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Does the "Bomb Crater" Effect Really Exist? Evidence From the Laboratory

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Keywords: Tax compliance; Bomb crater effect; Laboratory experiments
JEL codes: C9; H26; H83

Does the "bomb crater" effect really exist? Evidence from the laboratory[1]

Matthias Kasper[$] & James Alm[§]

Abstract

This study uses a laboratory experiment to investigate two behavioral explanations for taxpayers' tendency to reduce their compliance after an audit (*the "bomb crater effect")*: the tendency to make up for losses incurred in the past (*loss repair*), and the incorrect assumption that experiencing an audit decreases the risk of a future audit (*misperception of risk*). Our findings suggest that audits do not have a strong effect in the aggregate. However, behavioral responses depend on the audit outcome. While taxpayers who were found to report all income correctly are substantially less compliant in their subsequent tax declaration, taxpayers who were found to evade their entire income show the opposite response. These results suggest that audits do not induce a general tendency for loss repair or a general misperception of the risk of a subsequent audit. Moreover, when comparing these changes in reporting behavior to the behavior of taxpayers who did not experience an audit, we find that audits do in fact not induce strong behavioral responses in general, and they do not induce a "bomb crater effect" in particular. Rather, our findings suggest that taxpayers reporting compliance in the laboratory is volatile, even absent any audits. We conclude that experimental studies should use control groups of unaudited taxpayers to identify the causal effect of audits on post-audit tax compliance.

Keywords: Tax compliance; Bomb crater effect; Laboratory experiments.

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1. Introduction

Laboratory experiments have become a popular and a powerful tool to examine tax compliance behavior, because they generate direct measures of compliance choices and they allow testing causal relationships between factors that are otherwise unobservable (Alm & Kasper, 2021; Alm, 2019). In particular, laboratory experiments are frequently used to study the effect of audits on tax compliance. Many of these studies find that taxpayers reduce their compliance after they have been randomly selected for an audit. This phenomenon has been coined as the "bomb crater effect" (Guala & Mittone, 2005; Mittone, 2006).

The literature presents two main explanations for the "bomb crater effect": loss repair and misperception of risk. Loss repair describes the behavioral tendency to become more risk-seeking in order to make up for past losses. Audited taxpayers, and in particular those taxpayers who have been found to evade some of their income, might decrease their compliance in order to regain the losses they have incurred in the audit (Andreoni, Erard & Feinstein, 1998). However, several studies find that audited individuals who were found to be compliant report less income after experiencing an audit, suggesting that loss repair is not the main driver of "bomb crater effects" (Bernasconi & Bernhofer, 2020; Kastlunger, Kirchler, Mittone & Pitters, 2009; Kastlunger, Muehlbacher, Kirchler & Mittone, 2011; McKee, Siladke & Vossler, 2018). Instead, some prior studies suggest that misperception of chance drives the "bomb crater effect" (Kastlunger et al., 2009; Mittone, 2006; Maciejovsky, Kirchler & Schwarzenberger, 2007). In particular, these studies conclude that taxpayers might falsely believe that "the lightning never strikes twice", and thus underestimate the probability of being audited for a second consecutive time.

However, despite this large body of literature on the "bomb crater effect", the behavioral drivers of this phenomenon remain largely unknown. In particular, it remains unclear under which conditions audits induce loss repair tendencies and it also remains unclear under which conditions audits affect taxpayers' perceptions of the risk of future audits. To address this gap in the existing literature on the "bomb crater effect" we study the effect of audits on subsequent tax compliance in a laboratory experiment.

Our study makes two important contributions to the literature. First, we investigate potential explanations for the "bomb crater effect". More specifically, we study the differential effects of audits on compliant taxpayers, who correctly declared their entire income on the tax return that is audited, and noncompliant taxpayers, who do not report any income on the tax return that is audited. Investigating behavioral responses within these groups allows us to assess whether loss repair or misperception of risk explains the "bomb crater effect". Second, to identify the causal effect of audits on subsequent tax compliance, we compare changes in the reporting compliance of audited taxpayers to changes in the reporting compliance of unaudited taxpayers. Prior experimental studies investigate the "bomb crater effect" by comparing compliance levels in reporting decisions that are audited to compliance levels in subsequent reporting decisions (Kastlunger et al., 2009; Kastlunger et al., 2011; Maciejovsky et al., 2007; Mittone, 2006; Guala & Mittone, 2005). However, this comparison does not account for changes in compliance that do not result from the audit experience. By allowing for changes in reporting compliance that do not result from the audit experience, our study provides a more accurate assessment of the effect of audits.

Our results do not suggest that the "bomb crater effect" can be explained with loss repair tendencies or misperception of risk alone. More specifically, we do not find that taxpayers who experienced a loss – i.e. taxpayers who had to pay a fine because an audit detected their cheating - reduce their subsequent tax compliance. Conversely, we do also not find that audited taxpayers generally tend to underestimate the risk of a subsequent audit. In fact, when accounting for changes in reporting behavior that do not result from the audit experience, we find that audits do not have a strong effect on reporting behavior in general, and they do not induce a bomb crater effect in particular. These results indicate that tax audits in the laboratory might have a weaker effect on subsequent tax compliance than much prior experimental work suggests. Moreover, our results suggest that experimental studies should use control groups of unaudited taxpayers to identify the causal effect of audits, rather than comparing the pre- and post-audit compliance levels of audited taxpayers.

2. Theory and Prior Literature

A large body of literature investigates the economic (Alm, 2019; Slemrod, 2019) and psychological (Kirchler, 2007) determinants of tax compliance, but there is no dominant theory on how the audit experience affects subsequent compliance. While theories of deterrence generally distinguish between threat of punishment and experience of punishment (Chalfin and McCrary, 2007), the literature focuses mainly on the former. A taxpayer's compliance decision is typically analyzed within an expected utility framework that follows Becker's (1968) economics-of-crime approach, as first formalized by Allingham and Sandmo (1972), Srinivasan (1973), and Yitzhaki (1974). The standard model assumes that a taxpayer receives income I and must decide how much to report to the tax agency. Reported income R is taxed at the rate t, and unreported income is not taxed. The taxpayer faces the risk of being audited with a probability p. In case of an audit, the agency is assumed to detect all undeclared income and to impose a fine f on the undeclared taxes; in case of no audit, the taxpayer simply pays taxes on reported income. All relevant parameters are fixed and known with certainty. The taxpayer chooses R to maximize the expected utility of the evasion gamble, or:

$$(1) \qquad EU(I) = (1 - p)\, U(I - tR) + p\, U(I - tR - tf(I - R)),$$

where utility U( ) depends only upon income and E is the expectation operator. The model predicts that an increase in the audit probability p or the penalty rate f translates into greater compliance and there is indeed ample evidence that increasing the probability of tax audits and the fines for noncompliance has a positive effect on compliance (Alm, 2019; Slemrod, 2019). However, it is important to note that the standard model of tax evasion predicts that audits do not affect a taxpayer's subsequent reporting decision, because, within this framework, the audit does not provide the taxpayer with new information. As audit and penalty rates are fixed and known, experiencing an audit is merely a case of losing the evasion gamble, and this should not affect post-audit compliance.

In contrast to these theoretical considerations, several laboratory experiments find that the experience of enforcement may change behavior, even absent any change in the underlying

probability of detection (Alm and Kasper, 2021). More specifically, several laboratory experiments find that taxpayers decrease the share of income that they report to the tax agency after experiencing an audit (Guala and Mittone, 2005; Mittone, 2006; McKee et al., 2018; Bernasconi and Bernhofer, 2020; Kastlunger et al., 2009; Kastlunger et al., 2011; Maciejovsky et al., 2007). However, the mechanism that underlies this "bomb crater effect" is not yet fully understood.

The literature discusses two behavioral explanations for the decline in compliance among audited taxpayers. First, taxpayers might want to "get back at" the tax agency after their cheating has been detected (Andreoni, Erard, & Feinstein, 1998). More specifically, taxpayers who have been found to evade at least some of their income might want to make up for the "losses" that they have incurred as a result of the audit. Therefore, these taxpayers might respond to an audit by reducing their subsequent tax compliance. Second, taxpayers might believe that being selected for an audit reduces their risk of being audited again in the future.[2] Such a bias is related to the "gambler's fallacy" and implies that audited taxpayers falsely conclude that they are more likely to get away with cheating in the reporting decision that directly succeeds their audit (Mittone, 2006).

However, it remains unclear whether the tendency to make up for past losses or the tendency to misperceive the risk of a future audit is affected by the audit outcome. For example, some studies find that a decline in reported income after an audit cannot be explained by loss repair motivations alone because individuals who were found to be compliant also report less income after experiencing an audit (McKee et al., 2018; Bernasconi and Bernhofer, 2020). Similarly, other studies find that the decrease in compliance after an audit is strongest among taxpayers who reported their entire income correctly. These studies conclude that misperception of chance is the main driver of the bomb crater effect (Kastlunger et al., 2009; Maciejovsky et al., 2007).

Another explanation for these findings is that audited taxpayers base their estimate of the probability of a future audit on the "availability heuristic" (Kahneman and Tversky, 1973). In

[2] Laboratory experiments that investigate the "bomb crater effect" typically employ a random audit selection mechanism, where the risk of being selected for audit is unaffected by past audits.

particular, audited taxpayers might assess the probability of a future audit by the ease of recalling their previous audit, and audits might be particularly easy to recall when they resulted in an adverse outcome (Spicer & Hero, 1985). Consequently, audited taxpayers who have been found to be noncompliant should be more likely to increase their subsequent reporting compliance, while audited taxpayers who have been found to be compliant should be more likely to decrease their subsequent compliance.

In sum, theoretical predictions on the effect of audits on subsequent tax compliance are ambiguous. While the standard theory of tax evasion implies that audits do not affect tax compliance because the audit experience does not provide the taxpayer with new information, behavioral theories suggest that audits might increase or decrease subsequent compliance. If loss repair motivates behavioral responses to audits, then taxpayers who were caught evading should reduce their subsequent compliance. Conversely, if misperception of risk motivates behavioral responses to audits, then audited taxpayers should reduce their subsequent reporting compliance irrespective of the audit outcome. Finally, if taxpayers use the availability heuristic to assess the risk of a future audit, then the bomb crater effect should pertain to individuals who have been audited and found to be compliant, while audits should increase subsequent compliance among taxpayers who have been found to be noncompliant. In the next section we present our experimental design for examining these competing explanations for the bomb-crater effect.

3. Experimental Setup: Design, Procedure, and Sample

Our experiment implements the fundamental elements of voluntary income tax reporting, following the standard procedure of tax compliance experiments (Alm and Jacobson, 2007). In each round of the experiment, participants receive a random amount of income (2,000 to 3,500 Experimental Currency Units (ECU))[3]. They must decide how much income to report to the tax agency, and they may report any amount between 0 ECU and the amount they received. Reported income is taxed at a rate t of 25 percent ($t = 0.25$). Participants face the risk of being randomly selected for audit. The detection probability d ranges from 0.18 to 0.49. In particular, d is 0.18,

[3] 1,000 ECU equals € 3.50.

0.21, 0.24, and 0.28 in six rounds each and 0.36, 0.40, 0.44 and 0.49 in one round each (28 rounds in total). The fine f for noncompliance is twice the evaded amount that has been detected. All parameters are known to the participants in each round, and the tax system parameters are calibrated such that a "reasonably" risk-averse taxpayer should not report any income to maximize expected profit.[4] Also, to facilitate the compliance decision, we program a calculator that shows how declared income translates into after-tax income conditional on whether a taxpayer is audited or not. Once participants have reported their income, they learn whether they have been audited or not and the outcome of the audit. This process is repeated over 28 rounds in random order. Participants do not know the number of rounds. We provide a screenshot of the experimental task in Appendix A.

The experiment was conducted at the Vienna Center of Experimental Economics (VCEE) in December 2019 and January 2020.[5] Participants were recruited via ORSEE (Greiner, 2015). The final sample comprises 9324 compliance decisions from 333 participants.

At the beginning of the experiment participants learn that their information is private and that it is impossible to identify individual participants. The study starts with a few demographic questions. Subsequently, participants learn about the compensation mechanism. Each participant receives a show-up fee of € 5.00 and an additional compensation that is based on the after-tax income of a randomly selected round. After reading a detailed introduction to the experimental task and an example of the tax compliance decision, participants must answer two check questions correctly before they can proceed. Next, they play three practice rounds. One practice round is not audited, while the two other rounds result in an audit. Participants then proceed to the experiment. After completing the 28th round, they answer a few final questions. The experiment lasts approximately 45 minutes, and the mean payoff is € 12.66.

The participant pool has a slightly larger percentage of female subjects (57 percent) than male subjects, and the pool includes students and non-students. The mean age is 26 years (SD =

[4] An individual with "realistic" levels of constant relative risk aversion ($e \leq 1.5$) would optimally declare zero income for $d = 0.26$ (the average detection probability), $t = 0.25$, and $f = 2$. See Alm (2019) for details.
[5] The experiment was programmed in z-Tree (Fischbacher, 2007).

6.06) with a range from 18 to 59 years. Most participants hold at least a high-school degree (49 percent) and study business (19 percent). While 95 percent indicate that they participated in a laboratory experiment in the past, only 16 percent state that they participated in a study on tax compliance before. Moreover, 29 percent indicate that they self-prepared a tax return in the past. Table 1 presents descriptive statistics.

4. Results

We investigate the effect of audits on subsequent compliance (defined as the share of received income that the taxpayer declares to the tax agency) by comparing compliance levels in rounds that were audited to compliance levels in subsequent rounds following Guala & Mittone (2005), Mittone (2006), Kastlunger et al. (2009), and Maciejovsky et al (2007). We observe a total of 9324 reporting decisions from 333 individuals, 4131 of these decisions were randomly audited. To identify the effect of audits on subsequent reporting compliance, we focus our analysis on audits that take place before the last round of the experiment. This reduces our sample to 4016 audited reporting decisions (and 4016 subsequent reporting decisions). Audited taxpayers did not declare any income in 1015 of these decisions (noncompliant taxpayers), while they reported all their income in 1133 of these audited reporting decisions (compliant taxpayers).

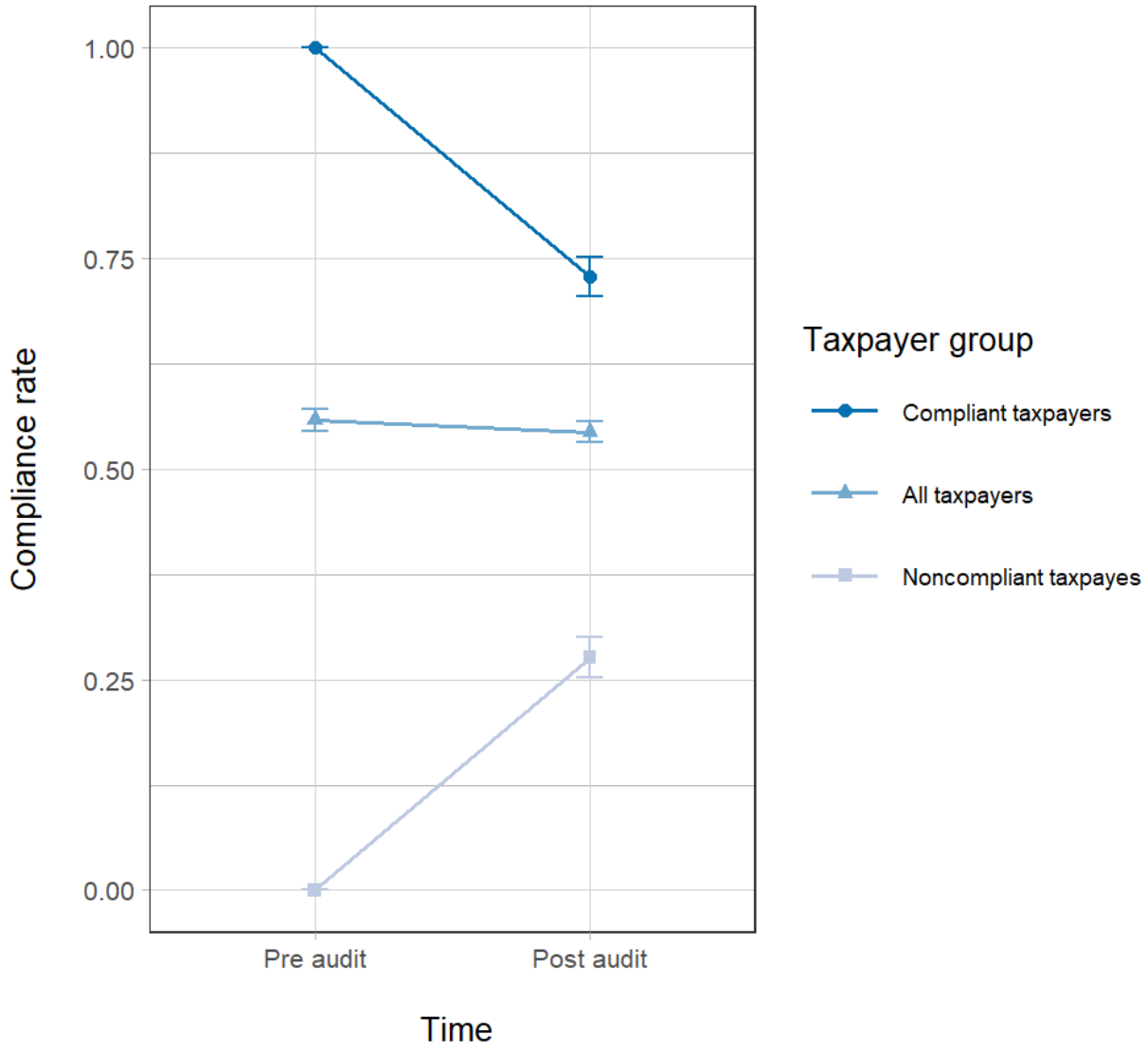
Table 1: Data Description

Variable	Description	Mean	SD
Dependent Variable			
Compliance rate	Reported income divided by received income	0.54	0.41
Experimental Treatment Variables			
Received income	Income received (in ECU, scaled in regressions)	2700.16	430.04
Detection risk	Probability of detection	0.26	0.08
Audited	= 1 if taxpayer was audited and 0 if taxpayer was not audited		
Post audit	= 1 if reporting decision directly succeeds an audit and 0 if reporting decision is audited		
Demographic Variables			
Female	= 1 if participant is female	0.57	0.50
Age	Participant's age in years	25.94	6.06
Higher education	= 1 if completed Bachelor Studies or higher	0.51	0.49
Economics major	= 1 if Major in Economics	0.08	0.27
German speaking	= 1 if Austrian or German	0.48	0.50
Prior experiments	= 1 if prior participation in laboratory experiments	0.95	0.23
Prior tax experiments	= 1 if prior participation in tax experiments	0.16	0.37
Self-preparation	= 1 if self-prepared tax return in the past	0.29	0.46
Risk seeking[#]	Do you like to gamble? (0 to 9)	4.36	2.36
Income maximization[#]	To what extent did you try to maximize your income? (0 to 9)	6.27	2.34
Tax morale[#]	Do you think cheating on tax if you have a chance can be justified? (0 to 9)	6.05	2.68

Notes: [#] denotes a scale from 0 to 9, where higher values indicate more risk-seeking, more income maximization, and higher tax morale.

Figure 1 depicts mean compliance levels in the rounds that were audited (pre-audit) as well as the first subsequent round (post-audit). Overall, compliance decreases by 1.4 percentage points after an audit ($t(4015) = 2.08$, $p < 0.05$). However, changes in reporting compliance differ substantially between compliant taxpayers, who reported all income correctly in the round that was audited, and noncompliant taxpayers, who did not report any income in the round that was audited. On average, compliant taxpayers report 27.2 percentage points less income in the round after an audit ($t(1132) = -23.23$, $p < 0.01$), while noncompliant taxpayers on average report 27.6 percentage points more in the round after an audit ($t(1014) = 22.42$, $p < 0.01$).

Figure 1: Changes in Reporting Compliance of Audited Taxpayers



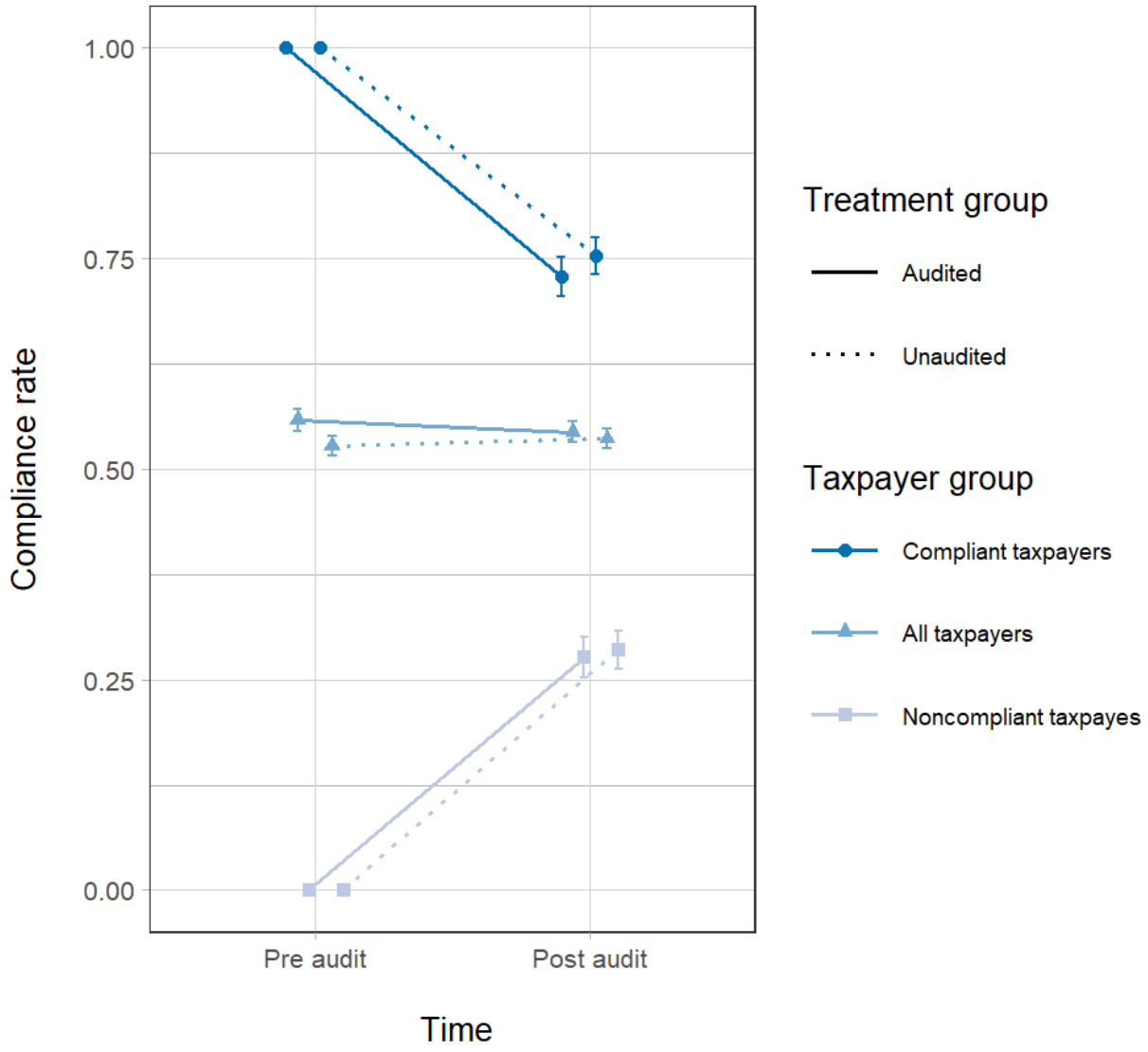
Notes: This figure depicts the mean compliance rate in reporting decisions that were audited (pre-audit) as well as the first subsequent reporting decision (post-audit). Taxpayer group "Compliant taxpayers" comprises observations from audited reporting decisions in which taxpayers declared all income correctly as well as observations from the subsequent round. Taxpayer group "All taxpayers" comprises observations from all audited rounds and all first subsequent rounds. Taxpayer group "Noncompliant taxpayers" summarizes information from all audited reporting decisions in which taxpayers did not declare any income as well as the subsequent round. Error bars depict 95% confidence intervals.

Although the change in the aggregate compliance rate is significant at the five percent level, Figure 1 does not indicate a substantial decline in reporting compliance among audited taxpayers ("bomb crater effect"). Moreover, Figure 1 does not suggest a systematic loss repair tendency. In particular, audited taxpayers who were found to evade at least some fraction of their income do not exhibit a general tendency to decrease their post-audit compliance. Instead, noncompliant taxpayers, who did not report any income, increase their post-audit compliance substantially. This suggests a pro-deterrent, rather than a counter-deterrent effect of audits among these taxpayers. However, we do observe a decline in post-audit compliance at the other end of the compliance spectrum. This seems to suggest that audited taxpayers who were found to be compliant underestimate the risk of a future audit and thus decrease their post-audit compliance.

In sum, Figure 1 does not provide strong evidence for a "bomb crater effect", nor does it suggest a general tendency for loss repair or a general tendency to underestimate the risk of a subsequent audit. However, in order to identify precisely how the audit experience affects subsequent reporting compliance, it is critical to compare changes in the reporting compliance of audited taxpayers to changes in the reporting compliance of unaudited taxpayers. This comparison accounts for changes in reporting compliance that do not result from the audit experience and thus provides a more accurate assessment of the effect of audits on post-audit compliance.

In Figure 2 we contrast changes in the reporting compliance of audited taxpayers with changes in the reporting compliance of unaudited taxpayers. More specifically, the group of "unaudited taxpayers" comprises information from all reporting decisions that were not audited before the last round of the experiment (4975 unaudited reporting decisions and 4975 subsequent reporting decisions). Figure 2 reveals that changes in compliance are very similar between audited and unaudited taxpayers. More specifically, we find that the average compliance rate does not change much after an unaudited round (All taxpayers). Conversely, however, we find that compliance changes substantially after an unaudited round in which taxpayers declared their entire income correctly (Compliant taxpayers) or no income at all (Noncompliant taxpayers). In fact, these changes in compliance after unaudited rounds are remarkably similar to the changes in compliance among audited taxpayers. Overall, these results suggest that audits do practically not affect post-audit tax compliance.

Figure 2: Changes in Reporting Compliance of Audited and Unaudited Taxpayers



Notes: This figure depicts compliance levels in reporting decisions that were audited (Treatment group audited, pre audit), respectively compliance decisions that were unaudited (Treatment group unaudited, pre audit) as well as compliance levels in the first subsequent reporting decisions (post audit). Taxpayer group "Compliant taxpayers" comprises observations from (un-)audited reporting decisions in which taxpayers declared all income correctly as well as observations from the subsequent rounds. Taxpayer group "All taxpayers" comprises observations from all (un-)audited rounds and all subsequent rounds. Taxpayer group "Noncompliant taxpayers" summarizes information from all (un-)audited reporting decisions in which taxpayers did not declare any income as well as the subsequent round. Error bars depict 95% confidence intervals.

In sum, our descriptive analysis reveals that analyzing changes in the reporting behavior of audited taxpayers does not provide a good estimate of the effect of audits on post-audit compliance. In particular, when comparing changes in the reporting compliance of audited and unaudited taxpayers, we find that the tax reporting of audited taxpayers is very similar to the reporting of unaudited taxpayers. This indicates that audits do in fact not have a strong effect on compliance. More specifically, our results do not suggest a general decrease in post-audit compliance ("bomb crater effect"), nor do they suggest a general tendency to make up for past losses (loss repair), or a general tendency to underestimate the risk of a future audit after experiencing an audit (misperception of chance). Instead, we find that taxpayers decrease their compliance after reporting all income correctly, and they increase their compliance after not reporting any income, irrespective of whether they have been audited or not. In the next section we employ regression analyses to further investigate these dynamics.

4.1. Regression Results

To identify the effect of audits on post-audit tax compliance, we estimate several variations of the following baseline model:

$$Compliance\ Rate_{i,t} = \beta_0 + \beta_1\ Received\ income_{i,t} + \beta_2\ Detection\ risk_{i,t} + \beta_3\ Audited_i + \beta_5\ Post\ audit_i + \beta_6\ \ Audited_i\ x\ Post\ audit_i + \beta_6\ Z_i + \varepsilon_{it},$$

Where i, and t are individual and period indices. The traditional error term is denoted by w_{it}, and is assumed to meet all of the usual requirements. The individual-specific effect is denoted by u_i, and controls for individual level heterogeneity, and $\varepsilon_{it} = u_i + w_{it}$. The variable Z_i represents individual-specific control variables as depicted in Table 1. In all regressions, we cluster standard errors at the individual level to account for serial correlation between observations.

Table 3 presents our main results.[6] Models one and two describe the entire sample. Overall, we find a negative effect of received income on compliance. Moreover, we find that increasing the

[6] In additional robustness tests (untabulated), we have used the evaded amount as the dependent variable. This does not affect our results.

risk of detection has a strong deterrent effect. More specifically, a 1 percentage point increase in the risk of detection increases compliance by 0.9 percentage points. However, compliance does not differ between audited and unaudited taxpayers (*Audited*), nor does the share of declared income differ between the pre audit and the post audit period (*Post audit*). Moreover, audits do not induce a change in the reporting compliance of audited taxpayers relative to unaudited taxpayers (*Audited x Post audit*).

Table 3: Regression Results

Dependent variable: Compliance rate						
Sample	All taxpayers		Noncompliant taxpayers		Compliant taxpayers	
Independent variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.3045 *** (0.0172)	0.3404 *** (0.0670)	-0.1435 *** (0.0161)	-0.1220 *** (0.0461)	0.8278 *** (0.0161)	0.8571 *** (0.0472)
Received income	-0.0203 *** (0.0023)	-0.0203 *** (0.0023)	-0.0180 *** (0.0040)	-0.0178 *** (0.0040)	-0.0093 ** (0.0037)	-0.0096 *** (0.0037)
Detection risk	0.0093 *** (0.0003)	0.0093 *** (0.0003)	0.0074 *** (0.0006)	0.0074 *** (0.0006)	0.0042 *** (0.0004)	0.0042 *** (0.0004)
Audited	-0.0020 (0.0065)	-0.0020 (0.0065)	-0.0107 (0.0114)	-0.0105 (0.0114)	-0.0147 (0.0105)	-0.0144 (0.0104)
Post audit	-0.0050 (0.0060)	-0.0050 (0.0060)	0.2656 *** (0.0106)	0.2656 *** (0.0106)	-0.2466 *** (0.0100)	-0.2465 *** (0.0100)
Audited x Post audit	0.0075 (0.0090)	0.0075 (0.0090)	0.0076 (0.0158)	0.0076 (0.0158)	-0.0077 (0.0144)	-0.0076 (0.0144)
Demographic variables		included		included		included
N	333	333	199	199	270	270
Observations	17982	17982	4544	4544	4666	4666
Marginal R^2 / Conditional R^2	0.033 / 0.478	0.161 / 0.483	0.230 / 0.303	0.243 / 0.307	0.190 / 0.375	0.253 / 0.382

Notes: *, **, and *** indicate significance at the 10%, 5%, and 1% level. Standard errors (in parentheses) are clustered at the individual level. Received income and continuous demographic variables are scaled.

Models three and four describe the effect of audits on noncompliant taxpayers, who did not report any income in the round that was audited. While compliance levels are substantially higher in the post audit period (by an estimated 26.5 percentage points), the insignificant interaction term indicates that taxpayers increase their reported income after not declaring any income, irrespective of whether they have been audited or not. Similarly, models five and six reveal that compliant taxpayers, who reported their entire income correctly, are substantially less compliant in the subsequent round (by an estimated 24.6 percentage points), irrespective of whether they have been audited or not.

In sum, the regression results confirm our descriptive analyses. Our results do not suggest a general decrease in post-audit compliance ("bomb crater effect"), and we also find no evidence of a general tendency to make up for past losses (loss repair), or a general tendency to underestimate the risk of a future audit after experiencing an audit (misperception of chance). Instead, we find that taxpayers change their reporting behavior substantially after reporting their entire income correctly or after not reporting any income at all, irrespective of whether they have been audited or not.

5. Conclusions

A large body of experimental studies finds that taxpayers decrease their compliance after they have been audited. Prior research suggests several explanations for this "bomb crater effect": the behavioral tendency to make up for losses incurred in the past (loss repair), the incorrect assumption that experiencing an audit decreases the risk of a future audit (misperception of risk), and the tendency to estimate the probability of future events based on the ability to recall similar events in the past (availability heuristic). If loss repair motivates behavioral responses to audits, then taxpayers who were caught evading should reduce their subsequent compliance. Conversely, if misperception of risk motivates behavioral responses to audits, then audited taxpayers should reduce their subsequent reporting compliance irrespective of the audit outcome. Finally, if the availability heuristic determines behavioral responses to audits, then taxpayers who have been found to be compliant should decrease their subsequent compliance while taxpayers who have been found to be noncompliant should increase their subsequent compliance.

We conduct a laboratory experiment to investigate these competing explanations for the "bomb crater effect". Our results suggest that neither loss repair nor misperception of risk fully explain behavioral responses to audits. In particular, we find that the aggregate response of audited taxpayers is slightly negative, while audited taxpayers who did not report any income are substantially more compliant in their subsequent reporting decision. Conversely, audited taxpayers who declared all income correctly are substantially less compliant in their subsequent reporting decision. These results suggest that the availability heuristic informs behavioral responses to audits. Moreover, the finding that taxpayers who have been found to be compliant decrease their subsequent compliance is in line with the results reported in Kastlunger et al. (2009), Kastlunger et al. (2007), and Maciejovsky et al. (2007). These studies conclude that such a decline in post-audit compliance among taxpayers who have been found to be compliant demonstrates their tendency to underestimate the risk of a future audit.

However, in order to identify the effect of audits on post-audit tax compliance, it is important to account for changes in reporting compliance that do not result from the audit experience. Therefore, we compare changes in the reporting compliance of audited taxpayers to changes in the reporting compliance of unaudited taxpayers. This comparison allows us to identify more precisely how the audit experience changes taxpayers' reporting behavior. When comparing changes in the reporting compliance of audited taxpayers to changes in the reporting compliance of unaudited taxpayers, we find that tax audits do in fact not have a strong effect on subsequent tax compliance. More specifically, we find that taxpayers increase their reported income after not declaring any income at all and they decrease their reported income after declaring their entire income correctly irrespective of whether they have been audited or not.

Our results suggest that tax audits have a weaker effect on subsequent tax compliance than much prior work on the "bomb crater effect" suggests. One explanation for this result is that taxpayers did not face any uncertainty in their reporting decisions. In particular, taxpayers could use a calculator that shows how declared income translates into after-tax income conditional on whether they were audited or not. As a result, taxpayers might have perceived an audit as a mere case of "losing the audit lottery", that does not induce behavioral change. However, our results raise the question why taxpayers respond strongly to an increase in the risk of detection (general

deterrence), while they do not respond to the audit experience (specific deterrence). Future studies might investigate in more detail the dynamic between general deterrence and specific deterrence. Finally, our findings suggest that laboratory studies should employ control groups of unaudited taxpayers to identify the causal effect of tax audits on subsequent tax compliance.

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Appendix A

INSTRUCTIONS

Welcome

Please read the instructions carefully!
You will receive 5.00 € for your participation.
Additionally, you can earn up to 12.25 € in this study, so make sure you understand the task well!
The information you provide is anonymous. It will not be possible to identify individual participants.
The study will last approximately 45 minutes.

Please answer a few questions before we get started.

- What is your gender? (m/f/not specified)
- What is your highest completed level of education? (high school/bachelor/masters)
- What is your field of study? (Economics, Psychology, Business, other, I'm not a student)
- What is your nationality? (Austrian, German, other)
- How old are you?

Instructions (1/2)

This study comprises several rounds.
In each round you will receive income between 2.000 Experimental Currency Units (ECU) and 3.500 ECU (1.000 ECU equals 3.5 €).
You will be asked how much income you want to declare to the tax agency.
You can declare any share of your income, i.e. between 0 ECU and the amount you received. You will pay taxes on the income that you declare.
In every round the tax agency might audit your income declaration.
The audit probability may vary and will be announced in every round.
If your income declaration is not audited, you will pay 25% taxes on the income that you declared.
If you are audited and the audit reveals that you have declared less income than you received, you must pay the taxes that you owe plus a fine of the same amount.
However, the tax audits might differ in their efficiency.
This means that a tax audit might only reveal a share of the income that you failed to declare.
In this case, the additional tax payment and the fine will be based on the share of undeclared income that the agency detects.
The audit efficiency may vary and will be announced in every round.

Instructions (2/2)

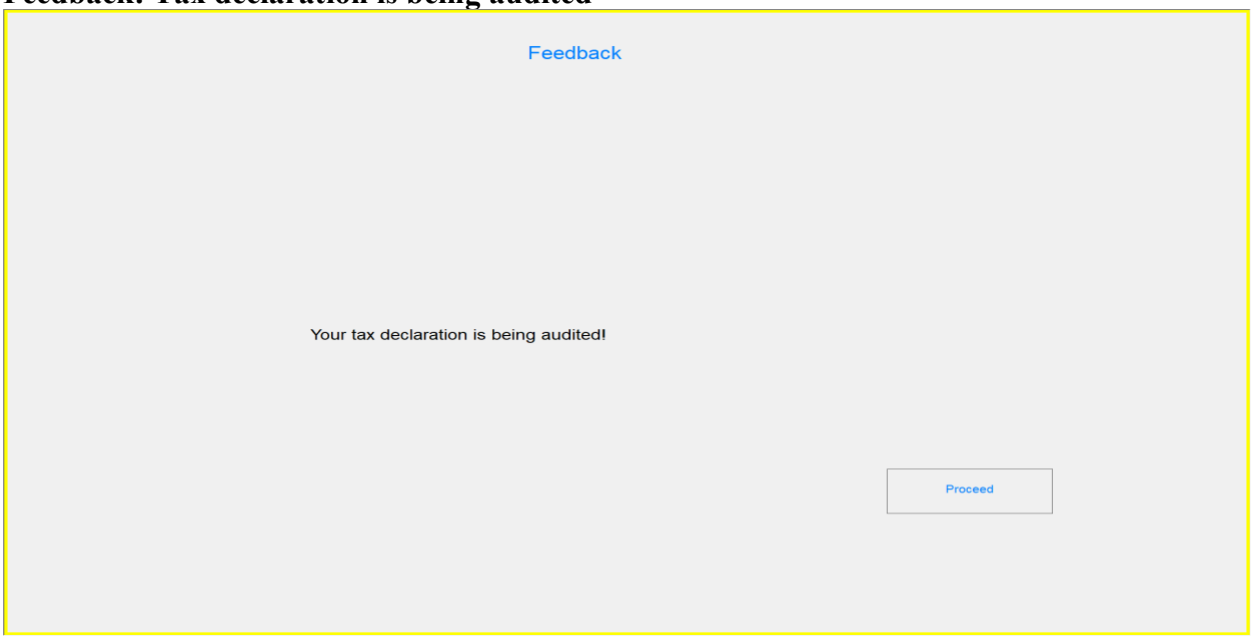
Your income, the audit probability, and the audit efficiency may vary and will be announced in every round.
The tax rate (25%) and the fine rate (100% of the evaded amount that the tax agency detects) are constant.
After every round you will learn whether your income declaration has been audited and what the result of the audit is.
After you completed all rounds, one round will be randomly selected. Your payoff will be based on the after-tax income you made in this round.
Feel free to earn as much money as you can!

Please proceed to view an example.

Experimental Task

Notes: Compliance choice for Task 23: "*low audit effectiveness*", "*e first*", $e = .67$, $p = .37$, detection risk = .24.

Feedback: Tax declaration is being audited



Feedback: Audit result