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Tax Evasion:
Cheating Rationally or Deciding Emotionally?

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Abstract: The economic models of tax compliance predict that individuals should evade taxes when the expected benefit of cheating is greater than its expected cost. When this condition is fulfilled, the high compliance however observed remains a puzzle. In this paper, we investigate the role of emotions as a possible explanation of tax compliance. Our laboratory experiment shows that emotional arousal, measured by Skin Conductance Responses, increases in the proportion of evaded taxes. The perspective of punishment after an audit, especially when the pictures of the evaders are publicly displayed, also raises emotions. We show that an audit policy that induces shame on the evaders favors compliance.

Résumé: Les modèles économiques d'évasion fiscale prédisent que les individus devraient frauder dès que le bénéfice attendu de l'évasion dépasse son coût espéré. Sous cette condition, le fort taux de revenu déclaré pourtant observé constitue une énigme. Dans cet article, nous nous intéressons au rôle des émotions comme explication possible de ce phénomène. Notre expérience de laboratoire montre que l'intensité des émotions, mesurée par la conductance de la peau, augmente avec la proportion du revenu qui n'est pas déclarée. La perspective d'une sanction à l'issue d'un contrôle, en particulier lorsque la photo des contrevenants est diffusée, soulève également des émotions. Nous montrons qu'une politique de contrôle qui suscite la honte chez les fraudeurs favorise l'honnêteté fiscale.

Keywords: Tax evasion, emotions, neuro-economics, physiological measures, shame, experiments.
Mots-clés: Fraude fiscale, émotions, neuro-économie, mesures physiologiques, honte, expériences.

JEL Codes: C91, C92, D87, H26

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1. INTRODUCTION

Tax evasion is a substantial phenomenon. According to the analyses of the National Research Program, the U.S. Department of the Treasury (2006) estimates that the 2001 Federal tax-underreporting gap represents $345 billions, i.e. about 16.3% of the tax liability in the United States (Slemrod, 2007). The importance of tax evasion is comparable in most high-income OECD countries. Understanding the reasons why individuals evade taxes and how to increase compliance is therefore extremely challenging.

The standard economics-of-crime model formulated by Allingham and Sandmo (1972) and Yitzhaki (1974) has inspired many empirical tests (see Alm (1991), Cowell (1990), Elffers (1991), Andreoni et al. (1998), and Slemrod (2007) for surveys). If they confirm the basic mechanisms of the deterrence models, these tests however reveal more compliance than predicted[1]. This has motivated the exploration of other dimensions of tax compliance, like tax morale, ethics, and social norms (see Torgler (2002)).[2] Civic norms (Slemrod (1998)), moral appeals (Schwartz and Orleans (1967), Blumenthal et al. (2001), Torgler (2004)), or expectation of collective blame (Bosco and Mittone (1997)) have been shown to exert contrasted influence on tax compliance without, however, fully explaining it.

[1] Also relaxing the hypothesis of risk neutrality, thus assuming risk aversion, does not help to explain the level of compliance observed in empirical settings (Bayer and Sutter (2004)).

[2] Another perspective explores the heuristics and biases that lead individuals to overweight small audit probabilities (Alm et al. (1992)). Another one consists of the analysis of equity and the role of voting on the use of taxes in compliance behavior (Pommerehne et al. (1994)). The role of social interactions has been investigated more recently (Myles and Naylor (1996); Fortin et al. (2007)).

In this paper, we investigate a new hypothesis by considering that our understanding of tax compliance can be improved by analyzing the role of emotions. Our expectation is that both income reporting and audit, possibly followed by sanctions, elicit emotions in individuals. We assume that emotions do not simply proxy the psychic cost of evading taxes; moreover, they constitute a driving force of behavior. In other words, the emotions associated with reporting, audit, and sanctions can influence further compliance. Our analysis is inspired by the recent developments of neuroeconomics. With emotions being functional in driving preferences and decisions (Zajonc (1980); Coricelli, Dolan and Sirigu (2007)), rational decision-making cannot be dissociated from emotions (Damasio (1994)). Closely related to this paper, Harbaugh et al. (2007) have recently shown that mandatory taxation for a charitable cause entails neural activity in brain areas of the ventral striatum that are related to individualistic rewards. This suggests that in some contexts, tax compliance can produce satisfaction for the taxpayer. We extend this reflection by considering situations where no charity is involved and where the individuals can evade taxes.

Different emotions might be related with the act of evading taxes and its consequences. Underreporting income might generate anticipatory and anticipated emotions (Loewenstein, Hsee, Weber and Welch (2001)).[3] Thus, the evader might experience intense feelings (i.e., anticipatory emotions) when taking the risky choice of reporting less than requested. We expect these risk-related anticipatory emotions to increase in the

[3] As defined by Lowenstein et al. (2001): "Anticipatory emotions are immediate visceral reactions to risks and uncertainties. Anticipated emotions are typically not experienced in the immediate present but are expected to be experienced in the future…anticipated emotions are a component of the expected consequences of a decision: they are emotions that are expected to occur when outcomes are experienced, rather than emotions that are experienced at the time of decision [i.e., anticipatory emotions]" (pp. 268).

level of tax evasion. Moreover, the evader might anticipate how bad he will feel if audited and punished (i.e., anticipated emotions). We also expect that the intensity of the emotions related to the detection of cheating differs according to the publicity of this information. Indeed, different events can generate various emotions according to the cognitive appraisal theory of emotions (Frijda (1986); Lazarus (1991)).[4] For instance, evaders can feel regret and guilt even when the information is not spread out and their reputation remains intact in the future.[5] They can feel shame and embarrassment if their cheating behavior is made public. This is at least what is expected by the authorities that resort to the public exposure of the offenders.[6] Since it is difficult to cope with a damaged reputation, we expect the "social" emotion of shame to have a larger impact on future choice behavior than its "private" counterpart (i.e., guilt).[7] Thus, shame avoidance, in addition to guilt avoidance, is likely to increase tax compliance.

To test these hypotheses, we have run a laboratory experiment in which subjects receive an exogenous income that is taxed at a proportional tax rate, and whose emotional arousal

[4] According to the appraisal theory (Frijda (1986)) emotions are concern-activated response patterns that depend on the cognitive evaluation of the context. For instance, a loss is a loss if a person feels it as a loss. The stimuli that elicit emotional responses are the ones that are relevant for the satisfaction of the individual's concerns (desired states or event). At a low cognitive level (*primary appraisal*), the intensity of the emotion increases in the importance of the concern and with the simultaneous presence of multiple concerns. At a higher cognitive level (*secondary appraisal*), the intensity and the nature of the emotions are primarily context-dependent. At this level, emotions are strongly related to the difficulty of the context, and mainly to the evaluation of our capacity to deal with the situation. Emotions are adaptive in that they prepare the organism for change in action tendency.

[5] Interestingly, Allingham and Sandmo (1972) explicitly mention that tax evasion may be limited if the individuals fear losing their reputation.

[6] While pillories have been historically used in many cultures, the web provides nowadays many examples of such policies. For example, the Chicago police department displays the pictures and home addresses of prostitute patrons arrested by the police; a listing of convicted pedophiles is available in every state in the U.S.A.; the government of Canada displays the names of citizens convicted of fiscal fraud; etc.

[7] For instance, appraised uncontrollability (*secondary appraisal*) of dealing with a public announcement of a cheating behavior intensifies the effects of the already negative emotion of guilt. This is because the social group effect may appraise the situation as more difficult to change. Similar *amplification effect* (Kahneman and Miller (1986)), when moving from a private to a social context, has been found in a recent paper by Bault et al. (2007). In this paper, the social emotions of envy and gloating are found to be more intense and to have a deeper behavioral effect than their private counterparts (regret and relief).

is measured. Each individual has to decide how much income he is willing to report. He faces a probability to be audited, in which case he must pay a penalty for underreporting. This audit probability is endogenous and depends on the median of reported incomes in the group of taxpayers. We compare behavior in two treatments. In contrast with the Benchmark treatment, in the Picture treatment any individual's cheating behavior is publicly revealed through the public display of his picture.

To measure the emotional arousal associated with the decisions and the feedback on audits, we use Skin Conductance Responses (SCRs) (Bradley et al (2000)). The SCR is a phasic component of the electrodermal activity (EDA) primarily controlled by the sympathetic division of the autonomic nervous system (ANS) (Dawson et al, 2000). We also use affective self-reports to assess the emotional arousal (low-high intensity) and the hedonic valence (pleasant-unpleasant) dimensions of emotion as a robustness check (Russell and Mehrabian (1977)).

Beyond the hypotheses under examination, an originality of our approach lies in the fact that our physiological measures are not only related to individual decisions but also to social interactions in the Picture treatment. To our knowledge, this is the first economic experiment that measures SCRs in a group of several interacting subjects.

Our experiment delivers several major findings. Although it is rational to evade taxes in our environment, the subjects express increased SCRs both when underreporting their income and when being audited. Indeed, the emotional arousal rises in the intensity of tax evasion. Emotional arousal is increased by the perspective of monetary sanctions and, even more by the perspective of additional non-monetary sanctions. As a

consequence, being in an environment where the picture of the detected evader is publicly displayed favors tax compliance. An interpretation is that people try to avoid the shame associated with detection. Last, the reporting decision time increases in the level of evasion and in the intensity of emotions. This suggests that the subjects need time to solve the tension between the rationality of evading and the associated psychic cost. Interestingly, these results show that, despite the sterility of the environment, it is possible to capture emotions and the fear of social stigma in the lab.

The reminder of this paper is organized as follows. Section 2 develops the experimental design and the predictions. Section 3 analyzes the results and Section 4 concludes.

2. THE EXPERIMENT

A. *Experimental design*

The experiment consists of two treatments. The Benchmark treatment is characterized as follows. The experimental game involves a group of 8 players who receive an individual income. The income can take the following values: $I \in \{50,100,150,200\}$. Each income level is randomly assigned to two subjects in each period, but this is not common information. The players are requested to pay a tax on their income. The uniform tax rate applied to the reported income is 55%. To satisfy this request, the players must report their income that will be taxed.[8] For the sake of simplicity and also to produce a stronger test of the social emotions, we do not introduce any public good dimension. The subjects are told that these paybacks will go into scientific research funds.

[8] The subject reports an income by means of a scrollbar of which maximum graduation corresponds to the subject's actual income. Therefore, a subject cannot report more than his actual income.

The players know that their reported income can be audited according to a certain cutoff audit scheme and that this audit will entail the payment of a fine if the reported income is less than the actual income. We have reinforced the experimental realism of the design not only by replicating the structure of income reporting, but also by using non-neutral terms in the instructions (see Appendix) and by introducing an endogenous audit rule. The probability of an audit is endogenous in that it depends on the median report in the group, and this is made common information.[9] If the reported income of a player is among the four highest reported incomes in the group, his audit probability is 35%. If his reported income is among the four lowest reported incomes in the group, his audit probability is 65%. If all subjects report the same amount, the audit probability is uniform and equal to 50%. The reason why low reported income players have a higher probability of being audited is because reporting low incomes signals to the tax authority, which knows the distribution of income that the individual might have underreported by a substantial amount. The tax authority has little to gain in auditing individuals who report a high income as auditing is costly.[10] Therefore, the subjects do not know their individual audit probability (for an early attempt to study the impact of uncertain audit probabilities on compliance, see Spicer and Thomas (1982)).

The payoffs are determined as follows. If the player is not audited, his payoff consists of his net income (i.e. his income minus the tax on his reported income). If the player is

[9] In real settings, the probability of an audit depends on the taxpayer's decisions since reports convey information. While empirical analyses are plagued by such an endogeneity problem (Alm (1991)), experiments allow clearing it up by using random audit probabilities. Most experiments however do not try to analyze how tax authorities use information from returns to determine audit and how endogenous probabilities influence decisions. Exceptions are Collins and Plumlee (1991), Alm et al. (2000).

[10] We could also have allocated audit probabilities as a function of past detected evasion behavior. This would have increased the realism of the experiment, but it would also have increased the complexity of the game and made the results less comparable with the existing literature.

audited and he has underreported his income, he has to pay the tax on his actual income and a fine is charged. As in the Yitzhaki (1974) deterrence model, the fine is proportional to the unpaid taxes and it is fixed at 20%, which is a realistic value (Andreoni et al. (1998)).

The Picture treatment follows the same timing as the Benchmark treatment: the players receive their income; they report an income; they are informed on whether they have been audited; then, the payoffs for the period are computed. In contrast with the Benchmark treatment however, if an audit reveals that a player has underreported his income, the picture of the contravener is displayed on his own screen and on the screen of other taxpayers. In a period, only one picture can be displayed on the screen of any subject; if more than one tax evader has been audited, there is a random display of each picture on the screen of the non-audited subjects and the honest audited taxpayers.[11] The extent of evasion is not displayed since it could be an additional source of influence on individual decisions. This treatment helps in identifying whether evading taxes involves social emotions, such as shame. Indeed, if the compliance rate differs from that in the Benchmark treatment, this can only be attributable to the flow of information sent to other subjects about one's cheating behavior and received about other subjects' cheating behavior.

To identify more precisely the treatment effects, we used a within-subject design to control that the subjects' characteristics are held constant. The experimental session consists of 30 periods, divided into six blocks of 5 periods. The Benchmark treatment is

[11] Displaying only one picture at a time does not allow the subjects to identify precisely the number of evaders in the session. This also means that a subject who is caught cheating does not know if there were other tax evaders and how many subjects can see his picture.

implemented in periods 1 to 5, 11 to 15, 21 to 25, and the Picture treatment is implemented in the remaining periods. The type of treatment in the current period is always kept visible at the top of the subjects' screens.

Each period is segmented into four or five events, depending on the treatment type, as follows: *i.* Decision – this event starts when the subject is informed about his income for the current period and ends when the subject makes his decision (self-paced); *ii.* Feedback on audit – the subject is informed on whether an audit has been conducted and if the audit led to the payment of a fine (fixed duration of 12 s); *iii.* Picture display (Picture treatment only) – the picture of an audited contravener is displayed (fixed duration of 6.5 s); if the audit did not identify any under-reporting, this event is skipped; *iv.* Feedback on payoffs – the payoff for the period is displayed (fixed duration of 3 s); *v.* Affective self-report – the subject reports his feeling at the end of the period (self-paced).

B. *Predictions with selfish and rational agents*

The theoretical predictions are the same for both treatments if we assume that players are rational. We also assume that the players are risk-neutral: the utility function of the participants is linear in income. We consider a game in the vein of Allingham and Sandmo (1972) and Yitzhaki (1974). I denotes the subject's gross income, which expected value is 0.25(50+100+150+200) = 125. For the symmetry of the game, we can assume that each player believes that the other players receive the same income with equal probability. The probability to be audited, assuming that each player uses the same strategy and reports the same income, is $p = 0.5*A_{Low} + 0.5*A_{High}$. A_{Low} is the audit rate for those reporting income below the median and A_{High} is the audit rate for income reported above the median.

Let t be the tax rate and f be the penalty rate. If an individual decides to report an amount R of his gross income I, his net expected income, ENI, is:

$$I - \left[p\left(t\left(I-R\right) + ft\left(I-R\right)\right) + t\left(1-p\right)R \right] = ENI \tag{1}$$

The term between the square brackets is the expected value of the tax t and the fine (f times the unpaid taxes) associated with this strategy. If an individual chooses to report his full income, then his net income, NI, is simply:

$$I - tI = NI \tag{2}$$

The expected rate of return from reporting no income (R=0 in equation (1)) relatively to reporting all his income is:

$$\frac{ENI\left(with\, R=0\right) - NI}{NI} = \frac{t\left(-p\left(1+f\right)+1\right)}{1-t} \tag{3}$$

With the following parameters, t = 55%, f = 20%, A_{Low} = 65% and A_{High} = 35% (therefore p=50%), this expected rate of return is 45%. This is a strong incentive not to report any income to the tax authority and full reporting is always a dominated strategy. Indeed, the return of evasion increases in absolute terms in the level of income; in addition, a subject may realize that it is easier to hide evasion when one receives a high income if he believes that other subjects have drawn a lower income.

This game has however no Nash equilibrium in pure strategies because a player has an incentive to deviate by reporting one unit more than the other players to reduce his own audit probability from 50% to 35%. The solution of the game is indeed a mixed strategy equilibrium with a positive compliance rate. Under the assumption of risk neutrality, one can suspect that this compliance rate is very low, due to the high expected return from each evaded unit of income even under the high audit probability.

C. *Predictions with emotional agents*

In addition to risk aversion, anticipatory and anticipated emotions can favor higher tax compliance. Indeed, emotional players may comply because they suffer a psychic cost in evading or when being caught cheating. For their part, the non-emotional players, if they expect the presence of emotional players in the group, may expect to bear the highest audit probability and therefore, should also report more. For these two reasons, the mixed strategy equilibrium in the presence of emotional players is likely to predict a higher compliance rate.

In our experiment, the parameters of the game are the same for both treatments and for each level of reported income; risk related anticipatory emotions should also be similar. Therefore, the level of reporting in the presence of psychic costs should be similar in both treatments. The only reason why the subjects might change behavior between treatments is shame avoidance. Indeed, we expect a lower probability to underreport in the Picture treatment in order to avoid the feeling of shame or embarrassment if audited. Such anticipated emotions should therefore be the main determinants of the treatment effects on decisions and on the pattern of SCRs.

D. *Experimental procedures*

The experiment consisted of six sessions. These sessions were conducted at the *Groupe d'Analyse et de Theorie Economique* (GATE), at the University of Lyon, France. 48 subjects (of which 63% were males), 8 for each session, were recruited from undergraduate courses in the local business and engineering schools. Some of the subjects had participated in previous experiments, but all of the subjects were

inexperienced in this particular type of experiment. The experiment was computerized using the REGATE program developed at GATE (Zeiliger (2000)).

Upon arrival and before entering the laboratory, the subjects drew a tag indicating their designated computer. Then, we asked them whether they allowed us to take a picture of their face (all have accepted). It was made explicit that this picture would be used at some point during the experiment, that they would be informed before the possible use of the pictures, and that they could quit immediately against the payment of the show-up fee. The subjects received also the guarantee that their picture would be immediately destroyed at the end of the session. The volunteers were required to keep a neutral face when we took their picture. Next, each subject was allowed to seat in front of his computer. The instructions for the preliminary part of the experiment were then distributed and read aloud. After the completion of a test of risk attitudes, the instructions for the other parts were distributed and read aloud. For the sake of realism, the instructions used tax specific language, but they made no reference to the measure of emotions.[12] We checked the understanding of the rules of the game by means of a questionnaire. We also answered the subjects' questions in private.

Eliciting risk preferences. Since there are good reasons to believe that risk attitude influences the individual compliance decision, we implemented in the preliminary part of the experiment a parsimonious procedure to elicit each individual's degree of risk aversion. This test was taken from Charness and Gneezy (2003). Each subject was

[12] Alm (1991) mentions that by using loaded terms, the experimenter loses some control over the subjects' preferences; on the other hand, it helps introducing context, which is important in explaining compliance behavior, and make mental scripts less necessary. Alm, McClelland, and Schulze (1992) compare two experiments using either loaded or neutral wording and find no difference in behavior.

endowed with 15 points (his show-up fee of €3) and was presented with a one-shot decision. He had to decide how much of this endowment to invest in a risky asset and how much to keep. There is an even chance for the investment to be a success or a failure. In case it fails, the amount invested is lost; in case of a success, the investment returns 2.5 times its amount. Each subject had also to choose one of two colors. If this color is randomly drawn (with a 50% chance), the investment is a success. Since the lottery gives an expected return of 1.25 point for each point invested, a risk-neutral subject should invest his full endowment. The lower the amount invested in the risky asset, the higher the degree of risk aversion. While the subjects chose the amount of their investment and their color at the beginning of the session, the random draw was made only at the end of the session in order not to influence behavior in the main game.

The "Physionomics lab". We proceeded to the simultaneous electrophysiological recording of a group of 8 interactive subjects. Experimental sessions took place in a noiseless room with stable temperature set to 21^{o} C. Skin conductance activity was recoded with a BIOPAC MP150W system and two TEL100C telemetry modules (BIOPAC Systems, EU). Two Ag/AgCl electrodes filled with 0.5% saline in a neutral base paste were placed on the subject's distal phalanges of the middle and the index fingers of the non-dominant hand, after the attachment site had been cleaned with a neutral soap (Dawson et al (2000)). A constant voltage of 0.5V was applied between the electrodes. The skin conductance signal was amplified (x2000) and low-pass filtered (30Hz) before being sampled at 125Hz. Skin conductance activity was continuously recorded until the end of the session

Skin conductance data analysis. Skin conductance signal was low-pass filtered at 0.5Hz offline, using a 5th order Butterworth low-pass digital filter. SCRs' onset and peak were automatically detected, when the first derivative of the filtered signal changed sign, by a program written in Matlab (The MathWorks Inc., EU). The detection of an accelerative deflection, during the onset and peak period (SCR's rise time), indicated a SCR overlapping. In the case of overlapping, the two SCRs were *i*) split, if they could be related to different events (according to criteria described below), or *ii*) summed together (see Boucsein (1992), p.136). The whole signal was visually inspected prior to further analysis and false SCR detections were removed. The SCR amplitude was calculated as the difference between the signal amplitude at the peak and the onset times. The SCR amplitude was thresholded at 0.02 μS (Dawson et al (2000)). Skin conductance responses were analyzed for the decision, the feedback on audit and the feedback on payoffs events, only.[13] Skin conductance responses with onset between 0.7 and 3.7 s, after the beginning of an audit or payoff, were assumed specific to the event. With respect to the decision event, given its self-paced duration, specific SCRs were allowed onset time from 0.7 s after the subject is informed on his income, until the subject's decision. In order to minimize SCRs overlapping between events, we imposed a minimum time interval of 6 seconds between adjacent events.

Affective self-reports. At the end of each period, the subjects had to report their feelings at the moment of the audit by means of two 7-point Likert-type scales of emotional arousal (from extremely weak to extremely strong) and hedonic valence (from extremely negative to extremely positive). These affective self-reports were aimed at a consistency

[13] The analysis of the SCRs related to the feedback on payoffs is not reported here because it does not bring more information than the analysis of the SCRs related to decision and audit.

check with the physiological measures. The physiological measures provide an autonomic measure of the subject's emotion; while the affective self-reports unveil, backwardly, the subjective emotional experience. An adequate assessment of emotions requires an integration of behavior, verbal-report and physiology (Bradley and Lang, 2001). A positive correlation between physiological and self-report measures is expected. They should however be considered complementary rather than redundant measurement since they do not necessarily convey exactly the same information.

At the end of the session, once the 30 periods were completed, the subjects had to report on a 7-point Likert-type scale their feelings (from extremely negative to extremely positive) regarding three types of frauds.[14] This attitudinal survey aimed at analyzing the consistency of reporting behavior in the laboratory with the attitude towards fraud in various real contexts. Next, the subjects had to click a button to draw the color that determined whether the investment they made in the preliminary part of the experiment was a success or not. Then, they completed a demographic questionnaire and they were allowed to leave the laboratory.

On average, a session lasted 75 minutes including preparation of the subjects for the physiological recording and including cash payment in private in a separate room. The subjects were informed from the beginning of the session that a person who is not aware of the content of the experiment would pay them.[15] Payment consisted of the average earnings in two randomly selected periods out of 30 in order to avoid possible

[14] A question focused on tax evasion by a shopkeeper who receives payment in cash. The second question was related to an individual who use public transportation without buying a ticket. The last scenario was related to a driver who does not respect the Highway Code.

[15] Indeed, it was important to avoid that some subjects worry that they might not get invited back for more experiments if the experimenter knew that they cheated. Similarly, it was made knowledge that all decisions were anonymous.

accumulated wealth effects. The subjects received a show-up fee of 3€. On average, they earned €19.33.

3. RESULTS

An overview of our experimental results is that we find substantial treatment effects on the reporting decision, as an environment where evading behavior is made public reduces the proportion of evaders. The results show that evading taxes raise emotions and that punishment, especially when it is made public, reinforces emotional responses and their behavioral consequences. We first provide descriptive statistics on individuals' behavior. We then consider the determinants of such behavior, providing regression analysis.

A. *Summary statistics and non-parametric analysis*

Table 1 displays some descriptive statistics.

Table 1. Summary statistics

	Benchmark treatment	Picture Treatment	All treatments
Proportion of reported income	60.71 (34.32)	67.66 (34.02)	64.18 (34.34)
when income is 50	64.27 (44.14)	70.41 (43.15)	67.34 (43.70)
when income is 100	64.96 (33.00)	73.05 (34.73)	69.00 (34.07)
when income is 150	58.75 (30.40)	68.48 (28.28)	63.61 (29.72)
when income is 200	54.86 (26.49)	58.69 (25.73)	56.77 (26.15)
Proportion of evaders	78.06 (41.42)	67.22 (46.97)	72.64 (44.60)
when income is 50	51.67 (50.11)	37.78 (48.62)	44.72 (49.79)
when income is 100	76.67 (42.41)	56.11 (49.76)	66.39 (47.30)
when income is 150	89.44 (30.81)	82.22 (38.34)	85.83 (34.92)
when income is 200	94.44 (22.97)	92.78 (25.96)	93.61 (24.49)
Proportion of punished subjects	37.92 (48.55)	35.56 (47.90)	36.74 (48.23)
Amount of taxes	55.11 (30.22)	58.18 (29.64)	56.65 (29.96)
Amount of fines	7.39 (5.55)	7.06 (5.38)	7.23 (5.46)
Payoffs	67.08 (39.21)	64.31 (36.78)	65.70 (38.03)
Emotions: SCR–decision in μSiemens	0.16 (0.27)	0.15 (0.25)	0.16 (0.26)
Non evaders	0.09 (0 .17)	0.09 (0 .22)	0.09 (0.21)
Evaders	0.18 (0.29)	0.17 (0.26)	0.18 (0.27)
Emotions: SCR – audit in μSiemens	0.13 (0.27)	0.13 (0.25)	0.13 (0.26)
Non evaders	0.05 (0.19)	0.04 (0.11)	0.05 (0.15)
Evaders	0.15 (0.28)	0.17 (0.29)	0.16 (0.29)
Decision time in seconds	12.68 (7.76)	10.42 (5.73)	11.55 (6.91)
Non evaders	9.73 (5.92)	8.92 (5.57)	9.25 (5.72)
Evaders	13.51 (8.02)	11.15 (5.66)	12.42 (7.12)
Self-reported emotional arousal: from 1 (extremely weak) to 7 (extremely strong)	3.91 (1.70)	3.90 (1.81)	3.90 (1.75)
Non evaders	3.15 (1.80)	3.08 (1.78)	3.11 (1.79)
Evaders	4.12 (1.61)	4.30 (1.69)	4.20 (1.65)
Self-reported hedonic valence: from 1 (extremely negative) to 7 (extremely positive)	3.97 (1.66)	3.94 (1.72)	3.96 (1.69)
Non evaders	4.32 (1.32)	4.24 (1.32)	4.27 (1.32)
Evaders	3.87 (1.74)	3.80 (1.87)	3.84 (1.80)
Number of observations	720	720	1440
Proportion of males		62.50 (48.43)	
Average amount invested		9.38 (3.58)	
Percentage of negative sentiments regarding			
Shopkeepers evading taxes		54.17 (49.84)	
Contraveners with highway code		85.42 (35.31)	
Fare dodgers		50.00 (50.02)	

Note: The Table indicates average values; standard deviations in parentheses.

Regarding the reporting behavior, Table 1 indicates three important elements. First, the proportion of reported income declines in the level of income. This is confirmed by non-

parametric statistics.[16] The second result is that the reporting behavior is affected by the Picture treatment. For each income level, the proportion of reported income is higher in an environment where underreporting may be made public (but the Mann-Whitney tests fail concluding on significant differences). Figure 1 illustrates this result.

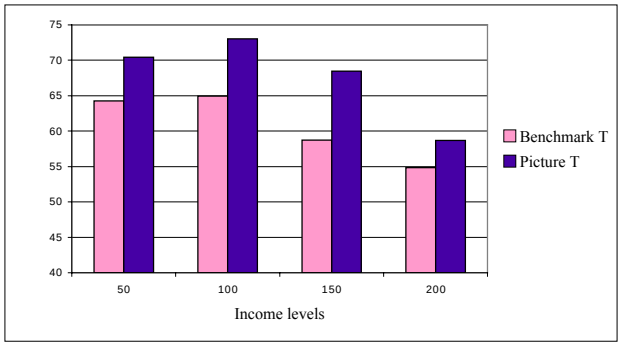


Figure 1. Proportion of reported income by treatment and by income level

The proportion of evaders follows a similar pattern as the proportion of reported income, as illustrated by Figure 2.

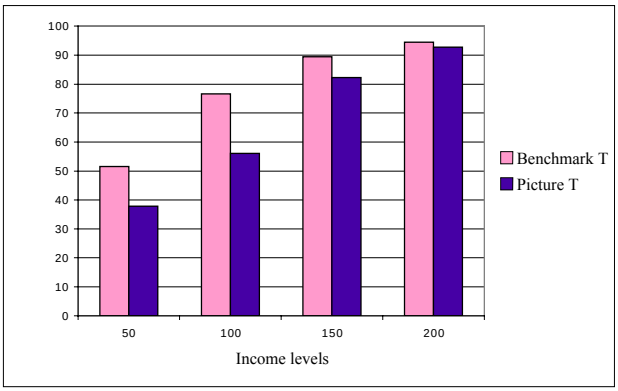


Figure 2. Proportion of evaders by treatment and by income level

[16] In all the reported non-parametric tests, a session is considered as one independent observation. According to Wilcoxon signed-rank tests, the average proportion of reported income is significantly lower at the 5% level when we compare individuals who receive an income of 200 with individuals who receive an income of 150 ($p = 0.046$), 100 ($p = 0.028$), and 50 ($p = 0.046$). It is significantly lower at the 10% level, when we compare individuals who receive an income of 150 with individuals who receive an income of 100 ($p = 0.075$). The average reported proportion is not significantly different when we consider incomes of 50 and 100.

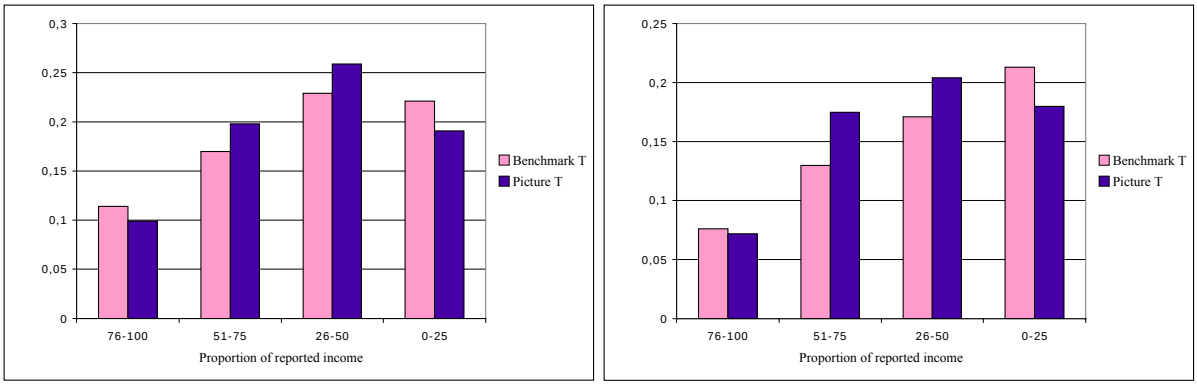
Table 1 and Figure 2 show that the proportion of evaders increases with income (all pair-wise comparisons indicate that the differences are significant at the 5% level)[17] and that it is significantly lower in the Picture treatment ($p = 0.078$).

Third, the average proportion of participants being caught is 37.92% in the Benchmark treatment. It is slightly lower in the Picture treatment (35.56%), but not significantly so (Mann-Whitney test, $p > 0.10$). These proportions should be 50% if all participants had chosen the evasion strategy, but a *t*-test concludes that these proportions are significantly lower than 50% ($p < 0.001$). Average taxes, fines and payoffs follow, as expected, the same pattern as the proportion of reported income.

Table 1 delivers also three important observations about emotions, as measured by Skin Conductance Responses. SCR is described by its amplitude and is expressed in μSiemens. First, the average SCR amplitude is significantly higher when people underreport than when they comply (Wilcoxon test: $p = 0.028$). It is twice as high when related to the reporting decision and three times higher when related to the feedback on audit. Indeed, we would expect non-evaders to be less emotionally aroused when receiving the feedback on audit since they do not risk any punishment. This explains that the average response of all the subjects is higher in the decision phase than in the audit phase (Wilcoxon test: $p = 0.046$).

Second, SCR is inversely related to the proportion of reported income. Figures 3a and 3b break down the SCR measures by proportion of reported income and by treatment.

[17] The Mann-Whitney tests indicate that the proportion of evaders when the income is 200 is significantly higher than when the income is 150 ($p = 0.034$), 100 ($p = 0.028$) and 50 ($p = 0.028$). This proportion when the income is 150 is significantly higher than when the income is 100 ($p = 0.046$) and 50 ($p = 0.028$). It is also significantly higher when the income is 100 than when it is 50 ($p = 0.034$).



a) SCR at the time of reporting *b) SCR at the time of audit*

Figures 3. SCR by proportion of reported income and by treatment

Figures 3a and 3b show that at both reporting and audit moments, emotional arousal increases when the proportion of reported income decreases. They also reveal that for the subjects reporting between 26% and 75% of their income, the Picture treatment is more arousing than the other treatment (Mann-Whitney tests: $p = 0.037$ for the SCR measured at the time of decision, and $p = 0.004$ for the SCR measured at the time of audit). In this treatment, when the subjects report a very low proportion (less than 26%), the SCR is not higher than when subjects report between 26 and 50% of their income (the difference is not significant, $p > 0.10$). This may be due to a selection bias, i.e. a fraction of those people who almost report nothing in this environment are more likely to have no psychic cost in evading taxes. This explains why the average SCRs, both at the time of decision and audit, do not differ much by treatment in Table 1, when we do not control for the proportion of reported income (Mann-Whitney tests indicate that the differences are not significant: $p > 0.10$).

Third, the level of SCR differs over time. Figure 4 displays the evolution over time of the proportion of reported income and of the SCR amplitudes with respect to reporting decision and to audit. Periods 1 to 5, 11 to 15, and 21 to 25 correspond to the Benchmark treatment; the other sequences correspond to the Picture treatment.

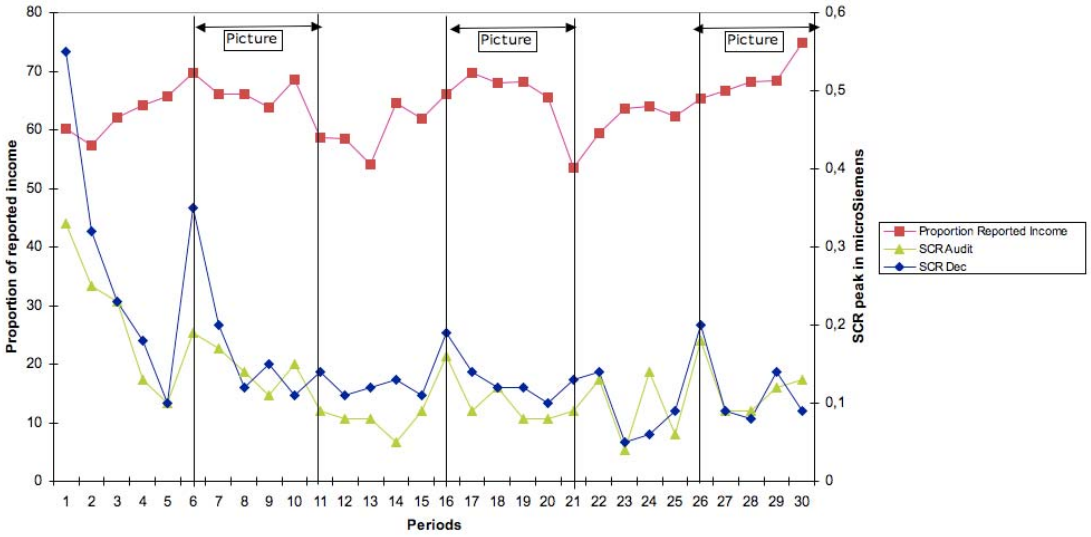


Figure 4. Evolution of the proportion of reported income and of the SCR amplitude related to reporting decision and to audit

Figure 4 shows a specific pattern of SCR amplitude at the beginning of the experiment. Both measures indicate the highest level of SCR in the first three periods of the game. This contributes to level off the differences in average SCR across treatments. Figure 4 also indicates that at the beginning of each sequence of the Picture treatment, SCR is shifting upwards relatively to the last period of the previous sequence under the Benchmark treatment. The proportion of reported income also increases when one switches to the Picture treatment.[18] We can also observe that after a peak, the amplitude

[18] This increase in the first periods of the Picture treatment cannot be attributable to a pure restart effect since we do not observe such a peak when switching to the Benchmark treatment.

of SCRs in this treatment is not sustained and that the proportion of reported income decreases when one switches to the Benchmark treatment.

B. *Regression analysis*

It appears that there are substantial differences in the individuals' behavior across treatments. We now turn to a regression analysis of the determinants of the observed behavior. A difficulty is that the reporting behavior and the emotional arousal may be both endogenous. To control for the potential endogeneity bias in the estimations, we use a two-step procedure. We first estimate the determinants of the proportion of reported income. The predicted proportion of reported income derived from this first regression is then introduced as an instrument in the next equations estimating the determinants of the SCR amplitude at the time of reporting and at the time of audit. Table 2 presents the results of the random-effects Tobit regression of the proportion of reported income. We use a Tobit model since in 11.93% of the observations, the subjects report a null income and in 27.95% of the observations, they report their income in full. The significant ρ coefficient in the regression confirms the necessity of a panel model to allow for the subjects' heterogeneity by including individual random effects.

Table 2. Determinants of the proportion of reported income

Dependent variable: Proportion of reported income	Random-effects Tobit model	
Treatments	Coefficient	Std.-error
Income	-0.173***	0.020
Picture treatment	11.232***	2.133
Time trend	0.112	0.137
Decision time	-1.054**	0.507
Decision time ^{2}	0.027**	0.014
Sanction in the previous period	6.019*	3.180
Amount of the fine in the previous period	-0.710**	0.346
Male	-12.659***	3.246
Risk attitude	-1.021***	0.353
Business education	-15.638***	2.778
Mother with university education	13.963***	2.733
Loan for paying studies	-18.845***	3.182
Negative opinion on:		
Shopkeepers evading taxes	5.191*	3.009
Contraveners with highway code	31.737***	4.102
Fare dodgers	11.159***	2.722
Constant	70.015***	7.679
Number of observations	1392	
Nb of left censured observations (%)	166 (11.93)	
Nb of right censured observations (%)	389 (27.95)	
Log Likelihood	-4703.217	
Wald χ^2	394.900	
Prob > χ^2	0.000	
ρ	0.421**	

Note: *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 level, respectively.

If Table 2 confirms that the proportion of reported income is inversely related to the subject's income level, its most important finding lies in the impact of the treatment variable. Indeed, it shows that an environment where a subject's tax evasion is made public through the public display of his picture favors tax compliance relative to an environment where a detected fraud is only punished by monetary sanctions. Such an impact of the Picture treatment is all the more remarkable as there is no public good dimension in our tax game. We can indeed expect that redistributing the product of taxes among the subjects would increase even further the impact of the perspective of non-monetary sanctions. A candidate explanation is the valence and the intensity of emotions raised by the perspective of such a non-monetary sanction. Tax compliance is also

marginally reinforced by a sanction in the previous period. In contrast, it is negatively affected by the amount of the associated fine. Individuals may attempt to regain a previous loss by evading more in the current period (see Tversky and Kahneman (1991) for a possible explanation in terms of reference dependence).

Interestingly, we also find that the extent of tax evasion is associated, although nonlinearly, with a longer decision time. This complements the observation from Table 1 that evaders take on average more time to make their decision than non-evaders (12.42 seconds and 9.25 seconds, respectively). This could be associated with the higher cognitive requirement involved by the decision to evade taxes if the subject tries to elaborate mixed strategies.

Individual characteristics also influence tax compliance. As usual in the experimental literature on tax evasion (Slemrod, 2007), we find that males report a lower proportion of their income than females. Not surprisingly, risk attitude (captured by the amount invested in the risky asset in the preliminary part of the experiment) is associated with a lower proportion of reported income.[19] A business education prepares the subjects to evade more, probably because these subjects are more used to calculate the return of a risky decision. The literature has shown that the level of wealth influences tax compliance (Slemrod, 2007). This is captured in our regression through the level of education of the subject's mother and through the existence of a loan to pursue studies.[20] Results show that less wealthy subjects evade more, possibly because the financial

[19] The average amount invested in the lottery is about 9 points out of a possible 15 points. It suggests a fairly high average level of risk aversion. Almost 19% of the subjects chose to invest all their points in the lottery and are considered the less risk averse participants.

[20] Asking direct questions on individual resources does not constitute a better alternative since almost no subject is working while studying. Asking about the parents' income is not better because some students are reluctant to report this information or are simply not well informed.

pressure is stronger than for the wealthier subjects. Lastly, the regression shows that the subjects who consider negatively shopkeepers evading taxes, drivers contriving the Highway Code and fare dodgers, consistently report a higher proportion of their income relatively to the other subjects.

After analyzing the determinants of the reporting decision, we next focus on the determinants of the physiological SCR amplitude, by means of random-effects Tobit models, in connection with tax-paying behavior. Table 3 reports the determinants of the SCR amplitude when subjects report their income and Table 4 the determinants of the SCR amplitude when receiving a feedback on audit. In both tables, we include the predicted value of the proportion of reported income resulting from the previous regression as an instrument to control for potential endogeneity.

Table 3. Determinants of the SCR amplitude at the time of decision

Dependent variable: SCR amplitude at the time of decision	Random-effects Tobit model	
Treatments	Coefficient	Std-error
Proportion of reported income	-0.011***	0.002
Picture treatment	0.087***	0.019
Time trend	-0.006***	0.001
Decision time	0.014***	0.004
Decision time ^{2}	-0.0001	0.0001
Risk attitude	-0.001	0.005
Male	0.024	0.050
Constant	0.560***	0.168
Number of observations	1392	
Nb of left censured observations (%)	509 (36.57)	
Log Likelihood	-477.120	
Wald χ^2	156.390	
Prob > χ^2	0.000	
ρ	0.239**	

Note: *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 level, respectively.

Table 3 shows that the instrumented reported income affects negatively the emotional arousal. Subjects who evade more are more aroused, probably due to the risk they take. Moreover, the Picture treatment has a strong positive and significant effect on emotions: the subjects are more emotionally aroused when placed in an environment with both monetary and non-monetary sanctions relatively to an environment with monetary sanctions only.

The time trend is negative and significant. Thus, as the game evolves, a lower SCR amplitude is recorded. Figure 4 has shown that the decline in the SCR amplitude is clearly visible at the beginning of the game. This phenomenon is typical of stimulus elicited SCRs and is known as SCR habituation.[21] In addition, after a while, the subjects have seen several pictures on their screen and they may realize that it is not uncommon to underreport. Therefore, we observe a phenomenon of habitation that does not necessarily mean an emotional disengagement, as shown below. Indeed, emotional disengagement should motivate people to evade more over time, considering the expected return of evasion. The proportion of reported income does not however change significantly over time (see Table 2). Figure 4 even shows a slight increase in the proportion of reported income in the last 10 periods. A possible interpretation is that the guilt and shame experienced in the early periods have a lasting effect on reporting behavior. It must be however acknowledged that the effect of time may be somewhat blurred by the sequence of treatments over time.

[21] As described by Dawson et al. (2000), "habituation is a ubiquitous and adaptive phenomenon whereby subjects become less responsive to familiar and non-significant stimuli". In fact, SCR is expected to decline in amplitude and eventually disappear after the presentation of 2-8 similar trials, reappearing again after two or three periods of silent interval (Dawson et al. (2000)).

Table 2 has shown that the proportion of reported income decreases in the decision time. Table 3 indicates that, controlling for reported income, more time taken to make a decision increases significantly the emotional arousal when deciding. These two joint results may suggest that the subjects need time to solve a conflict between the expected payoff of underreporting and the social norm of non-cheating, and this raises stronger emotions. Using different games, Rubinstein (2007) states that a higher decision time is correlated with a higher subject's cognitive activity and less emotional decisions. Our observations suggest a different interpretation. A tension between rationality and norms rises more decision time and more anticipated emotions. Last, Table 3 indicates that, controlling for tax compliance, there is no gender effect in the emotional arousal. Similarly, risk attitude influences the reporting decision, but not the emotional arousal conditional on this reporting.

Table 4 displays the results of a random-effects Tobit regression in which the dependent variable is the SCR amplitude when the subject receives a feedback on audit.

Table 4. Determinants of the SCR amplitude at the time of audit

Dependent variable: SCR amplitude at the time of audit	Random-effects Tobit model	
Treatments	Coefficient	Std-error
Proportion of reported income	-0.013***	0.003
Time trend	-0.006***	0.001
Sanction	0.071**	0.033
Sanction with own picture displayed	0.163***	0.039
Risk attitude	0.009	0.008
Male	0.014	0.063
Constant	0.526***	0.188
Number of observations	1392	
Nb of left censured observations (%)	763 (54.81)	
Log Likelihood	-731.238	
Wald χ^2	100.90	
Prob > χ^2	0.000	
ρ	0.153**	

Note: *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 level, respectively.

The SCR amplitude consistently indicates that the emotional arousal still increases in the degree of tax evasion when the subjects receive the feedback on audit. A major finding is related to the perspective of both monetary and non-monetary sanctions on emotions at the time of audit. When a subject has been audited and learns that he will be fined, he shows a higher emotional arousal than a subject who is not audited or is audited but not sanctioned. There is an additional and highly significant effect of the treatment: when the evader learns that his own picture is going to be disseminated, his emotional arousal further increases. Since the display of the picture means that the subject's decision to cheat is made public and that the subject may be recognized by the other players at the end of the session, it is reasonable to assume that these emotions are related to shame, whereas the emotions felt after an audit announcing a sanction in the Benchmark treatment are better associated with internally-oriented emotions, such as guilt or regret.

C. *A robustness check*

The affective self-reports that have been collected at the end of each period regarding audit offer a robustness check for our behavioral analysis based on physiological measures. Indeed, to some extent self-reports on emotional arousal should corroborate these measures. In addition, since the SCR measures cannot indicate the direction of emotions, self-reports can help us in making reasonable suggestions. Table 1 has already shown that the average emotional arousal, measured on a scale from 1 (extremely weak) to 7 (extremely strong), was higher for tax evaders (4.20) than for non-evaders (3.11). Similarly, evaders report less positive hedonic valence regarding the audit (3.84) than non-evaders (4.27), on a scale from 1 (extremely negative) to 7

(extremely positive). Providing a better-controlled analysis, Table 5 presents random-effects GLS models of affective self-reports, in which we include the same explanatory variables as in Tables 3 and 4. The first column estimates the determinants of the self-reported emotional arousal; the second column aims at explaining the hedonic valence of these emotions.

Table 5. Determinants of the level of affective self-reports
(Random-effects GLS models)

	Emotional arousal		Hedonic valence	
	Coefficient	Std-error	Coefficient	Std.-error
Proportion of reported income	-0.109***	0.009	-0.044***	0.008
Time trend	0.020***	0.004	-0.001	0.004
Sanction	0.342***	0.097	-2.454***	0.091
Sanction with own picture displayed	0.459***	0.118	0.144	0.110
Risk attitude	0.111**	0.045	0.006	0.019
Male	-1.386***	0.340	-0.305*	0.158
Constant	9.106***	0.703	7.346***	0.499
Number of observations	1392		1392	
Wald χ^2	231.79		1139.42	
Prob > χ^2	0.000		0.000	
R^2	0.024		0.434	

Note: *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 level, respectively. The emotional arousal variable is coded from 1 (extremely low) to 7 (extremely high). The hedonic valence variable is coded from 1 (extremely negative) to 7 (extremely positive).

This robustness check supports most of the previous results reported in Table 4. With respect to the influence of evading taxes and subsequent sanctions, the first column of Table 5 shows similar results for the affective self-reports than for the physiological measures at the time of audit.[22] In contrast to the SCR analysis however, the intensity of affective self-reports does not decline over time. This suggests that the phenomenon of habituation that we observed above plays an important role on modulating the SCR amplitude although the experienced emotional arousal increases over time. In addition,

[22] In addition, the simple correlation coefficient between the SCR amplitude at the time of the audit and the self-reported emotional arousal is significant and equal to 0.54.

the second column of Table 5 indicates that, controlling for sanctions, evasion is associated with more positive emotions at the time of the audit. This could be caused by relief when an evader is not audited and by the associated perspective of higher payoffs. Not surprisingly, the subjects report more negative emotions when they are sanctioned, with no specific effect of the picture dissemination.

If these regressions broadly support our SCR-based analysis and improve our understanding of the direction of emotions, they also confirm that here, the SCR measures and the self-reported emotions are more complement than substitutes. Nevertheless, it should be noted that , due to their subjective nature, self-reports may be biased. For example, males self-report less arousing emotions than females, whereas the SCR-analysis concludes to the absence of significant difference by gender. Physiological measures, uncontrolled by the subjects, are potentially more reliable than self-reported measures.

4. CONCLUSION

The deterrence models of tax evasion have recently been extended to include moral considerations. This paper explores a complementary avenue by testing the hypothesis that evading taxes generates emotions in the evaders. For example, the non-respect of civic duty may generate guilt when the fraud is detected; and public information on the cheating behavior of the evader may generate shame and embarrassment.

Our base design uses a tax game in which the players have to report their income and in which the individual audit probability depends on the position relative to the median of reported incomes. Skin Conductance Responses provide a physiological measure of the

emotional arousal that is uncontrolled by the individuals and thus, less subject to declarative biases. Our approach is original in three respects. First, we explore a new hypothesis, i.e. the role of emotions in tax compliance. Second, we are able to differentiate the impact of monetary vs. non-monetary sanctions on emotions by means of an additional treatment in which the picture of deterred tax evaders is publicly displayed. This helps in identifying the role of anticipatory (risk-related) and anticipated emotions. Third, we have studied physiological measures of emotions for several individuals interacting in a group.

Our results are striking. The subjects evade less after having been punished and when they are in an environment when monetary and non-monetary sanctions are present together. We show that the relationship between punishment and compliance is mediated by emotions. Emotions are elicited both at the moment of reporting and when subjects receive a feedback on their report's audit. Emotional arousal increases in the intensity of tax evasion and in the perspective of both monetary and non-monetary sanctions. The strong impact of the public display of the evaders' pictures on the emotional arousal is interpreted in terms of shame. There is a disutility of being identified as a cheater in a group although rationality justifies tax evasion and although the subjects learn over time that there are other evaders in the group.

There are reasons for caution in extrapolating these results. In particular, students may not be representative of taxpayers. One can however be relatively confident in the external validity of these results because if one observes that emotions arise even with small monetary stakes in the lab, they should be even greater when a yearly income is at stake in actual reporting decisions. Keeping these limitations in mind, one can however

derive three main implications of these results. First, they suggest that tax compliance may be guided by the willingness to avoid experiencing negative emotions raised by a potential detection. Second, the reporting decision is likely to result from the solution of a tension in the individual's mind between the expected monetary reward of tax evasion that motivates underreporting, and its expected moral cost that motivates compliance. Solving this tension is cognitively demanding and this could explain why we find a positive correlation between the decision time, the emotional arousal and the importance of evasion. This supports modeling strategies that include the psychic costs of evading in the taxpayer's utility function in interaction with its expected monetary payoff. A third implication of our results is a policy perspective. Indeed, income reporting increases when non-monetary sanctions are at risk, because the evaders who bear such sanctions experience negative social emotions. Therefore, a policy threatening to denounce cheaters publicly might contribute to reduce fiscal fraud.

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APPENDIX. Instructions

We thank you for participating in this experiment on decision-making designed by researchers from the University of Montreal, the Institute of Cognitive Sciences and the GATE research institute at the University of Lyon. This experiment consists of several independent parts. During these parts, all transactions are expressed in points, with

100 points = 20 Euro

We will first distribute the rules for the preliminary part; the instructions for the next parts will be distributed later.

Instructions for the preliminary part

Description of the task

You receive a show-up fee of €3, equivalent to 15 points. We ask you to choose the amount of points (between 0 and 15 points, included) that you are willing to invest on a risky asset. You keep the points that are not invested.

The investment

There is a 50% chance that the investment is a success.
If the investment is a success, you earn 2.5 times the amount that you have invested.
If the investment is not a success, you lose the amount that you have invested.

1st example: You invest 0 point. You earn: (15 –0) = 15 points

2nd example: You invest 6 points. If the investment is a success, you earn: (15 – 6) + (2.5*6) = 24 points. If the investment is not a success, you earn: (15-6) + 0 = 9 points.

3rd example: You invest 15 points. I f the investment is a success, you earn: (15 – 15) + (2.5*15) = 37 points. If the investment is not a success, you earn: (15-15) + 0 = 0.

How is the success of the investment determined?

You are required to choose one color, either white or black. At the end of the session, you will have to press a button « random draw » that will appear on your computer screen. The computer program selects randomly one of the two colors.
If the randomly drawn color is the color you have chosen, your investment is a success.
If the randomly drawn color is not the color you have chosen, your investment is not a success.

To sum up: You choose now the amount you are willing to invest; then, you choose a color. At the end of the session, after the other parts have been completed, you will press the random draw button. The computer program will inform you whether the investment is a success and the amount of your earnings for this part. This earning will be added to your earnings of the previous parts.

If you have any question regarding these instructions, please raise your hand. Somebody will answer your questions in private. You are not allowed to communicate with the other subjects throughout the session.

Instructions for the following parts *(Distributed after the preliminary stage has been completed)*

These instructions explain the next 6 independent parts. Each part consists of 5 independent periods. In each of the 30 periods, you have to make one decision. Your earnings depend on your decisions and of the decisions of the 7 other participants in this session.

At the end of the session, we will draw randomly 2 periods among these parts. We will compute the average of your earnings in points during these two periods and these points will be concerted into Euros. The amount of money that you will earn, added to your payoff in the preliminary part, is confidential.

Somebody who is not aware of the content of the experiment will pay you in cash and in private in a separate room.

Decision rules for the 5 periods of the first part

- At the beginning of each period, you receive **an income**. Your income can take the value 50, 100, 150, or 200 points. Your income is selected among these values by the computer program.
- We ask you to pay **a tax** on your income. This tax rate is 55%. It is the same for all the participants in this session. The product of the taxes will be used to fund the participants to other experiments.

To answer this demand, you must **report an amount** that lies between 0 and the income you have received. The 55% tax rate is applied to the amount you have decided to report. After you have made your choice, you must click the OK button on your screen to validate your decision; once you have clicked this button, you cannot change your choice anymore.

- The computer program can control your reported income according to a certain **audit probability** and this audit can entail the payment of **a fine**.

Your probability of being audited is determined as follows:

- If your reported income is among the 4 lowest reported incomes in the room in the current period , the audit probability is 65%. Therefore, you have 65 chances out of 100 to have your report audited.
- If your reported income is among the 4 highest reported incomes in the room in the current period, the audit probability is 35%. Therefore, you have 35 chances out of 100 to have your report audited.

If all the participants report the same income, an average audit probability, equal to 50%, is applied to each participant.

If an audit is conducted and if it reveals that you have reported an amount lower than your actual income, you have to pay both:

1) the tax on your actual income, i.e. 55% of your actual income
2) and a fine, which is determined as explained below.

Determination of your payoff in each period

At the end of each period, your net payoff is determined as follows. 3 cases may occur.

- **If your reported income is not audited,** the tax rate is applied to the amount you have reported. Your net payoff is determined according to the following formula:

Net payoff = income – tax with tax = 55% of the reported income

- **If your reported income is audited and if it is equal to your actual income,** the tax rate is also applied to your reported income. Your net payoff is determined according to the following formula:

Net payoff = income – tax with tax = 55% of the reported income

- **If your reported income is audited and if it is lower than your actual income,** the tax rate is applied to your actual income. One subtracts from your payoff a fine that is equal to 20% of the tax on the income that you did not report. Your net payoff is determined according to the following formula:

Net payoff = income – tax – fine with tax = 55% of the income and fine = 20% 55% (non reported income)

Note that the computer program rounds up the decimals when appropriate.

At the end of each period, you are informed on the following elements:

- whether your report has been audited or not

- the total amount of your tax (including the fine if appropriate)
- your net payoff.

You are not informed on the incomes, the reported amounts, and the payoffs of the other participants.

After you have received this information and before proceeding to the next period, we will ask you to express your sentiments regarding your audit during the current period. We first ask you to report the intensity of your sentiments when you have been informed on whether you were audited or not, by means of a scale graded from 1 (extremely weak sentiment) to 7 (extremely strong sentiment). Then, you will be requested to report the nature of these sentiments, by means of a scale graded from 1 (extremely negative sentiment) to 7 (extremely positive sentiment).

You answers to these questions are not paid. They have no influence on the rest of the session; in particular, they influence neither the determination of your income in the next period, nor your audit probability. We thank you for however paying attention to these questions and to answer them sincerely.

To sum up: you receive an income. You choose the amount that you are willing to report. Depending on whether you are among the 4 highest or the 4 lowest reported incomes, your audit probability differs. Then, you are informed on your audit, your total tax, and your payoff. Last, you answer the questions regarding your sentiments.

At the end of each period, once all the participants have answered, a new period starts automatically. You receive a new income at random and you make a new report. Each period is independent on the previous ones.

Decision rules for the 5 periods of the second part

The next part also consists of 5 periods. The decision rules are exactly the same as in the first part. The only difference between the first and the second parts is that if your reported amount is audited and if it is lower than your actual income, your picture will be displayed both on the computer screen of other participants in the session and on your own screen.

Similarly, you can receive the picture of another participant in the session who has been audited and who has reported a lower amount than his income, except if you have to pay a fine yourself. Indeed, only one picture can be displayed on each screen. This does not mean that only one participant has been audited and fined. But if you are audited and fined, you are sure that your picture is displayed in the room. If no picture appears on your screen, this is because nobody has been audited or because the reported incomes corresponded to the actual incomes.

The next parts

Each of the next 4 parts also consists of 5 periods. We alternate the rules of the first and of the second parts. The only difference between the parts depends on the display or not of the pictures of the participants who have been audited and fined. In other words, the pictures can be displayed during the even parts (2, 4, and 6); the pictures are never displayed during the uneven parts (1, 3, and 5).

You are always informed of the current part number and on the possible picture display.

End of the session

At the end of the 6 parts, we will ask you again a series of questions about your sentiments. We thank you for answering these questions sincerely.

Then, we will draw the two periods that will determine your earnings for these six parts.

Last, you will draw yourself the color that will determine your payoff for the investment decision you have made during the preliminary part.

We invite you to read these instructions again with attention. If you have questions regarding these instructions, please raise your hand. We will answer your questions in private.

We thank you for answering the questionnaire that is now distributed, in order to train yourself with the determination of payoffs. During the session, the computer program will make all the calculations.