Tax evasion under Oath [*]

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Abstract

This paper studies the effect of commitment based on the truth-telling-oath developed by Jacquemet, Joule, Luchini, and Shogren (2013) on tax compliance decisions. In a Baseline condition, participants play a classical tax evasion game without audits. In an Oath condition, the participants are first offered to sign voluntarily a truth-telling oath, before playing the same tax evasion game. Results show that in Experiment 1, compliance increases by one third under oath compared to the Baseline. Experiment 2 reproduces this result and highlights–for the first time in the literature–that the oath effect could be due to a change of taxpayers' preferences towards honest or dishonest fiscal declarations.

Keywords: tax evasion, tax morale, oath, commitment.

JEL classification: C9 ; H26.

1 Introduction

Individual personality traits are supposed to be powerful determinants of tax evasion behavior. However there are few empirical supports for this assumption (Calvet and Alm, 2014; Jacquemet, Luchini, Malézieux, and Shogren, 2017). There could be two hypothesis: tax evasion decision could entirely depend on the context or there would be an interaction between context and personality traits. In either case, context is supposed to be able to make honesty salient.

This hypothesis is not new in psychology or economics. Cronbach (1957) already described the opposition of the two main disciplines of scientific psychology: differential and experimental psychology. The first one preferably uses correlation to analyze individual differences. The second one focuses on understanding human behavior across different situations. Cronbach pleaded for the reunion of experimental and correlational psychology, in a discipline that could analyze people's individualities in different context. According to him, a precise behavior is always taken in a precise context, by a participant with a certain set of salient personality traits. In economics, Tversky and Kahneman (1981) also recognized the influence of context on decision-making. In this article, we first confirm if an honesty-inviting context can be created through a commitment to tell the truth. Secondly, we study its nature and the channel through which this binding commitment passes.

Context influencing decisions have probably attracted too little attention when considering dishonesty, and tax evasion more specifically[1]. Commitment is a valid method to fight against dishonesty when both non monetary incentives (McCabe and Trevino, 1993, 1997; McCabe, Trevino, and Butterfield, 2002) and monetary incentives (Mazar, Amir, and Ariely, 2008; Shu, Gino, and Bazerman, 2011; Shu, Mazar, Gino, Ariely, and Bazerman, 2012; Jacquemet, Luchini, Rosaz, and Shogren, 2014; Leal, Vrij, Nahari, and Mann, 2016) are at stakes.

As commitment and priming are two close methods that can produce context-specific decisions, both need to be defined and disentangled. Priming is a way of unconsciously influencing subjects. To illustrate this effect, Calvet and Alm (2014) made participants write the Golden Rule (i.e. the moral rule of treating others as we would liked to be treated) before giving them the opportunity to cheat in a tax evasion game. The mere fact of exposing participants to such fairness clues–priming them–made them less willing to cheat. Commitment, on the other hand, designates a precise process coming from social psychology (Joule and Beauvois, 1998). Let us consider a target behavior that social psychologists want to see adopted by participants (e.g. an ethical behavior). They will first design a costless prior action, to which participants will freely commit (e.g. a sentence in which participants commit themselves to adopt an ethical behavior). This free

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[1]To the best of our knowledge, the closest research dealing with commitment in TEG is a recent paper from Mittone and Saredi (2016) where participants are proposed to declare in advance a certain amount of their taxes.

acceptance of the prior act will lead to higher acceptance of the target behavior. To be internalized in the long term, the prior action is not public and is taken freely. Commitment is really about the intrinsic motivation to adopt a behavior, not about any extrinsic motivation (e.g. some social pressure) that could result in reactance effects (Jacquemet, Joule, Luchini, and Shogren, 2013).

More precisely, this article assesses the ability of an institutional mechanism, based on the social psychology of commitment, to foster compliance with the tax system. This institutional mechanism is a truth-telling oath (as an Hippocratic oath). An oath is a solution to reduce dishonesty and promote moral behavior, as in the workplace for bankers (Boatright, 2013; Cohn, Fehr, and Maréchal, 2014) or even in academia (DeMartino, 2010). This article is different from the other research using the oath, as first proposed in Jacquemet, Joule, Luchini, and Shogren (2013). It is the first time that the oath is used to limit a negative behavior, rather than reinforcing a positive one (like for coordination in Jacquemet, Luchini, Shogren, and Zylbersztejn, 2011, or truth-telling in Jacquemet, Luchini, Rosaz, and Shogren, 2014). While stressing its difference from the priming method, this article also proposes a literature review on commitment applied to dishonest behavior. We want to observe if the truth-telling oath respects the conclusions drawn from this literature review and highlight a possible explanation for the underlying mechanism of working binding commitments.

We design two lab experiments that allow us to observe tax evasion behavior in a controlled environment in which decisions have financial consequences. The first experiment is run to check if the truth-telling oath really increases declarations–as expected according to our literature review– and the second one, to look for the origin of such effect. There are two comparable conditions in both experiments: an Oath condition, in which before entering the lab participants are proposed to commit themselves to tell the truth, and a Baseline, where there is no commitment. In Experiment 1, participants play a one-shot tax evasion game with no audit. In Experiment 2, participants play the same tax evasion game but repeat the declaration decision five times, in order to analyze how the oath impacts subjects' certainty.

Results show that evasion occurs in Experiment 1: the compliance rate is about 48.98% in the Baseline. Under oath, this rate increases to 63.17%. As the literature stated, the oath to tell the truth significantly reduces tax evasion. In Experiment 2, similar results are found. However, participants' declarations are polarized towards both extremes under oath, and it is a novelty. This translates also in a global increase of their certainty about their declarations (through different measures). This enhanced certainty under oath, as if preferences were polarized towards honest and dishonest extremes, could be the factor driving the oath effect. Participants under oath could be surer of their preferences. We conclude on policy recommendation triggered by this novel feature put in light.

2 Fighting dishonesty with commitment

Monetary incentives and self regulation of ethical behavior are well often conflicting. In the example of tax evasion (one among others), there is an interest in not declaring one's full gross income. Taxes not levied on the concealed part can thus be spent other way by taxpayers. Risk aversion or individual morality traits do not seem explain why people comply or not (Jacquemet, Luchini, Malézieux, and Shogren, 2017). We are here interested in studying how context can influence honest and dishonest decision making. In the case of fiscal declaration, taxpayers' environment is supposed to be able to pre-commit them to pay their taxes, as, e.g., in France where incomes declaration are pre-filled thanks to third-party information since 2006.[2] Literature in behavioral ethics often modify people's environment by making them sign a general promise, that can be named honor code, code of conducts, honesty pledge, written commitment, vow or oath. In our framework, these terms are equivalent and are used to try to order the future, and back up honest behavior even when monetary incentives are at stake.[3]

An empirical literature in psychology already showed the impact of honor code on academic dishonesty (i.e., plagiarism and cheating that occur in the academia context). In a series of article McCabe and Trevino (1993, 1997) showed that students coming from a university with an honor code were less likely to self report having cheated and perceived less fraud from other fellow students. Another type of code (named "modified" honor codes by the authors, that was less strict and targeting than honor codes) was also integrated in a study from McCabe, Trevino, and Butterfield (2002). Results showed that there was the maximum fraud in universities with no codes (modified or not), average fraud in universities with modified honor codes and the least fraud in universities with traditional honor codes. In a more controlled environment, Mazar, Amir, and Ariely (2008) used honor codes to decrease dishonesty propensity of students. Authors used paper/pencil task such as counting the number of one in a matrix. In the control condition, participants gave their answers to a corrector who rated their work and paid them accordingly. In another condition, participants self corrected their tests and were paid in accord with their self report. A third condition was the same as the one before, people self corrected their answers but before passing the task, they had to sign their name below the following declaration: "*I understand that this short survey falls under MIT's [Yale's] honor system*". Results confirmed the impact of such declaration on cheating behavior: in the condition that allowed cheating, the declared scored was 5, while it was significantly lower in the control condition (equal to 3.2) and in the treatment (equal to 3). When the monetary incentives to cheat decreased from 2$ (as previously) to 50 cents, results were again confirmed (average score was 3.4 in the control, 6.1 when cheating was tolerated and 3.1 with the honor code). Honor codes thus indeed commit participants to honest behavior in and outside the lab.

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[2]See, e.g., *Le Monde* from 17/12/2005.

[3]Although this assumption is questionable, these terms may cover different realities as studied in the analytic philosophy (Austin, 1975).

Shu, Mazar, Gino, Ariely, and Bazerman (2012) studied the fact of signing at the beginning, rather than at the end, a pledge to tell the truth. They did so in two different experiments: in the equivalent of a tax evasion game and in a real life insurance contract. In the first experiment, there were two conditions. In the signature-after condition, participants had to earn an income, declare it to the experimenters and sign a declaration that they "*carefully examined the return and that to the best of their knowledge and belief it was correct and complete*" (p. 1599). In the signature-before condition, participants first earned an income, signed the declaration, then declared it. Results showed that 79% of participants declared an income that was not equal to their real one in the signature-after condition, but only 37% did so in the signature-before condition. Experimenters also tested the equivalent protocol in a naturalistic setting: an automobile insurance company. Insured people were asked to sign a policy form for their car and to declare the current odometer mileage. Two conditions were implemented: one in which insured people were asked to sign an honesty statement at the end of the form (after-form) and one in which they were asked to sign it at the beginning (before-form). The honesty statement was as follow: "*I promise that the information I am providing is true*" (p. 1598). Number of miles declared was significantly more important in the before-form condition, compared to the after-form. Signing an honesty pledge indeed increases honesty in the lab and in the field. However, the interpretation of Shu, Mazar, Gino, Ariely, and Bazerman (2012) is that signing an honesty pledge makes ethics salient and act only as a priming. It is quite close to the explanation developed by Mazar, Amir, and Ariely (2008) where participants would only be interested in maintaining a positive self concept (i.e. signing would prime the idea of self). Thus we can wonder what is the difference between self-priming and ethics-priming and from what a commitment should be constituted of. It seems that a signature to a neutral pledge is not enough in itself to influence dishonest behavior. Cagala, Glogowsky, and Rincke (2016) did not find evidence of the signature of the following pledge: "*I hereby declare that I will not use unauthorized materials during the exam. Furthermore, I declare neither to use unauthorized aid from other participants nor to give unauthorized aid to other participants*" (p. 29) on cheating behavior in an exam, even though it did change the participants' attitude towards cheating. An honesty pledge should thus be non neutral and should make appear clearly that the behavior to eliminate is dishonest behavior.

What is the difference between committing to an honor code and a priming of the same honor code ? Shu, Gino, and Bazerman (2011) answered this question in a comparable task to Mazar, Amir, and Ariely (2008) (i.e., self correcting task that allowed cheating). In a first condition, participants were asked to add their name and signature to a statement at the bottom of an academic honor code that they had to read. In a second condition, they just had to read the honor code without signing it. It was compared to a third condition in which there was no honor code. Results showed that reading an honor code reduced cheating, without eliminating it. In comparison, signing an honor code eliminated cheating. 57% (13/23) of participants cheated in the control condition, 32% (7/22) in the read-only, and 4.5% (1/22) in the signature. Commitment

can be qualified as more powerful than just priming. A commitment to tell the truth can also be written or oral. Leal, Vrij, Nahari, and Mann (2016) made participants read aloud the following sentence "*Hello my name is [...] and I state that the information I will give regarding this claim will be totally truthful to the best of my knowledge*" (p. 770) and observed that they were more honest when claiming insurance for stolen items. Moreover, the dishonest behavior (e.g. a lie) have to be easily identified as such. Jacquemet, Luchini, Rosaz, and Shogren (2014) used a truth-telling oath in a sender-receiver game where the sender have to communicate the result of a dice drawing to the receiver. According to this information, the receiver chooses a number that determines the payment of both subjects. The sender can thus lie or tell the truth to the receiver to improve his own or both payoffs. In one condition, experimenters kept a neutral environment. In another one, they created a loaded environment, where they underlined what was a lie and what was telling the truth. In the neutral environment, the truth-telling oath had no impact. In the loaded environment, the truth-telling oath was effective and really decreased all the different lies, from 25.4% to 17.1%.

To sum up, commitments to honesty are effective tools to overcome dishonesty, in the lab and in the field. However, to be effective, a solemn commitment needs: to ask for an explicit commitment, to be non neutral, to be written or oral and to apply in a situation where lies and truth can be easily recognized. The oath to tell the truth, as developed by Jacquemet, Joule, Luchini, and Shogren (2013), answers all these precise requirements and we choose to apply it in the tax evasion context.

3 Experiment 1

Experiment 1 aims to investigate whether an oath to tell the truth can change tax compliance decisions, by making them more truthful.

3.1 Design of the experiment

The standard game used to measure tax compliance behavior in the experimental literature is fairly straightforward: each participant is asked to report income, knowing that declared income will be taxed according to a common knowledge tax rate. The collected tax is deducted from experimental earnings. The target behavior is the share of income that is actually reported. Although the core decision task is standard, many variations in the design can be found in the literature–often associated with uncertain consequences on tax compliance. Our design balances three objectives: we ensure comparability with the existing literature, we generate enough variability in evasion decisions to correlate the outcome with individual covariates, and we enhance the ecological validity of the tax compliance observed in the laboratory.

In Experiment 1, subjects first earn an income through a real effort task.[4] We use a task first

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[4]The evidence on the effect of windfall money, as compared to earned income, on tax evasion is mixed; see

introduced by Alm, Cherry, Jones, and McKee (2012), in which the goal is to sort numbers in ascending order from a 3 * 3 matrix filled with digits generated in random order. Earnings are computed based on the time taken to complete the task, as: 150 ECU - (subject's time * 13). The task is repeated 5 times, earned income from this preliminary stage is the sum of earnings from all tasks. Participants then move to the declaration stage. They are asked to "*declare the amount of income they have earned at the previous stage*" (see Cadsby, Maynes, and Trivedi, 2006, on the importance of the way to ask for compliance). They do so using a cursor, which maximal value corresponds to the full income. The tax rate is fixed, common to all participants, and this declaration task is not repeated. In France, the marginal tax rates on 2014 incomes are: 0%, 14%, 30%, 41% and 45%, applied progressively based on the level of income.[5] We use a tax rate equal to 35% that is announced to participants before the beginning of the declaration stage. Declared income determines the taxed, and effectively collected, amounts from each participants' experimental earnings. Collected taxes are used to finance a real life public good: all money is donated to the World Wide Fund for Nature (WWF). To ensure the credibility of the process, donations given to the WWF are officially certified by WWF-certificates that are emailed directly to the participants. It is important to emphasize that there is no audit in this experiment–this allows us to put the spotlight on compliance-based tax morale. The implementation of this oath to tell the truth on income declaration behavior pleads for the framing of the task.[6] We describe the experiment as a fiscal simulation and the following words are used to describe the progress of the experiment: income, income declaration, tax and tax collected.

3.2   Experimental treatment

In the Baseline condition, participants are going through the different stages of the experiment (income earning, declaration, questionnaires) without any additional modification. This is our control group.The Oath condition uses an identical experimental environment as in the Baseline, except that before, participants are proposed to sign an explicit commitment to tell the truth in this experiment. The oath procedure is implemented as follow: after filling the contract of approval to participate in the experiment, participants have to give it back to the monitor who is waiting in a separate room next to the lab. In this room, subjects are coming one by one. The monitor offers each subject a form to sign as presented in Figure 1. The Université de Strasbourg logo on the top of the form and the address at the bottom indicate that it is an official paper; the topic

Boylan and Sprinkle (2001); Kirchler, Muehlbacher, Hoelzl, and Webley (2009); Muehlbacher and Kirchler (2009); Boylan (2010); Bühren and Kundt (2013). We favor this choice to strengthen the external validity of our tax evasion measure.

[5] Finance law number 2014-1654, December 29th 2014.

[6] Contextualization of the tax evasion game has be found to have no impact in Alm, McClelland, and Schulze (1992); Swenson (1996); Durham, Manly, and Ritsema (2014) and to undermine tax evasion in Baldry (1986); Wartick, Madeo, and Vines (1999); King and Sheffrin (2002); Mittone (2006); Choo, Fonseca, and Myles (2015). In all cases, evasion rates remain substantial enough to allow an empirical analysis of tax evasion determinants (see, e.g., Wahl, Muehlbacher, and Kirchler, 2010).

designation and the research number were added so to ensure credibility. The monitor explicitly points out to the subject before he reads the form that he is free to sign the oath or not and that participation and earnings in the experiment are not conditional on signing the oath. Subjects are not informed about the topic of the experiment when asked to take the oath. The subject reads the form, which asks whether he agrees "*to swear upon [his] honor that, during the whole experiment, [he] will **tell the truth and provide honest answers**" (in bold in the original form). Regardless of whether the subject signs the oath, he is thanked and invited to enter the lab. The exact wording used by the monitors to offer the oath to respondents was scripted to standardize the procedure. The monitor did not leave the room at any time. Another monitor remained in the lab until all subjects had been presented with the oath, to avoid communication prior to the experiment. Subjects waiting their turn could neither see nor hear what was happening at the oath-desk.

3.3   Experimental procedure

Our analysis relies on six experimental sessions (three for each condition), each of them has between 19 and 24 subjects. Although signing the oath is not mandatory, a large majority of subjects do so. All the subject except one accepted to sign the oath, leading to a 98% acceptance rate. This subject is thus excluded from our analysis. This percentage is in line with previous experiments involving the oath.[7] All sessions take place in the lab of Strasbourg University (LEES) between October 2014 and March 2015. The recruitment of subjects has been carried out by LEES database among individuals who have successfully completed their registration on the laboratory's website.[8] The experiment overall involved 129 subjects, 75 males and 54 females. The mean age of participants is almost 23. Each session lasted about 1 hour, with an average payoff of 20 euros (17 euros directly given to the participants and 3 euros given to WWF), including a 5 euro show-up fee.

4   Results

To be comparable, data coming from both conditions in Experiment 1 need to be as alike as possible. To be sure that any change in compliance behavior is really coming from our context manipulation, we look first for differences in both conditions, their impact on compliance and then study the differences induced by our treatment.

4.1   Descriptive statistics

Table 1 reports summary statistics on the different covariates measured in the socio-demographic questionnaire or during the experiment. Few variables were not correctly randomized across con-

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[7]See Jacquemet, Joule, Luchini, and Malézieux (2016) for a literature review.

[8]The recruitment process of the participants makes use of ORSEE (Greiner, 2015). The experiment is computerized using Econplay (www.econplay.fr).

Figure 1: Oath to tell the truth

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SOLEMN OATH

I undersigned_____ swear

upon my honor that, during the whole experiment I will:

Tell the truth and provide sincere answers

STRASBOURG..............   Signature...

Table 1: Summary statistics on individual covariates in Experiment 1

	Baseline	Oath	Overall
Monthly income	571.42	496.21	532.94
Age	23.07	22.33	22.69
Men	60.31%	56.06%	58.13%
French nationality	79.36%	92.42%	86.04%
Not speaking French at home	49.2%	33.33%	41.08%
Economic studies	23.80%	36.36%	30.23%
Believing in God	44.44%	40.90%	42.63%
Parents' financial help	58.73%	74.24%	66.67%
Self honesty	5.52	5.81	5.67
Others' honesty	4.61	4.78	4.70
Happiness	5.09	5	5.04
Perception of WWF's actions	5.68	5.70	5.69
N	66	63	129

Note. Summary statistics on individual covariates in Experiment 1. From left to right are the variables' names, their corresponding values in the Baseline and in the Oath conditions, and finally, the average on the total population. Due to a technical problem, question on perception of WWF's actions has been included only in 2 out of 6 sessions.

ditions. There is a significant difference between subjects from both conditions concerning French nationality ($p = .0325$). There are marginal significant differences concerning the number of people who speak French at home ($p = .0679$) and those who receive a financial help from their family ($p = .0625$) across conditions.

Table 3 reports compliance measures, percentages of full compliers and evaders, and the amount of tax collected. Tax evasion in the Baseline of Experiment 1 is intense with an average declaration rate equal to 49%. It is also widespread, as only one fourth of all participants–16 subjects–declare 100% of their income. Evasion decisions are also very heterogeneous. 5% of the participants (3 subjects) declare zero income, while 25% declare less than 17% of income and 50% less than 42%. In comparison, tax evasion in the Oath condition is less intense with an average declaration rate of 63%. Half of the participants–33 subjects–are full compliers. Evasion decisions are even more heterogeneous: 12% of participants (8 subjects) declare now zero income, 25% of subjects declare less than 16% of income and 50% less than 97%.

4.2 Income declaration: the impact of individual variables

We want to know first if socio-demographic variables or variables that were measured during the experiment, are explaining compliance.

Table 2 shows an OLS regression on socio-demographic variables (such as age, being a man etc.), as well as experimental measures (such as declared level of honesty, happiness etc.), in

Table 2: Experiment 1: Multiple regressions of compliance on socio-demographic variables and experimental measures

	(1) Baseline	(2) Oath	(3) Pooled
Monthly income	-0.000193	0.0000256	-0.0001039
	(0.000119)	(0.000126)	(0.0000847)
Age	0.0352***	-0.00269	0.0152234*
	(0.0121)	(0.0115)	(0.00801)
Men	-0.0268	0.0588	0.0240778
	(0.0921)	(0.0921)	(0.0626)
French nationality	0.00776	0.0194	0.00628
	(0.136)	(0.180)	(0.101)
Not speaking French at home	-0.104	-0.193*	-0.168**
	(0.108)	(0.108)	(0.0753)
Economic studies	-0.0745	-0.0828	-0.0573
	(0.121)	(0.100)	(0.0742)
Believing in God	-0.156	-0.0943	-0.105
	(0.0997)	(0.0927)	(0.0665)
Parents' financial help	0.0718	0.135	0.0869
	(0.0995)	(0.116)	(0.0735)
Self honesty	0.0885***	0.139***	0.122***
	(0.0315)	(0.0266)	(0.0197)
Others' honesty	-0.0590	-0.0763*	-0.0727***
	(0.0414)	(0.0386)	(0.0268)
Happiness	-0.00410	-0.0440	-0.00555
	(0.0384)	(0.0379)	(0.0254)
[1em] [1em] Intercept	-0.302	0.437	-0.0256
	(0.391)	(0.377)	(0.262)
N	63	66	129
adj. R^2	0.208	0.377	0.316

Note. OLS regression of the compliance rate (income declared divided by income earned) on different socio-demographics variables and experimental measures in Baseline, Oath and Pooled conditions. Standard errors in parentheses. **Legend.** Significance levels: *: 10% **: 5% ***: 1%

the Baseline condition, Oath condition and when data are Pooled. Few of these regressors turn out to be significant. Considering the pooled data, socio and demographic variables have little influence on compliance: only two variables have a significant impact. Age is significantly (at 10%) positively correlated with compliance: older people tend to comply more, and this effect is mainly coming from the participants in the Baseline. The fact of not speaking French at home also have a significant (at 5%) impact on compliance, but a negative one.[9] Other experimental measures seem to better explain compliance. Results show that there is a significant ($< 1\%$) positive correlation between compliance and the self level of honesty and a significant ($< 1\%$) negative correlation between compliance and the perceived honesty of others. The first result is quite straightforward as people who behaves honestly perceived themselves as more honest. The last result shows that there is no social norm influence and/or that free riders think that other taxpayers will fund the public good in their stead. Regarding self-honesty, this result is present in both conditions. However, significance of perception of other's honesty is mainly coming from the Oath condition.[10]

To conclude, once again, compliance is rather not to look inside participants' characteristics. As hypothesized, context is probably more apt to explain compliance.

4.3 Income declaration: the oath impact

Table 3 allows to compare compliance measures in both treatments. Compliance rate in the Oath condition is significantly higher than in the Baseline ($p = .0472$): signing a truth-telling oath increases income declaration by almost a third.[11] The median is also significantly higher in the Oath condition ($p = .043$). The median is multiplied by more than two: 50% of participants declare more than 41.89% in the Baseline versus 96.40% in the Oath. The number of full compliers is also significantly higher in the Oath ($p = .0038$), it doubles from 25.39% in the Baseline to 50% in the Oath. It is the same for the number of full evaders, doubling from 3 to 6, even though the sample is probably too reduced to be conclusive ($p = .3385$).

This significant difference is not only average: the Oath distribution stochastically dominates

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[9] The significance is mainly coming from the people not speaking French at home in the Oath condition. Table 7 from Section A in Appendix, shows the interaction effect between subjects not speaking French at home under oath and in the Baseline, and the difference is only of 3%. It means that these people did not respect the truth-telling oath, and, did not change their fiscal declarations under oath. To have an impact, an oath must thus be written in the language in which the oath taker is proficient.

[10] Table 8 from Section A in Appendix, shows a significant interaction effect between Oath and Self honesty: for the participants under oath, each point of self honesty increases compliance by 12.05%. However, there is no interaction between Oath and Other's honesty in Table 9.

[11] Table 10 from Section A in Appendix provides Probit model on the extensive margin and OLS regression on the intensive margin. Explanatory variables are again the same socio-demographic and experimental variables, augmented with an oath dummy (1 for the oath treatment, 0 otherwise). The oath effect is still significant–at $p = .051$–on the extensive margin, even with the numerous different individual variables, meaning that this effect is quite robust.

Table 3: Summary statistics on compliance in Experiment 1

	Baseline	Oath
Compliance:		
- Average	48.98%	63.17%
- Median	41.89%	96.40%
- SD	37.94%	42.24%
% Full compliers	25.39%	50%
(N)	(16)	(33)
% Full evaders	4.76%	12.12%
(N)	(3)	(6)
Tax collected	154€	214€

Note. Summary statistics on outcome behavior in Experiment 1. Compliance measures are presented in the Baseline (middle) and Oath (right) conditions.

the Baseline distribution ($p = .040$), i.e. people under oath declare more income (even though both distribution are the same till about 20% to 25% compliance rate). A graph representing both empirical distribution functions is available in Figure 2a. We observe that an oath is especially effective on the people declaring between 40% to 60% of their income. Most of these people are declaring all of their income under oath.

A possible explanation would be that people unsure of their preferences are declaring a medium amount (e.g. around 50% of their income). Taking an oath could generate a polarization of their preferences towards both extreme.[12]

5 Experiment 2

Observed behavior from Experiment 1 shows that *(i)* oath has, as predicted, a significant impact on compliance in a one-shot experiment and *(ii)* it could be due to a polarization of participants' preferences towards (dis)honesty. In Experiment 2, we assess the pertinence of this explanation to two variations in the design. First, we consider a repetition of the declaration task, to know if it varies more with time. Second, we ask explicitly to participants to rate their declarations' certainty.

5.1 Design of the experiment

The experiment is the same as presented before, except for the declaration stage. In the second stage, it is asked to participants to declare their amount of income in a succession of five rounds. The gross income is the same at each round. They are told that one declaration will be picked ran-

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[12]This is observed in Figure 3 where middle declarations are pushed towards 0% and 100% declaration rates.

domly and will determine their net income (thus their experimental earnings) and their donation to WWF.[13] One other question is added to the first questionnaire to fill by the participants after the 5 declarations. In this question, participants have to rate the income declaration decisions' certainty from 1 to 10 (1 being "*Totally uncertain*" and 10, "*Totally certain*"). No other changes are implemented. Our pool of subjects is again divided into two conditions: one Baseline and one Oath.

5.2 Experimental procedure

Our analysis relies on six experimental sessions (two for each condition), each of them has between 20 and 22 subjects. Although signing the oath is not mandatory, a large majority of subjects do so. All the subject except four accepted to sign the oath, leading to a 91.11% acceptance rate. These subjects are thus excluded from our analysis. This percentage is still in line with previous experiments involving the oath. All sessions take place in the lab of Strasbourg University (LEES) in june 2015. The recruitment of subjects has been carried out by LEES database among individuals who have successfully completed their registration on the laboratory's website.[14] The experiment overall involved 87 subjects, 38 males and 49 females. The mean age of participants is 22. Each session lasted about 1 hour, with an average payoff of 20 euros (17 euros directly given to the participants and 3 euros given to WWF), including a 5 euro show-up fee.

5.3 Descriptive statistics

Once again, Table 4 reports summary statistics on the different covariates measured in the socio-demographic questionnaire or during the experiment. The only variables that are different across conditions are: the declared self honesty ($p = .0108$) and the perceived level of honesty of other participants ($p = .0003$). It means that in the Oath condition, participants perceived themselves and others as significantly more honest.

As before, Table 5 reports compliance measures in Experiment 2 on the second last column, in average on the 5 rounds. Tax evasion in the Baseline of Experiment 2 is still intense with an average declaration rate equal to 43%. It is also widespread, as only 6 subjects declare 100% of their income in their five declarations. Evasion decisions are also very heterogeneous. 4.44% of the participants (2 subjects) declare zero income, and 50% less than 32%. In comparison, tax evasion in the Oath condition is less intense with an average declaration rate of 60%. Almost half of the participants–17 subjects–are full compliers. Evasion decisions are even more heterogeneous: almost 12% of participants (5 subjects) declare now zero income and 50% less than 73%.

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[13]Screen-shots of the Experiment 2, including the declaration stage are available in Appendix D.

[14]The recruitment process of the participants makes use of ORSEE (Greiner, 2015). The experiment is computerized using Econplay (www.econplay.fr).

Table 4: Summary statistics on individual covariates in Experiment 2

	Baseline	Oath	Overall
Monthly income	461.11	500	479.88
Age	21.64	22.40	22.01
Men	46.66%	40.47%	43.67%
French nationality	88.88%	88.09%	88.50%
Not speaking French at home	33.33%	33.33%	33.33%
Economic studies	33.33%	19.04%	26.43%
Believing in God	44.44%	40.47%	42.52%
Parents' financial help	62.22%	59.52%	60.91%
Self honesty	4.66	5.88	5.25
Others' honesty	3.68	4.90	4.27
Happiness	4.71	4.88	4.79
Perception of WWF's actions	5.6	5.54	5.57
Certainty	7.15	7.83	7.48
N	45	42	87

Note. Summary statistics on individual covariates in Experiment 2. From left to right are the variables' names, their corresponding values in the Baseline and in the Oath conditions, and finally, the average on the total population.

5.4 Income declaration: the oath impact

Table 5 again provides compliance measures from Experiment 1 on the last column, along with those from Experiment 2. Average compliance rates are strictly similar in both experiments. We confirm that average compliance rates in the Oath condition are significantly higher than in the Baseline ($p = .0501$): signing a truth-telling oath increases income declaration by almost a half, and it does not seem to decrease with time. The median is again significantly higher in the Oath condition ($p = .069$). The oath multiplies the median by more than two. The number of full compliers is also significantly higher in the Oath ($p = .0038$), it triples from 13.33% to 40.47%. The number of full evaders more than doubles, from 2 to 5, even though such a sample size is too small to be conclusive ($p = .2056$).

A graph representing both empirical distribution functions is available in Figure 2b. We replicate once again the same result as in Experiment 1: the Oath distribution stochastically dominates the Baseline distribution ($p = .042$), i.e. people under oath declare more income. However, the empirical distribution functions are not the same compared to the one-shot experiment: the difference between Oath and Baseline appears sooner and there is no big inflexion point around 50% as there was. There are now many different local inflexion point.

Table 5: Summary statistics on compliance in Experiment 2

Baseline							
Rounds	1	2	3	4	5	Mean Compliance	Reminder Expe. 1
Compliance:							
- Average	46.59%	40.60%	40.33%	43.85%	43.44%	42.96%	48.98%
- Median	36.49%	25.88%	22.83%	36.49%	36.49%	32.41%	41.89%
- SD	40.22%	40.78%	38.68%	39.84%	40.63%	37.88%	37.94%
% Full compliers	24.44%	17.77%	17.77%	20%	22.22%	13.33%	25.39%
(N)	(11)	(8)	(8)	(9)	(10)	(6)	(16)
% Full evaders	6.66%	11.11%	8.88%	6.66%	6.66%	4.44%	4.76%
(N)	(3)	(5)	(4)	(3)	(3)	(2)	(3)
Tax collected	92€						154€

Oath							
Rounds	1	2	3	4	5	Mean Compliance	Reminder Expe. 1
Compliance:							
- Average	64.76%	56.61%	57.83%	60.43%	60.75%	60.07%	63.17%
- Median	100%	69.65%	71.57%	89.41%	95.45%	73.07%	96.40%
- SD	44.53%	43.16%	44.16%	44.45%	44.29%	42.41%	42.24%
% Full compliers	54.76%	40.47%	47.61	50%	50%	40.47%	50%
(N)	(23)	(17)	(20)	(21)	(21)	(17)	(33)
% Full evaders	11.90%	14.28%	11.90%	11.90%	14.28%	11.90%	12.12%
(N)	(5)	(6)	(5)	(5)	(6)	(5)	(6)
Tax collected	132€						214€

Note. Summary statistics on outcome behavior in Experiment 2. Compliance measures are presented in the Baseline (above) and Oath (below) conditions. To ease comparison, compliance measures are also provided from Experiment 1 (last right-hand column).

Figure 2: Empirical distribution functions of compliance from Oath and Baseline conditions

(a) One shot

(b) Repeated
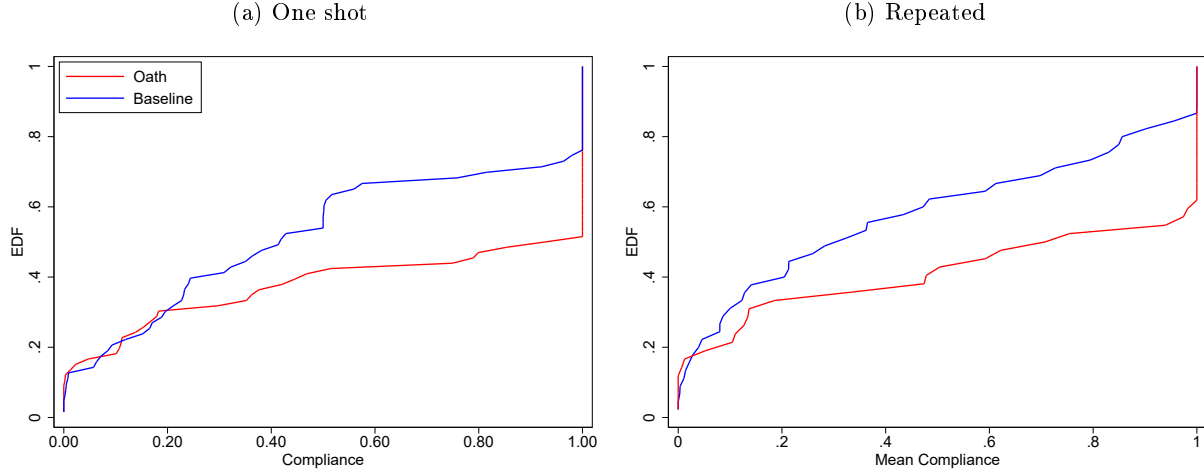
5.5 Compliance under oath: light on the polarization effect

In the previous experiment, we already put in light that oath polarized compliance towards both extremes. In an unknown situation, people would declare a medium amount because they would be unsure of their preferences. Opting for a medium response when unsure is a well documented effect in psychology (central tendency bias) and in economics (pull-to-center effect). We want to know if, signing an oath exacerbates participants' preferences, making them surer about their behavioral answer, in their thoughts and in their acts.

Table 4 also features the level of self declared level of certainty regarding their declarations on the bottom. In this Table, participants' mean is higher in the Oath, but there is no significant difference ($p = .2461$). The number of people who choose the maximal certainty is also higher in the Oath condition (19 in the Oath vs 13 in the Baseline), however it only comes close to significance ($p = .1167$). Thus, in their thoughts, participants do not seem to be significantly surer of their answers. Table 6 reports the percentage of people declaring five times exactly the same income. It is categorized according to the type of compliance: either 0%, 100% or somewhere between 0% and 100%. It represents a behavioral measure of participants' certainty. The number of certain participants more than doubles in the Oath compared to the Baseline (from 22.22% to 54.76%), and this difference is highly significant ($p = .0015$). It is especially effective in the full fraud and in the full compliance declarations where it triples. In their acts, participants behave as if they were surer of their declarations under oath.

The declaration task is about moving a slider and it can be quite difficult to position it at a precise point. We consider another behavioral measure of certainty, computed as the difference between highest and lowest declaration. The lower this spread, the higher the certainty of declaration. There is a strong negative correlation between spread and certainty scale ($p = .002$), i.e. the

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Table 6: Distribution of 5 identical declarations across type of declaration

	Full fraud	Fraud	Full compliance	Sum
Baseline	4.44% (2)	4.44% (2)	13.33% (6)	22.22% (10)
Oath	11.90% (5)	2.38% (1)	40.47% (17)	54.76% (23)

Note. This table presents the percentage of 5 identical declarations across type of declaration (full fraud, fraud, full compliance) and conditions.

surer subjects are of their declaration, the less they vary in their declarations. People are rather congruent between their behavior and self declared certainty. Again, under oath, participants are more certain of their answers: around 65% of participants under oath vary their five declarations by less than 5% versus 45% in the Baseline ($p = .010$).[15]

To conclude, in a new situation one does not know how to behave and opt for a medium response. It is what happens for people uncertain of their preferences for honesty in the baselines of these two experiments. Our design allows–for the first time–to observe distribution of compliance behavior, rather than average behavior. Signing an oath polarizes their preferences towards both extremes. It polarizes their preferences and makes them surer of their behavioral answer.

6   Conclusion

There is well often a dilemma between truth-telling and immediate gains, such as one has to choose between the first or the latter. Tax evasion is one of the situation illustrating this trade-off. In binding people's words to their behavioral acts, there is a way to ensure that a person could resist the sirens of dishonesty. This article investigates first if a truth-telling oath, as developed by Jacquemet, Joule, Luchini, and Shogren (2013), respects all the features of a written commitment. It investigates also if this oath to tell the truth can foster compliance with the tax law, in the situation in which there is no control. Finally, it looks for the channel of such commitment effect. We commit participants by proposing them to sign a truth-telling oath before entering the lab and playing a tax evasion game.

According to our literature review, the truth-telling oath is a valid commitment. Our results confirm this assumption: the mere fact of signing an oath to tell the truth significantly increases income declaration by one third to half of the incomes declared in an equivalent Baseline. Moreover, we discovered that this oath was ineffective on those who were not proficient enough in the language in which the oath was written. We bring further information on the channel through which the commitment is passing. Our proposition is that the oath transforms participants' unsure preferences to sure ones. In the Baseline, many participants do not know what behavior to adopt. This proceeds in an amount of centered declarations. Under oath, their declarations are polarized

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[15]A graph representing both empirical distribution functions is available in Figure 4 in Appendix.

towards both extremes (full fraud and full compliance). A truth-telling oath polarizes preferences.

A side finding from this experiment is that uncertainty on the "good" way to behave is confirmed to trigger dishonesty. This pleads for the hypothesis that ambiguity deters compliance. People unsure about what they should do in a situation cheat, but by a little. People do not cheat by the maximum of what they could achieve (Mazar, Amir, and Ariely, 2008). A straightforward public policy would be first to always disambiguate and publicize the "good" way to behave in a situation that could give rise to uncertainty (e.g., always describe clearly the precise conditions under which some categories of taxpayers have the right to a certain tax deduction).

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Appendix

A Additional statistics on Experiment 1

Figure 3: Histogram of the distribution of compliance across conditions

Graphs by Oath
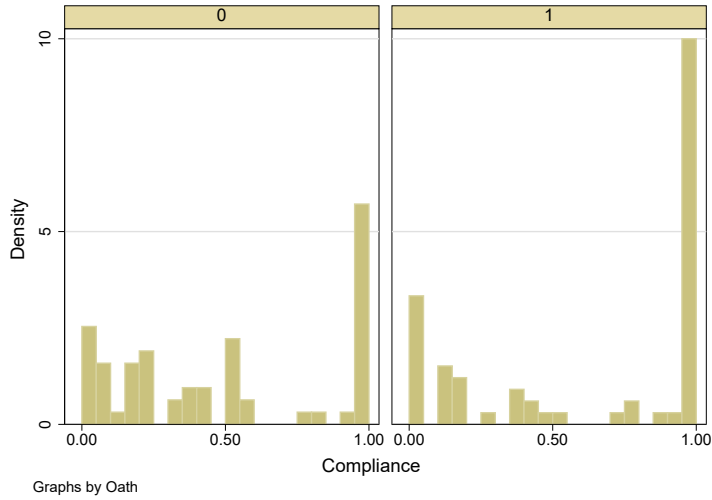
Table 7: Interaction effect between Oath and Not speaking French at home

Variable	Coefficient	(Std. Err.)
Oath	0.173*	(0.091)
Not speaking French at home	-0.110	(0.099)
Oath * Not speaking French at home	-0.147	(0.143)
Intercept	0.544***	(0.070)
N	129	
R^2	0.086	
$F_{(3,125)}$	3.91	

Table 8: Interaction effect between Oath and Self honesty

Variable	Coefficient	(Std. Err.)
Oath	-0.185	(0.185)
Self honesty	0.068***	(0.022)
Oath * Self honesty	0.053*	(0.031)
Intercept	0.115	(0.131)
N	129	
R^2	0.273	
$F_{(3,125)}$	15.676	

Table 9: Interaction effect between Oath and Other's honesty

Variable	Coefficient	(Std. Err.)
Oath	0.002	(0.238)
Other's honesty	0.029	(0.033)
Oath * Other's honesty	0.028	(0.048)
Intercept	0.355**	(0.162)
N	129	
R^2	0.057	
$F_{(3,125)}$	2.503	

Table 10: Experiment 1: Multivariate regressions of compliance decisions on socio-demographics variables, experimental measures and oath treatment

	Extensive margin		Intensive margin	
Variable	Coef.	(St. E.)	Coef.	(St. E.)
Monthly income	0.000	(0.000)	0.000	(0.000)
Age	0.039	(0.037)	0.010	(0.008)
Men	0.262	(0.317)	-0.116*	(0.065)
French nationality	-0.489	(0.590)	0.025	(0.099)
Not speaking French at home	-0.959**	(0.398)	-0.057	(0.078)
Economic studies	-0.062	(0.366)	-0.062	(0.081)
Believing in God	-0.447	(0.339)	-0.067	(0.067)
Parents' financial help	0.016	(0.399)	0.102	(0.069)
Self honesty	1.724***	(0.572)	0.035*	(0.021)
Others' honesty	-0.259*	(0.139)	-0.046	(0.030)
Happiness	0.005	(0.132)	-0.010	(0.028)
Oath	0.631*	(0.324)	-0.067	(0.065)
Intercept	-10.681***	(3.972)	0.273	(0.272)
(Pseudo) R^2	0.4458			0.207
$\chi^2_{(12)}$	76.362		$F_{(12,67)}$	1.454

Table 11: Interaction effect between Oath and Affective Empathy with its different sub-scales

	(1) Compliance	(2) Compliance	(3) Compliance	(4) Compliance
Oath	-0.0384	-0.0938	0.0959	0.0810
	(0.399)	(0.293)	(0.322)	(0.331)
Aff. E.	0.0186**			
	(0.00894)			
Aff. E. * Oath	0.00579			
	(0.0122)			
EC		0.00941		
		(0.0206)		
EC * Oath		0.0230		
		(0.0278)		
PERIR			0.0532**	
			(0.0208)	
PERIR * Oath			0.00398	
			(0.0294)	
PROXR				0.0378*
				(0.0212)
PROXR * Oath				0.00671
				(0.0284)
Intercept	-0.115	0.394*	-0.0776	0.0526
	(0.294)	(0.217)	(0.227)	(0.250)
N	129	129	129	129
adj. R^2	0.102	0.032	0.108	0.072

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B   Additional statistics on Experiment 2

Figure 4: Empirical distribution function of the spread across conditions
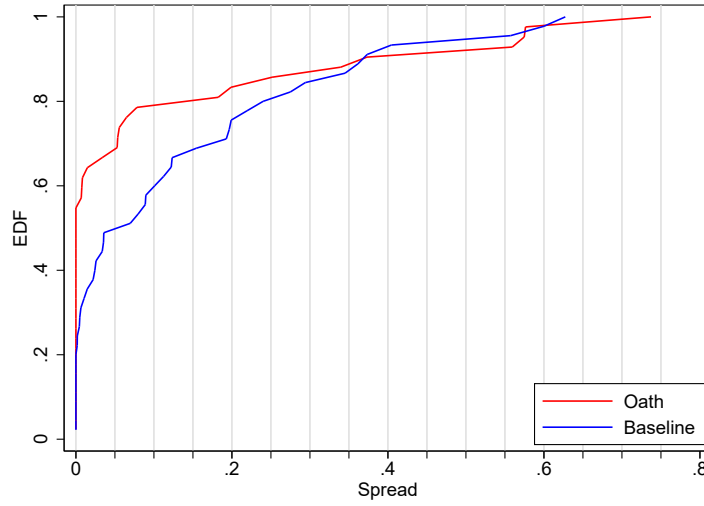
Supplementary Material

C   Decision interface of Experiment 1

Figure 5: Screen-shot of the beginning of the task
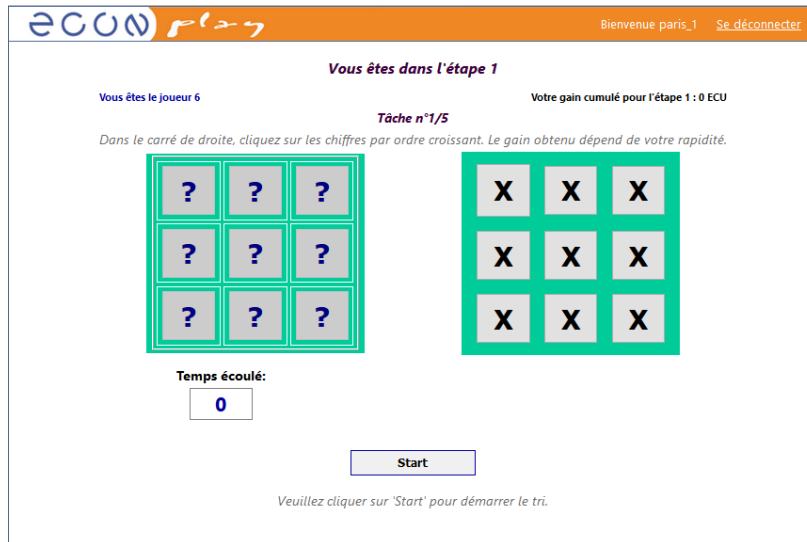
Figure 6: Screen-shot of the task during the sorting

Figure 7: Screen-shot of the declaration

D   Decision interface of Experiment 2

Figure 8: Screen-shot of the 5th declaration

Figure 9: Screen-shot of the 5 declarations

Figure 10: Screen-shot of the random draw