Tax Evasion and Institutions: An Experiment on the Role of Principal Witness Regulations

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Abstract

We experimentally study the effectiveness of a principal witness regulation on tax compliance when tax evasion is nested within a corruption framework. Subjects repeatedly declare taxes in institutional environments with and without a principal witness regulation. Our experimental design allows us not only to compare tax compliance under both regimes, but also to investigate whether a transition from one regime to the other can increase compliance or break up established collusive patterns. The results suggest that tax compliance is higher in the presence of a principal witness regulation when the regime is fixed. However, the transition towards a regime with a principal witness regulation has the opposite effect, i.e. introducing it in later rounds causes a drop in compliance. We provide evidence that the effectiveness of new political measures cannot reliably be judged in isolation, but must be considered in view of the actual institutional history, that is the particular institutional framework in place before the measure is introduced.

\textit{Keywords:} Corruption, Institutions, Principal Witness Regulation, Tax Compliance, Tax Evasion

\textit{JEL classification:} D03; D73; D81; H26

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1. Introduction

Tax evasion is one of the most pervasive forms of illicit behavior. It induces negative externalities on both the economic and societal level (Banerjee, 2016a; Slemrod, 2007). Understanding its drivers and implementing suitable institutional measures to curb its severity has been at the center of the past decade’s theoretical, empirical and experimental research. Beyond theoretical exercises, such as the seminal work of Allingham and Sandmo (1972), research that analyzes tax evasion empirically in general and in particular experimentally has been growing, suggesting that individuals pay more taxes than what would be predicted by standard economics (Alm et al., 1992; Torgler, 2003. For a general discussion see Andreoni et al., 1998 and Alm, 2012).

While most of the economic research has focused on deterrence of income tax evasion or its related variants, other forms of tax evasion, such as trade/import or custom taxes, where taxes are in some way collected through the direct intermediation of a third party (e.g. custom duties), have almost completely been neglected by the experimental literature (Orviska and Hudson, 2003; Bø et al., 2015). In particular, corruption within tax evasion has received little attention so far.

In contrast to existing experimental studies on this matter, we focus on the effectiveness of providing legal immunity to the bribe-giver as a measure to deter tax evasion embedded in a setting of collusive bribery, in which tax evasion can only be successful through cooperation among tax payers and public officials. The exchange of bribes is studied in our paper as one explicit collaboration inducing mechanism, which has previously been found to be effective in sustaining illicit cooperation (Weisel and Shalvi, 2013). Wu and Abbink (2013) study harassment bribes and consider rewarding self-reports as a mechanism to reduce collusive bribery. They find it to be only weakly effective, especially in a context of repeated interaction. Closely related to our work, Heinemann and Kocher (2013) study the effects of regime changes on tax compliance, however, they focus on changes in the tax rate and consider neither corruption nor reforms
akin to a principal witness regulation.

In many countries, the introduction of a principal witness regulation represents an integral institutional feature aimed at suppressing criminal behavior. In this paper, we are interested in examining the role of the institutional frame of tax evasion behavior. We compare institutional frames with and without a principal witness regulation and ask whether the presence of such a regulation constitutes an efficient means to, first, increase tax compliance and, second, to break established collusive patterns (e.g. corruption) when newly introduced.

To the best of our knowledge this is the first experiment studying tax evasion nested in a corruption framework in general, and the influence of an institutional change in the form of a principal witness regulation on tax compliance in particular. We contribute to the corruption and tax evasion literature by shedding light on how tax evasion is affected by the specifics of the strategic interaction of tax payers with an intermediary, a dimension not present in a setting of individual tax evasion. We use a controlled laboratory experiment modeling an income reporting scenario that requires the interaction between two parties, a tax payer and a tax officer, thus opening the door for collusive corruption. Existing research highlights the importance of studying the collaborative roots of deviant behavior due to their inherent negative economic and societal externalities (Weisel and Shalvi, 2015).

Our experimental design employs an extension of the standard tax evasion game (Allingham and Sandmo, 1972). First, we use a scenario of tax evasion nested in a corruption framework (Abbink et al., 2002), in which corrupt tax officers face little to no consequences. The idea was to mimic a situation where tax authorities do not have the means to sufficiently control the tax officers, for example due to the institutional environment rendering enforcement of adequate consequences impossible. Excessive costs of monitoring might be one reason why authorities are not able to detect dishonest officers. However, this could also be due to authority’s need to maintain a reasonable level of consensus among their tax officer’s, which can be undermined by a high level of control. In this basic variant of the game (bribery game) each tax payer receives
a fixed income that is taxed at a fixed rate that he is asked to report to the authorities in the form of a tax officer. The first distinct feature of our design is that underreporting requires the cooperation of the tax officer whom the tax payer can offer a bribe as reward for his cooperation. Tax reports are subject to audits with a known probability. Conditional on successful underreporting of taxes, the incidence of an audit leads to an imposed penalty for the tax payer, but not for the tax officer. Second, we then modify the basic bribery game by adding an additional stage in the spirit of a principal witness regulation. This extended bribery game follows the same rules except that now an underreporting tax payer can avoid the penalty, he would face upon detection, by denouncing the corrupt tax officer, who in that case must pay a fine instead. The idea of the principal witness regulation was to render the tax officer also formally responsible in that a corrupt tax officer now faces the threat of a fine as well.

The goals of this study are twofold: First, we seek to analyze tax compliance behavior under different regimes where due to the interaction between tax payer and tax officer corruption is feasible. Second, we investigate the effects of a principal witness regulation in settings with and without institutional transitions.

One way to think of the introduction of a principal witness regulation is as a stylized situation, where tax authorities decide to invest in establishing control mechanisms that allow for better monitoring of public officials. Hence allowing them to enforce legal consequences not only on tax payers but also on corrupt tax officers, e.g. via improved monitoring. We mimic transitions of that type by employing not only static treatments, where exactly one regime is present for the whole duration of the experiment, but also dynamic treatments

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1The basic bribery game can be considered as a game with an asymmetric punishment structure. We refer the reader to Engel et al. (2013) for a detailed analysis of symmetric vs asymmetric punishment schemes. See also Abbink et al. (2014).
involving a regime change from one to the other. This allows us to study both, the effectiveness of either setup in isolation and how subjects react to a change in either direction. In particular, we are interested in whether the transition from one scenario to the other can break collusive behavior established during a previous period where the other institutional frame was implemented, and hence can serve as a tool to reduce tax evasion in a world where that frame represents the status quo.

Our experimental results highlight the role of institutional history in rendering the effectiveness of institutional and economic environments, which is in line with Acemoglu et al. (2005). In particular, our findings highlight two distinct and surprising points: Firstly, when resorting to a between comparison of institutional environments, that is a world in which a principal witness regulation has always been absent with one in which it has been implemented from the get go, tax compliance is significantly higher in the latter. This effect is mainly driven by a higher tax compliance rate of females and is thus in line with existing literature on gender differences in illicit settings such as corruption or cheating behavior (cf. Croson and Gneezy, 2009; Torgler and Valev, 2010; Banuri and Eckel, 2012). In contrast, when shedding light on the impact of an institutional shock, that is a within-comparison of institutional changes, our results paint a substantially different picture. In particular, our results indicate that the introduction of a principal witness regulation into an environment where it has previously been non-existent leads to significantly less tax compliance. Much to our surprise and both against conventional wisdom and existing literature, we find that these welfare distortions are largely driven by the significantly increased non-compliance of females. In sum, our results provide robust evidence for the effectiveness of principal witness regulations across various institutional settings, which render important policy implications. Our results also add to the growing body of evidence on gender differences within the frame of choice under risk and strategic uncertainty, and provide further evidence to the idea that females are generally more sensitive to the contextual frame (Croson and Gneezy, 2009).
The paper is organized as follows: Section 2 describes the experimental design and develops our main hypothesis. Section 3 presents the analysis of our empirical results. In Section 4 we discuss our results and related literature. Section 5 concludes.

2. Experimental Design

Both of our institutional setups mimic a scenario where tax evasion is nested within a corruption framework. Taxes are collected through an intermediary, the tax officer. Hence, to successfully evade taxes the tax payer requires the cooperation of the tax officer, e.g. by “looking the other way”. We now give a detailed description of the two institutional frames used in our experiment.

2.1. Two institutional frames: Bribery Game and Extended Bribery Game

The upper part of Figure 1 illustrates the bribery game (BG). A tax payer (TP) receives an income of $I$ that has to be declared to the tax authorities represented by a tax officer (TO). Declared income $D$ is subject to a tax rate $t$. An incorrect declaration of less than the full income requires the cooperation of the TO and can be accompanied by a bribe $b$ between 1 and 30 that is offered to the TO. The TO receives the tax declaration together with a potential bribe from the TP. She then decides whether to accept or reject the tax report together with the potential bribe. The rejection of a bribe implies the rejection of the (potentially false) tax report, forcing the TP to truthfully declare taxes.

Correct tax declarations are automatically accepted. With an exogenous probability $p$, a TP’s declaration is audited and incorrect reports are detected. In that case the TP has to pay both the evaded amount of taxes $t(I - D)$ and a fine. The fine is proportional to the evaded tax amount; it is fixed at a rate.

\[\text{Of course one might also allow the tax officer to pocket the bribe without delivering the corrupt favor of accepting the tax report (see, e.g. Wu and Abbink, 2013). We explicitly exclude this possibility as we view this scenario as rather unrealistic in a context of tax evasion.}\n
\[\text{This is an institutional feature often observed in developed countries (Mittone, 2006).}\]
Figure 1: Extensive form representation of the (extended) bribery game depicting the interaction between a TO and a TP within a single round. Stage below the dashed line is only available in the extended bribery game. \( D \) denotes taxes declared, \( b \) bribes offered, \( p \) the probability of an audit, \( t \) the tax rate. For the sake of a simpler exposition the PO’s fixed wage of 50 is not depicted.

\[ f \] for a maximum fine of \((1 + f)tI\). Hence if the TP offers a bribe \( b \) and the TO accepts (rejects), the TP’s expected payoff for reporting an amount of \( D \) is 
\[
I - b - p(tI + ft(I - D)) - (1 - p)tD ((1 - t)I - b),
\]
while the TO’s payoff is 
\[
50 + ctD + b (50 + ctI)
\]
consisting of three components: a fixed wage of 50, a commission \( c \) of the taxes collected, and the bribe \( b \) she accepted in return for accepting the tax report.\footnote{The introduction of a commission for the TO mimics something existing in reality. In Italy for example the Tax Authority delegates a private Organization (Equitalia) to carry on inspections and audits and pays Equitalia with a percentage of the money collected.}

The extended bribery game (EG) is similar to the bribery game just de-
scribed, but with one important difference. In the EG we add an additional stage to BG intended to mimic a situation that is similar to a principal witness regulation. Decisions in EG are identical to those in BG, however, following detection of an incorrect tax report through an audit now the TP has the opportunity to denounce the TO. If the TP denounces, he is forced to correct the (false) tax report, i.e. to truthfully declare taxes. In that case he does not incur an additional monetary punishment, i.e. the fine is waived. A denounced TO, on the other hand, incurs a fine that equals the bribe received from the TP plus an additional penalty of $F$. Now, if the TP offers a bribe $b$ and the TO accepts, the TP’s expected payoff for reporting an amount of $D$, given that he denounces the TO when audited, is $I - b - ptI - (1 - p)tD ((1 - t)I - b)$, while the TO’s expected payoff is $50 + 0.15tD + b - p(b + F)$. If in the same situation the TO rejects the bribe, then the expected payoff for the TP and TO are $(1 - t)I - b$ and $50 + 0.15tI$, respectively.

In our experiment all amounts were presented in Experimental Currency Units (ECU) that were converted to EUR at the end of the experiment. The exact parameters of the experiment were as follows: $I = 80$, $t = 50\%$, $p = 20\%$, $f = 25\%$, $c = 15\%$ and $F = 10$. Note that we haven chosen the fine rate $f$ such that together with the upper bound (of 30) on bribes the TP never incurs a net loss. In the unique sub-game perfect equilibrium of the BG (with these parameters) tax payers declare zero taxes and offer a bribe of 6, which in equilibrium is always accepted by the tax officer. Similarly, in EG tax payers declare zero taxes, however, the bribe offered in equilibrium in EG is 10 (compared to 6 in BG), which again is always accepted by the tax officer. Given the opportunity to denounce tax payers will always do so in equilibrium. Anticipating this behavior tax officers reject bribes below 10, which increases optimal bribe offers.

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5In BG punishment can be viewed as asymmetric as only tax payers are running the risk of being fined, however, in EG the principal witness regulation shifts, at least partially, this risk towards the tax officer, hence creating a situation that might be perceived as more symmetric. See also Engel et al. (2013) for a discussion of symmetric vs asymmetric punishment regimes.
to exactly that value.

2.2. Treatments

In our experiment subjects repeatedly played the bribery game or its extended version (with principal witness regulation) over the course of a total of 20 rounds. The experiment consists of four treatments. In Treatment 1 (Treatment 2), participants play the (extended) bribery game in which the principal witness regulation is (not) absent throughout the full experiment. These two treatments represent a clean between-comparison of the role that principal witness regulation plays in affecting tax compliance. In addition, these treatments represent a benchmark to environments in which institutional shocks occur. We pick up the effects of institutional transitions in Treatments 3 and 4 in which institutional changes occur unannounced midway through the experiment after round 10. In particular, participants in the role of tax payers in Treatment 3 (noPwr-Pwr) start with the basic bribery game and are then transitioned into an environment in which denouncing the tax officer is introduced. Treatment 4 (Pwr-noPwr) depicts the same idea in reverse order, that is tax payers start with the option to denounced, which is then abolished after round 10. These two treatments involve a regime change that allows us to analyze the effectiveness of both the introduction and the removal of a PWR relative to a “status quo”, that is the regime present during the first block of 10 rounds. Table I summarizes the four treatments as well as the number of subjects assigned to each of them.

2.3. Behavioral Predictions and Hypotheses

As noted in the previous section TPs optimally declare zero taxes independently of the presence of a principal witness regulation in the unique sub-game perfect Nash-Equilibrium. In the extended bribery game the TP always denounces the TO in equilibrium, resulting in a higher acceptance threshold for bribes on the side of the TO, and thus higher bribe offers.

In contrast to these theoretical predictions, experimental evidence suggests
Table 1: Overview over the treatments and number of subjects assigned to each treatment. The principal witness regulation is present in the extended bribery game (EG) but not in the bribery game (BG).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Round 1-10</th>
<th>Round 11-20</th>
<th>Number of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1 (noPwr)</td>
<td>BG</td>
<td>BG</td>
<td>40</td>
</tr>
<tr>
<td>Treatment 2 (Pwr)</td>
<td>EG</td>
<td>EG</td>
<td>48</td>
</tr>
<tr>
<td>Treatment 3 (noP-Pwr)</td>
<td>BG</td>
<td>EG</td>
<td>88</td>
</tr>
<tr>
<td>Treatment 4 (Pwr-noPwr)</td>
<td>EG</td>
<td>BG</td>
<td>56</td>
</tr>
</tbody>
</table>

An important feature of our experiment is the nesting of tax evasion within a corruption framework that requires collusive behavior in order for tax evasion to be successful. We believe that this additional layer of interaction is important to help us better understand unethical behavior in situations in which cooperation is necessary. Such layer of interaction renders the existence of behavioral factors such as psychological costs, hence we expect tax compliance to be relatively high in comparison to other studies where this component has been absent.

One of our objectives is to study the effectiveness of a principal witness regulation as a means to increase tax compliance and hinder corrupt behavior. The presence of a principal witness regulation effectively reduces the risk the TP faces when evading taxes, while shifting responsibility to the TO and potentially reducing the TP’s psychological costs. Intuitively, the possibility to denounce the TO offers the TP a “safe way out” in the extended bribery game and we expect this to potentially decrease compliance. This gives rise to the following hypothesis:

**Hypothesis 1.** Tax compliance is lower in the extended bribery game when

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6It was shown in Banerjee (2016b) that a loaded frame that creates the right sense of entitlement significantly decreases corruption suggesting that moral costs are indeed at work.
a principal witness regulation is present in comparison to the regular bribery game, hence we expect subjects to declare more taxes in Treatment 1 compared to Treatment 2.

We want to point out that lower compliance does not necessarily imply an efficiency loss in the sense that there are less taxes collected. Our design allows for discernment between attempted non-compliance and actual compliance. Recall that in EG not only the TP faces less risk but it is effectively shifted to the TO as the principal witness regulation exposes the TO to a risk of being denounced and fined. This raises the TO’s optimal acceptance threshold for bribe payments. In order to sustain collusion, that is to ensure the TO’s continued cooperation, the TP has to compensate the TO for this additional risk with higher bribe payments. If TPs fail to acknowledge this increased risk on the TO’s side, collusion might fail resulting in more rejections and thus taxes collected might not decrease despite lower compliance in the sense of attempted tax evasion.

Existing literature on the slippery-slope effect indicates that unethical behavior increases over time (Gino and Bazerman, 2009; Welsh et al., 2015), suggesting that with reduced tax compliance over time we are likely to observe participants to approach the one-shot equilibrium prediction. We deliberately designed our experiment such that the same subjects would interact repeatedly under the same regime to facilitate collusive cooperation. There is evidence that cooperation of this type is easier to achieve when interacting repeatedly with the same partner (e.g., see Andreoni and Miller, 1993; Selten and Stoecker, 1986). We thus expect that for a fixed institutional environment tax compliance decreases and corruption in the form of collusion increases over time resulting in increasing acceptance rates.

**Hypothesis 2.** For a fixed institutional environment tax compliance is decreasing over time.
Hypothesis 3. For a fixed institutional environment acceptance rates are increasing over time.

Treatment 3 allows us to study the effect of introducing a principal witness regulation into a setting in which corrupt behavior has already been able to thrive in a less strict institutional regime. We are interested in whether a sudden change in an established institutional framework, i.e. in the form of the introduction of a principal witness regulation, is effective in breaking up existing collusive patterns. It is possible that during the first 10 rounds without a PWR the TO and TP collude by, for example, implicitly agreeing on a shadow price in return for the TO’s cooperation. As pointed out above, the introduction of a PWR might raise this shadow price and as a consequence collusion can fail. The question is whether, conditional on a history of successful collusion, coordination on a new shadow price is more easily accomplished. We hypothesize that the institutional break is (at least initially) able to distort established collusive relationships, hence we expect more miscoordination resulting in higher rejection rates on the side of the TO in the second block of Treatment 3.

Hypothesis 4. In Treatment 3 the introduction of a PWR leads (at least temporary) to a downwards shift in acceptance rates, that is collusive behavior between taxpayer and tax official is less often successful after PWR is introduced compared to the initial rounds without a PWR.

In Treatment 4 the logic is reversed. Subjects start under a regime with a principal witness regulation followed by its removal. If collusion is harder to achieve in the presence of a principal witness regulation, one would expect low acceptance rates in the first part when facing the extended bribery game. On the other, as the removal of the PWR supposedly facilitates collusion it should lead to higher acceptance rates in rounds 11 to 20.

Hypothesis 5. In Treatment 4, the removal of the PWR leads to an upwards shift in acceptance rates.
2.4. Experimental procedures

Subjects were randomly assigned either the role of a TP or that of a TO. Participants where randomly matched in groups of 4 consisting of one TO and 3 TPs, that is each TO is assigned 3 TPs to interact with simultaneously. In each session groups remained fixed throughout the experiment consisting of a total of 20 periods split into two phases of 10 rounds. In each period subjects played, depending on the treatment, either the bribery game or the extended bribery game. For Treatment 1 (noPwr) and Treatment 2 (Pwr) no institutional change occurred. In Treatment 3 (noPwr-Pwr) and Treatment 4 (Pwr-noPwr) the participants were informed about a change in the institutional setting after the 10th round via an announcement on screen. That is, we use a within variation of an institutional setting to study the effect of a principal witness regulation on tax compliance. Subjects were informed in the instructions that the existing institution may be subject to change but no information regarding the nature of the change was provided.

In order to make tax evasion more salient in the laboratory setting, we introduce a third party that incurs a monetary damage as a result of tax evasion. All participants were informed that the total tax yield collected would be used to finance future research of doctoral students at the University of Trento. That is, tax evasion in the experiment translates into an actual social welfare loss outside the lab (see Eckel and Grossman, 1996; Lambsdorff and Frank, 2010).

The experiment was conducted with a total of 268 undergraduate students.

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7Note that tax payers do not receive any information regarding the behavior of other tax payers within their group. We therefore view the decisions of TPs as independent (even within the same group).

8Note that we provided subjects in all treatments with the identical information at the start of the experiment. In particular, participants assigned to Treatment 1 and 2 were informed about the possibility of a change although, ultimately, they would not experience one.

9This is a common procedure in tax evasion experiments in order to link tax evasion to a negative externality, e.g. see Fortin et al. (2007); Coricelli et al. (2010).
(46% females) at the Computable and Experimental Laboratory at the University of Trento. Table 1 shows the distribution of subjects over the four experimental treatments. Sessions consisted of 20 rounds followed by an incentivized risk-elicitation task (Holt and Laury, 2002) and a demographic questionnaire. The final payoff of each subject was determined as the sum of all earnings over the 20 rounds plus their earnings from the risk-elicitation task, which were then converted to Euro at a rate of 100 ECU = €0.7. All participants were paid their final payoff plus an additional show-up fee of €3 in cash at the end of the experiment. On average, a session lasted about 60 minutes and subjects earned €12 on average excluding the show-up fee of €3.

3. Results

In what follows we will mainly focus on the results related to the introduction and removal of a principal witness regulation. Most of our general findings are in line with established patterns in the literature on tax evasion and we will only comment on general results when they differ from existing evidence. Table 2 provides some average results on tax compliance, both attempted and effective, the amount of bribes paid, the smallest bribe accepted by a TO, and the propensity of tax payers to denounce tax officers when given the chance.

3.1. The effectiveness of a principal witness regulation

In this section we aim to analyze the general effectiveness of a principal witness regulation in that we compare behavior in a world without a PWR (Treatment 1) to that in a world with PWR (Treatment 2). This between-comparison allows us to understand the differences in behavior in different institutional environments.

Table 2 indicates that mean declared taxes in Treatment 1 are 34.7 compared to 51.4 in Treatment 2 where a PWR was present. This difference is highly statistically significant (Wilcoxon rank-sum test, $p = 0.000$). Our results show that tax compliance is higher in a world with PWR compared to a world without,
Table 2: Summary statistics in percentages. In order to allow for easier interpretation, we use percentage values throughout the paper. Both for tax compliance and bribe payments, percentage values indicate the amount as a proportion of the tax required to pay (40 ECU) and the maximum amount of bribes that can be paid (30 ECU). The following terms are referred to as follows: taxes declared (TaxDeclared), taxes actually paid by the tax payer (TaxPaid), bribes offered (BribesOffered), minimal bribes accepted by the public official (MinBribeAccept), and the frequency (in %) of denounce decisions made by the tax payer conditional on having been offered the chance to denounce the respective tax officer (Denounce).

<table>
<thead>
<tr>
<th></th>
<th>Treatment 1 (noPwr)</th>
<th>Treatment 2 (Pwr)</th>
<th>Treatment 3 (noPwr-Pwr)</th>
<th>Treatment 4 (Pwr-noPwr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rounds</td>
<td>1-20</td>
<td>1-20</td>
<td>1-10</td>
<td>11-20</td>
</tr>
<tr>
<td>TaxDeclared</td>
<td>34.7</td>
<td>51.4</td>
<td>50.4</td>
<td>37.2</td>
</tr>
<tr>
<td>TaxPaid</td>
<td>50.2</td>
<td>69.8</td>
<td>65.2</td>
<td>62.0</td>
</tr>
<tr>
<td>BribesOffered</td>
<td>47.9</td>
<td>54.4</td>
<td>43.3</td>
<td>49.2</td>
</tr>
<tr>
<td>MinBribeAccept</td>
<td>49.0</td>
<td>54.6</td>
<td>48.3</td>
<td>54.3</td>
</tr>
<tr>
<td>Denounce</td>
<td>-</td>
<td>26.5</td>
<td>-</td>
<td>32.5</td>
</tr>
</tbody>
</table>

Table 2 shows that this effect is mainly driven by female participants, who show a significantly higher tax compliance in Treatment 2 compared to Treatment 1, where PWR was absent ($p = 0.000$). On the other hand, male participants barely change their tax compliance behavior as the small and insignificant increase in the amount of taxes declared from 30.9 in Treatment 1 to 34.7 in Treatment 2 demonstrates.

Further, our results suggest that, as predicted, TPs frequently used the...
option to denounce the TO in order to avoid paying a fine. On average TP’s chose to denounce (when given the chance to) in 91.4% of all possible cases with no significant difference across treatments. That is, they preferred to go free at the expense of the tax officer although this might negatively influence collusive cooperation in the future.

What is more, we observe that the minimal bribe acceptance threshold of the compared to other treatments. In particular, the being controlled for tax compliance in the previous round leads to lower (higher) tax compliance when the principal witness regulation is absent (present) in the subsequent round. In addition, when PWR is in place, having to pay a fine in the previous round leads to higher tax compliance in the subsequent round. The estimations for all treatments are presented in the appendix.
tax officers are significantly higher \( (p = 0.000) \) when principal witness regulation is in place (Treatment 2) as compared when it is not (Treatment 1). This is in line with our theoretical prediction that tax officers optimally increase their acceptance threshold from 6 in the bribery game (Treatment 1) to 10 in extended bribery game (Treatment 2). Evidently, taxpayers acknowledge the higher risk that public officials have to bear in the presence of a PWR and, at least partially, compensate them with higher bribes.

The dashed lines in Figure 2 show the evolution of the amount of taxes actually collected over the course of the experiment. We observe a significant decrease in tax yield collected over time in both static treatments independent of whether PWR is present \( (p < 0.000) \). Since our tax evasion experiment is nested within a corruption framework, the amount of taxes actually paid is the result of taxpayers as well as tax officers decision. On the one hand, higher acceptance rates for bribes (and hence flawed tax reports) on the side of the TO will lead to less taxes being collected. On the other hand, lower tax declarations by the TP might also explain why tax yield collected is at a constant decline. In line with Hypothesis 2 and 3 we find that in treatments 1 and 2 acceptance rates are increasing over time, while tax compliance is decreasing as Figure 2 illustrates. Hence the combination of higher acceptance rates and lower compliance leads to a constant decline in efficiency.

We find that the observed effects regarding tax compliance are heavily driven by gender heterogeneity. When comparing gender behavior in treatments 1 and 2, that is where PWR was either present (Pwr) or not present (noPwr) over the full course of the experiment, we observe that tax compliance is significantly higher for females when PWR is present \( (p = 0.000) \). We do not observe significant changes in behavior for males. Results are presented in Figure 3.

3.2. The role of institutional history

In this section we analyze how the introduction (Treatment 3) and removal (Treatment 4) of a PWR affects behavior, in particular tax compliance.
3.2.1. Behavior of Tax Payers

Figure 4 shows the evolution of tax compliance behavior over time in the four different treatments. Treatment 1 (noPwr) and Treatment 2 (Pwr) allow us to study the effect of a PWR on tax compliance when there is no institutional change. We observe a constant decline of tax compliance in Treatments 1 and 2 that did not feature an institutional change. Surprisingly, the picture is drastically different for Treatment 3 (noPwr-Pwr). Here, we see a steady decline in tax compliance prior to the introduction of a PWR, and then observe a drastic and highly significant break and change in slopes following the institutional change ($p = 0.000$). In addition, the drop in tax compliance following the institutional shock is highly significant ($p = 0.000$), indicating that the institutional transition to PWR breeds tax evasion. Surprisingly and in contrast to existing literature, we find that this drop in compliance is driven by
female participants. This is also insofar surprising, as that we, in contrast, do not observe a similar and/or significant reversal in trends in Treatment 4 ($p = 0.746$), where the order of institutional change is reversed. That is, an institutional environment with PWR is replaced by an institutional environment in which PWR has been abandoned. Instead, we merely observe a restart effect that results in an initial jump of taxes declared but the same gradual decline in compliance as in the first 10 rounds with PWR.

The literature suggests that there is ample gender heterogeneity with respect to both risk taking in general and particularly engaging in risky unethical behavior within contexts of or similar to tax evasion. Existing research indicates that males have a tendency to be less risk-averse and engage in illicit behavior more often than females (cf. Croson and Gneezy, 2009; Torgler and Valev, 2010; Banuri and Eckel, 2012). Figure 5 illustrates the gender heterogeneity and the significant change of behavior on the side of females. We find that in Treatment 3 females evade significantly more taxes when PWR is introduced ($p < 0.01$), as opposed to males who do not exhibit any significant reaction to the institutional change ($p = 0.21$).

Overall, these results suggest that it is not the mere institutional shock that causes significant changes in compliance behavior, but rather the order in which the institutional transition occurs. Thus, observed behavior in Treatment 3 is in stark contrast to Hypothesis 2 while behavior in all other treatments is in line with Hypothesis 2.

Examining the evolution of tax (non-)compliance by gender, Figure 6 illustrates tax compliance over rounds for the two treatments involving a regime change separately for males and females. In Treatment 3, we observe a highly significant change in slopes for females ($p < 0.01$) and males ($p < 0.01$) respec-

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12 We examine differences in trend using OLS estimations with a standard error correction that accounts for repeated game effects. Indicated p-values are obtained using post-hoc estimation tests.

13 Restart effects have been observed in various repeated environments such as repeated public good games (Andreoni, 1988).
Figure 4: The interpretation of this graph and the solid or dashed lines is identical to the interpretation in Figure 2. However, we now present the treatments in which there has been a change of institutions after round 10 (represented by the vertical line between round 10 and 11). This is to say that the graph for Treatment 3 (4) depicts the behavior without PWR (with PWR) left of the vertical line, while the behavior with PWR (without PWR) is depicted to the right of the vertical line.

In Treatment 3, the change in slopes also suggests that females and males react differently to the change in the institutional frame: females resort to a stationary high tax evasion behavior, while males gradually converge towards higher tax compliance. In Treatment 4, we find no difference in trends for both, females ($p = 0.4379$) and males ($p = 0.8517$).

3.2.2. Behavior of Tax Officers

Figure 4 also shows the evolution of the proportion of bribes accepted by the TO over time in treatments 3 and 4. For a fixed institutional environment the slopes are positive (with the slopes being significantly different from 0 at the 1% level) in both treatments indicating that collusion increases over time.
This supports Hypothesis 3.

Interestingly, although collusion increases constantly for a fixed institutional frame, the findings in Treatment 3 indicate that the average acceptance rate of bribes drops from 66% to 55% following the transition to an institutional environment with existing PWR. While this difference is not statistically significant ($p = 0.20$) due to lack of statistical power resulting from a limited amount of tax officers in our experiment, we indeed find a significantly lower acceptance rate in the short run, i.e. during the first five rounds with PWR ($p = 0.013$). This result suggests that the introduction of a PWR might, at least temporary, dampen corruption by decreasing the frequency of successful corrupt collaboration. This provides partial support for Hypothesis 4 suggesting that indeed the introduction of a PWR can hinder (at least temporary) collusion, as the higher rejection rates indicate. Again, the reversed pattern cannot be observed.
in Treatment 4 (Pwr-NoPwr). Although acceptance rates are increasing the removal of the PWR does not result in a significant upwards shift in acceptance rate. Hence we can reject Hypothesis 5. We interpret this as evidence indicating that this effect is not driven by the presence of a PWR per se, but crucially depends on the initial system that is in place before the reform is implemented.

4. Discussion

We provide empirical evidence that judging a political measure in isolation, without taking into account the importance of the pre-reform system as some form of reference point, can lead to a flawed assessment of its effectiveness. It is therefore crucial to consider the whole history of political or legal systems in order to decide upon means to combat tax evasion and corruption. The classical economic model of tax evasion does not consider the fact that individuals
are “born into” a certain legal system, however, exactly this status quo might determine whether a potential reform is effective or not. Taking this evidence into account will be crucial in understanding why sometimes reforms are highly effective in a certain country or cultural environment, while they are ineffective in others. This might be related to the echo effect found in Mittone (2006), that a change in the audit sequence affects behavior because subjects “learn” to be risk-averse or risk-seeking through experiencing early or late first audits. As a consequence past experience can create some sort of reference behavior that cannot easily be “unlearned”, and hence might hinder the effectiveness of a subsequent reform. Following that line of argument reforms can often be a one way street, once implemented it cannot be undone as easily. Hence rolling out reforms is a process that ought to be taken with great caution by policy makers.

We have seen that tax payers made use of the possibility to denounce almost to the full extend with an overall average propensity to denounce the TO of about 91.4%. Denouncing was most frequently used in Treatment 4 (98.6%), but no significantly different from Treatment 3 (87.4%) and Treatment 2 (90%). We thus do not find any evidence for reciprocity among TPs and TOs, which may partially be attributed to the fact that in our setting TPs, who chose to denounce, where granted partial anonymity. TOs were only informed that and by how many TPs they were denounced, but not exactly by whom. Hence, unless a TO was denounced by all (evading) TP’s it was not possible to determine whether a particular TP chose to denounce or not, limiting the scope for retaliation (e.g. withholding future cooperation). In contrast it has been argued that betrayal, such as denouncing, is associated with a moral or psychological cost (see also Coricelli et al., 2010). Lastly, an alternative explanation to the gradual increase of tax compliance following the introduction of a principal witness regulation in Treatment 3 is the tax payer’s decision to avoid unpleasant situations altogether, i.e. avoiding one’s exposure to the temptation to harm the public official to one’s own benefit through denouncing or even to avoid taxes at all. Such an anticipation has been shown to exist in previous research (Mead et al., 2010).
We find surprising differences in behavioral reactions to the introduction, but not the removal, of a principal witness regulation across gender. Gender differences have been repeatedly demonstrated in various domains such as risk preferences, social preferences, lying behavior (Childs, 2012), and honesty (Muehlheusser et al., 2015). For example, Hasseldine and Hite (2003) study framing effects in tax compliance and find a significant frame by gender interaction indicating a stronger reaction to changes in framing for females. Although, aside from the standard observation that females are found to be less inclined to be corrupt or evade taxes (see e.g., Kastlunger et al., 2010; Torgler and Valev, 2010), we did not expect such strong gender differences. In what follows, we will briefly discuss potential drivers of our surprising results. The experimental design adopted in our study included two main factors that potentially play a role in explaining female participants reactions to the implemented institutional change. The first ingredient is risk (to be fined) and the second one is the particular institutional setting adopted. For one, a general difference in risk attitudes across gender could potentially explain the significant drop in female tax compliance after the introduction of a PWR in Treatment 3, since by design the PWR sharply reduces the risk of deviant behavior. However, our results survive and remain highly significant when controlling for individual risk aversion attitudes (see the regression in Figure A.1 provided in Appendix A). For another, Lighthall et al. (2009) study how stress affects decision making under risk and find that overall males take more risk than females, but interestingly stress increases risk-taking for males, whereas females become more risk-averse. Assuming that stress affects females and males differently, we can interpret our results as an “inverted stress effect”. In the first block of Treatment 3 TPs were aware that the decision to evade exposes them to the risk of being punished, a burden they had to bear alone. In the second block of Treatment 3, however,

14This result holds using both Tobit and OLS estimations with robust standard errors clustered on the individual level. See Figure A.1 in Appendix A for further details.
the PWR provides a possibility to avoid a severe sentence after tax evasion is detected, thus providing a “safe way out” that potentially creates an environment that is perceived as less stressful. We hypothesize that different reactions to such a reduction in stress across gender might potentially explain our results. Unfortunately, this hypothesis cannot be tested using our data because the experiment was not designed to investigate this kind of phenomena. Regardless, we view this as an interesting avenue for future research.

An alternative explanation would be that the sudden institutional change affects females more strongly than males, which is in line with (Croson and Gneezy, 2009) who argued that females are more sensitive to the contextual frame. There is a growing body of evidence on gender differences within the frame of choice under risk and strategic uncertainty arguing that females are generally more sensitive to the contextual frame. Hasseldine and Hite (2003) study framing effects in tax compliance and find a significant frame by gender interaction indicating a stronger reaction to changes in framing for females. In our context, the introduction of a PWR renders the TO formally responsible, hence creating a situation where the responsibility (and risk) is shared among TP and TO. Our evidence indicates that females strongly react to this new situation by a drastic drop in compliance, whereas males appear to be unaffected. It is important to note that the same does not hold for the removal of a principal witness regulation as this effect is not present in Treatment 4. We interpret this as, at least partial, evidence in support of the idea that gender effects might oftentimes stem from a higher sensitivity of females to the institutional environment as proposed by Croson and Gneezy (2009).

5. Conclusion and Policy Implications

Our examination represents, to our knowledge, the first attempt to shed light on the effectiveness of the principal witness regulation utilizing a controlled laboratory setting. We nest a general tax evasion setting within a corruption framework, therefore adding a dimension of strategic interaction that allows us
to capture a broader spectrum of tax evasion contexts such as custom duties. We provide evidence that in such a setting the effectiveness of new political measures heavily depends on history, that is the particular institutional frame in place before a change is introduced. Comparing a static setting without PWR (Treatment 1) to a static setting where PWR is available (Treatment 2), we find significantly higher tax compliance by TPs under PWR. Had we not run additional dynamic settings involving a regime change (Treatments 3 and 4), one might have easily come to the conclusion that a regime change towards a system with PWR is recommendable. The data from our dynamic treatments, however, draws a slightly different picture. Here the introduction of such a policy measure, given a history where it was absent, has a negative short-term effect of decreased average tax compliance, but at the same time induces a reversal in the dynamic adjustment over time. Before PWR was introduced tax compliance was at a steady decline, whereas we observe a significant upwards trend following the regime change. One might interpret this as a hint upon a potential positive long-term effect of a principal witness regulation on tax compliance. Nevertheless we want to emphasize that the large effect one might have expected from the difference between the static settings does not carry over to the dynamic setting. This is also important from a normative point of view and poses a question for future research: How can we improve tax compliance without introducing negative consequences? We show that not only the final outcome/system one wishes to achieve is relevant, but also the sequence of, potentially minor, intermediate reforms that are implemented on the way should be taken into serious consideration. In particular, a reform that proves to be successful in a particular country or institutional frame, will not necessarily yield the same positive result when introduced in another environment where the status quo/history of reforms differs dramatically. Interpreted on a more general level, our results suggest that the success of political reforms may, at least to some extent, also hinge upon the particular path taken and hence should be taken into account in policy decision-making.
Acknowledgements

We gratefully acknowledge helpful comments and suggestions by Simon Gächter, Heike-Hennig Schmidt as well participants at the Workshop for Experimental Psychology at the University of Pennsylvania and the 7th International Conference of the French Association of Experimental Economics. We would like to thank Marco Tecilla for the technical support.

Appendix A.

Table A.1: Treatment 2: Tax Declared using Tobit (1) & (2) and OLS (3) & (4)

<table>
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<td>TaxDeclared</td>
<td>TaxDeclared</td>
<td></td>
</tr>
<tr>
<td>main</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRIBE</td>
<td>-0.1396 (0.2784)</td>
<td>-0.0436 (0.1428)</td>
<td>-0.1011 (0.1326)</td>
<td>-0.0365 (0.0633)</td>
</tr>
<tr>
<td>Sex</td>
<td>-8.3677 (6.0383)</td>
<td>-3.0672 (2.5292)</td>
<td>-4.4605 (2.9868)</td>
<td>-1.2687* (0.7125)</td>
</tr>
<tr>
<td>HL_Value</td>
<td>-1.9466 (1.7378)</td>
<td>-0.9300 (0.7314)</td>
<td>-0.6640 (0.6815)</td>
<td>-0.1467 (0.1178)</td>
</tr>
<tr>
<td>l1TaxDeclared</td>
<td>1.0613*** (0.1242)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l1ACCEPTED</td>
<td>-2.7218 (1.8992)</td>
<td></td>
<td></td>
<td>-1.9529** (0.8587)</td>
</tr>
<tr>
<td>l1CONTROL</td>
<td>0.8593 (2.2153)</td>
<td></td>
<td></td>
<td>0.6225 (1.0220)</td>
</tr>
<tr>
<td>l1FINE</td>
<td>0.0504 (0.1309)</td>
<td></td>
<td></td>
<td>0.0205 (0.0648)</td>
</tr>
<tr>
<td>Constant</td>
<td>17.4506 (14.9855)</td>
<td>1.7149 (7.1679)</td>
<td>14.3044** (6.6189)</td>
<td>4.3282** (1.9876)</td>
</tr>
</tbody>
</table>

Observations 351 273 351 273

Standard errors in parentheses

* p < 0.10, ** p < 0.05, *** p < 0.01

Our dependent variable TaxDeclared depicts the amount of declared taxes. Our independent variables are: BRIBE = amount of bribe paid by the tax payer; Sex = 1 if male; HL_Value = Holt and Laury risk aversion measure, with a higher number indicating a later switching point and thus more risk-aversion; l1ACCEPTED = 1 if bribe was accepted by PO in the previous round; l1CONTROL = 1 if TP was audited in previous round; l1FINE = fine paid by TP in the previous round.
References


Online Appendix for “Tax Evasion and Institutions: An Experiment on the Role of Principal Witness Regulations”

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\textsuperscript{a}University of Cologne, Germany
\textsuperscript{b}University of Pennsylvania, USA
\textsuperscript{c}University of Trento, Italy

Appendix B. Regressions and Figures

Table B.1: Treatment 1: Tax Declared using Tobit (1) & (2) and OLS (3) & (4)

<table>
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</tr>
<tr>
<td>main</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRIBE</td>
<td>-1.2806*** (0.3984)</td>
<td>-1.6112*** (0.4421)</td>
<td>-0.3347*** (0.1079)</td>
<td>-0.3262*** (0.1014)</td>
</tr>
<tr>
<td>Sex</td>
<td>1.3174 (8.1511)</td>
<td>2.5524 (6.8820)</td>
<td>0.1683 (1.5965)</td>
<td>0.6124 (1.0596)</td>
</tr>
<tr>
<td>HLVValue</td>
<td>2.1492 (2.0694)</td>
<td>2.7887 (2.0357)</td>
<td>0.0300 (0.4266)</td>
<td>0.2844 (0.2985)</td>
</tr>
<tr>
<td>l1TaxDeclared</td>
<td>1.0901*** (0.1541)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l1ACCEPTED</td>
<td>0.1156 (3.9157)</td>
<td>2.5524 (6.8820)</td>
<td>0.1683 (1.5965)</td>
<td>0.6124 (1.0596)</td>
</tr>
<tr>
<td>l1CONTROL</td>
<td>0.0235 (0.1504)</td>
<td>0.0235 (0.1504)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>l1FINE</td>
<td></td>
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</table>

| sigma   |          |          |          |          |
| Constant | 21.2617*** (3.1520) | 16.2882*** (3.0173) |          |          |

| Observations | 391 | 308 | 391 | 308 |

Standard errors in parentheses. Standard errors are clustered on the individual level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Our dependent variable TaxDeclared depicts the amount of declared taxes. Our independent variables are: BRIBE = amount of bribe paid by the tax payer; Sex = 1 if male; HLVValue = Holt and Laury risk aversion measure, with a higher number indicating a later switching point and thus more risk-aversion; l1ACCEPTED = 1 if bribe was accepted by PO in the previous round; l1CONTROL = 1 if TP was audited in previous round; l1FINE = fine paid by TP in the previous round.

This version: July 14, 2016
Table B.2: Treatment 3: Tax Declared using Tobit (1) & (2) and OLS (3) & (4)

<table>
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<td>TaxDeclared</td>
<td>TaxDeclared</td>
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<tr>
<td>main</td>
<td>-0.4210** (0.1989)</td>
<td>-0.5002*** (0.1659)</td>
<td>-0.2067** (0.0898)</td>
<td>-0.3017*** (0.0912)</td>
</tr>
<tr>
<td>BRIBE</td>
<td>11.6403*** (3.3409)</td>
<td>-5.9740*** (2.2453)</td>
<td>-4.5286*** (1.5129)</td>
<td>-1.7497** (0.7176)</td>
</tr>
<tr>
<td>Sex</td>
<td>0.9736 (0.9772)</td>
<td>0.5163 (0.6416)</td>
<td>0.1578 (0.3799)</td>
<td>-0.0695 (0.2023)</td>
</tr>
<tr>
<td>HL Value</td>
<td>-9.5134*** (2.0252)</td>
<td>-5.1350* (2.9562)</td>
<td>-4.8183*** (0.8501)</td>
<td>-3.8761** (1.4787)</td>
</tr>
<tr>
<td>PWR</td>
<td>0.8837*** (0.0994)</td>
<td>0.5155*** (0.0563)</td>
<td>0.1801** (0.0859)</td>
<td>0.1834 (0.1795)</td>
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<tr>
<td>l1TaxDeclared</td>
<td>-0.5767 (1.2541)</td>
<td>-0.3044 (0.6406)</td>
<td>-8.4270** (3.7774)</td>
<td>-3.9383*** (1.4618)</td>
</tr>
<tr>
<td>l1ACCEPTED</td>
<td>6.1062* (3.3523)</td>
<td>2.6767** (1.3126)</td>
<td>12.3296*** (1.2616)</td>
<td>0.1801** (0.0859)</td>
</tr>
<tr>
<td>l1FINE</td>
<td>0.0552 (0.0782)</td>
<td>0.0352 (0.0229)</td>
<td>0.0352 (0.0229)</td>
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<tr>
<td>Constant</td>
<td>16.5744*** (1.3780)</td>
<td>12.3296*** (1.2616)</td>
<td>13.0689*** (2.5527)</td>
<td>9.0279*** (2.0713)</td>
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Standard errors in parentheses. Standard errors are clustered on the individual level.

* p < 0.10, ** p < 0.05, *** p < 0.01

Our dependent variable TaxDeclared depicts the amount of declared taxes. Our independent variables are: BRIBE = amount of bribe paid by the tax payer; BRIBE_PWR = amount of bribe conditional on the existence of a principal witness regulation; Sex = 1 if male; HL Value = Holt and Laury risk aversion measure, with a higher number indicating a later switching point and thus more risk-aversion; PWR = 1 if a principal witness regulation was in place; l1ACCEPTED = 1 if bribe was accepted by PO in the previous round; l1CONTROL_PWR = interaction between previous rounds audit and the existence of a principal witness regulation; l1FINE = amount of fine paid by TP in the previous round.
Table B.3: Treatment 4: Tax Declared using Tobit (1) & (2) and OLS (3) & (4)

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<tr>
<td>main</td>
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</tr>
<tr>
<td>BRIBE</td>
<td>-0.5033** (0.2408)</td>
<td>-0.1601 (0.1665)</td>
<td>-0.3815*** (0.1288)</td>
<td>-0.1667** (0.0728)</td>
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<tr>
<td>Sex</td>
<td>-6.5296 (5.3804)</td>
<td>0.5513 (2.6173)</td>
<td>-4.1066 (2.8111)</td>
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<td>HL_Value</td>
<td>-0.1028 (1.5096)</td>
<td>0.0916 (0.7247)</td>
<td>-0.1759 (0.7740)</td>
<td>-0.0139 (0.3140)</td>
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<tr>
<td>PWR</td>
<td>5.9618*** (2.0677)</td>
<td>4.1651 (2.6483)</td>
<td>3.8366*** (1.1293)</td>
<td>3.2882* (1.6134)</td>
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<tr>
<td>l1TaxDeclared</td>
<td>0.9933*** (0.0986)</td>
<td>0.6513*** (0.0666)</td>
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<tr>
<td>BRIBE_PWR</td>
<td>-0.2559* (0.1392)</td>
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<tr>
<td>l1ACCEPTED</td>
<td>0.7012 (1.4472)</td>
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<td>l1CONTROL</td>
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<td>l1CONTROL_PWR</td>
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<td>l1FINE</td>
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<td>Constant</td>
<td>11.8546 (11.1166)</td>
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<td>15.7734** (5.9445)</td>
<td>4.1179 (3.0765)</td>
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<tr>
<td>Constant</td>
<td>16.0609*** (1.4910)</td>
<td>10.1878*** (1.1416)</td>
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* p < 0.10, ** p < 0.05, *** p < 0.01

Our dependent variable TaxDeclared depicts the amount of declared taxes. Our independent variables are: BRIBE = amount of bribe paid by the tax payer; BRIBE\_PWR = amount of bribe conditional on the existence of a principal witness regulation; Sex = 1 if male; HL\_Value = Holt and Laury risk aversion measure, with a higher number indicating a later switching point and thus more risk-aversion; PWR = 1 if a principal witness regulation was in place; l1ACCEPTED = 1 if bribe was accepted by PO in the previous round; l1CONTROL = 1 if TP was audited in previous round; l1CONTROL\_PWR = interaction between previous rounds audit and the existence of a principal witness regulation; l1FINE = amount of fine paid by TP in the previous round.
Table B.4: Treatment 3 (1 & 2) and Treatment 4 (3 & 4): Tax Declared using Tobit (1 & 3) and OLS (2 & 4)

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<tr>
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</tr>
<tr>
<td>PWR</td>
<td>-8.7379$^{***}$ (1.5882)</td>
<td>-14.2441$^{***}$ (2.9272)</td>
<td>-0.7733 (2.2688)</td>
<td>-0.6876 (3.0802)</td>
</tr>
<tr>
<td>HL_Value</td>
<td>0.6295 (0.6616)</td>
<td>1.3232 (1.1196)</td>
<td>0.5246 (1.3499)</td>
<td>0.8911 (2.0060)</td>
</tr>
<tr>
<td>Sex</td>
<td>-0.8648 (3.0718)</td>
<td>-4.2472 (4.5462)</td>
<td>-5.2823 (4.8688)</td>
<td>-8.0227 (6.8939)</td>
</tr>
<tr>
<td>Sex_PWR</td>
<td>5.7894$^{**}$ (2.8060)</td>
<td>8.8827$^{*}$ (4.7138)</td>
<td>2.0516 (3.4785)</td>
<td>3.3045 (4.9917)</td>
</tr>
<tr>
<td>Constant</td>
<td>15.7129$^{***}$ (4.1400)</td>
<td>8.0988 (7.0303)</td>
<td>18.5788$^{**}$ (9.0487)</td>
<td>13.1770 (13.6189)</td>
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<table>
<thead>
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<th>sigma</th>
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| Observations | 1240 | 1240 | 760 | 760 |

Standard errors in parentheses. Standard errors are clustered on the individual level.

$^*$ $p < 0.10$, $^\ast \ast \ast \ast$ $p < 0.01$

Our dependent variable TaxDeclared depicts the amount of declared taxes. Our independent variables are: PWR = 1 if a principal witness regulation was in place; HL\_Value = Holt and Laury risk aversion measure, with a higher number indicating a later switching point and thus more risk-aversion; Sex = 1 if male; Sex\_PWR = interaction between gender and existence of PWR.
Appendix C. Instructions

Appendix C.1. Paper instructions at the beginning of the experiment

Thank you for taking part in this experiment!

For your participation you have earned €3; you can earn an additional amount of money accordingly to the decisions taken by you and others participants during the experiment. During the experiment you are not allowed to speak with other participants: for any questions please ask the experimenter.

Please, read the following instructions carefully: you have at your disposal 5 minutes. When the 5 minutes are expired, in order to ensure common knowledge among participants, an experimenter will read aloud the instruction. Before the beginning of the experiment, you will be asked to answer few control questions on the rules of the experiment.

The experiment is about tax payment. Several rounds compose the experiment; in each of them 4 participants form a group. Each group is made of 3 TAXPAYERS and 1 TAX OFFICER.

Groups remain fixed throughout the whole experiment, that as taxpayer you always interact with the same tax officer and as tax officer you always interact with the same 3 taxpayers.

Rules remain the same through all the experiment unless a warning message would be delivered on your PC screen announcing a change of the rules. In the case of a change this will not affect the past rounds of the experiment. However, your assigned role will be unaffected throughout the whole experiment.

The number of rounds is predetermined: nevertheless you will not be informed about the number of rounds. Anonymity of participants will be guaranteed through the provision of a personal secret identity code that will also be used to pay the participants at the end of the experiment. At the beginning of
the experiment you will be randomly assigned to a PC workspace and you will be required to open the session by inputting your personal code.

The first screen will inform you about your role, this is to say that you will know if you are a TAXPAYER or a TAX OFFICER.

**If you are a Tax Payer:** at the beginning of each round you receive an initial income (IC) of 80 ECU (Experimental Currency Units: 1 ECU = 0.7€). Throughout the experiment, you will be required to declare your income. Taxes are collected according to the amount of income you decide to declare (DI) and correspond to 50% of your declared income.

This tax rate (50%) is in line, according to a recent study of Confcommercio, with the mean tax burden in Italy. According to these regulations any declared income below of your initial income will lead to the evasion of taxes.

If you would decide to declare less than your initial income you must try to collude with your Tax Officer. This can be done by offering a bribe to your Tax Officer. You can offer any amount B between 0 and 30 ECU. Your bribe (B) will be delivered to the Tax Officer who can accept or reject your offer. If the Tax Officer accepts then you will be able to declare less than 80 ECU of your income, on the contrary if the Tax Officer rejects you will be forced to declare the full 80 ECU. The Tax Officer will never know how much income you have decided to declare.

During the experiment several fiscal audits will be carried out to check the correctness of income declarations. With a probability of 20% (i.e. 1 out of 5 times), your declaration will be checked: if your declared income is smaller than your initial income, you will have to pay a fine (F) of 125% of your evaded taxes (ET). This means, you have to pay back 100% of the evaded taxes plus an additional fine equal to 25% of evaded taxes, i.e.:
• Evaded Taxes (ET) = (80 - DI)*0.5

• Fine (F) = ET + 0.25* ET = 1.25 * ET

At the end of each round, your payoff is equal to:

1. if you have not been audited then your payoff is equal to your initial income minus the taxes you have paid minus the bribe. This means 80 ECU minus 50% of declared income minus the bribe: 80 - 50%*0.5*DI - B

2. if you have been audited then your payoff is equal to your initial income minus the taxes you have paid minus the fine minus the bribe, this means your payoff is equal to: 80 - 50%*DI - F - B.

If you did not evade any taxes, then the fine is zero, this means your income is just: 80 - 50%*DI - B.

If you did evade taxes then you have to pay a fine of F and the bribe.

Of course if you dont want to offer any bribe to your Tax Officer, you can enter a bribe equal to 0 and pay the full amount of taxes.

If you are a TO: you are responsible for collecting taxes from the 3 tax payers in your group. The tax yield collected (TY) is the sum of the group’s tax payments. At the beginning of each round you will receive a fixed salary of 50 ECU. This amount of ECU will be increased by 15% of the tax yield collected from the Tax Payers belonging to your group.

If you received one or more bribe offers and you accepted them, this amount will be added to your income. Therefore, your personal income at each round will be equal to your fixed salary plus the additional income from the tax yield collected. This means: Personal income in ECU = 50 + 15%*TY + bribes accepted.

The tax yield collected save the 15% paid to the Tax Officer is collected throughout the experiment and the whole amount collected at the end of the experiment will be used to finance the University Library.
[Only in treatments starting with PWR, i.e. Treatment 2 and 4]

**Denounce:** Tax Payers have the ability to denounce their Tax Officer. Every time a Tax Officer accepts a bribe and the respective Tax Payer is audited, the Tax Payer is able to denounce the Tax Officer in order to avoid paying a fine (F). However, when a Tax Officer is denounced, he himself has to pay a penalty (P).

When choosing to denounce, the following outcomes for both the Tax Payer and the Tax Officer are yielded:

- The Tax Payer pays the full taxes (40 ECU) but avoids paying the fine (F) = 1.25 * ET
- The Tax Officer has to pay a penalty (P) = 10 + bribe accepted (from the Tax Payer who denounced the Tax Officer).

This means that when the Tax Payer is audited and he chooses to denounce the Tax Officer, the rounds payoffs look as follows:

- Payoff Tax Payer: 80 - 40 - B = 40 - B
- Payoff Tax Officer: 50 + 0.15*TY + bribes accepted - P

[All treatments] When the predetermined number of rounds is reached the experiment is over. At the end of the experiment all of your per period earnings will be added up and converted to Euro (exchange rate: 100 ECU = 0.7 €) to determine your total payoff. You will be privately paid your total payoff in cash at the end of the experiment.

If you have any questions, please ask the experimenter.

*Appendix C.2. Announcement of introduction of PWR in Treatment 3*

From now on and until the end of the experiment, all Tax Payers have the ability to denounce their Tax Officer. Every time a Tax Officer accepts a bribe
and the respective Tax Payer is audited, the Tax Payer is able to denounce the Tax Officer in order to avoid paying a fine (F). However, when a Tax Officer is denounced, he himself has to pay a penalty (P).

When choosing to denounce, the following outcomes for both the Tax Payer and the Tax Officer are yielded:

- The Tax Payer pays the full taxes (40 ECU) but avoids paying the fine (F) = 1.25 * ET
- The Tax Officer has to pay a penalty (P) = 10 + bribe accepted (from the Tax Payer who denounced the Tax Officer).

This means that when the Tax Payer is audited and he chooses to denounce the Tax Officer, the rounds payoffs look as follows:

- Payoff Tax Payer: 80 - 40 - B = 40 - B
- Payoff Tax Officer: 50 + 0.15*TY + bribes accepted - P

Appendix C.3. Announcement of removal of PWR in Treatment 4

From now on and until the end of the experiment, all Tax Payers do NOT have the ability to denounce their Tax Officer. Every time a Tax Officer accepts a bribe and the respective Tax Payer is audited, the Tax Payer is NOT able to denounce the Tax Officer and the Tax Payer has to pay the Fine (F).

When the Tax Payer is audited and he has evaded, the following outcomes for both the Tax Payer and the Tax Officer are yielded:

- The Tax Payer pays the full taxes (40 ECU) and he pays the fine (F) = 125% * ET
- The Tax Officer does NOT pay the penalty.

This means that when the Tax Payer is audited and he has evaded, the payoffs for this round look as follows:
• Payoff Tax Payer: 80 - 40 - B - F

• Payoff Tax Officer: 50 + 15% TY + bribes accepted
Appendix D. Screenshots

Figure D.1: First decision screen. Tax payers have to choose the amount of their income they want to declare. Tax officers were given a filler task.
Figure D.2: Second decision screen. Tax payers have to choose the size of the bribe they want to offer. Tax officers are shown the offers by all tax payers in their group and can individually choose to accept or reject each offer.
Figure D.3: Screen was shown to tax payers following an audit in treatments/rounds where denouncing was possible.

Figure D.4: Screen depicting feedback for tax officers including the information whether they have been denounced.
Figure D.5: Screen was shown to participants in Treatment 3 before round 11 informing them about the upcoming regime change, here the introduction of a PWR.

Figure D.6: This screen was shown to participants in Treatment 4 before round 11 informing them about the upcoming regime change, here the removal of a PWR.