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# The Effect of Tax Transparency on Consumer and Firm Behavior: Experimental Evidence

Michael Razen<sup>†</sup>

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## Abstract

Tax avoidance among large multinational corporations has considerably increased in recent years, triggering an intense discussion about how to ensure that all pay their ‘fair share’. We propose a novel experimental design to incentive-compatibly model the firm-consumer relationship in a consumer goods market. This new paradigm allows us to analyze the effect of increased tax transparency on consumer and firm behavior in a dynamic framework. We find that absent the threat of being directly exposed as a tax avoiding firm, only 26% of the firms decide to pay taxes. Once tax avoiding firms are identifiable in the market, this rate rises to 58%. Providing market participants additionally with information about the social costs of tax avoidance increases the fraction of tax paying firms further to 74%. We observe that these improvements are the consequence of firms proactively deciding to pay taxes. At the highest level of transparency, we further observe that consumers show a stronger proclivity to boycott tax avoiding firms, even if these firms offer cheaper prices.

## Keywords:

economic experiment, public good dilemma, corporate tax avoidance, consumer behavior, firm behavior

## JEL codes:

C9, C92, H26

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# 1 Introduction

*‘It’s only outrage that will stop the system.’*

Joseph Stiglitz at World Economic Forum 2018  
talking about corporate tax avoidance

In recent years, numerous news reports have brought to light the extent to which multinational corporations engage in tax avoidance to minimize their tax burden. These tax optimization strategies are not prohibited by law, but rely on exploiting a wide range of legal loopholes (Fuest et al., 2013, European Commission, 2015 and European Commission, 2017). Tentative estimations of the resulting global shortfalls in tax revenues range from 100 billion to 500 billion US-Dollars (Crivelli et al., 2015 and OECD, 2015a). Moreover, tax avoidance might further cause inordinate tax competition among countries, leading to an unsustainable ‘race to the bottom’ of corporate tax rates (Devereux et al., 2008, Genschel et al., 2011 and Overesch and Rincke, 2011). Proposed measures initiated by the OECD’s Base erosion and profit shifting (BEPS) project to counter such practices focus on establishing further international tax rules and efforts to intensify coordination among international tax authorities (OECD, 2013a and OECD, 2013b). While it is assumed that these initiatives could indeed moderate tax avoidance of multinational corporations (Evers et al., 2016), they require arduous negotiations between policy makers worldwide and might still leave some countries with incentives to deviate from the agreed upon policies (Genschel and Schwarz, 2011 and Fuest and Sultan, 2019). Another aspect of the OECD BEPS project aims to increase tax transparency with, e.g., Country-by-Country Reporting (OECD, 2015b) as increased tax transparency and resulting public pressure are also conjectured to promote tax responsibility among competing firms (Dyregang et al., 2016). While an advantage of this approach is that it requires less regulatory interventions and does not depend on possibly fragile international legal coordination, empirical evidence is needed to assess its effectiveness. Particularly, the potential dynamics between consumers and firms as a result of increased tax transparency is unexplored to this point and is hence a focus of the present paper.

Existing research on corporate tax avoidance identifies a tradeoff between the costs and the value of tax avoidance. While its value is obvious (lower tax payments), the costs are typically weighed in terms of reputational damage, adverse media attention, the risk of restating financial statements or (in case of illegal activities) the risk of detection and penalties (Graham et al., 2014). Although existing studies conclude that reputational costs represent a relevant concern for managers to not engage in corporate tax avoidance (see, e.g., Graham et al., 2014 or Austin and Wilson, 2017), the analysis of share prices (as a proxy for the overall assessment of investors) delivers inconclusive findings: For instance, although both Desai and Hines (2002) and Hanlon and Slemrod (2009) analyze the reaction of firms’ share prices when information about their tax avoiding behavior is disclosed, Hanlon and Slemrod (2009) observe negative reactions on share prices and Desai and Hines (2002) find a posi-

tive reaction. The study by Hanlon and Slemrod (2009) further differentiates between more consumer-orientated industries and less consumer-orientated industries, observing that share prices decrease more for consumer-related industries. This indicates that consumers' opinion on the reputation of a firm seems to be considered as relevant by investors. In a similar vein, Dyreng et al. (2016) examine companies' tax avoidance behavior when their are publicly named of being noncompliant to an U.K. law that requires to disclose significant subsidiaries. Even though the nondisclosure of significant subsidiaries is no evidence for tax avoidance, the authors observe that these firms report higher than expected effective tax rates after being publicly named. However, *actual* consumers' reactions are rarely examined and Hanlon and Heitzman (2010) explicitly call for research in that aspect. Taking a step in this direction, Hoopes et al. (2018) make use of Australia's policy to disclose detailed information on tax returns of private and public firms. Their study also examines how consumer sentiment on these firms is affected when their tax information is released. While the authors find no effect of public disclosure on consumer sentiment for large international corporations, there is some consumer backlash for relatively smaller firms. The authors hypothesize that tax disclosure may matter for consumer sentiment, yet that the corresponding information might not be new for firms with large, influential brands.

In light of the difficulty to isolate potential effects with respect to consumer behavior, some studies use an experimental approach. In the survey-based work by Hardeck and Hertl (2014), participants take on the role of consumers and are asked about their purchase intention and willingness to pay for a certain product. In two treatments, they are presented with either neutral information or media reports on tax avoidance about the corresponding firm. The study finds evidence that both purchase intention and willingness to pay is lower when the firm engages in tax avoidance. Taking a similar approach, Antonetti and Anesa (2017) investigate whether consumers' political ideology is a potential mediator for consumer reaction. Their main results also suggest that engagement in tax avoidance lower consumers' purchase intentions. In addition, the authors find that right-leaning consumers punish tax avoiding behavior less than left-leaning consumers do. Asay et al. (2018) analyze both consumers' purchase intention and actual choice in a simple decision setting. After reading background information about two firms, participants received an additional news article about one firm avoiding taxes. They were then asked to indicate whether they would buy products from the two firms (purchase intention), and could also choose between (equally valued) gift cards from either of the firms (consumer choice). Participants' answers were then compared to a control group who received the same background information on the firms, but without the additional news article about one firm avoiding taxes. Consumers in the former treatment showed lower purchase intention and were less likely to choose the gift card of the tax avoiding firm. While the choices in the above studies were either not incentivized or choices were not payoff-relevant, Hardeck et al. (2021) elicit subjects' actual willingness to pay for a certain good (a pen) using the mechanism suggested by Becker et al. (1964). Interestingly, they find no direct effect of tax avoidance on willingness to pay. In a non-incentivized question on the

attitude towards the firm, however, tax avoiding firms are perceived more negatively than a firm with a neutral description.

Taken together, the above findings indicate that engagement in tax avoidance can indeed cause reputational damage, yet it is unclear whether consumers are willing to sanction tax avoiding firms if it comes at a cost. Aside from the inconclusive results on willingness to pay, in all of the above settings firms are modelled as exogenous and unresponsive entities. As a consequence, these frameworks do not allow to study the *behavioral dynamics* between consumers and firms. However, this is a crucial element of their relationship: Consumers have the possibility to discipline firms and thereby enforce a socially more desired behavior by boycotting tax avoiding firms. Hence, incorporating this feature of consumer markets is key to studying the effect of tax transparency on corporate tax avoidance. In this paper, we present a novel and simple experimental paradigm that allows to analyze these market dynamics in the presence of taxes. In particular, we formulate the following research questions:

RQ1: What is the effect of tax transparency on the engagement in corporate tax avoidance?

RQ2: Are consumers willing to actively sanction tax avoiding firms?

RQ3: Does increased tax transparency increase social welfare?

Researchers often study human behavior in social dilemmas – such as the one posed by taxes – by approximating the decision situation with so-called public goods games (see, e.g., Bruner et al., 2017 for a recent example or Burton-Chellew and West, 2021 for an extensive meta study). In this paper, we propose an experimental consumer market where firms subject to tax payments interact with consumers in a market for a standardized consumption good. To align subjects’ incentives with real world analogues, firms are paid corresponding to their profits, while consumers are paid corresponding to their consumption. Moreover, tax revenues are increased by a fixed multiplier and evenly redistributed to all market participants. Some firms, however, can choose to avoid taxes. This design captures the public good dilemma generally inherent in taxation systems: From an individual point of view, firms who avoid taxes can charge lower prices to gain market shares as well as increase profit margins, and consumers buying from cheaper (tax avoiding) firms can purchase a higher quantity of the consumption good. From a societal of view, however, avoiding tax payments means a decrease in the provision of public goods, lowering overall social welfare. To examine whether tax transparency can resolve this dilemma (as conjectured by, e.g., Dyreng et al., 2016), we conduct three treatment variations where we gradually increase the amount of publicly available information. In the BASELINE treatment, no information on tax avoidance is disclosed. In the IDENTIFICATION and the TRANSPARENCY treatment, all market participants are informed which firms are avoiding taxes in the current period on their trading screens. In the TRANSPARENCY treatment, the summary screens additionally include information about (i) the aggregated revenue of tax avoiding firms, (ii) the resulting total loss in tax income

and (iii) the individual loss in tax income.

We find a substantial effect of tax transparency on the engagement in tax avoidance, consumer sanctioning and social welfare. Decision rates to pay taxes increase from 26% in treatment BASELINE to 58% in IDENTIFICATION and 74% in TRANSPARENCY. Analyzing the dynamics that drive these results, we find that the effect of increased transparency is twofold. First, firms exhibit a higher inclination to pay taxes right from the start, even before interacting with consumers on the market. Second, we observe that at the highest level of transparency, consumers show a stronger proclivity to boycott tax avoiding firms, even if these firms offer cheaper prices. However, we only observe tentative evidence for the effectiveness of consumer sanctioning on the disciplining of tax avoiding firms. Overall, we can nonetheless report a substantial and significant increase in welfare in IDENTIFICATION and TRANSPARENCY compared to the BASELINE treatment. Our findings thus support the hypothesis that promoting tax transparency can both reduce engagement in tax avoidance and increase social welfare.

As this study is, to the best of our knowledge, the first to analyze corporate tax avoidance in a dynamic setting where consumers and firms interact over several periods in the same market, we contribute to the existing literature along the following three dimensions. First, as outlined above, allowing for an interaction between consumers and firms is an important feature to test whether consumers are actually willing to sanction tax avoiding firms. So far, the answer to this question remained unclear, as previous studies observed different responses in hypothetical and incentivized settings. This difference could either indicate that consumers are not willing to sanction tax avoiding firms if it is costly, *or* simply be the result of subjects realizing that their choice in the static incentivized setting has no effect on the behavior of the firm. We contribute by showing that consumers are indeed willing to sanction tax avoiding firms in a dynamic framework when they are informed about the consequences of corporate tax avoidance.

Second, we also contribute methodologically by proposing a framework that adequately reflects the social dilemma posed by corporate taxes in the firm-consumer-relationship. We thereby significantly add to the experimental economics literature, which has been centering around *individual* tax behavior of homogeneous agents (see, e.g., Alm and Mal  zieux, 2020’s meta-analysis).<sup>1</sup> A distinct characteristic of the firm-consumer-relationship, however, is the fact that each individual consumer has an *incentive to support tax avoiding behavior*, as they benefit from the lower prices that tax avoiding firms can offer. Traditional tax and public good games fall short of capturing this aspect. Aside from the tax aspect, our design can

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<sup>1</sup> In these ‘tax evasion games’, as the authors call them, subjects receive an initial income that is subject to taxes. Subjects can then decide on the actual income they report which will determine the size of their tax payment. However, underreporting comes with the threat of fines in case of being detected. While this strand of literature thus studies (illegal) *tax evasion among individuals*, we address (non-illegal, but socially undesirable) *tax avoidance among firms*. Some of these studies (e.g., Alm et al., 1992a, Alm et al., 1992b or Bosco and Mittone, 1997) share our feature of redistributing taxes (including a potential tax multiplier) back to the participants.

also serve as an general incentive-compatible workhorse for experimental studies on consumer goods markets.

Third, from a policy perspective, we contribute by examining the efficiency of tax transparency as a measure to curb corporate tax avoidance and its effect on social welfare. While it has been established that recognizing contributors in public good games does increase contribution rates (see, e.g., Samek and Sheremeta, 2014), prior literature cannot answer whether this is also the case when the interdependence is more complex, i.e., if those who refuse to contribute can make use of their decision to offer monetary benefits to beguile their potential punishers. Our results suggest that learning about the effects of corporate tax avoidance serves as catalyst for the reduced engagement in tax avoidance. Hence, we argue that proposed measures such as country-by-country reporting could be effectively supported by informing consumers about the individual and quantified consequences of corporate tax avoidance.

## 2 Experimental Design

In total, 144 subjects (bachelor and master students of all disciplines) participated in the study. Subjects were recruited via hroot (Bock et al., 2014) and randomly assigned to one of the three treatments. The experiment was conducted using z-Tree (Fischbacher, 2007) and GIMS (Palan, 2015). Instructions were distributed at the beginning of the experiment and control questions ensured that all participants understood the experiment. Payments ranged from 9.4 to 17.6 Euro with an average of 14.3 Euro. We ran six markets per treatment with each market being composed of four consumers and four firms. Trading took place during 10 periods lasting two minutes each. We ran six experimental sessions, each consisting of three markets. In total, there exist six markets per treatment with each market being composed of four consumers and four firms.

The experimental protocol was organized as follows. At the beginning of each period, consumers receive an income of 1,200 experimental currency units (‘Taler’) which they can use to buy the consumption good from the firms. Consumers can buy as many units of the good as their budget allows. The firms act as retail sellers who can buy the consumption good at a fixed price of 200 Taler and resell it to the consumers in the market. Consumers’ income and the firms’ cost of purchasing the product are not disclosed to the other group in the experiment.<sup>2</sup>

Figures 1 and 2 depict the market view for firms and consumers, respectively.<sup>3</sup> To engage in the market, firms announce the price at which they are willing to resell the good. To

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<sup>2</sup> While the information could also be structured in different ways, we believe it to be the most realistic assumption that firms are not perfectly informed about their customers’ income, and that vice versa customers do not know the firms’ purchasing prices.

<sup>3</sup> The figures show the screens for treatments IDENTIFICATION and TRANSPARENCY. In the BASELINE treatment, there is no information on tax avoiding firms. For more details on the instructions, see the Appendix.



prevent a single firm from flooding the market, firms can only offer one unit of the good at a time. The offers along with the corresponding firms' label (ID) are visible to all market participants on their trading screens. Consumers can freely choose from the available offers. If a consumer accepts an outstanding offer, they receive one unit of the good in exchange for the corresponding Taler price. Whenever a firm sells a product, it has to pay 20 percent of the corresponding revenues as taxes. The firm's profit is thus calculated as the resale price minus a tax of 20%, minus the purchasing price of 200 Taler.<sup>4</sup> Accounting for firms' different financial and legal resources, only half of the firms are given the opportunity to decide whether they want to avoid taxes prior to each period (discretionary tax payers) while the other half has no such option (mandatory tax payers). At the end of each period, tax revenues are increased by a fixed multiplier of five and then evenly redistributed to all market participants. With 8 participants per market, the multiplier of 5 converts to a marginal per capita return (MPCR) of 0.625. While this rate is larger than what could be expected in the real world, it is only slightly above the average rate in public good games of 0.50 (see Burton-Chellew and West, 2021, for recent a meta-analysis of 237 studies). However, in classic public goods games, participants *directly* decide on the entire amount they wish to contribute. Since, in our setting, only 20% of the firms' revenues are contributed to the common resource pool, we chose a slightly higher MPCR for salience reasons. Finally, summary screens displaying the individual number of transactions, individual earnings, overall tax income and individual tax income are provided after each period.

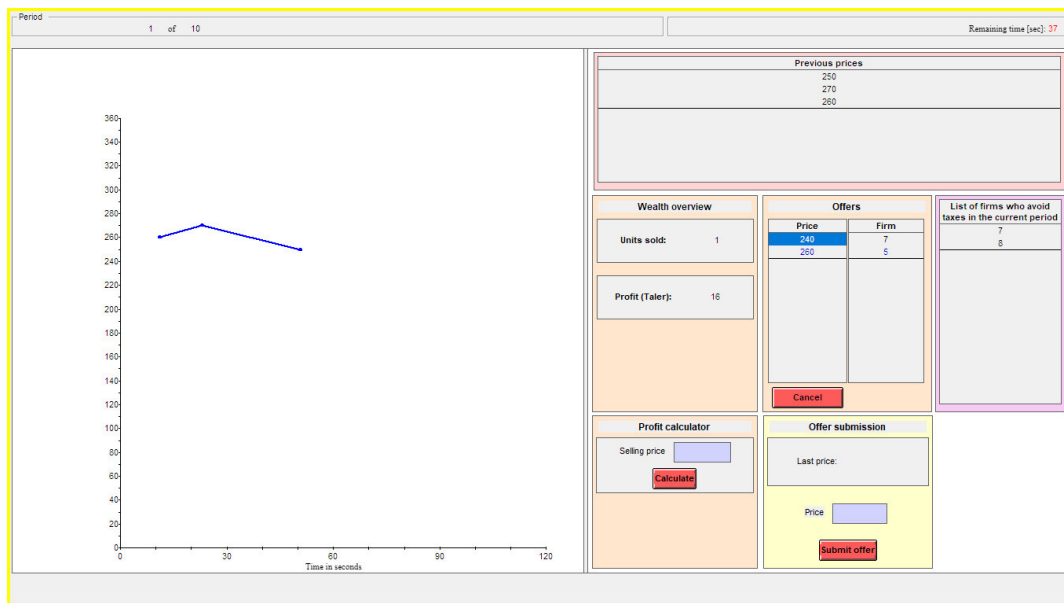


Figure 1: FIRM VIEW

Market view for firms. The cockpit shows prior prices, an overview of the firm's own transactions and profits, current offers, a list of the tax avoiding firms in the current period (treatments IDENTIFICATION and TRANSPARENCY only), a profit calculator (net profit based on sales price), and a panel to enter new offers.

<sup>4</sup> To facilitate computations, firms are provided with a profit calculator where they can enter a desired price and then directly see the resulting profit.

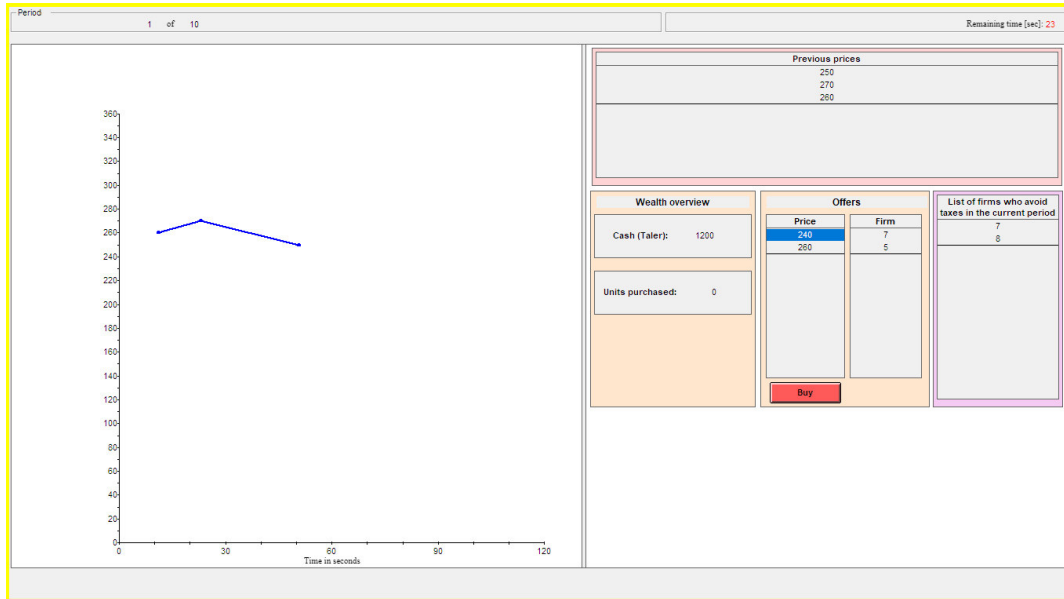


Figure 2: CONSUMER VIEW

Market view for consumers. The cockpit shows prior prices, an overview of the consumer’s own wealth and purchases, current offers the consumer can choose from, and a list of the tax avoiding firms in the current period (treatments IDENTIFICATION and TRANSPARENCY only).

When modeling common discretionary tax avoidance, we built on the following assumptions: (1) Some, but not all firms have the means to avoid taxes. This assumption is motivated by the literature on corporate tax avoidance (for example, Koester et al. (2017) find that executives’ ability contributes to corporate tax avoidance, while Kubick et al. (2015) show that firms’ product market power supports their ability to engage in tax avoidance.) (2) A firm knows whether it has the means to avoid taxes. (3) Firms and consumers know that some firms have the means to avoid taxes. (4) Firms and consumers do not know if a specific firm (other than itself) has the means to avoid taxes, until it has been exposed publicly engaging in it. They might, however, try to infer whether a firm is avoiding taxes based on its (pricing) behavior. As a result, we argue that ‘boycotting’ means that consumers *negatively sanction* firms who *engage* in tax avoidance (by not buying from these firms); in doing so, they also *reward* firms who *do not engage* in tax avoidance. However, among firms who do pay taxes, consumers *do not provide premium rewards* to firms who *could engage* in tax avoidance but refrain from doing it compared to firms who do not have the possibility.

To ensure a simple and realistic incentivization scheme, the consumers’ Euro payoff depends on their consumption (unused Taler income forfeits at the end of each period), while the firms’ Euro payoff depends on their Taler profits. Aside from the features of consumer goods markets, modelling firms as retailers also gives us some control over the traded volumes and consequently also about the costs for conducting the experiment. In particular, it limits the maximum amount of units a consumer can reasonably purchase. By setting the purchase price for retailers to 200 Taler, we can assume that consumption per consumer falls between 1 unit (at a price of 1,200 Taler) and 6 (at a price of 200 Taler), which in turn allows us to

align the incentives for consumption utility and firm profits. Consumers obtain 20 Eurocents for each unit of the consumption good they bought, while firms' Taler profits are converted to Eurocents at an exchange rate of 10:1. Given our experimental design, we expected price competition between firms to emerge. As this results in lower payments for participants in the firm role, we paid firms an additional compensation fee. We did not inform consumers about the compensation fee of firms (see also the Appendix for instruction summaries). In addition to their respective incomes, each subjects' Taler income from tax revenues is converted at the same exchange rate of 10:1.

We run three treatments with varying degrees of publicly available information to analyze the effect of increased tax transparency on the behavior of firms and consumers. In the *BASELINE* treatment, no information on tax avoidance is provided. This treatment serves as a benchmark for the intensity of tax avoidance when firms do not have to fear reputational downsides of their tax choices.

In contrast, in the *IDENTIFICATION* treatment, market participants are informed which firms avoid taxes in the current period, which provides the opportunity to study how firms and consumers behave in the dilemma stated above. On the firm side, Graham et al. (2014) present survey evidence that corporate tax executives do factor in reputational concerns as a reason to not adopt tax avoiding strategies. Austin and Wilson (2017) find that firms with valuable brands refrain from engaging in tax avoidance, which the authors attribute to managers' concerns over reputational costs. At the same time, they argue that 'the existing literature has yet to provide evidence that firms actually incur reputational costs as a result of tax avoidance'. As outlined above, our proposed framework also enables tax avoiding firms to undercut the sales prices of tax paying firms, thus making boycotts of tax avoiding firms potentially costly for consumers. Of course, this does not mean that firms *have to* pass on part of their tax savings to consumers via lower prices. Alternatively, they could also simply pocket the entire additional profit and forgo the possibility of undercutting their competitors. We consider this a key feature for a more realistic interplay of firms' tax decisions, reputational concerns and actual consumer sanctioning.

Given the implicit nature of the welfare losses caused by tax avoidance and the explicit nature of the consumption losses caused by boycotting tax avoiding firms, we conjecture that the tax dilemma might still have a strong impact in the *IDENTIFICATION* treatment. We thus conduct a third treatment where we further increase transparency by providing market participants with a summary of the social and individual losses caused by tax avoidance at the end of each period. With this *TRANSPARENCY* treatment, we seek to analyze whether publishing the implicit costs of corporate tax avoidance can act as a catalyst to improve the societal outcome.

Note that uncertainty about future prices and discrete consumption ensure that sanctions are indeed costly for consumers. If consumers had full foresight of future prices, and if the price differences between tax paying and tax avoiding firms are sufficiently small, it could become rational for an egoistic consumer to buy from tax paying firms (if the tax benefits

outweigh the loss in consumption). However, as consumption is discrete and the dominant contributor to consumers’ welfare, even small price premiums can end up being costly for consumers, if these premiums later prevent them from buying an additional unit of the consumption good.<sup>5</sup>

Summing up, we gradually increase the amount of publicly available information across treatments to study the effect of tax transparency on firm and consumer behavior. In the BASELINE treatment, no information on corporate tax avoidance is disclosed. In the IDENTIFICATION and the TRANSPARENCY treatment, all market participants are informed which firms are avoiding taxes in the current period on their trading screens. In the TRANSPARENCY treatment, the summary screens additionally include information about (i) the aggregated revenue of tax avoiding firms, (ii) the resulting total loss in tax income and (iii) the individual loss in tax income. Table 1 gives an overview of the experimental design. Following the literature, we also elicited gender, political view, and competitiveness as control variables at the end of the experiment (see, e.g., Antonetti and Anesa, 2017 and Gao et al., 2019).<sup>6</sup>

Table 1: TREATMENT DESIGN

Treatment	BASELINE	IDENTIFICATION	TRANSPARENCY
Consumers	4	4	4
Firms (Mandatory/discretionary tax payers)	4 (2/2)	4 (2/2)	4 (2/2)
Identification of tax avoiding firms	No	Yes	Yes
Information on losses in tax income	No	No	Yes
Number of markets	6	6	6

Overview of market structure and level of tax transparency in each treatment. Discretionary tax payers can choose whether they wish to avoid taxes while mandatory tax payers have no such option. In the IDENTIFICATION and the TRANSPARENCY treatment, market participants are informed which firms are avoiding taxes in the current period on their trading screens. In the TRANSPARENCY treatment, participants additionally receive summarized information on the losses in tax income due to tax avoidance at the end of each period.

<sup>5</sup> In the following, we illustrate these mechanics based on an example where tax avoiding firms charge a price of 240 while tax paying firms charge 260. At these prices, a consumer could buy 5 units from the tax avoiding firm, but only 4 units from the tax paying firm. This would correspond to a Eurocent payoff of 100 [ $5 \times 20$ ] when buying from the tax avoiding firm compared to a Eurocent payoff of only 93 [ $4 \times 20 + (260 \times 0.2 \times 5 \times 4) / (8 \times 10)$ ], rendering boycotting tax avoiding firms costly for consumers. At the same time, if all consumers coordinated on buying from the tax paying firm, their payoff would increase to 132 [ $4 \times 20 + (260 \times 0.2 \times 5 \times 4 \times 4) / (8 \times 10)$ ] Eurocent.

<sup>6</sup> The corresponding questions are: ‘What is your political view?’ on a scale from 0 ‘Left’ to 10 ‘Right’ and ‘How much do you agree with the following statement: It is important to me to perform better than others.’ on a scale from 0 ‘Strongly disagree’ to 10 ‘Strongly agree’.

## 3 Results

### 3.1 Overview

Figure 3 Panel A depicts the average selling prices per period. In all treatments, prices exhibit a downward trend with a convergence tendency towards the end. We also find significantly lower average prices in BASELINE ( $\bar{p} = 243.12$ ) compared to IDENTIFICATION ( $\bar{p} = 283.08$ ) and TRANSPARENCY ( $\bar{p} = 272.01$ ); pairwise t-tests yield p-values of 0.003, 0.035, and 0.469. With a purchase price of 200 and a sales tax of 20%, these results already give away that strategic undercutting of tax avoiding firms could play a role in the BASELINE treatment, as tax paying firm cannot operate profitably below prices of 250. The price convergence in the neighborhood of 250 in the other two treatments indicates increasing price competition, however with tax paying firms not necessarily pushed out of the market.

As shown in Panel B of Figure 3, average turnovers reflect a mirror image of prices, which is expected since lower prices allow higher consumption. Analogously, average turnover is significantly higher in BASELINE ( $\bar{q} = 111.10$ ) treatment compared to the IDENTIFICATION ( $\bar{q} = 92.40$ ) and the TRANSPARENCY ( $\bar{q} = 97.40$ ); pairwise t-tests yield p-values  $< 0.001$ , 0.004, and 0.318.

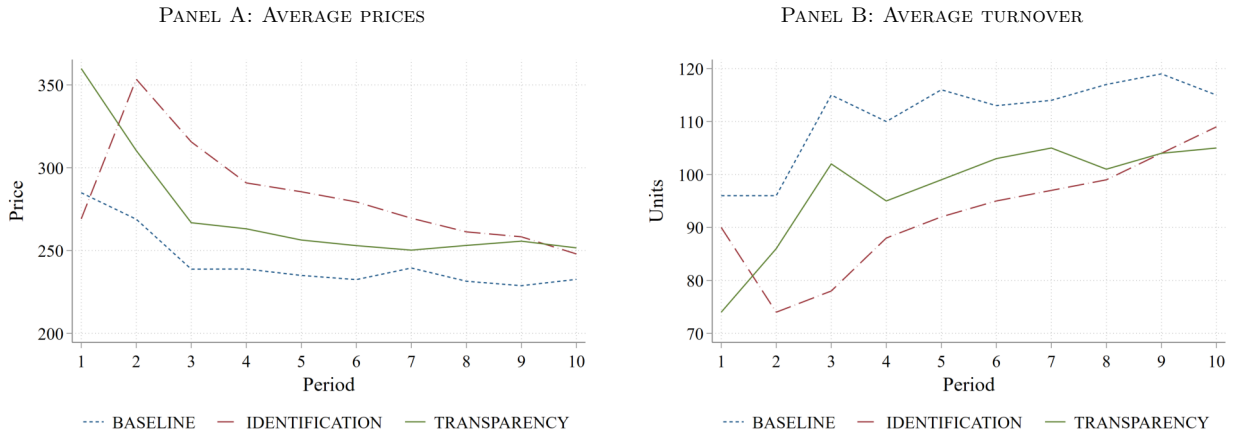


Figure 3: OVERVIEW OF TRANSACTIONS

Panel A shows average prices per period and treatment. Panel B shows average turnover per period and treatment. Blue (dashed) line indicates BASELINE, red (dash-dotted) line indicates IDENTIFICATION and green (solid) line indicates the TRANSPARENCY treatment, respectively.

### 3.2 Firms' overall tax decisions

We first analyze how the disclosure of information on tax avoidance affects firms' tax decisions. In our experiment, prior to each period, discretionary tax payers can decide whether they pay taxes in the upcoming trading period. Hence, with two discretionary tax payers per market, 10 periods per market and six markets per treatment, there are 120 tax decisions per treatment. In the BASELINE treatment, which represents an economy that provides no information on tax avoidance, we observe that firms decide to pay taxes in only 31 cases

(i.e., 26% of tax decisions). Put differently, without the threat of being exposed, firms decide to avoid taxes in almost three quarters of all decisions. When the information about the firms who have chosen to avoid taxes in the current period is publicly disclosed (treatment IDENTIFICATION), the number of tax paying decisions increases to 70 (i.e., 58%). Finally, when market participants are also informed about the losses caused by tax avoidance (treatment TRANSPARENCY), firms decide to pay taxes in 89 out of 120 cases (i.e., 74%). Figure 4 shows the composition of the market for each treatment (as outlined in Section 2, to emulate different financial and legal resources, half of the firms do not have the opportunity to pay taxes).

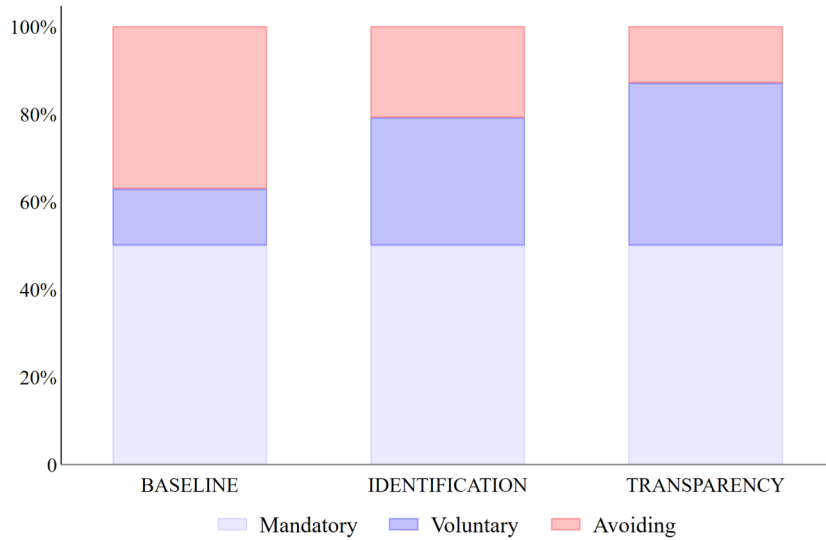


Figure 4: MARKET SHARE IN TERMS OF MARKET COMPOSITION.

Market shares of tax paying and tax avoiding firms in terms of market composition. In all treatments, 50% of the firms have no opportunity to avoid taxes (Mandatory). The other 50% of the firms can decide whether they choose to pay taxes (Voluntary) or not (Avoiding). In BASELINE, 37% of all firms avoid taxes (left graph). In IDENTIFICATION, the fraction of tax avoiding firms drops to 21%. In TRANSPARENCY, only 13% of all firms avoid taxes.

In Table 2, we provide the results of a logistic regression with the firms' tax decision (0 = do not pay taxes, 1 = pay taxes) as the dependent variable. Column 1 confirms that firms in both the IDENTIFICATION and TRANSPARENCY treatment exhibit significantly higher tendencies to pay taxes than those in the BASELINE treatment ( $p < 0.05$  and  $p < 0.01$ ). The difference between IDENTIFICATION and TRANSPARENCY is not significant. These results are robust when controlling for gender, political view, and competitiveness (Column 2). Here, we find that competitiveness correlates with the engagement in tax avoidance.

Table 2: FIRMS' OVERALL TAX DECISIONS

<i>Dep. Var.: Pay taxes</i>	(1)	(2)
IDENTIFICATION	1.391** (0.570)	2.223*** (0.612)
TRANSPARENCY	2.109*** (0.578)	3.079*** (0.530)
Female		0.673 (0.472)
Political view		-0.153 (0.112)
Competitiveness		-0.244** (0.110)
Observations	360	360
Pseudo- $R^2$	0.122	0.224
TRANSPARENCY – IDENTIFICATION	0.718 (0.613)	0.857 (0.544)

Logistic regression of the firm's decision to pay taxes (0: no, 1: yes) on treatment dummy variables, with BASELINE as the reference category. Control variables are gender, political view (0: left, 10: right) and competitiveness (0: low, 10: high). Standard errors are provided in parenthesis (clustered at firm level). The last row shows the treatment effect between TRANSPARENCY and IDENTIFICATION. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

### 3.3 Firms' initial tax decisions

We next turn to the question what motivates firms' decision to pay taxes in the treatments with higher transparency. As tax transparency enables consumers to sanction tax avoiding firms, we analyze whether firms already act upon *anticipated* consumer sanctioning or whether they only react to *experienced* boycotts of consumers. To address the first channel, we study the choices of the discretionary tax payers before the first period, as these decisions are made prior to any interactions with the consumers. Hence, any differences in tax decisions across treatments can only arise due to differences in the (announced) degree of publicly available information. Estimating the same logistic regression as above for the decisions before the first period only, we again observe a significantly positive effect ( $p < 0.05$  for IDENTIFICATION,  $p < 0.01$  for TRANSPARENCY) of tax transparency on the decision to pay taxes (Table 3). This result indicates that higher transparency and hence potential future sanctioning already creates a credible threat for the firms and thus reduces the engagement in corporate tax avoidance.

Table 3: FIRMS' INITIAL TAX DECISIONS

<i>Dep. Var.: Pay taxes</i>	(1)	(2)
IDENTIFICATION	2.303** (0.987)	3.845** (1.578)
TRANSPARENCY	4.007*** (1.300)	5.914*** (1.910)
Female		1.263 (1.303)
Political view		-0.255 (0.268)
Competitiveness		-0.271 (0.269)
Observations	36	36
Pseudo- $R^2$	0.326	0.458
TRANSPARENCY – IDENTIFICATION	1.705 (1.211)	2.069 (1.339)

Logistic regression of the firm's decision to pay taxes (0: no, 1: yes) in period 1 on treatment dummy variables, with BASELINE as the reference category. Control variables are gender, political view (0: left, 10: right) and competitiveness (0: low, 10: high). Standard errors are provided in parenthesis. The last row shows the treatment effect between TRANSPARENCY and IDENTIFICATION. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

### 3.4 Consumer sanctioning

To address the second channel, we analyze whether consumers do indeed adjust their buying behavior under regimes with higher tax transparency. Since consumers can freely choose the firm they want to buy from, they also have the possibility to sanction tax avoiding firms by refusing to accept their offers. Formalizing this notion, for those periods where at least one firm avoids taxes, we define consumer sanctions as purchases from more expensive tax paying firms while passing by better outstanding offers from tax avoiding firms.<sup>7</sup> The dependent variable in Table 4 is thus the number of sanctions by the consumer in a given period.

Remarkably, we observe a significant increase in consumer sanctioning in the

<sup>7</sup> As opposed to firms' tax decisions, this measure takes on the consumer's view. We hence count the number of firms a consumer boycotts with the corresponding purchase. I.e., if a consumer forgoes two cheaper offers from tax avoiding firms, we count this as two incidents of sanctioning. As a robustness check, we also performed the subsequent analysis counting the above example as only one incident of sanctioning. Results remain unchanged. To further ensure that consumer sanctioning incidents represent a deliberate choice of participants, we examined whether the opposite incident can be observed as well (i.e., purchases from more expensive tax avoiding firms). In the treatments that clearly identify tax avoiding firms (i.e., IDENTIFICATION and TRANSPARENCY), we only observe one and three such incidents, respectively. Although we observe 15 such incidents in the BASELINE treatment, it is important to note that participants in the BASELINE treatment were not informed about which firms avoid taxes and can only infer a firm's tax choice based on its prices. Hence, we conclude that our measure of consumer sanctioning is not random but captures consumers' deliberate choices to sanction tax avoiding firms.



TRANSPARENCY treatment ( $p < 0.05$ ), but not in the IDENTIFICATION treatment ( $p > 0.10$ ). Comparing the two treatments directly, we also find significantly more sanctioning in the TRANSPARENCY treatment ( $p < 0.05$ ). We believe this to be an important observation. It seems that making tax avoiders easily identifiable in the market alone does not alter consumer behavior. However, if consumers are also informed about the costs of corporate tax avoidance, they do factor in whether the seller pays taxes when making their buying decisions.

Table 4: CONSUMER SANCTIONING

<i>Dep. Var.: Consumer sanctioning</i>	(1)	(2)
IDENTIFICATION	0.013 (0.135)	0.017 (0.141)
TRANSPARENCY	0.685** (0.323)	0.684** (0.321)
Female		0.017 (0.176)
Political view		0.008 (0.031)
Competitiveness		-0.007 (0.028)
Observations	504	504
$R^2$	0.054	0.059
TRANSPARENCY – IDENTIFICATION	0.672** (0.323)	0.667** (0.321)

Ordinary least squares regression with active consumer sanctioning per consumer and period as dependent variable. Only periods with at least one tax avoiding firm are considered (periods where all firms pay taxes by definition preclude the possibility to sanction tax avoiding firms). Control variables are gender, political view (0: left, 10: right) and competitiveness (0: low, 10: high). Standard errors are provided in parenthesis (clustered at consumer level). The last row shows the treatment effect between TRANSPARENCY and IDENTIFICATION. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

### 3.5 Behavioral dynamics

To investigate the behavioral dynamics between firms and consumers, we analyze their choices over time. Figure 5 Panel A refers to firms and depicts the tax decisions of discretionary tax payers (that is, the share of firms who decide to pay taxes) per period and per treatment. The corresponding graphs illustrate our previous findings: firms are least (most) willing to pay taxes in the BASELINE (TRANSPARENCY) treatment, both initially and over the course of the experiment (see also Section 3.1 and Section 3.2). It seems possible that the IDENTIFICATION treatment exhibits some end-of-game effect in the final period.

Figure 5 Panel B refers to consumers and shows the average number of consumer sanctions per period and per treatment.<sup>8</sup> Again, the graphs illustrate what we find in Section 3.3, namely that consumer sanctioning is most intense in the TRANSPARENCY treatment. Notably, consumer sanctions in the BASELINE and IDENTIFICATION treatment appear quite similar. However, while there is (almost) no sanctioning in the initial periods in BASELINE (which would be expected), we observe an increasing number of incidents in the second half of the experiment. This implies that although consumers in the BASELINE treatment were not informed about which firms avoid taxes, they were indeed able to infer firms' tax choices based on their pricing behavior. However, it is unclear if firms in the BASELINE treatment realize they give themselves away over time.

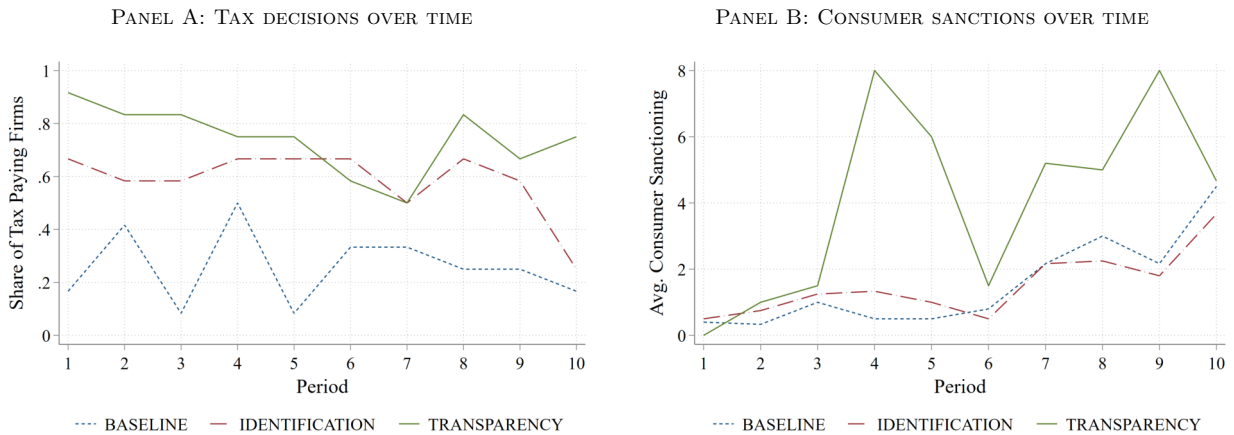


Figure 5: PARTICIPANTS' DECISIONS OVER TIME

Panel A refers to the share of discretionary tax payers who decide to pay taxes per period and per treatment. Panel B refers to the average number of consumer sanctions per period and per treatment. Blue (dashed) line indicates BASELINE, red (dash-dotted) line indicates IDENTIFICATION and green (solid) line indicates the TRANSPARENCY treatment, respectively.

Comparing the two panels, it seems hard to detect an unequivocally clear relationship between consumer sanctioning and firms' tax decision. Focusing only on the treatments where firms know that they can be identified if they avoid taxes, it seems that spikes in consumer sanctioning are more often followed by higher inclination to pay taxes on part of the firms (with the exception that the first sharp increase in period 4 has no effect in the TRANSPARENCY treatment). To investigate the potentially disciplinary effect of consumer sanctioning on firms' decision more rigorously, we include *experienced sanctioning* (that is, the number of times a firm was sanctioned in the previous period) in the regression explaining the tax choices of firms introduced in Section 3.1, thereby conditioning on the firm having avoided taxes in the previous period. Note that this condition reduces the sample size (n=148)

<sup>8</sup> Of course, consumer sanctioning can only appear in periods where at least one firm decides not to pay taxes. To sensibly compare the actual intensity of consumer sanctioning across treatments and periods, we need to control for (that is, divide by) the number of markets where with at least one tax avoiding firm. The rigorous description of the corresponding graph would be *incidents of consumer sanctioning per period and treatment, in markets with at least one tax avoiding firm*. Note that this is the same correction as in the analysis conducted in Table 4, where the corresponding coefficients also reflect the treatment differences in consumer sanctioning for markets with at least one tax avoiding firm.

considerably and also results in an unbalanced dataset across treatments. Thus, the following analyses are more exploratory in nature, but they provide interesting hints at the potential interplay between consumers and firms. Table 5 depicts the results of this exercise without control variables (Column (i)) and with control variables (Column (ii)). At first, the results suggest that the higher rate of consumer sanctioning in the TRANSPARENCY treatment has no immediate impact on the subsequent decision of tax avoiding firms.

Table 5: EFFECT OF PREVIOUS CONSUMER SANCTIONS ON FIRMS' OVERALL TAX DECISIONS.

<i>Dep. Var.: Pay taxes</i>	(1)	(2)
Experienced sanctioning	-0.094 (0.092)	-0.069 (0.109)
IDENTIFICATION	0.188 (0.647)	0.625 (0.701)
TRANSPARENCY	1.409* (0.775)	2.125*** (0.699)
Female		1.433*** (0.548)
Political view		0.091 (0.130)
Competitiveness		-0.058 (0.113)
Observations	148	148
Pseudo- $R^2$	0.041	0.102
TRANSPARENCY – IDENTIFICATION	1.221 (0.813)	1.500* (0.851)

Logistic regression of the firm's decision to pay taxes (0: no, 1: yes) on treatment dummy variables, with BASELINE as the reference category. Experienced sanctioning refers to the number of times a firm was sanctioned in the previous period. Sample is conditioned on the firm having avoided taxes in the previous period. Control variables are gender, political view (0: left, 10: right) and competitiveness (0: low, 10: high). Standard errors are provided in parenthesis (clustered at firm level). The last row shows the treatment effect between TRANSPARENCY and IDENTIFICATION. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

This raises the question whether consumer sanctioning is futile. In the subsequent analysis, we thus turn to the unconditional profits of discretionary tax payers, depending on their actual tax decisions. In theory, consumer sanctioning should negatively impact the profit of tax avoiding firms. Figure 6 shows the average profit per period of discretionary tax payers, separated by their tax decision. The difference in profit between tax strategies amounts to 0.12 Euro (or 33 percent) in BASELINE, 0.11 Euro (or 21 percent) in IDENTIFICATION and 0.04 Euro in TRANSPARENCY (or 6 percent), respectively. While the outperformance of tax avoiding firms is comparable in size in the BASELINE and IDENTIFICATION, pairwise t-tests indicate that only the difference in BASELINE is statistically significant.

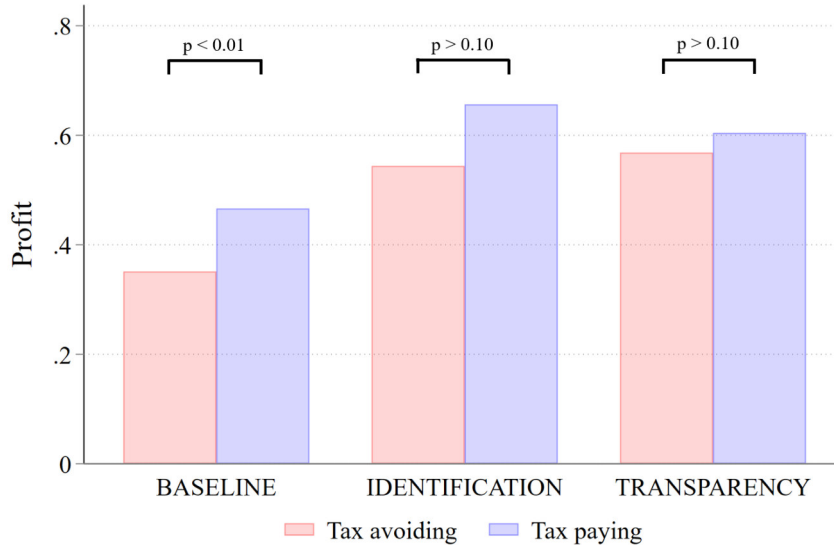


Figure 6: UNCONDITIONAL PROFITS OF DISCRETIONARY TAX PAYERS.

Unconditional profits of discretionary tax payers per treatment, depending on their actual tax decisions. The blue bars show the profits of discretionary tax payers when they decide to pay taxes. The red bars show the profits of discretionary tax payers when they decide to not pay taxes. The difference in profit between tax strategies amounts to 0.12 Euro in BASELINE, 0.11 Euro in IDENTIFICATION and 0.04 Euro in TRANSPARENCY. Horizontal brackets show p-values of pairwise t-tests ( $N = 120$  per treatment).

To further investigate the effect of tax choices and consumer sanctions on firms' profit, we run an unconditional ordinary least squares regression with profit of discretionary tax paying firms as dependent variable. As explanatory variables, we include firm's tax choices per treatments (that is, the interaction terms of treatment and current tax choice) and current consumer sanctions. In essence, this allows to quantify the contribution of consumer sanctioning to the result presented in Figure 6. Table 6 reports the corresponding estimates. Although the coefficient of (current) consumer sanctions is not statistically different from zero ( $p = 0.18$  for Column (i) and  $p = 0.15$  for Column (ii), respectively), its negative sign and magnitude suggest that it contributes to closing the profitability wedge between tax avoidance and paying taxes in the TRANSPARENCY treatment: as a tax avoiding firm faces, on average, 3.65 incidents of consumer sanctioning in TRANSPARENCY (compared to only 1.04 and 1.01 in the other two), the expected loss in profitability is 0.07 Euro ( $= -0.019 \times 3.65$ ). Thus, while the higher intensity of consumer sanction in TRANSPARENCY does not directly reduce tax avoidance, it *possibly eliminates the advantage* of avoiding taxes just so much that it renders firms indifferent in their decision. While firms who engage in tax avoidance achieve significantly higher profits than firms who pay taxes in the BASELINE treatment, this wedge in profits is gradually closed with increased tax transparency. Put differently, looking at realized profits, firms no longer have an incentive to avoid taxes in the TRANSPARENCY treatment. However, we emphasize that these interpretations require caution and call for further research, as the argument is based on economic rather than statistical significance.

Table 6: EFFECT OF CONSUMER SANCTIONS ON DISCRETIONARY TAX PAYERS' PROFIT

<i>Dep. Var.: Profit</i>	(1)	(2)
Current sanctioning	−0.019 (0.013)	−0.019 (0.013)
BASELINE × <i>Pay no taxes</i>	0.134** (0.049)	0.133** (0.049)
IDENTIFICATION × <i>Pay no taxes</i>	0.332*** (0.081)	0.329*** (0.092)
IDENTIFICATION × <i>Pay taxes</i>	0.193** (0.094)	0.199* (0.101)
TRANSPARENCY × <i>Pay no taxes</i>	0.321*** (0.096)	0.326*** (0.098)
TRANSPARENCY × <i>Pay taxes</i>	0.217*** (0.065)	0.217*** (0.064)
Female		−0.007 (0.042)
Political view		0.009 (0.010)
Competitiveness		−0.006 (0.013)
Observations	360	360
$R^2$	0.089	0.094

Ordinary least squares regression with profits per discretionary tax payer and period as dependent variable. Current sanctioning refers to the number of times a firm is sanctioned in the current period. Interaction terms of treatment and current tax choice (i.e., pay taxes and pay no taxes) are included and BASELINE × *Pay taxes* represents the reference category. Control variables are gender, political view (0: left, 10: right) and competitiveness (0: low, 10: high). Standard errors are provided in parenthesis (clustered at firm level).  
\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

### 3.6 Market and welfare aspects

So far, our analysis has focused on the effects of higher tax transparency on individual decisions of firms and consumers. We finally examine the implications on both market and societal level. The effects on individual behavior we observed in the previous sections is also reflected in market shares of tax avoiding firms. Figure 7 contrasts the revenue distributions of tax paying and tax avoiding firms (aggregated) in each of the treatments. The histograms show a considerable decline in market shares of tax avoiding firms that comes with increased tax transparency from 55% in BASELINE through 33% in IDENTIFICATION to 20% in TRANSPARENCY. This further confirms that tax transparency can indeed push back tax avoiding firms.

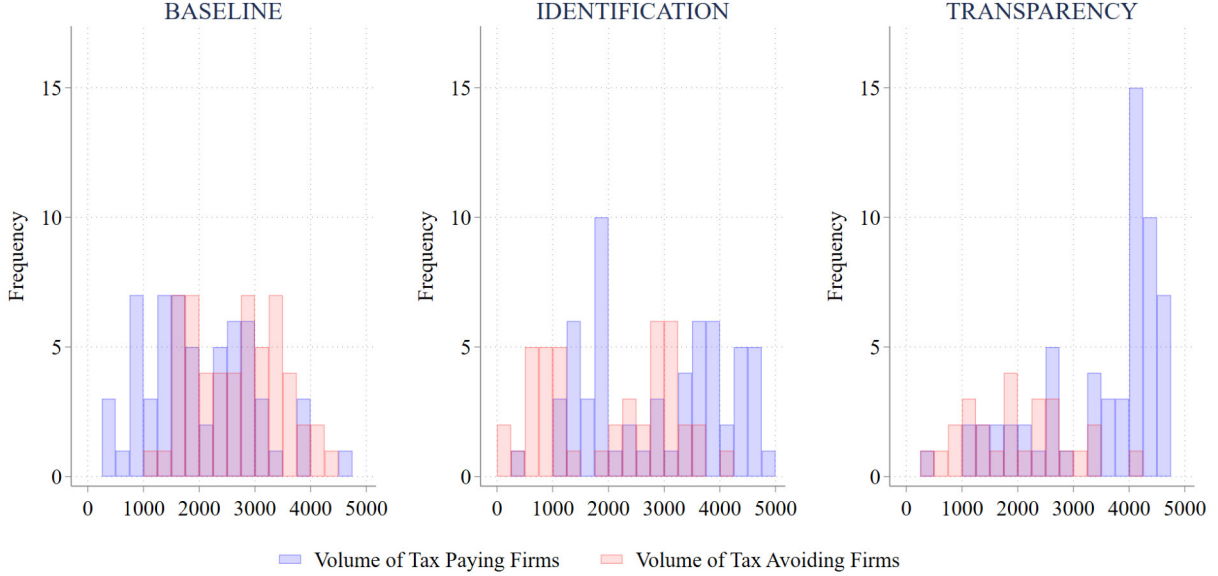


Figure 7: DISTRIBUTION OF OVERALL REVENUES.

Revenue distribution in each treatment for tax paying firms and tax avoiding firms, respectively. The blue (light) histograms show the revenues of all tax paying firms, while the red (dark) histograms show the revenues of the tax avoiding firms. In BASELINE, tax avoiding firms account for 55% of the overall revenue (left graph). In IDENTIFICATION, tax avoiding firms generate 33% of the overall revenue. In TRANSPARENCY, the revenue of firms that avoid taxes declines to 20%.

Next, we examine treatment effects on social welfare. While it is trivial that the total (Taler) tax income, c.p., increases with the number of firms paying taxes, the *total Euro income* of all market participants provides a more informative measure of social welfare: It represents the total wealth generated in the economy, including the gains from trade (for both firms and consumers) and thus the efficiency of the market. Figure 8 shows the average total Euro income per period in each of the treatments. We find that increasing tax transparency also improves social welfare. Average payouts per period are 6.08 Euro in BASELINE, 6.63 Euro in IDENTIFICATION and 7.15 Euro in the TRANSPARENCY treatment, respectively. The treatment effects hence amount to an increase in welfare of 9% and 17%, respectively. Pairwise t-tests confirm that all treatment differences are statistically significant.<sup>9</sup>

<sup>9</sup> As a robustness check, we also performed a regression analysis to examine treatment differences in welfare. For this purpose, we used participants' profit as dependent variable, included dummy variables that indicate participants' role and the respective treatment and applied clustered standard errors at the participant level. Profits in both, the TRANSPARENCY and the IDENTIFICATION treatment are significantly higher ( $p < 0.01$  and  $p < 0.05$ ) than in the BASELINE treatment. Profits in the TRANSPARENCY treatment are also significantly higher ( $p < 0.05$ ) than in the IDENTIFICATION treatment (results not tabulated).

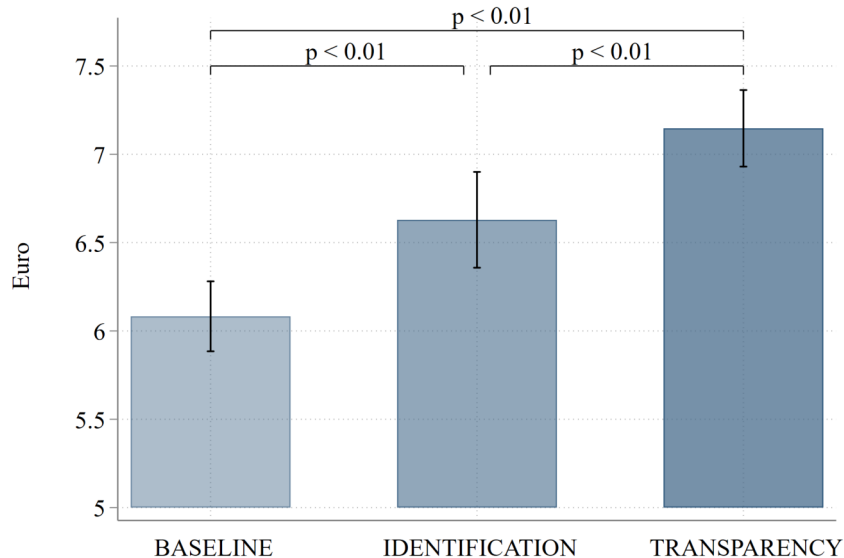


Figure 8: SOCIAL WELFARE.

Average social welfare generated per period in each of the treatments. Welfare increases from 6.08 Euro in BASELINE to 6.63 Euro in IDENTIFICATION and 7.15 Euro in TRANSPARENCY. Error bars indicate 95%-confidence intervals. Horizontal brackets show p-values of pairwise t-tests ( $N = 60$  per treatment).

## 4 Discussion

In this paper, we present a novel experimental design to study corporate tax avoidance. Our setup – which can also be utilized as a general, incentive-compatible framework for consumer goods markets – allows for a dynamic interaction between firms and consumers, where corporate tax avoidance is neither illegal nor exogenously punished. In particular, we use the model to analyze whether engagement in tax avoidance can be reduced under increased tax transparency. Along our treatment variations, we make the following important observations.

First, avoiding taxes is the predominant choice of firms when they do not face the threat of being directly exposed. If consumers cannot distinguish between tax paying and tax avoiding firms, the individual firm’s monetary incentive to increase market shares and profits seems to outweigh the social incentive to utilize the benefit of the tax multiplier. As a result, we also observe the lowest total welfare in this scenario, indicating a socially undesirable outcome. Given that cost-benefit considerations of public good contributions are often less obvious in real life, firms’ incentives to avoid tax payments might even be higher when they do not face any potential downsides.

Second, making tax avoiding and tax paying firms identifiable in the market significantly improves the decision to pay taxes. Interestingly, without additional information on the cost of tax avoidance, the effect seems to be mainly driven by firms’ anticipation of potential consumer sanctioning rather than actual changes in consumer behavior. This is also confirmed by the observation that firms show significantly lower engagement in tax avoidance from the very beginning, even before interacting with consumers on the market. Our results thus

indicate that reputational concerns do play a role for firms' tax decisions if they expect these decisions to be observable by the public. It is important to highlight that, in our experimental design, consumers can easily check whether a certain offer was made by a tax avoiding firm. One possible way to achieve this in real world consumption decisions would be the introduction of an official labelling system for corporate tax avoidance or to publish each firm's (global) effective tax rate. Both measures could be based on corporate tax returns, ensuring that no firm-specific confidential financial information – which is viewed as a problematic aspect of extensive country-by-country reporting (Cockfield and MacArthur, 2015, Devereux, 2011 and Evers et al., 2016) – other than the label or tax rate itself would be publicly disclosed. One potential limitation of our study concerns the stylized modeling of the tax decision as a dichotomous choice. Of course, the complexity of a firm makes the question of how aggressively it applies tax avoiding strategies rather a continuum. Hence, future research could examine, for instance, whether consumers' reactions depend on different magnitudes of tax avoidance – displayed by, e.g. traffic light labels or a firm's effective tax rate.

Third, we find that once consumers also learn about the cost of tax avoidance, they do adjust their buying behavior. Specifically, we observe that consumers are more willing to pay price premia to tax paying firms when they are informed about the social and individual losses due to tax avoidance. This has an important implication for the current debate on how to counter corporate tax avoidance. If policymakers aim to comprehensively internalize firms' decision to pay taxes in consumer goods markets, it is vital to inform them about the costs of tax avoidance, e.g., by publishing annual reports or including the corresponding losses in a labelling system as suggested above. At the same time, we find only tentative evidence for the effectiveness of consumer sanctioning on the disciplining of tax avoiding firms. At best, it could contribute to supporting the maintenance of the initially lower level of tax avoidance of firms in more transparent environments by counterbalancing the edge in profitability tax avoiding firms otherwise have, but our results call for further research in this regard.

While we have studied how tax transparency can reduce the engagement in tax avoidance in a stylized model, further research could refine the proposed labelling system with respect to real world applicability. For example, firms could be offered a broader spectrum of tax avoiding strategies which then would also be reflected in a more detailed labelling system. Moreover, the market environment in our experiment most closely resembles that of a price comparison website where the firms' labels could be displayed as an additional information. Further studies could explore the effect of increased tax transparency when consumers have to actively engage in acquiring the corresponding information. In any case, interventions targeting tax transparency seem promising, as we observe that they do not distort market efficiency: To the contrary, we find that social welfare increases in our experimental setup with the degree of tax transparency in the market.



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## **Appendix: Experimental instructions for participants (online only)**

The following appendices provide the instruction summaries for participants with the role ‘firm’ (Appendix A) and for participants with the role ‘consumer’ (Appendix B).

Note that information in square brackets indicates that this text is only provided in the respective treatment and/or for a specific role. For example:

- ‘[Treatment 1: The other market participants ...]’ means that the text ‘The other market participants ...’ is only provided in Treatment 1.
- ‘[All Treatments, Firm 1 and Firm 2: Profit per unit: ...]’ means that the text ‘Profit per unit: ...’ is provided in all treatments but only to Firm 1 and Firm 2 (i.e., mandatory tax payers).

## Appendix A: Experimental instructions for participants with role 'firm' (online only)

**Dear Participants,**

Welcome to the experiment.

Please read the experimental instructions carefully. All statements in the instructions are true. Your payment at the end of the experiment also depends on how well you have understood the instructions. If you have a question, please raise your hand. Your question will then be answered in private. The experiment and the data analysis are conducted anonymously.

From now on, please do not communicate with other participants and only use the devices provided by the experimenter. Please switch off all electronic devices.

Thank you very much for your attention and your participation in today's experiment.

## Introduction

There are two roles in this experiment: firms and consumers. In a common market, firms can offer a product, which consumers can buy. The experimental currency is called "Taler".

Each market consists of 4 firms and 4 consumers who can trade during 10 periods of 2 minutes each. Roles (firms and consumers) are assigned randomly at the beginning and remain unchanged throughout the experiment. You thus have the same role throughout the entire experiment and you are always interacting with the same firms and consumers.

In the following sections, you will learn more about the two roles.

### Firms

Firms can obtain the product from a central supplier. The price charged by the supplier is constant and the same for all firms. Firms are always free to decide at what price they wish to offer the product to the consumers. Offers always comprise of one unit of the product and each firm can only make one offer at a time.

For the duration of the experiment, firms receive the fixed labels "Firm 1", "Firm 2", "Firm 3" and "Firm 4". All market participants (firms and consumers) can observe which offer was made by which firm.

A sale is realized whenever a consumer accepts a firm's offer. In this case, the consumer pays the price demanded by the firm and receives one unit of the product in return. After paying a tax on the selling price, the firm also pays the central supplier. The remaining difference constitutes the firm's profit. Afterwards, the firm can make a new offer.

If a firm wants to change the price of an outstanding offer, they can cancel the existing offer and submit a new offer with the desired new price. Submitting and cancelling offers is free of charge.

*Final payout to firms:* At the end of each period, the firms' Taler profits are converted to Euro. Remaining outstanding offers are deleted free of charge. Additionally, all tax revenues of the state are evenly distributed to firms and consumers at the end of each period (see section "Taxes").

### **Consumers**

At the beginning of each period, consumers receive a fixed amount of Taler income that they can use to purchase the product. This income is the same for all consumers and remains constant during the experiment. Once a consumer has spent their income, they cannot purchase further units of the product in the corresponding period. Unused Taler income forfeits at the end of the period.

*Final payout to consumers:* At the end of each period, consumers receive a fixed Euro amount for each unit of the product they have purchased. Additionally, all tax revenues are evenly distributed to firms and consumers at the end of each period (see section "Taxes").

### **Taxes**

Firms have to pay 20% of the selling price as taxes. Taxes are paid to the state who, at the end of each period, distributes these revenues to all market participants as follows: All tax revenues are multiplied by a factor of 5 and then evenly distributed to all 8 market participants. These payments are credited to a separate account that will be converted to Euro and paid out at the end of the experiment.

Some firms have the possibility to avoid taxes. At the beginning of each period, these firms can decide whether or not to pay taxes in the current period. Firms who have the possibility to avoid taxes remain the same throughout the experiment.

[Treatment 1: The other market participants receive no information on which firms have decided to avoid taxes in the current period.]

[Treatment 2: All market participants can observe which firms have decided to avoid taxes in the current period.]

[Treatment 3: All market participants can observe which firms have decided to avoid taxes in the current period. Additionally, at the end of each period, every market participant receives detailed information on the losses due to tax avoidance for the state and for him/her individually.]

### Your role: Firm

As a firm, you can resell the product from a central supplier to the consumers in your market. Your market consists of 3 more firms and 4 consumers. The purchase price of the product is 200 Taler for every firm and remains constant throughout the entire experiment. Each time a consumer accepts a selling offer from you, you are charged a 20% tax on the selling price. Then, 200 Taler are deducted for the central supplier. The remaining amount is your profit. A selling offer always comprises of unit of the product. You can only submit one offer at a time.

[All Treatments, Firm 1 and Firm 2: You do not have the possibility to avoid taxes.]

[All Treatments, Firm 3 and Firm 4: At the beginning of each period, you can decide whether you want to avoid taxes in the current period.]

### Your payout

Your Euro income depends on your profits and the tax revenues of the state. Tax revenues of the state are multiplied by 5 at the end of each period and then evenly distributed among all 8 market participants. The conversion rate of tax revenues from Taler to Eurocents is 10:1.

*Your Taler profit per unit sold is calculated as follows:*

[All Treatments, Firm 1 and Firm 2:

$$\text{Profit per unit} = \underbrace{\text{selling price} \times (1 - 0.2)}_{\text{sales revenue} - \text{tax}} - \underbrace{200}_{\text{purchase price}}$$

]

[All Treatments, Firm 3 and Firm 4:

$$\text{If you pay taxes: profit per unit} = \underbrace{\text{selling price} \times (1 - 0.2)}_{\text{sales revenue} - \text{tax}} - \underbrace{200}_{\text{purchase price}}$$

$$\text{If you avoid taxes: profit per unit} = \underbrace{\text{selling price}}_{\text{sales revenue}} - \underbrace{200}_{\text{purchase price}}$$

]

*From the tax revenues of the state you receive:*

$$\text{Income from taxes} = (\text{total tax revenues of the state} \times 5) : 8$$



*Your Euro income per period is hence given by:*

$$\text{Income (in Eurocents)} = \text{sum of profits} : 10 + \text{income from taxes} : 10$$

**Your total payout is the sum of your income in all periods. In addition, you receive a participation fee of 8 Euro.**

**Information at the end of each period**

At the end of each period, you receive summary information about your sales and your resulting profits, the tax revenues of the state and your individual income from taxes.

[Treatment 3: Additionally, you receive detailed information on the losses due to tax avoidance for the state and for you individually.]

## Trading and summary screens

### Trading screen

The trading screen is divided into several sections:

- Current period** (top left)
- Remaining time** (top right)
- Price chart of the current period** (left side)
- Sales summary** (middle left): Shows the number of sales and your profits (in Taler) in the current period.
- Profit calculator** (bottom left): Shows the tax payment and your profit depending on the selected selling price.
- Previous prices** (top right): Shows prices from the current period.
- Offers** (middle right): A table with columns for Price and Firms.
- List of current tax avoiders** (far right): A list of firms that avoid taxes.
- Offer submission** (bottom right): A form to enter a selling price and confirm the offer by clicking "Submit offer".

Callouts provide additional details:

- Previous prices in the current period**: Points to the 'Previous prices' section.
- List of all firms who avoid taxes in the current period**: Points to the 'List of current tax avoiders' section. Note: [This entire box is not displayed in Treatment 1.]
- List of all outstanding offers, sorted by price**: Points to the 'Offers' section. Note: Your offers are displayed in blue color. To cancel your offer, select the offer and click on "Cancel".
- Offer submission**: Here, you can enter the selling price and confirm your offer by clicking on "Submit offer".

### Summary screen (at the end of each period)

The summary screen displays the following information:

- Current period** (top left)
- Summary** (center):
 

Sold products:	Units
Your profit:	Taler
Tax revenues of the state:	Taler
Your income from tax revenues:	Taler
- Information on tax avoiding firms** (bottom):
  - In this period, products worth Taler have been purchased from tax avoiding firms.
  - This caused a loss of Taler in tax revenues for the state after inclusion of the tax multiplier.
  - On an individual level, you have lost Taler.

Callouts provide additional details:

- Information about your income from sales profits and from tax revenues of the state**: Points to the 'Summary' table.
- Additional information on the losses due to tax avoidance for the state and for you individually**: Points to the 'Information on tax avoiding firms' section. Note: [This information is displayed in Treatment 3 only.]

### Questionnaire

Please answer the questions below. When you have answered all the questions, please raise your hand.

How many firms (F) and how many consumers (C) participate in each market?	__ (F) __ (C)
What is the tax rate on the selling price for firms?	__%
What is the factor with which tax revenues are multiplied before they are redistributed?	___
Are the tax revenues evenly distributed to all market participants?	<input type="radio"/> Yes <input type="radio"/> No
Can all market participants observe which firms have decided to avoid taxes in the current period? [Correct answer depends on treatment.]	<input type="radio"/> Yes <input type="radio"/> No
Can consumers transfer unused Taler to the next period?	<input type="radio"/> Yes <input type="radio"/> No
What are the components of your Euro income? [Correct answer depends on participants' role.]	_____

## Appendix B: Experimental instructions for participants with role ‘consumer’ - (online only)

**Dear Participants,**

Welcome to the experiment.

Please read the experimental instructions carefully. All statements in the instructions are true. Your payment at the end of the experiment also depends on how well you have understood the instructions. If you have a question, please raise your hand. Your question will then be answered in private. The experiment and the data analysis are conducted anonymously.

From now on, please do not communicate with other participants and only use the devices provided by the experimenter. Please switch off all electronic devices.

Thank you very much for your attention and your participation in today’s experiment.

## Introduction

There are two roles in this experiment: firms and consumers. In a common market, firms can offer a product, which consumers can buy. The experimental currency is called "Taler".

Each market consists of 4 firms and 4 consumers who can trade during 10 periods of 2 minutes each. Roles (firms and consumers) are assigned randomly at the beginning and remain unchanged throughout the experiment. You thus have the same role throughout the entire experiment and you are always interacting with the same firms and consumers.

In the following sections, you will learn more about the two roles.

### Firms

Firms can obtain the product from a central supplier. The price charged by the supplier is constant and the same for all firms. Firms are always free to decide at what price they wish to offer the product to the consumers. Offers always comprise of one unit of the product and each firm can only make one offer at a time.

For the duration of the experiment, firms receive the fixed labels "Firm 1", "Firm 2", "Firm 3" and "Firm 4". All market participants (firms and consumers) can observe which offer was made by which firm.

A sale is realized whenever a consumer accepts a firm's offer. In this case, the consumer pays the price demanded by the firm and receives one unit of the product in return. After paying a tax on the selling price, the firm also pays the central supplier. The remaining difference constitutes the firm's profit. Afterwards, the firm can make a new offer.

If a firm wants to change the price of an outstanding offer, they can cancel the existing offer and submit a new offer with the desired new price. Submitting and cancelling offers is free of charge.

*Final payout to firms:* At the end of each period, the firms' Taler profits are converted to Euro. Remaining outstanding offers are deleted free of charge. Additionally, all tax revenues of the state are evenly distributed to firms and consumers at the end of each period (see section "Taxes").

### **Consumers**

At the beginning of each period, consumers receive a fixed amount of Taler income that they can use to purchase the product. This income is the same for all consumers and remains constant during the experiment. Once a consumer has spent their income, they cannot purchase further units of the product in the corresponding period. Unused Taler income forfeits at the end of the period.

*Final payout to consumers:* At the end of each period, consumers receive a fixed Euro amount for each unit of the product they have purchased. Additionally, all tax revenues are evenly distributed to firms and consumers at the end of each period (see section "Taxes").

### **Taxes**

Firms have to pay 20% of the selling price as taxes. Taxes are paid to the state who, at the end of each period, distributes these revenues to all market participants as follows: All tax revenues are multiplied by a factor of 5 and then evenly distributed to all 8 market participants. These payments are credited to a separate account that will be converted to Euro and paid out at the end of the experiment.

Some firms have the possibility to avoid taxes. At the beginning of each period, these firms can decide whether or not to pay taxes in the current period. Firms who have the possibility to avoid taxes remain the same throughout the experiment.

[Treatment 1: The other market participants receive no information on which firms have decided to avoid taxes in the current period.]

[Treatment 2: All market participants can observe which firms have decided to avoid taxes in the current period.]

[Treatment 3: All market participants can observe which firms have decided to avoid taxes in the current period. Additionally, at the end of each period, every market participant receives detailed information on the losses due to tax avoidance for the state and for him/her individually.]

### **Your role: Consumer**

As a consumer, you can purchase the product from the firms in your market. Your market consists of 3 more consumers and 4 firms. At the beginning of each period, you receive 1,200 Taler as income on your account. Each time you accept a selling offer, you receive one unit of the product. At the same time, the corresponding price will be charged to your account and transferred to the selling firm.

### **Your payout**

Your Euro income depends on the number of purchases you make and the tax revenues of the state. You receive 20 Eurocents for each unit you have purchased. Tax revenues of the state are multiplied by 5 at the end of each period and then evenly distributed among all 8 market participants. The conversion rate of tax revenues from Taler to Eurocents is 10:1.

Unused Taler will forfeit at the end of each period. Taler that still remain in your account at the end of the period will neither be exchanged to Euro nor transferred to the next period.

*Your income from purchases:*

Income from purchases (in Eurocents) = number of purchased products × 20

*From the tax revenues of the state you receive:*

Income from taxes = (total tax revenues of the state × 5) : 8

*Your Euro income per period is hence given by:*

<b>Income (in Eurocents) = income from purchases + income from taxes : 10</b>
---

**Your total payout is the sum of your income in all periods. In addition, you receive a participation fee of 4 Euro.**

### **Information at the end of each period**

At the end of each period, you receive summary information about your purchases, the tax revenues of the state and your individual income from taxes.

[Treatment 3: Additionally, you receive detailed information on the losses due to tax avoidance for the state and for you individually.]

## Trading and summary screens

### Trading screen

The Trading screen interface includes the following elements:

- Current period** (top left)
- Remaining time** (top right)
- Price chart of the current period** (left side)
- Overview of your wealth:** Remaining Taler income and number of units you have already purchased in the current period. (center left)
- Previous prices** (top right panel)
- Previous prices in the current period** (callout for the previous prices panel)
- Wealth overview** (center left panel) showing:
 

Cash (Taler):	1200
Units purchased:	0
- Offers** (center right panel) showing:
 

Price	Firm
- List of all outstanding offers, sorted by price. You can freely choose from all offers.** (callout for the offers panel)
- List of all firms who avoid taxes in the current period** (right side panel)
- List of all firms who avoid taxes in the current period** (callout for the tax-avoiding firms panel)
- [This entire box is not displayed in Treatment 1.]** (note for the tax-avoiding firms panel)

### Summary screen (at the end of each period)

The Summary screen interface includes the following elements:

- Current period** (top left)
- Summary** (center panel) showing:
 

Summary	
Purchased products:	Units
Tax revenues of the state:	Taler
Your income from tax revenues:	Taler
- Information about your income from purchases and from tax revenues of the state** (callout for the summary table)
- Information on tax avoiding firms** (bottom panel) showing:
  - # In this period, products worth Taler have been purchased from tax avoiding firms.
  - # This caused a loss of Taler in tax revenues for the state after inclusion of the tax multiplier.
  - # On an individual level, you have lost Taler.
- Additional information on the losses due to tax avoidance for the state and for you individually** (callout for the tax-avoiding firms panel)
- [This information is displayed in Treatment 3 only.]** (note for the tax-avoiding firms panel)
- Continue** (bottom right button)



## Questionnaire

Please answer the questions below. When you have answered all the questions, please raise your hand.

How many firms (F) and how many consumers (C) participate in each market?	__ (F) __ (C)
What is the tax rate on the selling price for firms?	__%
What is the factor with which tax revenues are multiplied before they are redistributed?	___
Are the tax revenues evenly distributed to all market participants?	<input type="radio"/> Yes <input type="radio"/> No
Can all market participants observe which firms have decided to avoid taxes in the current period? [Correct answer depends on treatment.]	<input type="radio"/> Yes <input type="radio"/> No
Can consumers transfer unused Taler to the next period?	<input type="radio"/> Yes <input type="radio"/> No
What are the components of your Euro income? [Correct answer depends on participants' role.]	_____

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Michael Razen, Alexander Kupfer

The Effect of Tax Transparency on Consumer and Firm Behavior: Experimental Evidence

**Abstract**

Tax avoidance among large multinational corporations has considerably increased in recent years, triggering an intense discussion about how to ensure that all pay their "fair share". We propose a novel experimental design to incentive-compatibly model the firm-consumer relationship in a consumer goods market. This new paradigm allows us to analyze the effect of increased tax transparency on consumer and firm behavior in a dynamic framework. We find that absent the threat of being directly exposed as a tax avoiding firm, only 26 % of the firms decide to pay taxes. Once tax avoiding firms are identifiable in the market, this rate rises to 58 %. Providing market participants additionally with information about the social costs of tax avoidance increases the fraction of tax paying firms further to 74 %. We observe that these improvements are the consequence of firms proactively deciding to pay taxes. At the highest level of transparency, we further observe that consumers show a stronger proclivity to boycott tax avoiding firms, even if these firms offer cheaper prices.

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