

# Effects of tax payment systems on tax compliance: Comparing the withholding system with the tax declaration system

Mariko Shimizu<sup>1\*</sup>

## Abstract

I investigate using experiments whether an individual's tax compliance level varies with the method of collecting income tax, comparing: 1) a withholding tax system, in which income tax is withheld from income before the taxpayer is paid, and 2) a tax declaration system, in which taxpayers must self-declare their income in order for tax to be calculated and paid after the corresponding business period. Under expected utility theory, there is no difference between these two systems. However, under prospect theory, taxpayers perceive the two tax payment systems differently. In the tax declaration system, paying tax may be perceived as an expenditure or loss for the taxpayer that may strongly elicit loss aversion. Conversely, in the withholding tax system, taxpayers receive a partial refund or pay an additional tax much smaller than what they would pay under the tax declaration system. As a result, elicited loss aversion is much smaller than in the tax declaration system. Therefore, the withholding tax system may achieve higher tax compliance than the tax declaration system. Results show that the tax compliance rate is 100% when taxpayers pay too much advance tax. A tax evasion rate of 35.3% is observed in the withholding system when too little advance tax is paid. In the tax declaration condition, the rate of tax evasion is 50%, significantly higher than for the withholding tax condition even in the presence of under-withholding. Furthermore, this effect was sustained during all five experimental periods. Thus, even though the amount of tax due is unchanged, the payment method affects the degree of individuals' tax compliance.

**JEL Classification:** H24; H26

## Keywords

tax compliance — loss aversion — prospect theory

<sup>1</sup> *University Paris 2 Panthéon-Assas, Laboratoire d'économie mathématique et de microéconomie appliquée, Paris*

\***Corresponding author:** mariko.tiralongo@gmail.com

## Introduction

Currently two taxation systems are used to collect income tax: 1) the payer of the income withholds the income tax before it pays the taxpayer and remits it to the taxing authority on behalf of the taxpayer (hereafter termed the “withholding tax system”); 2) taxpayers declare their income at the end of or after the business period in which activity is taxed, and pay their income tax themselves (hereafter termed the “tax declaration system”). Despite the cumbersome administrative procedures and enormous costs required, all developed countries except Hong Kong and Singapore<sup>1</sup> presently employ the withholding tax system.

Under expected utility theory, the income tax collection system plays no role in the taxpayer's evasion decision (Yaniv, 1998, 1999). As prospect theory brought with it a new wave of economic theories, the method of collecting tax began to

be viewed as a way of reducing tax avoidance. Myriad studies argue that the overpayment of a taxpayer's estimated tax increases tax compliance. However, most prior studies focus only on the different rates of compliance found in situations where the taxpayer pays too much versus too little advance tax. No experimental study has shown clearly that a withholding tax system will result in less tax avoidance than a tax declaration system.

The withholding tax system seems to be a useful tool in decreasing tax evasion. According to a 2016 report of the Internal Revenue Service of the United States (the IRS), the tax evasion rate depends on the tax system's administrative features. When third parties report the income of a taxpayer to the government and withhold taxes, the tax evasion rate is lowest, and only 1% of income is misreported. When the income of a taxpayer is not withheld, the tax evasion rate is higher than in a withholding tax system. For instance, 21% of net capital gains and 16% of partnership income are estimated to be not reported to the government, even though a third

<sup>1</sup>In France, the declaration tax system was abolished in 2018 and the withholding tax system was implemented from 2019.

party reports the income. Furthermore, when the income is not reported by a third party and not withheld, the compliance rate is lowest. The IRS estimates that more than 60% of farm income and sole proprietorship income are not reported to the government.

If reporting of a taxpayer's income by a third party and the withholding tax system decrease the tax evasion rate, then governments should be interested in ways to extend the withholding tax system to other forms of income (e.g., capital gains, partnership income, farm, and sole proprietorship income), and perhaps to increase third-party reporting, if it seeks higher tax compliance.

My aim in this paper is to investigate whether individuals' level of demonstrated tax morale (i.e., compliance) changes depending on the taxation system. In the theoretical background section, I provide a big-picture overview of the field, summarizing the history of past studies about tax compliance under both expected utility theory and prospect theory. Next, I apply prospect theory to a simple model of decision making and offer predictions that can be tested experimentally. To investigate those predictions I run a laboratory experiment that replicates a real tax payment situation. Then, finally, I analyze the results and discuss the differences between the two taxation systems and the behavior they elicit.

## Theoretical background

Income tax is a major revenue source for governments in many countries. Therefore, reducing the number of tax-dodgers at an acceptable cost is an issue both for governments and for the citizens who pay taxes. However, the decision to evade or not evade taxes is complex and involves a number of factors.

In empirical studies, it has been shown that an individual's level of tax compliance is influenced by various factors, e.g., related to social background (Aml & Torgler, 2006; Cummings et al., 2009; Martínez-Vázquez & Torgler, 2009; Torgler, 2004; Torgler, 2005a; Torgler, 2005b; Torgler, 2006; Torgler & Schneider, 2007). According to Lago-Peñas and Lago-Peñas (2010), differentiating variables fell under four major umbrellas: first, socio-demographic characteristics such as gender, age or social class; second, political and social attitudes; third, tax policy and personal factors that include tax rates, fine rates, audit probability, risk aversion, and personal income; and finally, national differences related to language, culture, or political systems.

Psychologists have reported several psychological motivations for tax evasion, such as individual perceptions of fairness (Eriksen & Fallan, 1995), perceptions regarding inequity in tax rates faced by other taxpayers and/or set by the government (Bazart & Bonein, 2014), and trust in government (Kirchler, Hoelzl, & Wahl, 2008; Prinz, Muehlbacher, & Kirchler, 2014). As shown by results from past studies, an individual's level of tax compliance depends on a complex decision-making process.

Even though innumerable factors are involved in the problem of tax morale, studies focusing on tax policies (i.e., tax

rate, fine rate, and audit rate) have contributed to our understanding of tax avoidance.

First, the relation between the tax rate and the rate of tax avoidance has been investigated both empirically and experimentally. Empirical studies have reported both negative and positive effects of the tax rate. Mainly it has been reported that a higher tax rate decreases tax compliance (Clotfelter, 1983; Lang, Nöhrbaß, & Stahl, 1997; Pommerehne & Weck-Hannemann, 1996; Ali, Cecil, & Knoblett, 2001). Conversely, Feinstein (1991) found higher compliance at higher tax rates in aggregate data on American taxpayers from the Taxpayer Compliance Measurement Program (TCMP). Meanwhile, laboratory experiments have shown a consistent effect: when the penalty charged for non-compliance is sufficiently high (200% - 300%), the rate of tax avoidance decreases as the tax rate increases (Alm, Jackson, & McKee, 1992; Friedland, Maital, & Rutenberg, 1978).

It has also been shown that the penalty for avoidance and the audit rate both increase tax compliance. Most empirical studies have shown a positive effect of the audit probability and the penalty rate on tax compliance (Pommerehne & Weck-Hannemann, 1996; Ali, Cecil, & Knoblett, 2001), and the results of laboratory experiments are consistent with empirical studies: at a fixed tax rate, tax avoidance decreases with increases in the audit rate and the penalty rate (Alm, Sanchez, & De Juan, 1995; Bazart & Bonein, 2014).

However, while these past studies have found some aspects of tax policy that affect individuals' tax compliance rate, prior research has not been well-linked to actual taxation policy. Most prior laboratory experiments that use the decision-making model proposed by Allingham and Sandmo (1972) and Yitzhaki (1974) assume that the decision strategy of taxpayers depends on the tax rate, the detection probability, and the penalty rate. Though these decision models of Allingham and Sandmo (1972) and Yitzhaki (1974) have underpinned out theoretical understanding of tax evasion over several decades, their theoretical results are not consistent with other empirical studies: in the models proposed by Allingham and Sandmo (1972) and Yitzhaki (1974), an increase in the tax rate raises tax compliance (Piolatto & Rablen, 2014). Furthermore, the rates used in the models of Allingham and Sandmo (1972) and Yitzhaki (1974) are completely out of touch with the rates actually applied by policymakers (Dhami & al-Nowaihi, 2006).

Since prospect theory was proposed by Daniel Kahneman and Amos Tversky in 1979, taxing individuals in ex-ante rather than ex-post began to attract attention as a way to increase tax compliance.

Yaniv (1998, 1999) points out that while tax payment in advance is not an effective strategy for increasing compliance under expected utility theory, it plays an important role in taxpayers' decisions about whether to avoid tax under prospect theory. Yaniv assumed that a mental reference point is set at the individual's current financial situation (i.e., just before the tax declaration, in an ex-post payment system), and points

out that when people pay too much advance tax during the taxable period, they receive a refund that they perceive as a gain. By contrast, when taxpayers pay an amount of advance tax that is lower than the tax they owe, they have to pay the difference at the end of the taxable period and perceive this payment as a loss.

Applying prospect theory to an analysis of the advance tax system raises the additional question of whether the relevant reference point relates to the taxpayer's current asset position (Schepanski & Shearer (1995; Elffers & Hessing, 1997) or to his expected asset position (Dhami & al-Nowaihi, 2006). Kiechler & Maciejovsky (2001) showed that it was possible for the reference point to change, depending on the taxpayer's mental habits. They investigated subjects in self-employment and business entrepreneurship. They found the level of tax compliance amongst self-employed subjects changed depending on whether they faced an unexpected refund or an unexpected additional payment. By contrast, the level of tax compliance for business entrepreneurs changed in response to the expected level of refund or payment due. The authors concluded that both asset positions (actual and expected) are commonly used to form the reference point, and which position is used depends on the typical decision-making framework used by the individual, and his/her expectation.

Though the discussion of reference points continues, many empirical and experimental studies show that taxpayers who pay too much advance tax exhibit a higher rate of compliance than those who pay too little advance tax (Chang & Schults, 1990; Chang & Schults, 1990; Elffers & Hessing, 1997; Engstrom et al., 2013; Schepanski & Kelsey, 1990). This behavioral tendency has been called the "withholding phenomenon" (Schepanski & Shearer, 1995). The results of these studies imply that taxpayers tend to anchor their reference point in their current asset position.

Ayers, Kachelmeier, and Robinson (1999) report that when paying in advance, taxpayers prefer to pay the full amount of their tax rather than paying only a set minimum payment, and their preference is not affected by the payment form (e.g., withholding from wages or paying instalments of estimated tax). They point out that taxpayers seem to regard the advance tax as forced saving in preparation for large future expenses.

Past studies have shown that paying too much tax in advance is effective in decreasing tax avoidance. However, there is no direct evidence that the advance tax system is more effective than the tax declaration system in increasing tax compliance. Furthermore, it is not clear whether paying tax in advance, but paying too little rather than too much, is more effective than the tax declaration system in decreasing tax avoidance.

In this paper, I investigate the difference in tax compliance levels between the two taxation systems currently used in practice by governments: the withholding tax system and the tax declaration system. My results also offer new evidence relevant to ascertaining taxpayers' reference points.

## Experiment

### Taxpayers' decision model and hypothesis

In this section, I formalize taxpayers' choices under each situation. I assume the individual's income is  $W$ , and income tax is levied by the government. When he files his tax declaration, the taxpayer reports his income as  $X$ , and pays tax based on  $X$ . If he declares his actual income (i.e.,  $X = W$ ), he will pay all of his tax liability ( $tW$ ). If he declares less than his actual income (i.e.,  $X < W$ ), he can avoid a portion of the tax liability (specifically,  $t(W - X)$ ). I assume the government's taxing authority does not know taxpayers' actual incomes, but audits them and punishes tax avoiders at the penalty rate for the quantity of unpaid tax  $t(W - X)$ . The probability of the audit occurring is assumed to be  $q(0 \leq q \leq 1)$ .

Figure 1 shows the difference in the taxpayers' income trajectories under the two systems. Reference points are assumed to be "W-D" in the withholding tax system and "W" in the tax declaration system.

First, I formalize the income levels associated with the choices of taxpayers who pay too much advance tax (over-withholding) as follows:

$$(D - tW) > 0 \text{ with probability } 1 \\ \text{(if the taxpayer declares income honestly)}$$

or

$$(D - tX) \text{ with probability } \\ 1 - q, \wedge D - tX - t(1 + \pi)(W - X) \\ \text{with probability } q \text{ (if the taxpayer under-reports} \\ \text{his income).}$$

Given the over-withholding, the taxpayer receives a refund at the end of the activity period regardless of whether he avoids tax. Since we assume that the taxpayer's reference point is fixed at the income observed at the end of the period (i.e.,  $W - D$ ), he would perceive the tax refund as a gain. Based on this plus individuals' tendency to avoid the ambiguity (Ellsberg, 1961) that would arise if they avoided tax, I expect that taxpayers in this condition would declare their income honestly.

Second, assume the withholding tax is set below the true tax liability,  $D < tW$  (under-withholding). In this case, the taxpayer declaring his full income will be asked to pay additional tax at the end of the period, which would be perceived as a loss. His choices are to receive

$$(D - tW) < 0 \text{ with probability } 1$$

or

$$(D - tX) \text{ with probability } \\ 1 - q, \wedge D - tX - t(1 + \pi)(W - X) \\ \text{with probability } q$$

The taxpayer must choose from two alternatives: a certain small loss, and a lottery between an even smaller loss and a larger loss. His decision would depend on his levels of loss aversion and risk aversion.

	N	Income	Declared income	Average undeclared income
Tax declaration condition	10	316.00 (80.46)	237.20 (113.77)	157.60 (84.77)
Withholding tax condition	10	339.00 (75.11)	316.00 (75.89)	
Under-withholding		386.80 (38.67)	352.94 (60.23)	88.46 (46.34)
Over-withholding		237.00 (34.16)	237.50 (31.16)	

Note: Standard deviations in brackets. The average undeclared income was calculated across all income declarations that exhibited tax avoidance. For example, when the participant under-reported income in three rounds and his undeclared income was 100 euro, 150 euro, and 120 euro in each of those rounds, respectively, his average undeclared income would be calculated as  $(100 + 150 + 120)/3$ .

**Table 1.** Mean and standard deviation across subjects of income and declared income, by condition

Third, assume that taxpayers do not pay the withholding tax, or in other words that a tax declaration system is in operation. Then his choices are between:

$$(-tW) < 0 \text{ with probability } 1$$

or

$$(-tX) \text{ with probability } 1 - q, \wedge -tX - t(1 + \pi)(W - X) \text{ with probability } q$$

In this case, the taxpayer must choose between a certain big loss and a lottery. As in Case 2, his decision would depend on his levels of loss aversion and risk aversion.

The amount of undeclared income may also differ across the two experimental conditions. For taxpayers in the withholding tax condition, their tax payment at the time of declaration is  $D - tX$ . If they try to avoid this loss as much as possible ( $D - tX \rightarrow 0$ ), then their reported income  $X$  will be close to  $\frac{D}{t}$ . Therefore, the amount of tax avoided will be close to  $W - \frac{D}{t}$ .

The tax liability of taxpayers in the tax declaration condition is  $-tX$ , all payable at the end of the period and hence seen in its entirety as a loss. If they try to avoid this loss as much as possible ( $-tX \rightarrow 0$ ), their reported income  $X$  will be close to 0. Therefore, their amount of tax avoidance will be close to  $W$ . From the assumptions that  $0 < W$  and  $0 < t < 1$ ,  $W - \frac{D}{t} < W$ . This means that we would expect that the undeclared income would be bigger in the tax declaration system than in the withholding tax system if taxpayers aim to avoid the loss presented to them in each condition.

## Method

A paper-based tax game experiment was run consisting of five periods. The subjects received a reward of 90 to 400 points, based on their achievement of the tasks in each period. The tax rate was set at  $t = 30\%$ , the fine rate at  $\pi = 200\%$  for unpaid

tax, and the audit probability at  $q = 1/3$ . At the beginning of the experiment, the rules were explained to the subjects.

The subjects were Masters students at the Pantheon-Sorbonne University, studying economics and psychology. The number of subjects was ten for each condition, totaling twenty subjects. These 20 subjects were randomly divided into 2 groups: (1) the tax declaration condition, and (2) the withholding tax condition. To avoid having information shared among the subjects that might affect decisions, subjects were prevented from communicating with each other during the experiment and were asked not to talk about the experiment outside of the laboratory.

In the tax declaration condition, the subjects received their income according to their number of correct answers. They declared their income at the end of each period. In the withholding tax condition, the subjects also received income according to their number of correct answers, but before they declared their income, a withholding deduction of 90 points was made. For both conditions, I assumed that the tax authorities did not know the taxpayers' actual income. To prevent the income of subjects in the withholding tax condition from being negative, I set a minimum earnings level of 90 points. Also, to avoid a negative asset situation, I gave subjects 500 points at the beginning of the game.

## Results

The significance level was set at .05. The mean age of the subjects in the tax declaration condition was 25.6 (SD = 2.84) and in the withholding tax condition was 26.5 (SD = 3.37). Table 1 shows the mean and standard deviation of the income earned and declared by subjects during the game period, including the withholding tax in the income of subjects in the withholding tax condition. There was no significant difference between the average incomes of subjects in the two conditions ( $t(98) = -1.478$ ,  $p = .143$ ). By contrast, even with the small

	Tax avoidance rate	Full avoidance rate	Full compliance rate
Tax declaration condition	50.0%	30.0%	10.0%
Withholding tax condition	24.0%	0.0%	60.0%
Under-	35.3%		
Over-	0.0%		

**Table 2.** Probability of avoidance

sample size used, the average declared income of subjects in the tax declaration condition was significantly lower than that of subjects in the withholding tax condition ( $t(98) = -4.074, p = .002$ ). The average of undeclared, “hidden” income was commensurately higher in the tax declaration condition than in the withholding tax condition ( $t(36) = 2.72, p = .01$ ).

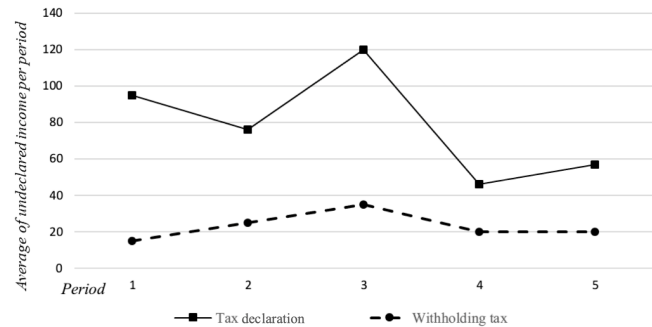
The probabilities of tax avoidance in each condition, and in the case of under- versus over-withholding in the withholding condition, can be compared. In the tax withholding condition, subjects’ behaviour changed depending on whether the tax was over-withheld or under-withheld. With over-withholding, subjects never cheated on their tax declaration (tax compliance was 100%). By contrast, with under-withholding, the tax avoidance rate increased significantly to 35.5% ( $\chi^2 = 6.513, p < .000$ ).

The tax avoidance rate in the tax declaration condition (50%) was significantly higher than in either case of the withholding tax condition: the over-withheld situation ( $\chi^2 = 8.165, p < .000$ ) and the under-withheld situation ( $\chi^2 = 2.145, p = .032$ ).

We also compare compliance rates for subjects across the five periods. In the tax declaration condition, 30% of subjects cheated in all periods (shown in the second column of Table 2). On the other hand, in the withholding tax condition, no subject cheated in every period (0%) ( $\chi^2 = 5.940, p < .000$ ). The fraction of subjects who never cheated was also significantly higher in the withholding tax condition than in the tax declaration condition. The final column of Table 2 shows that some 10% of subjects reported their income honestly over all five periods in the tax declaration condition, and 30% did so in the withholding tax condition ( $\chi^2 = 7.413, p < .000$ ).

A two-way ANOVA was conducted to compare the main effect of conditions and periods on the level of undeclared income. There was a statistically significant main effect of condition on undeclared income ( $F(2, 90) = 12.82, p < .00$ ). However, there was no statistically significant main effect of period ( $F(4, 90) = 0.99, p = .42$ ), and the interaction between condition and period was also insignificant ( $F(4, 90) = 0.56, p = .69$ ). The results of this two-way ANOVA showed that the level of undeclared income was not affected by the period, but it was significantly affected by the condition.

Finally, I tested the correlations amongst subjects’ elicited risk aversion and loss aversion sensitivities<sup>2</sup>, the number of



**Figure 1.** Average of undeclared income per period

times they avoided tax, and the average of their undeclared income. Subjects’ risk aversion levels and loss sensitivities were not particularly related to their tax avoidance behavior.

## Discussion

In this paper, I investigated the effects of two different income tax systems on individuals’ tax compliance. Past empirical studies focused only on the differences between the over-withheld situation and the under-withheld situation in the withholding tax system. Therefore, the difference in taxpayer behavior under the withholding tax system versus the tax declaration system was not clear.

The results of my experimental investigation highlighted the effect of the withholding tax system on decreasing tax avoidance. Under the withholding tax condition, the average tax compliance rate of subjects in the over-withheld situation was 100% and significantly higher than that of subjects in the under-withheld situation (35.3%). In the tax declaration condition, the rate of tax avoidance was 50%, and significantly higher than for the withholding tax condition. Furthermore, average undeclared income was significantly lower in the withholding tax condition than in the tax declaration condition. From this analysis, the withholding tax system, even with an amount of withholding set below taxpayers’ full tax liability, is shown to be a potentially viable substitute for costly detection effort in enhancing compliance (Yaniv, 1998, 1999).

Behavioral differences between taxpayers facing the two tax payment systems may relate to individuals’ perceptions of aversion test developed by Gächter, Johnson, & Herrmann (2007).

<sup>2</sup>To measure individuals’ risk aversion and loss aversion in this experiment, I used the risk aversion test developed by Boschini (2014) and the loss

tax and income: when taxpayers anchor their income at the level observed just before the moment of tax declaration, they perceive a refund as a gain and an additional tax payment as a loss. Taxpayers in the tax declaration system feel a bigger loss than in the withholding tax system. Consequently, they tend to avoid more tax and to avoid tax more frequently than taxpayers in the withholding tax system.

My results showed that, even if the amount of tax liability is not changed and even if third parties do not report the taxpayer's income information to the government, the withholding tax system decreases tax avoidance.

As a limitation of this study, since the tax rate, the audit rate and the penalty rate were all fixed, the interrelation of the two different taxation systems with those tax policy parameters are not clear. Furthermore, students were used as subjects. According to Kiechler & Maciejovsky (2001), the reference point used may be different for taxpayers with different habitual decision-making frameworks. Therefore, running this experiment with subjects of different professional backgrounds may yield different results.

Despite these limitations, the present investigation may assist policymakers who wish to decrease tax avoidance at low cost. For example, the withholding tax system is primarily designed for taxpayers whose income is reported by a third party. My strong results imply that the tax compliance of farm and sole proprietorships may also increase by employing a withholding tax.

In future research on tax compliance, not only subjects' occupations (Kiechler & Maciejovsky, 2001) but also differences in payment methods, such as an hourly wage versus salary, should be accounted for as these may also influence an individual's tax compliance.

## Conclusion

In this paper, I compared the effect on suppressing tax avoidance of two taxation systems that are currently used in practice: the tax withholding system and the tax declaration system.

A laboratory experiment was conducted that replicated a real tax-payment situation. Results showed that when subjects paid too much advance tax in the withholding tax condition, the tax compliance rate was 100%. Conversely, when subjects in this condition paid too little advance tax, the tax avoidance rate rose to 35%. Furthermore, when subjects did not pay any advance tax and instead faced a tax declaration condition, the tax avoidance rate rose to 50% and the amount of undeclared income was significantly higher than under the withholding tax condition. I suggest that the subjects perceive a refund as a gain, and the payment of tax as a loss, and that taxpayers' reference point for income is anchored at the level of income at the end of the activity period and just before the income declaration. These results reveal a strong and significant effect of using a withholding tax system on decreasing tax avoidance.

I hope these findings contribute to the development of this field and are useful in effective policy-making.

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