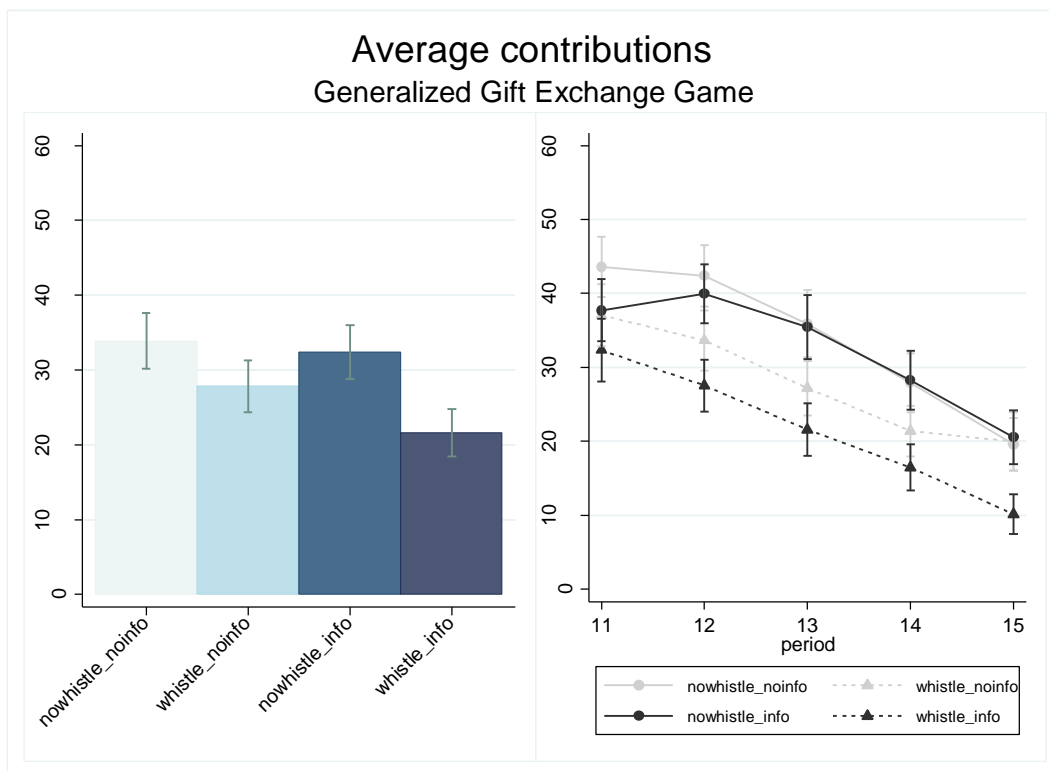
In Table 3, we report a series of multilevel models with standard errors that are clustered at both the group and subject level and where the dependent variable is the number of tokens contributed to the Generalized Gift Exchange Game.[8]

In order to investigate whether allowing individuals to blow the whistle on others in the tax evasion game affects their contributions in the second phase, in Model 1 we include *Whistleblowing*, *Info* and *Period* as regressors. We observe that whistleblowing is indeed marginally significant in decreasing ingroup contributions in the gift exchange game. However, the effect disappears when information about the second phase of the experiment is not provided at the beginning of the experimental session, as shown by the coefficient of the variable *Whistleblowing* in Model 2.

In Model 3, we also add *Contribution_prev_period,* which stands for the individual contribution in the previous period, and *Group_contribution_prev_period*, that consists in a

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[8] See Table A.2 in Appendix A for the results of a series of Tobit models, left censored at zero, with clustered standard errors at the group level. Results are almost unchanged. The only remarkable difference relies on the effect of N_audited. In the *Whistleblowing sessions*, the higher the number of times an individual was audited in the tax evasion game (and the higher the number of whistleblowers' signals on the subject), the lower her contributions in the gift exchange game is. The opposite effect is instead observed in the *NoWhistleblowing* sessions, suggesting that being audited might have an educative effect on future cooperation.

continuous variable expressing the average contributions of the remaining 4 group members in the previous period. We find a strong evidence in favor of in group reciprocity, whereby the average contribution made by a subject increases in the average number of tokens contributed by group members in the previous period. *Proportion_report_1st_part*, *Group_proportion_report_1st_part* and *N_audited* are built upon subjects' behavior in the tax evasion game, and respectively indicate subject's average reported income, the average income reported by the remaining 4 group members, and the number of times the participant was audited. Estimates indicate that results in the first phase of the experiment do not exert significant effects on the decisions in the gift exchange game. Similarly, Model 4 suggests that both the individual level of trust and willingness to help others do not significantly affect participants' contributions.

Finally, in the last two columns of Table 3, we restrict our analysis on the *Whistleblowing* and *NoWhistleblowing* treatments. It is worth noticing that, when whistleblowing is introduced, providing information about the gift exchange game before playing the tax evasion game decreases contributions in the second phase, as shown by the negative and marginally significant coefficient of *Info*. Surprisingly, in the *NoWhistleblowing* sessions, the average income reported by the other 4 group members in the tax evasion game has a negative effect on individual contribution in the gift exchange game.

Table 3. Multilevel regressions. Amount contributed in the Generalized Gift Exchange game.

Independent variables	Model 1	Model 2	Model 3	Model 4	Whistle	NoWhistle
Whistleblowing	-8.408**	-6.030	1.026	1.241		
	(4.075)	(5.743)	(2.301)	(2.305)		
Info	-3.865	-1.487	1.302	1.816	-3.572*	1.532
	(4.075)	(5.743)	(2.143)	(2.155)	(2.167)	(2.173)
Period	-5.261***	-5.261***	-2.416***	-2.430***	-1.970*	-3.479***
	(0.439)	(0.439)	(0.712)	(0.710)	(1.029)	(0.982)
InfoXWhistleblowing		-4.757	-3.649	-4.272		
		(8.122)	(3.030)	(3.039)		
Contribution_prev_period			0.510***	0.504***	0.448***	0.523***
			(0.026)	(0.026)	(0.038)	(0.036)
Group_contribution_prev_period			0.260***	0.263***	0.157**	0.309***
			(0.044)	(0.044)	(0.072)	(0.056)
Proportion_report_1st_part			0.480	-0.882	-4.200	-0.634
			(3.628)	(3.694)	(7.766)	(4.344)
Group_proportion_report_1st_part			-7.800	-7.419	6.839	-14.775**
			(5.347)	(5.382)	(9.614)	(6.931)
Female			1.217	0.713	0.885	-0.647
			(1.606)	(1.625)	(2.277)	(2.328)
N_audited			0.093	0.064	-1.266	1.312
			(0.632)	(0.639)	(0.944)	(0.958)
Economics				-2.393	-6.189**	1.150
				(1.757)	(2.439)	(2.538)
Trust				0.080	0.524	0.026
				(0.436)	(0.604)	(0.642)
Help_others				0.700	0.593	0.663
				(0.461)	(0.669)	(0.637)
Tax_morality				-0.206	-0.079	-0.413
				(0.294)	(0.391)	(0.448)
Constant	103.457***	102.267***	39.025***	38.174***	32.499*	52.396***
	(6.710)	(7.004)	(11.123)	(11.748)	(17.167)	(16.167)
Observations	1200	1200	960	960	480	480
Log likelihood	-5581.4845	-5581.3136	-4390.5422	-4388.0923	-2184.389	-2192.5022
Wald Chi2	148.792	149.172	646.418	654.638	229.456	423.267
p	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Table 3 presents the coefficients from a series of Tobit regressions left-censored at zero. The dependent variable is the amount contributed in each period of the generalized gift exchange game. Clustered standard errors at the session level appear in parentheses. ***, ** and * indicate significance at the 1% level, 5% level and 10% level, respectively.

5. Discussion

In this paper, we investigated the interaction between ingroup cooperation and whistleblowing. Stemming from the previous literature, we conjectured that whistleblowing may have exerted some unintended adverse effects, undermining the group morale, and compromising its ability for collective actions. If that would be the case, then even the positive effect the whistleblowing might have on tax payments could be outweighed by negative externalities of such institution.

Our results reject the existence of adverse spillover effects from the tax evasion game to the generalized gift exchange game: although the whistleblowing somewhat discouraged contributions in the generalized gift exchange game, when controlling for other factors this difference is not significantly different from zero.

Moreover, the main driving force behind our experiment was to observe whether the shadow of the future cooperation deter participants from blowing the whistle on tax evaders. Indeed, if whistleblowing is perceived as that, it would be the case that this can be one of the mechanisms that explain the reluctance of agents to blow the whistle. Being aware that whistleblowing would suppress the ingroup cooperation, the rational profit-maximisers would avoid to report tax evaders within their group. The results of our experiments do not confirm this intuition.

These results are good news for policy makers who try to promote whistleblowing as a means of horizontal control to fight the tax evasion or other norm-violating behavior. However, the lack of the effect may mean that we need to consider some other uncounted factors. For instance as Kennedy and Schweizer (2018) have shown, whistleblowers are generally perceived as more trustworthy than individuals who stayed idle. Since these two effects push the cooperation rate to the opposite direction the net effect is hard to predict.

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Appendix A - Additional tables and figures

Table A.1 Tobit models, clustering errors at the group level. Reported proportion of income in each period of the tax evasion game.

Independent variables	Model 1	Model 2	Model 3	Model 4	Whistle	NoWhistle
Info	0.013	0.007	0.001	0.013	0.018	0.030
	(0.063)	(0.094)	(0.053)	(0.051)	(0.035)	(0.062)
Whistleblowing	0.185***	0.180**	0.071	0.075*		
	(0.063)	(0.080)	(0.044)	(0.045)		
Endowment	-0.001*	-0.001*	-0.001**	-0.001**	-0.000	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Period	-0.026***	-0.026***	-0.010***	-0.011***	-0.007***	-0.016***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)	(0.006)
InfoXWhistleblowing		0.011	0.010	0.004		
		(0.125)	(0.068)	(0.070)		
Female			0.095***	0.051*	0.021	0.059
			(0.028)	(0.029)	(0.025)	(0.062)
Proportion_report_prev_period			0.733***	0.683***	0.659***	0.708***
			(0.060)	(0.056)	(0.062)	(0.093)
Audited_prev_period			-0.061	-0.059	0.116***	-0.292***
			(0.038)	(0.038)	(0.022)	(0.061)
Economics				-0.050*	0.020	-0.147**
				(0.030)	(0.028)	(0.069)
Income_family				0.002	-0.002	0.019
				(0.009)	(0.011)	(0.019)
Relative_wealth				0.009	0.017	0.004
				(0.010)	(0.011)	(0.016)
Perceived_tax				-0.012	0.004	-0.036*
				(0.009)	(0.007)	(0.020)
Fair_tax				0.015	-0.002	0.038
				(0.011)	(0.008)	(0.024)
Risk_audit				-0.002	-0.001	-0.006
				(0.005)	(0.004)	(0.013)
Risk_level				-0.020***	-0.019***	-0.033***
				(0.006)	(0.005)	(0.011)
Reciprocal_evasion				-0.010	-0.002	-0.030*
				(0.006)	(0.005)	(0.015)
Tax_Morality				0.002	0.000	-0.005
				(0.005)	(0.004)	(0.012)
ineff_gov				0.006	0.001	0.011
				(0.005)	(0.005)	(0.012)
High_tax				-0.003	-0.012**	0.001
				(0.007)	(0.005)	(0.012)
Trust					-0.006	-0.044**

	(1)	(2)	(3)	(4)	(5)	(6)
					(0.006)	(0.021)
Help_others					0.033***	0.020
					(0.011)	(0.017)
Constant	0.931***	0.934***	0.331***	0.541***	0.248**	1.079***
	(0.062)	(0.064)	(0.068)	(0.109)	(0.113)	(0.255)
Observations	2400	2400	2160	2160	1080	1080
Pseudo R-squared	0.035	0.035	0.222	0.236	0.436	0.210
F	14.337	12.268	36.047	22.259	40.962	13.386
P	0.000	0.000	0.000	0.000	0.000	0.000

Note: Table A.1 presents the coefficients from a series of Tobit models left-censored at zero and right-censored at one with errors clustered at the group level. The dependent variable is the reported proportion of income in each period of the tax evasion game. ***, ** and * indicate significance at the 1% level, 5% level and 10% level, respectively.

Table A2. Tobit models left-censored at zero, clustering errors at the group level. Amount contributed in the Generalized Gift Exchange game.

Independent variables	Model 1	Model 2	Model 3	Model 4	Whistle	NoWhistle
Whistleblowing	-10.104*	-6.654	2.350	2.413		
	(5.423)	(7.554)	(3.115)	(3.128)		
Info	-5.529	-2.083	1.694	2.194	-6.210*	1.398
	(5.462)	(9.153)	(3.513)	(3.430)	(3.339)	(3.008)
Period	-7.859***	-7.862***	-4.518***	-4.550***	-4.531***	-5.390***
	(0.897)	(0.898)	(0.967)	(0.978)	(1.391)	(1.213)
InfoXWhistleblowing		-6.977	-5.883	-6.796		
		(10.827)	(4.394)	(4.427)		
Contribution_prev_period			0.613***	0.604***	0.527***	0.630***
			(0.055)	(0.054)	(0.095)	(0.060)
Group_contribution_prev_period			0.369***	0.372***	0.213***	0.444***
			(0.063)	(0.062)	(0.074)	(0.073)
Proportion_report_1st_part			7.107	5.490	-2.744	8.155
			(7.605)	(7.420)	(14.789)	(8.808)
Group_Proportion_report_1st_part			-10.845*	-9.790	6.442	-14.352**
			(6.389)	(6.484)	(12.842)	(7.137)
Female			4.770**	4.160*	4.404	2.058
			(2.127)	(2.172)	(2.866)	(2.962)
N_audited			0.392	0.355	-2.264**	2.903***
			(0.827)	(0.860)	(0.985)	(1.069)
Economics				-1.665	-8.027**	4.970
				(2.611)	(4.053)	(3.764)
Trust				0.381	1.159	0.253
				(0.752)	(1.349)	(0.924)
Help_others				0.988	0.821	0.838
				(0.628)	(0.825)	(0.849)
Tax_morality				-0.557	-0.341	-0.906
				(0.383)	(0.601)	(0.587)
Constant	131.627***	129.951***	47.764***	45.772***	54.565***	50.354**
	(11.392)	(12.142)	(14.480)	(15.170)	(18.675)	(19.931)
Observations	1200	1200	960	960	480	480
Pseudo R-squared	0.012	0.012	0.060	0.061	0.047	0.075
F	29.432	22.746	43.664	34.499	16.917	46.674
p	0.000	0.000	0.000	0.000	0.000	0.000

Note: Table A.2 presents the coefficients from a series of Multilevel regression models, clustering both at the individual and group level. The dependent variable is the individual contribution in each period of the generalized gift exchange game. ***, ** and * indicate significance at the 1% level, 5% level and 10% level, respectively.

Table A3. Socio-demographic characteristics of the participants across treatments

	nowhistle_noinfo	nowhistle_info	whistle_noinfo	whistle_ info
Age				
Mean	21.78	21.38	21.20	21.28
St.deviation	2.96	2.17	2.63	2.76
Gender				
Female	56.67% (34)	58.33% (35)	60.00% (36)	61.67% (37)
Male	43.33% (26)	41.67% (25)	40.00% (24)	38.33% (23)
Year of study				
Primo (triennale)	28.33% (17)	15.00% (9)	18.33% (11)	25.00% (15)
Secondo (triennale)	21.67% (13)	25.00% (15)	25.00% (15)	21.67% (13)
Terzo (triennale)	28.33% (17)	33.33% (20)	31.67% (19)	28.33% (17)
Primo (specialistica)	10.00% (6)	13.33% (8)	13.33% (8)	8.33% (5)
Secondo (specialistica)	11.67% (7)	13.33% (8)	11.67% (7)	16.67% (10)
Share of Economics students				
	78.33% (47)	68.33% (41)	70.00% (42)	73.33% (44)
Occupational status				
No	40.00% (24)	36.67% (22)	30.00% (18)	50.00% (30)
Part-time	41.67% (25)	41.67% (25)	53.33% (32)	40.00% (24)
Full-time	18.33% (11)	21.67% (13)	16.67% (10)	10.00% (6)

In Table A4 we provide a more detailed analysis of the whistleblowing behavior. More specifically, Table A4 reports the per period number of whistleblower's signals (from 0 to 4) on a group member as a function of her relative proportion of reported income within the group. We first observe that while in the *Whistle_info* treatment in 19% of cases (114/600) participants decide not to blow the whistle at all, in the *Whisle_NoInfo* treatment the percentage decreases to 12% (72/600). Thus, being aware of future cooperative environments seem to make individuals more reluctant to blow the whistle on others, although the effect does not reach statistical significance (p=0.127, Somers' D, 24 clusters). In most of the cases, participants blow the whistle on the group member(s) who declared the lowest or the second lowest proportion of income within their group, namely 179 out of the 436 whistleblowing decisions made in the *Whistle_NoInfo* treatment (41%) and 163 out of 369 in the *Whistle_Info* treatment (44.2%). However, a non-negligible number of whistleblowing choices were addressed to those subjects fully reporting their income or declaring the highest proportion of their income within their group. Specifically, they were signalled to the central authority by at least 1 of their ingroup members 51 times (11.7%) in the *Whistle_NoInfo* and 41 times (11.1%) in the *Whistle_Info* treatments, respectively.

Table A4. Per period number of whistleblowers' signals on a group member as a function of her relative proportion of reported income.

Relative proportion of reported income within group	Whistle_NoInfo treatment						Whistle_Info treatment					
	Number of whistleblowers' signals						Number of whistleblowers' signals					
	0	1	2	3	4	Total	0	1	2	3	4	Total
Lowest proportion of reported income	7	19	27	39	23	115	11	10	33	33	27	114
	2.31	11.59	45.00	81.25	92.00	19.17	3.24	7.46	58.93	82.50	90.00	19.00
Joint (2 individuals) lowest proportion of reported income*	1	3	3	1	0	8	2	2	2	1	1	8
	0.33	1.83	5.00	2.08	0.00	1.33	0.59	1.49	3.57	2.50	3.33	1.33
Second lowest proportion of reported income	42	41	15	6	2	106	56	33	14	5	2	110
	13.86	25.00	25.00	12.50	8.00	17.67	16.47	24.63	25.00	12.50	6.67	18.33
Joint (2 individuals) second lowest proportion of reported income*							2	0	0	0	0	2
							0.59	0.00	0.00	0.00	0.00	0.33
Third lowest proportion of reported income	69	27	3	1	0	100	81	25	3	1	0	110
	22.77	16.46	5.00	2.08	0.00	16.67	23.82	18.66	5.36	2.50	0.00	18.33
	25	11	0	0	0	36	9	3	0	0	0	12

Joint (3 individuals) highest proportion of reported income*	8.25	6.71	0.00	0.00	0.00	6.00	2.65	2.24	0.00	0.00	0.00	2.00
Second highest proportion of reported income	94	20	4	1	0	119	92	23	1	0	0	116
	31.02	12.20	6.67	2.08	0.00	19.83	27.06	17.16	1.79	0.00	0.00	19.33
Joint (2 individuals) highest proportion of reported income*	25	16	1	0	0	42	39	15	0	0	0	54
	8.25	9.76	1.67	0.00	0.00	7.00	11.47	11.19	0.00	0.00	0.00	9.00
Highest proportion of reported income	40	27	7	0	0	74	48	23	3	0	0	74
	13.20	16.46	11.67	0.00	0.00	12.33	14.12	17.16	5.36	0.00	0.00	12.33
Total	303	164	60	48	25	600	340	134	56	40	30	600

Notes: In the first and second line of each row, we report, respectively, the per period number and the percentage of whistleblowers' signals on a group member as a function of her relative proportion of reported income within the group. *When there are 2 or more group members reporting exactly the same proportion of their gross income (i.e. 0% or 100%), we are referring to them as the "joint" lowest/highest proportion of reported income.

Appendix B – Experimental instructions and post-experimental questionnaire

The experimental instructions, originally in Italian, were shown on the screen of each participant and were read aloud by the experimenter. Participants were not allowed to proceed with the instructions until the experimenter decided to let them click on the "Next" button. Instructions in black roman refer to the NoWhistle_NoInfo treatment, while specific instructions for the Information treatment are signaled in <mark>yellow</mark> specific instructions for the Whistleblowing treatments are signaled in *italic*.

Words in square brackets are just meant for the readers of the paper, they were not included in the original instructions.

[New Screen]

Instructions

You are participating in an experiment on decision-making. During this experiment, you can earn money. The amount of your earnings depends on your decisions and the behavior of other participants you will interact with, according to the rules that will be described in what follows.

The whole session lasts about one hour and a half.

Please switch your mobile off and do not talk to each other during the experiment.

What happens now?

We will give you detailed instructions about the experiment. You can raise your hand at any time so that a research assistant will come to your desk and answer your questions in private.

[New Screen]

Introduction

In this experiment, you will be randomly matched with 4 other participants to form a group of 5. You will be matched with the same in-group members for the entire duration of the experiment. You will never know the identity of your group members and all decision will be taken anonymously.

The experiment is composed by two different parts: Part 1 and Part 2. Part 1 consists of 10 periods and Part 2 consists of 5 periods. In each period of Part 1 and of Part 2, you have to make

some decisions. The decisions you take in each period will affect your payoff as well as they might affect the payoffs of other participants who are matched with you. Similarly, the decisions made by participants matched with you, will also affect their payoffs as well as they might affect your payoff.

At the end of the study, we will randomly select the first or the second part with equal probability and, within the selected part, we will randomly select one period. You will be paid in cash the earnings you obtained in that period. Your total earnings from the experiment will be the earnings for the randomly selected period, plus a show up fee of € 3.

You will get paid one by one, in private, in order to preserve confidentiality, on presentation of the ticket that you have randomly drawn from the envelope upon entering the laboratory.

During the experiment we will speak of points rather than Euros.

The conversion rate between points and Euro is: 12 points = 1 euro.

Before giving you detailed instructions about the first part [Information treatments] and the second part of the study, we will resume here the main information about the functioning of [Information treatments] both the first [Information treatments] and the second part part of the experiment:

FIRST PART	SECOND PART
In each period of the first part you and your group members will receive an endowment and you have to privately and anonymously decide how much of it to report. A tax is withdrawn from the reported amount.	Instructions about the second part will be given once the first part is terminated. [Information treatments]
The reported amount of each in-group member might be subject to an auditing procedure. In case the reported amount is lower than the initial endowment, a fine must be paid.	In each period of the second part you and your ingroup members will receive an endowment and have to privately and anonymously decide how much of it to keep with you and how much of it to invest in a project.
Each individual is informed about other group members' endowment and reported income.	The amount of points you decide to invest in the project will be doubled and equally divided between the other members of your group, you excluded. Symmetrically, the amount of points that each member of your group decides to invest in the project
Whether each in-group member is audited or not depends on a random procedure.	will be doubled and equally divided
[Whistleblowing treatment]	

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On the base of this information, each individual will have the opportunity to signal the other in-group members. The higher the number of times an individual is signaled, the higher is the probability he will be audited.	<mark>between you and the remaining group members.</mark>

What happens now?

We will now give you detailed instructions [Information treatments] <mark>both</mark> about the first [Information treatments] <mark>and second</mark> part of the experiment. You can raise your hand at any time so that a research assistant will come to your desk and answer your questions in private. Once you have carefully read the instructions, you will be asked to answer a few questions to verify your understanding.

Instructions - first part

Your choices in the first part.

In each period of the first part, you have to choose which share of income to report in order to pay taxes. In particular, in the first part, the computer will randomly and anonymously assign to each participant an amount of points included between 100 and 240 points, in integer numbers. For simplicity, let us refer to this amount of points as the gross income. Given your gross income, you have to choose how many points to report. Based on the reported income, the computer will collect 30% of it as a tax. The total amount collected will be used by the experimenter for funding future research projects.

Once all your group members have decided their declared income, you are informed about their **real gross** income and the income they have declared.

The amount of points you have chosen to report can be selected for auditing to verify the correspondence of your choice with respect to your gross income.

How payoffs are determined

- In the case your choice is not selected for auditing, then your earnings in the period is given by:

  your gross income **minus** the taxes computed on the amount of points you have reported (30%).

- In the case your choice is selected for auditing and the amount of points you have reported is lower than your gross income, then your earnings in the period is given by:

  your gross income **minus** the taxes computed on your gross income **minus** a fine that is equal to the taxes you have not paid.

Once each participant has reported his own income, each subject in your group is randomly and anonymously assigned one of five cards, numbered from 1 to 5, by the computer. Then, the computer randomly selects one of the 5 cards. The choices made by the owner of this card will be audited. Notice that the probability to be audited in a given period does not depend on the results of the auditing procedures conducted in previous periods.

At the end of each period you are informed about whether you were audited by the central authority and about your payoff for the period.

Whistleblowing

[Whistleblowing treatment]

Once each participant has reported his own income, you and the other group members will choose whether to signal one ingroup members to the central authority in order to be audited.

Once all signaling decisions have been taken, one randomly selected participant is randomly selected and her/his decision is implemented:

- If, for example, the randomly selected participant decided to signal to the central authority one participant with whom he or she was matched, this participant will be audited by the central authority.
- If, for example, the randomly selected participant decided not to signal anyone to the central authority, the central authority's audit decision develops as follows:.
  - Each subject in your group is randomly and anonymously assigned one of five cards, numbered from 1 to 5, by the computer. Then, the computer randomly selects one of the 5 cards. The reporting decision made by the owner of this card will be audited. Notice that the probability to be audited in a given period does not depend on the results of the auditing procedures conducted in previous periods.

At the end of each period you are informed about whether you were audited by the central authority and about your payoff for the period. Please note that your group members are never informed about your signaling decision. Neither you will be informed whether you were selected for auditing randomly or due to information received from some of your group members.

What happens now?

You will be now asked to answer a few questions to verify your understanding about the first part of the experiment.

[Information treatments] Before starting the first period of the first part, we will give you detailed instructions about the second part of the experiment.

[New Screen]

Comprehension questions for the first part

- Suppose a participant received an endowment of 100 points. He/she decided to declare 100 points. He/she was not audited in this period. What will be his/her final earnings for this period?

  100, 70, 40

  [Correct answer: 70]

- Suppose a participant received an endowment of 100 points. He/she decided to report 50 points.

- What's the amount of the fine he/she has to pay in case he/she is audited?

  30, 15, 0

  [Correct answer: 15 (which is equal to the amount of the taxes not paid. When reporting his/her entire gross income, he/she would have paid 30 points in taxes. However, since he/she is reporting 50 points instead of 100 points, he/she just paid 15 points in taxes.)]

- What's the final payoff of the participant if he/she is audited?

  100, 85, 55

  [Correct answer: 55 (which is equal to his/her gross income (100) minus the taxes computed on his/her gross income (30) minus a fine that is equal to the taxes he/she has not paid (15).)]

- What's the final payoff of the participant if he/she is is not audited?

  100, 85, 55

  Correct answer: 85 (which is equal to his/her gross income (100) minus the taxes computed on his/her reported income (15)).

- [NoWhistleblowing treatments] What is the probability for a participant of being audited in each period?

  1/5, 2/5, it depends on my reported income

  [Correct answer: 1/5]

- [NoWhistleblowing treatments] In period 1 a participant was audited and his/her reported income was different than his/her gross income.

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- [NoWhistleblowing treatments] What is the probability that this participant will be audited in period 2?

  1/5, 2/5, It depends on his/her reported income

  [Correct answer: 1/5]

- *[Whistleblowing treatments] One group member, let's call him/her subject A, chose to signal to the central authority one of his/her ingroup members, let's call him/her subject B. Subject B decided not to signal anyone to the central authority.*

- *If Subject A is randomly chosen by the central authority as the group member whose signaling decision is implemented, what is the probability that subject B will be audited?*

  Subject B will be audited for sure, 1/5, 0, It depends on his/her reported income

  [Correct answer: Subject B will be audited for sure]

- *If Subject B is randomly chosen by the central authority as the group member whose signaling decision is implemented, what is the probability that subject A will be audited?*

  Subject A will be audited for sure, 1/5, 0, It depends on his/her reported income

  [Correct answer: 1/5]

[New Screen]

What happens now?

The first part of the experiment is about to start. During the experiment, you can raise your hand at any time so that a research assistant will come to your desk and answer your questions in private. If everything is clear please click on "Continue".

[Information treatments] We will now give you detailed instructions about the second part of the experiment. You can raise your hand at any time so that a research assistant will come to your desk and answer your questions in private. Once you have carefully read the instructions, you will be asked to answer a few questions to verify your understanding.

[New Screen]

<div align="center">

Second part - Instructions.

</div>

Your choices in the second part

In each period of the second part, you and other 4 participants you were matched with in the first part, will receive an endowment of 100 points.

In each period you and other members of your group will have to make a decision how many points to keep with you and how many points invest into a project.

The points you invest in the project is doubled and shared equally between other 4 members of your group, you excluded. Similarly, the amount of points eventually invested in the project by another member of your group, for example by ingroup member A, will be doubled and equally shared between you and the other 3 members of your group, ingroup member A excluded.

How payoffs are determined

In the second part, your earnings in each period are given by:

Your initial endowment **minus the** amount of points you invest in the project **plus** the amount of points your group members invested in the project **multiplied** by 2 and **divided** by **4.**

Example 1:

You decided to invest half of your endowment (50 points) in the project. Other group members in total invested 200. You will receive:

100 - 50 + (200 * 2 / 4) = 150

Example 2:

You decided to invest nothing in the project. Other group members in total invested 200. You will receive:

100 – 0 + (200 * 2 / 4) = 200

What happens now?

You will be now asked to answer a few questions to verify your understanding about the second part of the experiment.

Once you have correctly answered to these questions, the second part of the experiment will start. During the experiment, you can raise your hand at any time so that a research assistant will come to your desk and answer your questions in private. If everything is clear please click on "Continue".

[Information treatments] Once you have correctly answered to these questions, the first part of the experiment will start. During the experiment, you can raise your hand at any time so that a

research assistant will come to your desk and answer your questions in private. If everything is clear please click on "Continue".

[New Screen]

Comprehension questions for the second part

- Suppose subject A invested his/her entire endowment in the project. The other members of his/her group invested nothing.

- What will be group member A's final earnings for this period?

  0, 100, 150, 200, 300

  [Correct answer: 0]

- What will be A's in group members' final earnings for this period?

  0, 100, 150, 200, 300

  [Correct answer: 150]

- Suppose subject A invested nothing in the project. Each of the other 4 members of his/her group invested their entire endowment (100 points). What will be subject A's final earnings for this period?

  0, 50, 100, 200, 300

  [Correct answer: 300]