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# What Goes Around Comes Around? Experimental Evidence of the Effect of Rewards on Tax Compliance

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## Abstract

The current experimental study examined the effect of monetary rewards on tax compliance. Eighty-six participants were randomly assigned to one control and two reward conditions (low vs. high reward). Overall, tax compliance was not affected by the rewards. However, a change in compliance strategies was observed. It seems that rewards provoked an all-or-nothing behavior. Whereas in the reward conditions, participants were either completely honest or evaded all of their income, in the control condition, the amount of evasion varied more strongly. Furthermore, audited compliant taxpayers who are rewarded evaded less in the following period compared with audited compliant taxpayers who experienced no rewards.

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## Keywords

tax compliance, fines, rewards, positive incentives, bomb-crater effect

## Introduction

Over the last few decades, tax compliance has become a prominent subject of research generating a great variety of publications in different disciplines (Andreoni, Erard, and Feinstein 1998; Hasseldine and Li 1999; for an overview, see Kirchler 2007). One of the main reasons for the increased consideration of the subject is the considerable yearly amount of tax losses for governments due to dishonest tax declarations (Slemrod 1992; Hasseldine and Li 1999) and the increase in the shadow economy (Schneider and Enste 2002). To maintain the tax revenue at a high level, governments punish those who do not comply with the tax law. However, empirical results on the deterrent effect of fines on tax evasion appear inconclusive (Alm, Jackson, and McKee 1992b; Pommerehne and Weck-Hannemann 1996; for a review, see Andreoni, Erard, and Feinstein 1998). Some studies conclude that fines that are too high or unfair may even have a negative effect on tax compliance and breed resistance, reactance, and hostility among the targeted taxpayers (e.g., Schwartz and Orleans 1967; Strümpel 1969; Fjeldstad and Semboja 2001). Consequently, it was suggested that draconic punishment should be left behind and new ground broken by enhancing tax compliance through establishing positive attitudes toward tax authorities (Slemrod 1992; Braithwaite 2003a, 2003b; Feld and Frey 2007). One way to do so is to communicate respect and gratitude to compliant taxpayers by rewarding them for their honesty.

Although the call for introducing positive incentives into tax policy has been made quite often (e.g., Jackson and Milliron 1986; Falkinger and Walther 1991; Feld, Frey, and Torgler 2006), empirical evidence of the effects of rewards on compliance and tax evasion strategies is scarce. To the best of our knowledge, only three experimental studies on this topic have been published so far (Alm, Jackson, and McKee 1992a; Torgler 2003; Bazart and Pickhardt 2010). Here, we report a further experiment that was designed to overcome some of the shortcomings of previous studies. First, we aimed to replicate prior findings with a bigger sample size. Second, we tried to balance differences in the expected value of tax compliance across experimental conditions. Our design allowed us to test for pure psychological effects of rewards on compliance. We analyzed the effect of rewards on

taxpayers' strategies regarding their decision on how much to evade and on their reaction to a tax audit—the so-called bomb-crater effect (Guala and Mittone 2005; Mittone 2006).

### *Rewarding Compliant Taxpayers*

In psychology, the effect of rewards and punishments on behavior has been comprehensively studied (e.g., Skinner 1938, 1965; Estes 1944). It was suggested that rewards are more effective than punishment in shaping behavior (e.g., Skinner 1965). Regarding tax compliance, Smith and Stalans (1991) discuss and categorize different types of rewards under the umbrella term “positive incentives.” They provide the following definition: “[Positive incentives] are those actions by government authorities—*other than* threats, punishments, and incapacitation—that are directed toward specific individuals and that are intended to increase their compliance with laws. Positive incentives are intended to reinforce or increase something that the target individuals find pleasant: they increase utility in the broadest sense of the term” (Smith and Stalans 1991, 37). The authors distinguish positive from negative and material from nonmaterial rewards. A theoretical analysis of introducing monetary rewards into conventional tax systems was made by Falkinger and Walther (1991). The authors propose a mixed reward–penalty system with fines for evaded taxes and rewards for honestly paid taxes. According to their analysis, not only would taxpayers benefit from such a system but also the governmental revenue could be increased, provided that the fine rate is high enough to cover the expenses for the rewards. Feld, Frey, and Torgler (2006) published an elaborate design for a field experiment on the effect of rewards on tax compliance. Although—to our knowledge—this experiment has not been conducted yet, the authors emphasize the possibility that rewards could induce problematic taxpaying strategies such as paying all or nothing of the tax due.

### *Experimental Results on the Effect of Rewards*

Some evidence of the positive effects of monetary rewards is provided by three experimental studies. Bazart and Pickhardt (2010) report results from laboratory experiments in Germany and France, where rewards were provided in the form of a lottery for audited and completely compliant taxpayers. Additionally, tax revenues were returned in the form of public goods. Taxpayers behaved similarly in Germany and in France. The reward in the form of winning a lottery prize had a positive impact in both samples;

however, the impact of a positive reward on tax compliance was stronger for men than for women.

Torgler (2003) conducted a one-shot experiment with professionals from Costa Rica. Tax compliance in this experiment was higher when monetary rewards were given for completely honest income declarations. The compliance rate in the monetary reward condition was 100 percent. However, the sample size was quite small (thirteen participants in the reward condition) and the experiment consisted of one period only.

An experiment with multiple periods is reported by Alm, Jackson, and McKee (1992a). They compared the effects of a small monetary reward, of a bigger but uncertain monetary reward in the form of a lottery ticket, of a reward for the whole group by providing a public good, and of rewarding honest taxpayers by reducing the audit probability in consecutive periods. Compared with a control condition, tax compliance was higher in all four reward conditions. The strongest effects were observed in the conditions with the fixed reward and the lottery ticket (with the same expected value), respectively. However, the authors point out that the increase in compliance was primarily achieved by altering the frequency of extreme tax compliance behaviors—evading all or nothing of the tax due.

With respect to the aforementioned experiment, Collins' (1992) criticism was that the expected value of being compliant varied between the control and the experimental conditions. Hence, it is difficult to disentangle the psychological effect of rewards (such as provoking reciprocal behavior, Gouldner 1960; shaping compliance behavior by operant conditioning, Skinner 1938; or increasing the perceived fairness of the system, Smith 1992) from the effect of their economic consequences (i.e., reducing the costs of compliance). We try to account for this critique in the design of our experiment by balancing the difference between the expected values of compliance and evasion, respectively. Our approach in doing so will be explained in detail in the following subsection. The experimental design of our study allows us to test for the psychological effects rewards have on taxpaying behavior.

We tested for two predictions. First, we expected to observe an all-or-none taxpaying behavior due to the prospect of a reward as reported by Alm, Jackson, and McKee (1992a). We assumed that taxpayers may be divided into three groups: the completely honest, the mild evaders, and the completely dishonest. We further assumed that the first and the last group have found their strategy and that the prospect of a reward would not change their taxpaying behavior much. The mild evaders, however, might be persuaded to change their strategy and might be pushed toward complete honesty by

the reward (cf. Alm, Jackson, and McKee 1992a). Our second prediction regarded taxpayers' reaction to tax audits. In tax experiments, compliance typically decreases in consecutive periods to an audit. This phenomenon has been coined the bomb-crater effect (Guala and Mittone 2005; Mittone 2006; Kastlunger et al. 2009). An explanation for this effect is that, due to misperception of chance, the probability of a second audit immediately after the first one is underestimated. However, in accordance with the reciprocity norm (Gouldner 1960), we expected the bomb-crater effect to diminish when positive incentives are introduced. Although taxpayers might not expect a second, consecutive audit, we assumed that they will not exploit the (subjectively) safe opportunity for tax evasion, if they had been rewarded before.

In the following subsection, we will present a payoff structure for an experiment with a control condition and a condition where tax honesty is rewarded by a fixed sum of money. Our design accounts for Collins' (1992) critique and allows us to test for our predictions.

### *Balancing Expected Values*

When declaring their income, taxpayers have to decide whether to be compliant or to evade. If they comply, their gross income ( $I$ ) would be reduced by the tax due ( $T$ ). If they choose to evade part or all of their taxes ( $E$  = amount of evasion), two possible outcomes emerge: in the case of an audit (occurring with probability  $p$ ), the evaded amount of taxes plus a fine have to be paid. The fine is typically a multiple ( $F$ ) of the amount evaded (=  $E$  multiplied by  $F$ ). In the case where no audit occurs, their effective income is increased by the amount evaded. Economic theory assumes that taxpayers choose the option with the higher expected value, that is, to evade one's taxes. If the expected value of being noncompliant is reduced by the threat of a high fine  $F$ , tax evasion becomes less attractive and preferences for the noncompliant option should be weaker (Allingham and Sandmo 1972; Srinivasan 1973). Vice versa, by rewarding compliance, the difference between the two options decreases and tax compliance gains in attraction (Falkinger and Walther 1991).

Higher compliance due to an increased expected value of compliance would simply mean a rational reaction of the *homo oeconomicus*. Rewards, however, might also induce other noneconomic effects. As Collins (1992) points out, to disentangle the effect of economic and noneconomic factors in tax experiments, it would be necessary to balance the expected values of being compliant and of being noncompliant across experimental conditions.

**Table 1.** Expected Values Without Rewarding Compliance

Expected value of compliance	$I - T$
Expected value of evasion	$(I - T + E)(1 - p) + (I - T - FE)p$
Difference in expected values	$E(Fp + p - 1)$

Note:  $E$  = amount of evasion;  $F$  = fine rate;  $I$  = income;  $p$  = audit probability;  $T$  = tax due.

**Table 2.** Expected Values When Compliance is Rewarded

Expected value of compliance	$(I - T)(1 - p) + (I - T + R)p$
Expected value of evasion	$(I - T + E)(1 - p) + (I - T - FE)p$
Difference in expected values	$E(Fp + p - 1) + Rp$

Note:  $E$  = amount of evasion;  $F$  = fine rate;  $I$  = income;  $p$  = audit probability;  $R$  = reward;  $T$  = tax due.

The following analyses will explain how we balanced the expected values in the design of our experiment.

First, we calculate expected values for the control condition (see table 1). The difference between the expected values of being compliant and of evading taxes is a measure of the strength of the preference a rational taxpayer would have for one of the two options.<sup>1</sup> As long as neither  $p$  nor  $F$  exceeds a certain threshold, tax evasion is more profitable in the long run.

By providing rewards for tax compliance, the expected value of the honest option in the compliance decision increases. If a completely honest payment of taxes is rewarded with a fixed amount of money ( $R$ ), the calculation formula for the expected value changes as presented in table 2. Please note that a reward can only be provided, if a taxpayer is audited and found to be compliant. Hence, the prospect of a reward is uncertain and occurs with the same probability ( $p$ ) as the fine.

The differences in the expected values in tables 1 and 2 can be interpreted as the strength of preference a rational decision maker would have for one of the two options. As presented in tables 1 and 2, this difference changes by the product of  $R$  and  $p$  when rewards for compliance are provided. In other words, introducing a reward shifts taxpayers' preferences toward compliance. As Collins (1992) points out, however, an increase in compliance in such a setting would simply mean a rational reaction to the reduced costs of compliance. If rewards also have other, noneconomic effects, they cannot be tested with an experimental design where the expected value of compliance varies across conditions as presented in tables 1 and 2, respectively.

A way to balance the expected values is to reduce the fine rate  $F$  for evasion when compliance is rewarded. As a reward makes tax compliance more attractive, lowering the fine rate makes tax evasion more likely. In other words, by lowering the fine rate, the expected value of tax evasion increases and thus balances the increased expected value of compliance due to the reward.<sup>2</sup>

## Method

### *Participants*

Participants were recruited through announcements on the bulletin board of the Faculty of Economics, University of Trento, Italy. Eighty-six undergraduate students participated (39.5 percent women, 60.5 percent men; participants' age in years  $M = 23.65$ ,  $SD = 2.79$ ).

### *Experimental Design and Procedure*

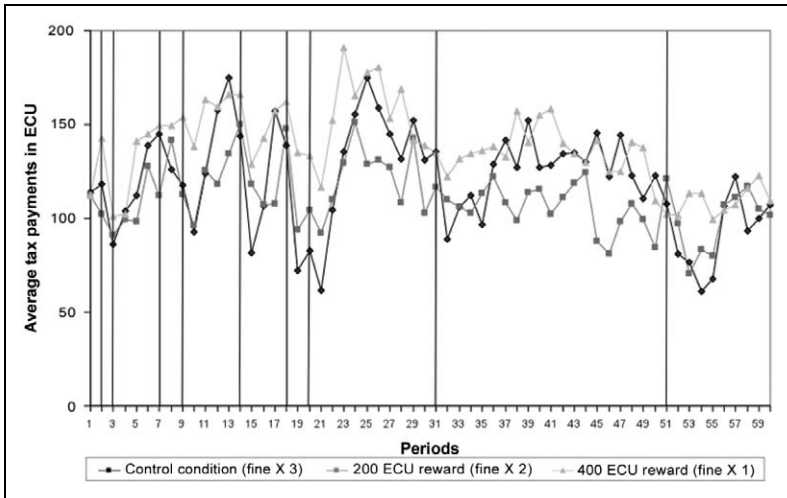
In three experimental conditions, we manipulated whether and how compliance was rewarded (control condition without rewards; reward of 200 experimental currency unit [ECU]; and reward of 400 ECU). For each condition, two sessions were conducted in groups of fifteen participants (except for one session where only eleven students participated). Following prior tax experiments by Mittone (Guala and Mittone 2005; Mittone 2006), a repeated measures design with sixty periods overall was implemented. All the instructions were given on computers. Participants were informed that they were endowed at the end of the experiments in relation to their performance. In each period, they received an income of 1,000 ECU and paid (all or part of) their tax due. They were informed about the tax rate (20 percent), audit probability (15 percent), and that in the case of an audit they would have to pay the remaining tax due and an additional fine. The size of the reward and fine rates varied across conditions (see table 3 for an overview of the experiment's parameters).

In the control condition, compliance was not rewarded and the fine was three times the evaded amount. In the two reward conditions, the participants received monetary rewards, if they were audited and found to be compliant. In the experimental conditions, a reward of 200 ECU and 400 ECU, respectively, was provided. To balance the differences in expected values between the control condition and the experimental conditions, the fine rate was lower in the experimental conditions than in the control condition (as discussed in the previous section). In the 200 ECU reward condition, the



**Table 3.** Parameters of the Experiment and Expected Values in the Experimental Conditions

	Income	Tax Rate	Audit Probability	Fine Rate	Reward for Compliance	Expected Value of Compliance	Expected Value of Evading the Total Tax Due	Difference of Expected Values
Control condition ( <i>n</i> = 30)	1,000 ECU	20%	.15	3 ×	0 ECU	800	880	-80
200 ECU reward condition ( <i>n</i> = 30)	1,000 ECU	20%	.15	2 ×	200 ECU	830	910	-80
400 ECU reward condition ( <i>n</i> = 26)	1,000 ECU	20%	.15	1 ×	400 ECU	860	940	-80



**Figure 1.** Average tax payments per experimental condition.  
 Note: Means are adjusted for gender, vertical lines mark periods with tax audits.

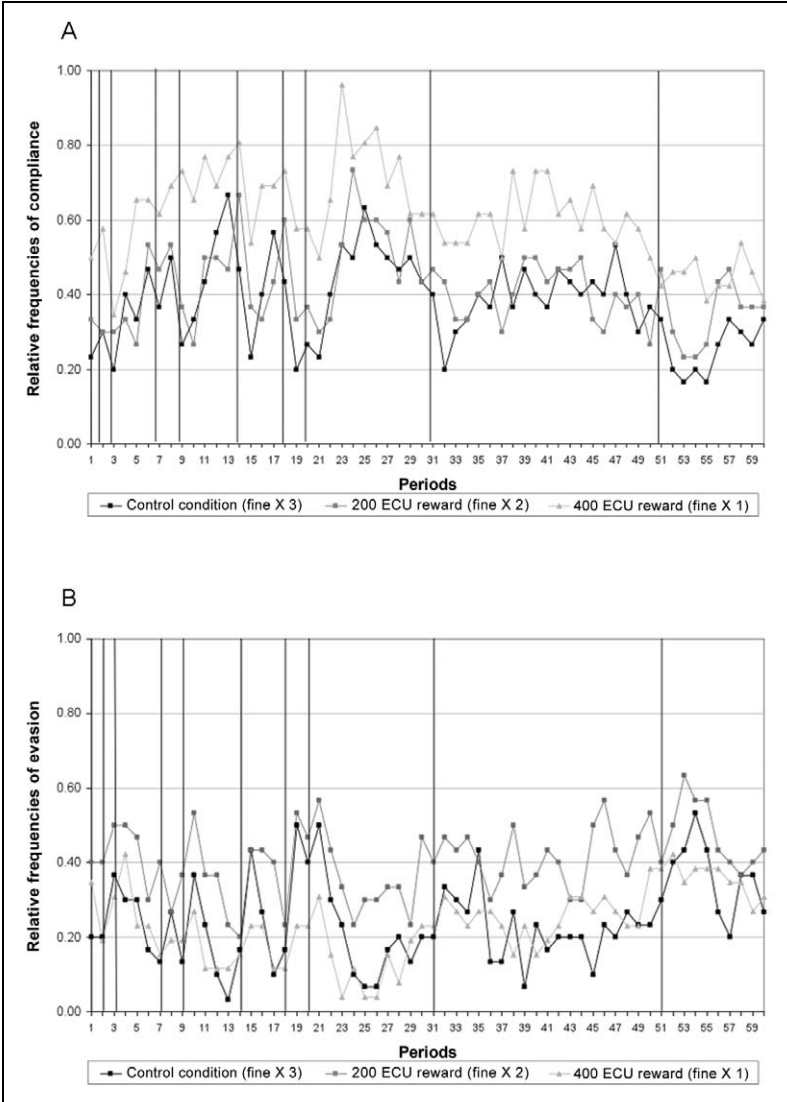
fine rate was twice the evaded amount. In the 400 ECU reward condition, the fine rate was only once the evaded amount.

Table 3 gives an overview of the parameters in all the experimental conditions, the expected values for tax compliance and tax evasion in the case of total tax evasion (i.e., evading the complete tax due) and the differences in the expected values for each condition.

The participants were not informed about the number of periods they would play. Periods where participants faced a tax audit were randomly chosen prior to the experiment. Hence, the pattern of audits was the same for all the participants (see figure 1). At the end of each session, the participants were debriefed and were paid. The three participants with the highest earnings over the sixty periods received 15 euro, the next three received 12.5 euro, the next three received 10 euro, the next three 7.5 euro, and the three participants with the lowest earnings received 5 euro. Each experimental session lasted for approximately one hour.

## Results

First, we calculated the average tax compliance in each condition. Next, we analyzed what Alm, Jackson, and McKee (1992a) have coined all-or-none



**Figure 2.** A. Relative frequencies of compliance in each period by condition. B. Relative frequencies of complete evasion in each period by condition. Note: Vertical lines mark periods with tax audits.

behavior by comparing the frequencies of completely honest tax reports and total evasion, respectively, across the conditions. Finally, we analyzed the participants' reactions after an audit and examined whether rewards diminished the bomb-crater effect (Mittone 2006), that is, the decrease in compliance after an audit has occurred.

Because prior studies found evidence of gender differences in tax compliance (Hasseldine 1999; Bazart and Pickhardt 2010), we controlled for gender in all the following analyses.

### *The Effect of Rewards on Tax Compliance*

Figure 1 shows the average tax payments in the sixty periods for each condition when controlling for gender effects. A repeated measures analysis of covariance was conducted, with conditions as between-subjects factor, sixty periods as the within-subjects factor, gender as the covariate, and mean tax payments as the dependent variable. No significant differences emerged between the conditions (control condition: *estimated marginal mean* = 119.72, *SE* = 9.53; 200 ECU reward condition: *estimated marginal mean* = 110.71; *SE* = 9.70; 400 ECU reward condition: *estimated marginal mean* = 137.55, *SE* = 10.03;  $F(2, 82) = 1.90, p = .16$ ); the covariate gender, however, was significant,  $F(1, 82) = 6.48, p = .01, \eta^2 = .07$ . The main effect of periods was significant (*Greenhouse Geiser*  $F(23.92, 1985.11) = 6.85, p < .01, \eta^2 = .08$ ) whereas the interaction of periods with conditions was not (*Greenhouse Geiser*  $F(47.83, 1985.11) = 1.03, p = .43$ ).

### *All-or-None Tax Compliance Behavior*

Although the means of tax payments were not affected, the participants seem to follow different taxpaying strategies when honest tax reports are rewarded. Figures 2A and B show the relative frequencies of total compliance (i.e., evading zero taxes) and total evasion (i.e., evading the whole tax due) for the sixty periods. Obviously, such all-or-none behavior occurs more frequently when the prospect of a reward is provided. To test whether different taxpaying strategies were applied in the reward conditions compared with the control condition, we calculated for each participant the relative frequencies of completely honest and of completely dishonest tax reports over the sixty periods. These two values per participant were analyzed by a multivariate analysis of covariance with the experimental conditions as the independent factor and gender as the covariate. The multivariate effects of conditions were found to be significant,  $F(4, 164) = 4.44, p < .01$ ,

$\eta^2 = .10$ . Again, gender accounted for a significant part of the variance,  $F(2, 81) = 4.95, p < .01, \eta^2 = .11$ ). The univariate results show that the frequency of total compliance was affected by the experimental conditions (control condition: *estimated marginal mean* = .36, *SE* = .05; 200 ECU reward condition: *estimated marginal mean* = .44; *SE* = .05; 400 ECU reward condition: *estimated marginal mean* = .60, *SE* = .05;  $F(2, 82) = 5.77, p < .01, \eta^2 = .12$ ). The increase in honest tax payments in the 200 ECU reward condition was not significant compared with the control condition (*contrast estimate* = .09, *SE* = .07,  $p = .25$ ), whereas in the 400 ECU reward condition, more honest tax payments were made than in the control condition (*contrast estimate* = .24, *SE* = .07,  $p < .01$ ). Complete evasion, however, occurred about equally often in the three conditions (control condition: *estimated marginal mean* = .28, *SE* = .05; 200 ECU reward condition: *estimated marginal mean* = .36; *SE* = .05; 400 ECU reward condition: *estimated marginal mean* = .25, *SE* = .05;  $F(2, 82) = 1.32, p = .27$ ).

### Reactions to Tax Audits

Next, we analyze whether rewards diminish the bomb-crater effect (Guala and Mittone 2005; Mittone 2006). For this purpose, we selected only observations in periods after a participant was audited and found to be completely honest. Tax payments after such an audit were averaged per person. Thus, we had one measure per participant indicating participants' average reaction to an honest tax report that was audited—and in the two reward conditions reinforced by monetary rewards. A total of eight participants were excluded from this analysis, because they were not compliant in any of the nine audit periods. On average, the remaining participants were found to be completely honest in more than four of the nine audits ( $M = 4.51, SD = 2.56$ ). Participants' average compliance in periods after an honestly completed tax report has been audited were compared between the experimental conditions by an analysis of covariance with gender as the covariate.

Significant differences between the conditions emerged,  $F(2, 74) = 5.11, p < .01, \eta^2 = .21$ . The covariate gender was again significant,  $F(2, 74) = 9.55, p < .01, \eta^2 = .12$ . As expected, the lowest level of compliance was observed in the control condition (*estimated marginal mean* = 90.37, *SE* = 13.30), where honest tax reports were not reinforced by rewards. By contrast, the highest compliance rate was observed among the participants after obtaining a reward of 400 ECU (*estimated marginal mean* = 150.16, *SE* = 14.14), followed by those who obtained a reward of 200 ECU (*estimated marginal mean* = 132.14, *SE* = 14.20). Simple contrast analysis revealed

that tax payments after an audit were lower in the control condition than in both reward conditions (control condition vs. 400 ECU reward condition: *contrast estimate* = 41.77, *SE* = 20.07,  $p < .05$ ; control condition vs. 200 ECU reward condition: *contrast estimate* = 59.79, *SE* = 19.20,  $p < .01$ ).

## Discussion

The findings from our experiment suggest that rewarding honest taxpayers does not generally increase the tax revenue. These results are in contrast to prior experimental evidence by Alm, Jackson, and McKee (1992a), Torgler (2003), and Bazart and Pickhardt (2010). An important difference between our experiment and the previous studies concerns the payoff structure. As Collins (1992) and Alm, Jackson, and McKee (1992a) have discussed earlier, introducing positive incentives increases the expected value of compliance. Compared with a control treatment with the same penalty for tax evasion but without the reward for an honest tax report, the option to evade one's tax due becomes less attractive. An increase in tax payments would, therefore, simply be a rational reaction toward the altered incentive structure. To disentangle this purely rational reaction from other, more psychological mechanisms rewards might have on compliance, we have tried to balance the differences in the expected values of compliance and noncompliance across the experimental conditions. Consequently, the participants in our reward conditions faced lower penalty rates than the participants in the control conditions. Hence, to evade the whole tax due should have been equally attractive in all three treatments. Accordingly, the average tax payments were about the same in all our experimental conditions. This could mean that the rewards in our experiment affected participants' compliance, but the lower penalties have counteracted this effect. Or, another explanation could be that incentives in general have only weak, if not zero, effects on compliance as discussed in the tax literature (Muehlbacher, Hölzl, and Kirchler 2007; Kirchler, Hoelzl, and Wahl, 2008; Kirchler et al. in press).

However, further results suggest that positive incentives alter taxpayers' decision strategies. As in the study by Alm, Jackson, and McKee (1992a), all-or-none behavior—that is, paying all or nothing of one's tax due—was more pronounced when rewards were provided. An interpretation of this finding could be that when the prospect of a reward for tax honesty is provided, taxpayers pursue one of the two goals: either they go for the additional income from tax evasion or they head toward obtaining the reward. Interestingly, the number of total evaders was about the same in the three conditions, but completely honest tax reports were more often observed

in the rewards conditions. It seems that rewards have increased the tax payments of “mild” evaders who did not evade all but only parts of their tax due. However, our observation of an all-or-none taxpaying behavior could also be a consequence of the different payoff structures in our experimental conditions. Whereas the expected value of completely evading one’s tax due was the same in all the conditions, the expected value of evading smaller amounts differed as discussed in footnote 2. Hence, participants who did not want or did not dare to evade their complete tax liability might have been pushed toward honesty due to the decreasing differences in the expected values of compliance and a lower level of evasion.

That rewarding honesty also provokes psychological effects is suggested by our findings on the bomb-crater effect (Guala and Mittone 2005; Mittone 2006). The decrease in compliance immediately after an audit, which has been observed in so many experiments before, was less pronounced in the reward conditions. This is in line with the literature on operant conditioning (Skinner 1938) and reciprocity (Gouldner 1960; Smith 1992), but it can also be interpreted as an income effect resulting in higher tax compliance in the following periods (Feld and Frey 2007).

Limiting to our study is the rather artificial taxpaying situation in the laboratory, which participants might have perceived as a gambling situation rather than a real-life taxpaying simulation. Furthermore, the use of students in tax experiments, due to their lack of experience of paying taxes, might be somewhat problematic. However, inexperienced participants might also be an advantage, since they have no routine and taxpaying strategy yet, and therefore might react more sensibly to the experimental manipulation.

Before any conclusions can be made for tax policy, further research on the introduction of positive incentives is necessary. In theory, providing rewards for tax honesty might also have unwanted effects on compliance. As Feld, Frey, and Torgler (2006) point out, rewards might crowd out intrinsic motivation for tax compliance. By contrast, intrinsic motivation, that is, voluntary tax compliance, could also be enforced by rewarding honesty and communicating gratefulness to citizens who comply with the law. The latter argumentation is in line with Braithwaite’s (2003b) claim for responsive regulation, that is, fair and respectful treatment of compliant taxpayers but the full rigor of the law for persistent tax dodgers.

## Notes

1. Note that the strength of preferences can also be approximated by the ratio between the expected values of compliance and evasion. Referring to Elffers (1999), we decided to use the difference between the two options.

2. Note that the difference in expected values as presented in table 1 is always negative as long as the amount of evasion  $E$  is bigger than zero. Therefore, in the formula in table 1, tax evasion is more attractive, regardless of the amount of evasion. However, the difference in table 2, where a reward for compliance is provided, is only negative if the amount of evasion is bigger than  $-Rp/(Fp + p - 1)$ . Thus, tax evasion in the formula in table 2 pays only if more than this specific amount is evaded.

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