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Attitude–behavior consistency in tax compliance: A cross-national comparison

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ABSTRACT

Are individuals' attitudes about paying taxes consistent with their behavior? A direct link between attitudes (tax morale) and behavior (tax compliance) has long been assumed, despite an extensive social scientific literature attesting to the generally weak congruence between the two. This study builds on an emerging body of work questioning the link between tax morale and compliance. It innovates with a cross-national experimental research design whose results indicate that populations with high levels of tax morale exhibit higher evasion rates than those with low levels of tax morale; thus, the study finds that individual self-reported tax morale cannot predict actual evasion choices. Methodologically, the paper contributes the first results of a laboratory experiment on taxation in Denmark, comparing them to laboratory findings from Italy; while previous research indicates that these two countries lie at opposite extremes in tax compliance and morale, our findings run contrary to "culturalist" explanations. Our results show that Danes are more likely to evade tax than Italians, and that individuals' attitudes toward tax do not significantly predict their actual evasion choices. Finally, we show that discrepancies in tax behavior between Italian and Danish subjects are affected by gender and risk aversion.

1. Introduction

Are individuals' attitudes about paying taxes consistent with their behavior? An extensive body of research in social science, dating back to the 1930s, suggests that attitude–behavior consistency is weak (LaPiere, 1934; Kutner et al., 1952; Deutscher, 1966; Liska, 1974). Although individuals are motivated to align their behaviors with their beliefs (Bandura, 2002), empirical studies suggest that such congruence is rarely achieved—particularly when it comes to questions of morality and ethics (White, 2002). Yet taxation research has long been predicated on the opposite claim: that the behavior of paying tax (*tax compliance*) follows directly from attitudes, particularly the intrinsic motivation to pay (*tax morale*) (Riahi-Belkaoui, 2004; Cummings et al., 2009; Bonatti and Lorenzetti, 2016). In fact, tax morale is viewed as so closely tied to behavior as to serve as a proxy for action (Halla, 2011, 2012).

However, an emerging stream of taxation research has begun to question this linkage between attitudes and actions (e.g., Casal and Mittone, 2016). For example, a series of studies in Europe and the Americas have exposed the negative correlation between tax morale and the shadow economy: in those regions, motivation to pay taxes is high, but compliance is low

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(Torgler, 2005; Alm and Torgler, 2006; Barone and Mocetti, 2009). The present study advances and builds on this literature by comparing attitude–behavior consistency in an experimental setting. The results are novel, showing that individuals' self-reported tax morale does not significantly predict their actual evasion choices.

Empirically, the study draws from data collected in two countries that previous research has identified as representing opposite extremes on tax morale and compliance: Denmark and Italy. Previous research has identified the former as having exceptionally high tax morale and one of the highest rates of tax compliance in the world, while Italians have among the lowest rates of morale and compliance in Europe (Alm and Torgler, 2006). In addition, the two countries appear to stand at opposite poles in terms of underlying social norms that might affect taxation-related attitudes and behavior, such as interpersonal trust and honesty; Danes rank very high internationally on both items (Rothstein and Uslaner, 2005), while Italians rank quite low (Floris, 2010).

But while Denmark and Italy appear to represent straightforward cases of tax compliance stemming from tax morale, recent research has complicated the attitude–behavior relationship, making this an analytically fruitful case to explore. For example, research on Denmark suggests that Danes' high rates of tax compliance may stem not from high tax morale, but from state-level institutions that make it nearly impossible to evade (Kleven et al., 2011; Kleven, 2014). By the same token, recent work suggests that Italians are as tax compliant—or more so—than some Northern Europeans, despite having lower levels of tax morale (Andrighetto et al., 2016; Zhang et al., 2016; Ottone et al., 2018).

Building on these suggestive findings, this paper makes three contributions to taxation scholarship. First, it offers an unusual cross-national analysis of the relationship between morale and compliance, in contrast to studies that have focused on single countries (Barone and Mocetti, 2009; Casal and Mittone, 2016). Second, unlike previous work that looked either at positive or negative relationships between taxation attitudes and behaviors (Alm and Torgler, 2006), this study examines both. Finally, this paper advances a recent stream of research calling into question national stereotypes and "culturalist" explanations for variations in tax compliance (Lewis et al., 2009; Andrighetto et al., 2016; Zhang et al., 2016; Ottone et al., 2018). Methodologically, the paper innovates by offering the first experimental study of tax morale and compliance in Denmark, and by combining experimental data on compliance with survey-based data on morale.

The remainder of this paper is organized as follows. Section 2 describes the methodology, including the experimental design and procedure, the subject pool and the econometric method. Section 3 presents the results. Section 4 discusses the main findings, possible limitations of our analysis, and directions for future research. The Appendix contains tables and figures.

2. Methodology

We used a laboratory experiment to analyze tax compliance in Italy and in Denmark. We chose laboratory experiments because, unlike field experiments, this methodology allowed us to measure actual evasion choices and compare them between countries while controlling for formal institutional conditions, such as tax rates, audit probabilities and fines. The experimental design and procedure were identical in the two countries. This allowed us to focus purely on attitude–behavior consistency among individuals, removing the effects of the real-world differences between Italy and Denmark in terms of the two nations' taxation apparatus and policies.

2.1. Experimental design

The experiment involved three main parts. The first consisted of the tax compliance experiment. The second was a risk aversion elicitation task, involving lottery choices à la Holt and Laury (2002). The third and final part was a questionnaire eliciting information about individual characteristics and attitudes towards taxation.

Our experimental design follows the basic outlines of recent work by Andrighetto et al. (2016), Zhang et al. (2016) and Ottone et al. (2018). Our study, like theirs, adopts a within-subject design where participants earned income through a clerical task; in keeping with the practice of most tax compliance experiments, participants were then asked to decide how much to declare under different audit probabilities (Alm and Jacobson, 2007; Alm, 2010; Coricelli et al., 2010; Doerrenberg and Duncan, 2014; Alm et al., 2017).[1] Compared to previous work, our design innovated by including an extensive set of explanatory variables, along with questions about the perceived compliance of other experimental participants after *each round* of the experiment—instead of at the end of the whole experimental procedure, as in Andrighetto et al. (2016), Zhang et al. (2016), and Ottone et al. (2018). This was intended to facilitate more accurate responses from participants, enabling them to provide immediate impressions of others' compliance levels, rather than trying to retrieve them from memory at the end of a complex multi-round experiment.

[1] We adopted a within-subject design for two main reasons. As pointed out by Cummings et al. (2009) and Coricelli et al. (2010), a within-subject design increases statistical power, since the characteristics of the participants remain constant while the treatment conditions change. Second, it allows us to impose the same tax policy parameters on all subject groups; this is crucial to evaluate behavior across different cultures. As a minor reason, other experimental studies on tax evasion—which are closely related to our paper—used similar within-subject designs. See, among others, Cummings et al. (2009), Coricelli et al. (2010), Andrighetto et al. (2016), Zhang et al. (2016), and Ottone et al. (2018). This makes our study coherent with and comparable to the previous literature on tax evasion.

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Table 1
Experimental design.

Stage	Round	Treatments		
		Tax rate	Audit probability	Tax redistribution
1	1	30%	5%	No
	2	30%	5%	Redistribution
	3	30%	5%	Redistribution × 2
2	4	5%	5%	Redistribution
	5	30%	5%	Redistribution
	6	50%	5%	Redistribution
3	7	30%	5%	Redistribution
	8	30%	30%	Redistribution
	9	30%	50%	Redistribution

2.1.1. The tax compliance experiment

Participants in this study earned income through a clerical task, and chose how much income to self-report to the tax authority. The tax authority was simulated by the computer. In each experimental round, participants were informed of the tax rate, the probability of being audited, and the planned redistribution of the tax revenues. If auditing uncovered under-declaration of income, both unpaid taxes and fines were collected.

There were three stages in this part of the experiment, with each stage divided into three rounds (see Table 1). Each stage was completely independent from the others, meaning that the choices made in each stage had no effect on the earnings in the other stages. Subjects were paid their after-tax earnings at the end of the experiment.

At the beginning of each stage, participants were asked to perform a real-effort task for three minutes. This task, intended to proxy labor supply and to induce a feeling of ownership of income, was designed by Steinmo et al. (2015). It consisted of data entry: copying information about fictional students from a sheet of paper onto the computer.[2] For each row of information copied correctly, participants received 10 points. This task had a number of advantages: it was easy to explain and implement, did not allow guessing, did not require any prior knowledge or expertise, and was identical across stages, treatments and subjects.

At the end of each clerical task, subjects were told how many points they had earned as income. As is standard in the experimental tax evasion literature, subjects were then asked to declare any amount between 0 and true gross income under different scenarios. In the instructions, participants did not know the details of the following stage's tax scenario until the end of the previous stage. This option was chosen because we wanted to avoid any influence from subjects' performance and decisions in one stage "leaking" into the subsequent states of the experiment. Each scenario constituted a round, which was defined by different taxation rules and redistribution mechanism, as shown in Table 1.

From the beginning of the experiment, subjects were informed that they were free to report any amount from 0% to 100%, that only reported earnings would be taxed, and that there was a risk of being audited at the end of the study.[3] For each round, if subjects were caught under-reporting actual earnings, they had to pay a fine equal to twice the tax they should have paid. This is a commonly-used penalty structure in the experimental literature on tax evasion. Participants were informed that at the end of the experiment, for each individual and each round, the computer would randomly select a number between 0 and 100. If the number were between 0 and the announced probability of being audited, then the individual would be audited. The automated and randomized nature of this process assured participants that they had a credible opportunity to evade, and that audits were not controlled or manipulated by the experimenters.

Finally, in each round, immediately after reporting income, each participant was asked to estimate the compliance choices of other participants in the room. That is, individuals had to state how many others they believed had declared their true earnings for tax purposes. The possible answers were: none; less than half; about half; more than half; almost everyone; and everyone.

As described in Table 1, the different tax scenarios unfolded as follows. In all three rounds of Stage 1, participants faced a 30% tax rate, a 5% probability of being audited, a fine of '2× underreported income' and varying redistribution mechanisms. The revenues collected were not redistributed at all in round 1; in round 2, revenues were equally redistributed among participants; and in round 3, revenues were first doubled and then equally redistributed among participants. In all three rounds of Stage 2, participants faced the same probability of being audited, and the same fine and redistribution scheme as in Stage 1; only the tax rate varied, from 5% in round 4, to 30% in round 5, and then 50% in round 6. Finally, in all three rounds of Stage 3, the tax rate, the fine, and the redistribution scheme were identical to those in Stage 1; only the probability of being audited varied, from 5% in round 7, to 30% in round 8, to 50% in round 9.[4]

[2] If the computer detected a mistake, an error message appeared on the participant's screen and s/he had to correct the mistake before proceeding. On another labor task stage in tax experiment, see Doerrenberg and Duncan (2014).

[3] Before being asked to report their income, participants were given explicit examples under hypothetical decisions to ensure their understanding of the instructions.

[4] We considered randomizing the order of the different stages and rounds. However, as also pointed out by Andrighetto et al. (2016) and Zhang et al. (2016), such randomization is not strictly necessary because our main objective is not to evaluate the effects of institutional changes, but

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Audit results were revealed only at the end of the experiment. Importantly, at no point during the experiment did participants have information about the others' declaration of income or their audit rates. This procedure was implemented to avoid influences of reciprocity, conditional cooperation, or reputation and wealth effects, all of which lie beyond the scope of this research.

For the sake of realism (that is, to simulate as closely as possible taxpayers' motives and decision-making), and in line with previous experiments on tax compliance, the experiment was framed in non-neutral terms, using words such as "tax," "income," "audit," and "report." However, it avoided loaded terms such as "cheating" or "lying."[5] Using non-neutral language had two advantages for our design. First, it avoided giving participants the impression that the experiment was a risky gamble instead of a tax compliance decision. Second, it ensured that there was no ambiguity about what honest behavior was: that is, to declare the total amount of earnings. Together with this framing choice, the fact that subjects had to earn real income and pay real fines aligned the experiment with the behavior of interest in the real world.[6]

2.1.2. The risk elicitation task

Following the three stages of the main tax compliance experiment, we next carried out a lottery-choice task based on Holt and Laury (2002) to elicit individual risk attitudes.[7] The test involved 10 choices between pairs of two-outcome options (or lotteries), as shown in Table 2 in the Appendix. In Option A, the possible outcomes were 16 points and 20 points (low variance–low risk). In Option B, the possible outcomes were 1 point and 38.50 points (high variance – high risk). The probability of receiving the higher payoff increased from decision 1 to decision 10, so that expected value initially favored Option A but reversed at decision 5, finally leaving Option B dominant at decision 10. A strongly risk-seeking participant would select Option B throughout. The choice profile of a coherent decision maker is a vector of 10 choices, beginning with Option A and shifting at some point to Option B. A risk neutral participant would switch from A to B at decision 5, where higher switching points indicate greater risk aversion. Decision 10 provided a check on comprehension and attentive responding, since it offered 38.50 points guaranteed (Option B) versus 20 points never guaranteed (Option A). Our measure of risk aversion (operationalized as the variable "risk aversion" in our estimates) was constructed from the number of times an individual picked the safer choice, Option A.

After the risk aversion test, participants were informed about the results in each round of the experiment. That is, they learned of the tax on income they declared, and the benefits they received from the tax-funded common pool. They were also informed whether they had been audited, and if so, what fine they had to pay in case they had underreported their earnings.

2.1.3. The post-experimental questionnaire

In the final stage of the study, subjects were asked to complete a questionnaire that included questions about their gender, nationality, previous participation in experimental research, and other factors potentially correlated with their income declaration choices. This post-experimental survey measured tax morale using a question taken from the European Values Study EVS, 2011) and World Values Survey [WVS] (Inglehart et al., 2014): "Can cheating on tax if you have the chance always be justified, never be justified, or something in between?" Subjects were asked to evaluate this statement on an ordered scale from "never justifiable" ((1) to "always justifiable" (10). The variable *Tolerance of Tax Evasion* serves as a proxy for tax morale and ranges from 1 (never justified) to 10 (always justified).

As Frey and Torgler (2007) have noted of the EVS and WVS, use of a single question to measure tax morale has some advantages and disadvantages. Among the advantages, a single question reduces the problems of index construction complexity, and guarantees that respondents are not influenced by other questions on the tax context. However, it can also be argued that tax morale is a multidimensional concept that requires a multi-item measurement tool (e.g., Kirchler, 1997, 1999, 2007; Torgler and Schneider, 2007). In this case, the measure of tax morale may consist of more complex evaluations of individual perceived fairness of tax systems and efficiency of governments. We recognize that a single-item measure of tax morale in cross-cultural comparisons is not free of bias and should be treated with some caution. However, this index is frequently used in survey-based cross-cultural comparison of tax morale, and a multi-item measure would present disadvantages and bias as well.

Overall, as Halla (2012: 3) explains, "this survey question is the best available source to measure tax morale." Its formulation is general, and has been in use since 1981. Its usefulness is such that the question has been employed by most

rather to analyze how individuals from different countries respond to the *same* institutional scenario. For this purpose, the potential ordering effect should remain constant across the culture vector. This is why our experiment holds the sequence of tax scenarios constant across the Danish and Italian settings. In the econometric analysis, we did control for potential dependence among the repeated decisions of participants by estimating panel double-hurdle models (see Section 2.4). However, we cannot exclude *a priori* that the ordering effect might have an impact on the level of the outcomes (i.e., the compliance rates). It would be interesting to explore this possibility in future research.

[5] Instructions with tax-specific language are generally used in tax compliance experiments to avoid subjects perceiving the experiment as a risky-choice gamble rather than a tax declaration situation. See, among others, Cummings et al. (2009), Coricelli et al. (2010), Andrighetto et al. (2016), Zhang et al. (2016), Alm et al. (2017), and Ottone et al. (2018). See also Alm et al. (1992), which used experimental data with student participants and found no behavioral difference between experiments using neutral terminology and those using tax-specific language.

[6] For a similar design, see also Bühren and Kundt (2014) and Bühren and Pleßner (2014).

[7] For other experimental studies that used Holt and Laury's (2002) test on risk aversion, see Kugler et al. (2012). On measuring individual risk attitudes, see Rabin (2000) and Eckel and Grossman (2008).

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social scientists comparing tax morale across European countries (e.g., Torgler, 2005, 2006; Alm and Torgler, 2006; Frey and Torgler, 2007; Torgler and Schneider, 2007; Hug and Spörri, 2011). The main relevant point for this research is that *whatever measure is used*, survey-based analyses argue—without providing any evidence at the individual level—that individual attitudes towards tax evasion are consistent with individual fiscal behavior (e.g., Lewis, 1982; Kirchler 2007; Lewis et al., 2009). Use of the EVS/WVS tax morale question with a set of participants, in conjunction with experimental data on the tax evasion choices of those same participants, allows us to test claims of attitude–behavior consistency in tax compliance.

Table 9 reports the summary statistics of *Tolerance of Tax Evasion* for Denmark and Italy using data from the European Values Study survey in the year 1999/2000.[8] The number of observations is 1,017 respondents for Denmark and 1,967 respondents for Italy. The average tolerance of tax evasion is lower in Denmark (2.004) compared to Italy (2.391). The two-sample *t*-test shows that this difference is statistically significant (p-value = 0.000). In addition, 65.6% of Danish respondents stated that tax evasion is never justifiable, against 56.6% of Italians. The two-sample test of proportions reveals that this difference is statistically significant (p-value = 0.000).

Similar statistics are obtained from our experimental data, as we will show in Section 4.

2.2. Experimental procedure

The experimental sessions were conducted during the academic year 2016/2017 at the University of Bologna's Laboratory for Experiments in Social Science (BLESS) in Italy, and at Copenhagen University's Laboratory for Experimental Economics (LEE) in Denmark.[9] The recruitment process, the experimental design and procedure were the same in each site and in each session. To ensure consistency, the experimental instructions were translated and back-translated between Italian (for the sessions in Bologna) and English (for the sessions in Denmark).[10]

Participants were recruited using ORSEE (Greiner, 2015), a web-based Online Recruitment System for Economic Experiments specifically designed to optimize recruitment for economic experiments. Since the aim of the study was to examine determinants of tax compliance, including morale and other cultural factors, we recruited only native students—meaning individuals born in Denmark (Italy) to Danish (Italian) parents. Neither the aims nor the cross-cultural scope of the research project were stated in the invitation email to participants or during the experimental sessions.

Participants were undergraduate and graduate students from various fields, including social sciences, humanities and medicine.[11] Such students are the typical sample group in economics experiments. Though they are unlikely to have paid income tax, this does not undermine the external validity of the results (Alm et al., 2015; Choo et al., 2016).[12]

The experiments were designed using *z*-Tree (Fischbacher, 2007) and participants performed all the experimental tasks via computer. Computer clients in both labs are partitioned to ensure confidentially and avoid communication between participants. To ensure anonymity and reduce the feeling of scrutiny, participants were informed that their decisions during the experiment and their final payment would be kept confidential and linked to their client ID number, rather than to their names. We assured them that neither the experimenters nor anyone else would be able to link participants to their individual choices. Questions were answered in private and payments were issued in cash at the end of the session to each participant individually, to further ensure confidentiality and anonymity.

On the day of the experiment, participants were given a random client ID number and assigned to the corresponding computer client. Once everyone was seated, the experimenters handed out the clerical task packet and began reading the instructions, which were also shown on each participant's screen. Participants were informed that—based on the others' and their own choices, as well as on chance—they would earn points, to be converted at the end of the experiment into the local currency (Euros in Italy and Danish Kroner in Denmark). The exchange rate was calibrated such that the average payment to participants per hour (including time to read the instructions and payment of participants) would be approximately equal to

[8] The year 1999/2000 is the most recent survey-based dataset on tax morale for both Italy and Denmark. Information about tax morale is missing in the EVS dataset 2008 for Italy, and in the European Social Value dataset 2009 for Denmark.

[9] The experiment was approved by the Ethics Committee of the Independent Research Fund Denmark. The experiment was conducted in line with the ethics policies of both BLESS and LEE. At the beginning of each experimental session, each participant was asked to fill out and sign an informed consent document outlining the rules under which the experimental lab operated, with information on the voluntary nature of the study that they were participating in and the processing of their personal data. Participants were permitted to opt out at any time with no penalty and were allowed to withdraw their data subsequent to participating. Both BLESS and LEE operate under the methodological paradigm of experimental economics, where participant deception is not allowed.

[10] The instructions in Denmark were given in English (and not in Danish) because that is a requirement of LEE; experimentalists are not allowed to use any other language. Indeed, the terms and conditions for usage of laboratory facilities at the Centre for Experimental Economics at the University of Copenhagen specify that "experiments at CEE are in English, i.e. all (oral and written) instructions *must* be given in English."

[11] Both BLESS and LEE have existing databases of active participants. These participants are undergraduate and graduate students. They have expressed interest in participating in behavioral experiments by registering their personal details in ORSEE. This includes their name, gender, degree programme (if applicable), and e-mail address. Both labs have strict policies on the confidentiality of the data provided by our participants.

[12] Recently, Choo et al. (2016) compared tax compliance choices among three distinct populations: undergraduate students, individuals in full-time employment who pay income tax through a third-party reporting system, and individuals who are self-employed and thus self-report their income tax liabilities. They found students the least compliant subject pool, but also the most responsive to treatment changes, particularly with regard to ambiguity in audit probabilities. In contrast, self-employed taxpayers and taxpayers who paid through third-party reporting were more compliant and mostly non-responsive to differing conditions.

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the average hourly wage for student employment in the local context.[13] In addition, each participant received a show-up fee for participation (5 Euros in Italy and 100 Danish Kroner—approximately equivalent to 14 Euros—in Denmark).[14] Volunteers who exceeded the number of slots available for the session received the show-up fee. Each session lasted about 90 min and participants earned an average of 10.641 Euros in Italy and 191.804 DKK (equivalent to 25 Euros) in Denmark.

2.3. Subject pool

The overall experiment consisted of 16 sessions, of which 6 took place in Italy and 10 in Denmark.[15] Since the number of participants per session might impact individual tax behavior, we controlled in the regression analysis for the number of participants per session (variable "*Pool Size*"). The results indicate that subject pool size had no effect on individual tax behavior.

A total of 180 participants (53.9% male and 46.1% female) took part in the experiment, of which 106 (58.89%) were from Italy (41.51% from the North) and 74 (41.11%) were from Denmark (39.19% from Copenhagen area). Participants were mainly in the 20–24 age bracket, and were mainly undergraduates. The undergraduates' majors included Social Sciences (22.78%), Mathematical, Physical and Natural Sciences (11.11%), Engineering (9.44%), and Humanities, Philosophy and Arts (8.89%).

The characteristics of the subjects are summarized in Table 3. It is not surprising that there are some differences between the Danish sample and the Italian sample. Among others, Italian subjects were on average more risk averse than Danish subjects. The percentage of male participants was higher in the Danish sample than in the Italian sample (64.0% against 46.2%). Since risk aversion and gender proportions differ between the Italian and Danish sample, and both can affect tax reporting behavior, we included controls and interaction effects in our estimations.

2.4. Econometric method

In our analysis, we estimate the determinants of tax evasion by using pooled and panel double-hurdle (DH) models.[16] Both models capture important characteristics of our experimental data. Hence, we report results from both specifications.

This empirical strategy, introduced by Cragg (1971), allows us to estimate two distinct processes: "the first hurdle, which can be interpreted as a probit model, determines whether or not a person participates in evasion and is particularly suited to capture effect occurring mainly at the extensive margin; the second hurdle, which can be interpreted as a Tobit model, determines the level of evasion only for those people who ever choose to evade and is therefore relevant for the effect occurring at the intensive margin" (Alm et al., 2017, p. 20).

To estimate the DH models, we used the two-stage procedure developed by Engel and Moffat (2014) where subjects must cross two hurdles. The first hurdle needs to be crossed to be an evader. Once the subject becomes an evader, his or her current circumstances, along with the experimental treatments, affect whether s/he contributes (this is the second hurdle). It follows that the double-hurdle model contains two equations, which can be interpreted as a combined Probit and Tobit estimator.

Formally, following Engel and Moffat (2014) and Alm et al. (2017), the observed evasion rate is given as follows:

$$ER_{ij} = d_{ij}\, ER^{*}_{ij} \tag{1}$$

where ER_{ij} is the observed evasion rate of subject i in round j; d_{ij} and ER^{*}_{ij} represent the first and the second hurdle, respectively, which are defined in the following.

The first hurdle is represented by a binary variable for evasion as follows:

$$d_{ij} = \begin{cases} 1 & \text{if } d^{*}_{ij} > 0 \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

The latent variable d^{*}_{ij} is given as follows:

$$d^{*}_{ij} = x'_{ij}\ \gamma_1 + \mathbf{y}_i\, \gamma_2 + \mathbf{z}_i\, \gamma_3 + \ \varepsilon_{1,ij} \tag{3}$$

[13] At Copenhagen University, LEE requires external researchers to calibrate the exchange rate from earnings in experimental currency units to kroner such that the average payment to participants per hour is at least 120 DKK per hour. Our experimental sessions lasted 1 hour and a half each, so the average payment to participants was 191.804 DKK.

[14] In Bologna, BLESS requires external researchers to guarantee a minimum payment to all invited volunteers who show up on time, and also to volunteers who exceed the number of slots available for the session. LEE does not require a show-up fee, but researchers have to guarantee that only few participants earn less than 50 DKK in total.

[15] The higher number of sessions in Denmark is due to some difficulties recruiting Danish participants. Indeed, despite inviting more than 800 Danes per session via ORSEE, the number of Danish participants at LEE ranged from 4 to 14, whereas the number of Italian participants at BLESS was consistently higher (from a minimum of 18 to a maximum of 25).

[16] Several experimental studies on tax evasion have used the Tobit model to estimate relationships between censored dependent variables (i.e. declared income) and the relevant covariates (e.g. Andrighetto et al. 2016; Zhang et al., 2016; Ottone et al., 2018). However, as pointed out by Alm et al. (2017), the standard assumption of the censored Tobit regression model—that is, that variables which influence individual choice to evade taxes have the same effect on *whether* a subject evades and *by how much*—are not appropriate to analyze compliance behavior at the extensive and intensive margins.

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where $\varepsilon_{1,\,ij}$ is subject i's idiosyncratic propensity to pass the hurdle in round j, which is assumed to be normally distributed with zero mean and variance normalized to unity.[17]

The regressor vector $\mathbf{x}_{ij}$ includes three variables for the parameters of the experiment (redistribution, tax rate, audit probability) as well as the intercept. The regressor vector $\mathbf{y}_i$ includes individual-specific characteristics (e.g. nationality, age, gender, education, age, and others) along with socio-economic and behavioral factors (e.g. tolerance of tax evasion, perceived behavior of the other participants, and degree of risk aversion). The vector $\mathbf{z}_i$ includes interaction effects (e.g., interaction between nationality and tolerance of tax evasion).

The second hurdle, which is similar to the Tobit model, is given as follows:

$$ER^{*}_{ij} = \max\left\{ER^{**}_{ij}, 0\right\} \tag{4}$$

where the latent variable ER^{**}_{ij} is given as:

$$ER^{**}_{ij} = x'_{ij}\,\beta_1 + \mathbf{y}_i\,\beta_2 + \mathbf{z}_i\,\beta_3 + \alpha_i + \varepsilon_{2,ij} \tag{5}$$

Table 8 in the Appendix describes the list of the variables included in the econometric analysis.

The pooled DH model includes only the contemporaneous error term $\varepsilon_{2,\,ij}$ (which is assumed to be normally distributed, with zero mean and variance σ^2_{ε}), while the subject-specific random effects α_i are assumed to be zero. In the pooled HD model, the two error terms $\varepsilon_{1,\,ij}$ and $\varepsilon_{2,\,ij}$ are assumed to be independently distributed.

Conversely, the panel DH model includes the subject-specific random effects α_i (which is assumed to be normally distributed, with zero mean and variance σ^2_{α}), which measures subject i's idiosyncratic propensity to evade, conditional on passing the first hurdle. In this way, the panel HD model controls for potential dependence for the repeated decisions made by participants by capturing the correlation between the two hurdles (i.e., the correlation between the random effects α_i and the error term $\varepsilon_{1,\,ij}$, i.e., $\rho = corr(\alpha_i, \varepsilon_{1,ij})$).[18]

As pointed out by Alm et al. (2017), there is one crucial feature that distinguishes the panel DH model from the pooled DH model. Unlike the pooled DH model, in the panel DH model a subject is classified as fully compliant (a zero-type subject) only if s/he fully declares her/his true earnings in *all* the rounds of the experiment. Otherwise, the subject is identified as an evader. This means that a subject who fully declares earnings in some, but not all, rounds is classified as an evader. The same holds for a subject who evaded in some or all the rounds. Hence, given the possible presence of zero-type subjects in the experiment, the panel DH model has the potential to significantly improve the estimates.

3. Results

As a general overview, our data reveal that across all subjects, stages, periods, and countries, the mean reporting compliance rate averages 61.16%. This overall level of compliance, which far exceeds the levels predicted by expected utility theory (Allingham and Sandmo, 1972; Yitzhaki, 1974), is in line with the experimental literature on tax compliance and public goods (Bosco and Mittone, 1997; Cummings et al., 2009; Alm, 2012; Andrighetto et al., 2016; Casal and Mittone, 2016; Zhang et al., 2016; Alm et al., 2017; Ottone et al., 2018). When considering the full evasion rate, we found that subjects fully evade taxes 27.34% of the time. In the following sections, we present more detailed descriptive statistics (Section 3.1), estimates from regression analyses (Section 3.2), and robustness checks (Section 3.3).

3.1. Descriptive statistics

Evasion rates varied widely depending upon the specific tax scenarios presented in each round. Overall, subjects responded in a predictable manner to changes in the classical economic parameters (i.e. redistribution, tax rate, probability of being audited). Table 4 in the Appendix reports the summary statistics of evasion rates—defined as the ratio between undeclared income and total earned income—in each of the nine rounds, for each country. The average evasion rate is negatively associated with the redistribution policy (rounds 1–3) and with the probability of being audited (rounds 7–9). Subjects responded to higher tax rates by evading more (rounds 4–6).

Pooling across countries and sessions, we observe that an increase in the probability of being audited from low (5%) to high (50%) reduces the evasion rate from 50.73% to 8.78% (see Table 4). A similar pattern follows when redistribution increases from low (no redistribution) to high (redistribution $\times$ 2): the evasion rate decreases from 58.85% to 25.21%. An increase in the tax rate from low (5%) to high (50%) has a positive impact on evasion: the evasion rate increases from 33.53% to 54.14%. Overall, the effect of audits on evasion rates is larger if compared to increases in the redistribution rate of the tax-funded common pool or in the tax rate. Similar increments are present in the two countries individually.

To test whether tax-treatment effects are statistically significant, we used the multiple hypothesis testing procedure proposed by List et al. (2016). This procedure includes three tests advanced by List et al. (2016), as well as the classical Bonferroni's (1935) and Holm's (1979) multiple test procedures.[19] Table 5 shows the results, pooled across countries and

[17] This is usually required for identification in Probit estimates, given that the outcome of the first hurdle is binary.

[18] For an extensive discussion of pooled and panel DH models, see Alm et al. (2017).

[19] The multiple hypothesis testing procedure implemented by List et al. (2016) is more accurate in detecting truly false null hypotheses than the standard multiple testing procedures such as Bonferroni (1935) and Holm (1979), since it incorporates information on the joint dependence structure of the test statistics.

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sessions. For each of the nine pairwise comparisons among the treatments, Table 5 displays the following five quantities: difference in evasion rates (in percentage terms) between the treatments (column 2); multiplicity-unadjusted p-value computed using List et al.'s (2016) Remark 3.1 for comparison purposes (column 3); multiplicity-adjusted p-value computed using List et al.'s (2016) Theorem 3.1 (column 4); multiplicity-adjusted p-value computed using List et al.'s (2016) Remark 3.7 (column 5); multiplicity-adjusted p-value obtained by applying Bonferroni's (1935) adjustment to the p-values in column 3 (column 6); multiplicity-adjusted p-value obtained by applying Holm's (1979) adjustment to the p-values in column 3 (column 7). The p-values from List et al.'s (2016) Theorem 3.1 and Remark 3.1 represent an improvement upon those from Bonferroni's (1935) or Holm's (1979) adjustments, because List et al.'s (2016) procedure incorporates information about the joint dependence structure of the test statistics when determining which null hypotheses to reject. This feature is evident in Table 5, as the p-values in column 4 are always weakly smaller than the p-values in columns 6 and 7. List et al.'s (2016) Remark 3.1 is also reported in Table 5 because it may improve Theorem 3.1 by exploiting transitivity and imposing smaller critical values in the presence of multiple treatment conditions. The results show that the tax-treatment effects are all statistically significant at 1% significance level—except when comparing the treatments "Tax rate 30% vs Tax rate 50%." Similar results are obtained by considering the two countries individually.

It is worth noting that considering treatment averages ignores the great degree of heterogeneity in our data. Fig. 1 in the Appendix illustrates that, for each country and round, two types of behavior emerge: individuals who declared 100% of their true income and, in contrast, individuals who completely evaded their taxes. Fig. 1 clearly shows that in both countries, subjects are very likely to be fully compliant in round 9, when the probability of being audited is 50%. Full evasion rates decrease as redistribution and audit probability increases, whereas higher tax rates increase the percentage of full evaders.

Since our main interest is the effect of morale and culture on compliance, we compare tax behavior between subject pools: Danes vs Italians in each round, keeping experimental parameters constant. Since the Italian and Danish samples are independent groups, we report results from Wilcoxon rank-sum tests. Table 4 in the Appendix shows that, for each tax treatment (except for "Redistribution $\times$ 2", "Audit Prob 30%" and "Audit Prob 50%"), the evasion rate is lower for Italians than for Danes. Interestingly, the difference in compliance behaviors between the two countries is no more statistically significant in the presence of high audit rates ("Audit Prob 30%" and "Audit Prob 50%") or higher redistribution (i.e. "Redistribution $\times$ 2"). More specifically, Danish participants failed to report roughly the 64.29% of their gross income when the audit probability was at 5%—but this percentage was reduced to 5.45% of income unreported when the audit probability was at 50%. The response of the Italian subjects to increases in audit probabilities was more nuanced. Italians failed to report 41.26% of their income when the audit probability was at 5%; when the audit probability was at 50%, Italians did not report 11.11% of their income. The stronger reaction of Danes to audit probability changes indicates that they are more sensitive than Italians both to enforcement measures and to opportunities for evading taxes without being detected.

The overall difference between Italian subjects and Danish subjects can be clearly seen in Fig. 2 in the Appendix, which plots the cumulative distribution function of the "Evasion Rate" pooling across treatments. That the cumulative distribution function of the Danish subject pool is lower is consistent with the fact that the average evasion rate in the Danish subject pool is higher than the average reporting compliance rate in the Italian subject pool.[20] The CDFs of evasion rate between countries are almost parallel to each other, indicating that the difference in tax behavior holds true at all evasion levels (i.e. both at the extensive and intensive margins).

Let us now consider tax morale, which is measured in the post-experimental survey as the complement of tolerance for tax evasion. *Tolerance of Tax Evasion* is a discrete variable which is measured via the following question asked in the post-experimental questionnaire: "Can cheating on tax if you have the chance always be justified, never be justified, or something in between?" *Tolerance of Tax Evasion* ranges from 1 (never justified) to 10 (always justified). Fig. 3 in the Appendix plots the histogram and kernel density of the degree of tolerance for tax evasion in Italy and Denmark. To test whether the mean of tolerance for tax evasion is different between the two subject pools, we performed a two-sample t-test. We found that average tolerance for tax evasion was higher in the Italian sample than in the Danish sample, and this difference is statistically significant (two-sample t-test, p-value $= 0.0289$).[21] The statistics also show that 22.97% of Danes never justify tax evasion, versus 18.86% of Italians; this difference is statistically significant (two-sample test of proportions, p-value $= 0.0442$).

However, at the tails of its distribution, tax morale does not differ in a statistically significant way between the Italian and Danish samples.[22] For example, by looking at the proportions of subjects answering 1 (i.e., never justifiable), 2, or 3, it turns out that Danes are not significantly less tolerant of tax evasion than Italians (66.2% of Danes vs 64.15% of Italians; two-sample test of proportions, p-value $= 0.391$). At the right tail, the number of subjects answering 8, 9, 10 (i.e., always justifiable), is too small to derive any significant conclusion (three Danish subjects vs two Italian subjects). The same results hold by considering the proportions of subjects answering 1 or 2 (39.19% of Danes vs 42.45% of Italian; two-sample test of proportions, p-value $= 0.189$), and the proportions of subjects answering 9 or 10 (one Danish subject and one Italian subject).

[20] The corresponding Kolmogorov-Smirnov and Epps-Singleton tests on the distributions of two samples over average compliance rates are statistically significant, meaning that the two subject pools differ significantly. Combined K-S: D=0.1579; p-value=0.000; corrected=0.000.

[21] The corresponding two-sample Kolmogorov-Smirnov and Epps-Singleton tests for equality of distribution functions over tolerance for tax evasion are statistically significant, meaning that the two subject pools differ significantly in the degree of tolerance for tax evasion. Combined K-S: D=0.1127; p-value=0.000.

[22] We would like to thank an anonymous referee for suggesting this alternative view of our data.

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In this section, we have shown that Danish subjects were *on average* significantly less tolerant of tax evasion than Italian subjects, although this difference disappeared at the tails of the distribution. In terms of average evasion rates, there was a significant difference between rounds and between countries, with Danish subjects evading more than Italian subjects. The simple descriptive statistics provide suggestive results. However, the link between attitudes and behavior needs to be fully examined by appropriate econometric techniques, as we show in the next section.

3.2. Determinants of evasion

Table 6 in the Appendix presents the regression analyses regarding the determinants of tax behavior; Table 8 describes the list of variables included in the analysis. In Table 6, models (1) and (2) show the estimates from pooled and panel DH basic models; models (3) and (4) add some complexities to the basic models by including interaction effects. Potential dependence for the repeated decisions made by participants (9 rounds) is controlled by including random effects at the individual level in the panel DH models.

For each regression model, results from estimating the first and second hurdle equations are shown in separate columns. Estimating the first hurdle reveals how the regressors affect the probability that a subject is identified as an evader. Estimating the second hurdle reveals how the regressors affect the amount of evasion, conditional on a subject being an evader. For a more informative economic interpretation of the effect size of each coefficient in the first hurdle, Table 6 also reports the marginal effects of the first-hurdle coefficients in italics. Thus, Table 6 shows both the significance level and effect size of each coefficient in the first and second hurdles.

The main econometric specification captured in Table 6 can be described as follows:[23]

$$ER_{ij} = \begin{cases} d^*_{ij}\, ER^{**}_{ij} & \text{if } d^*_{ij} > 0 \text{ and } ER^{**}_{ij} > 0 \\ 0 & \text{otherwise} \end{cases} \quad \text{observed evasion rate} \tag{6}$$

where ER_{ij} is the observed dependent variable, which is the evasion rate of subject i in round j. It is computed as 1 minus the reporting compliance rate, and ranges from 0 to 1. The latent variables d^*_{ij} and ER^{**}_{ij} are defined as following:

$$d^*_{ij} = x'_{ij}\ \gamma_1 + \mathbf{y}_i\, \gamma_2 + \mathbf{z}_i\, \gamma_3 + \ \varepsilon_{1,ij} \quad \text{first hurdle} \tag{7}$$

$$ER^{**}_{ij} = x'_{ij}\, \beta_1 + \ \mathbf{y}_i\, \beta_2 \ + \ \mathbf{z}_i\, \beta_3 + \ \alpha_i + \ \varepsilon_{2,ij} \quad \text{second hurdle} \tag{8}$$

where d^*_{ij} is a latent variable describing the individual binary decision to participate in evasion (first hurdle); ER^{**}_{ij} is a latent variable describing the individual decision on the level of tax evasion, for those who decided to evade in the first place (second hurdle); x'_{ij} is a vector of variables including the experimental treatments (*Tax Rate, Audit, Redistribution*) and the intercept. The regressor vector $\mathbf{y}_i$ includes individual-specific characteristics and other control variables; the regressor vector $\mathbf{z}_i$ includes interaction terms (only in models (3) and (4)).

Specifically, the explanatory variables are given by the dummy variable *Italy*, plus the following control variables: *Male* controls for gender; *Age* measures the age of the participant in years; *Education* is a discrete variable for the level of education (0 "junior high school;" 1 "high school;" 2 "bachelor's degree;" 3 "master's degree;" 4 "master;" 5 "Ph.D."); *No Previous Participation* is a dummy variable which takes into account whether the subject participated previously in experimental studies; *Rows* is a discrete variable which measures the number of rows correctly copied in each clerical task; *Pool Size* is the number of participants per session.

The regression model also includes the variables *Risk Aversion, Perception*, and *Tolerance of Tax Evasion. Risk Aversion* captures individuals' risk aversion, measured as the number of "Option A" choices in the risk aversion elicitation task. *Perception* is a discrete variable—ranging from 0 to 5—which measures individual beliefs about others' compliance choices. This is captured via a question asked of each participant in each experimental round: "In your opinion, how many participants in this room declared their true earnings for tax purposes?" The possible answers were: none (*Perception = 0*); less than half (*Perception = 1*); about half (*Perception = 2*); more than half (*Perception = 3*); almost everyone (*Perception = 4*); everyone (*Perception = 5*).

Tolerance of Tax Evasion is a discrete variable which proxies individual tax morale. This is measured via a question asked in the post-experimental questionnaire: "Can cheating on tax if you have the chance always be justified, never be justified, or something in between?" *Tolerance of Tax Evasion* ranges from 1 (never justified) to 10 (always justified).[24]

The pooled DH model (1) in Table 6 shows that the effects of tax rate and redistribution are statistically significant only in the first hurdle. Increasing the tax rate increases the probability of a subject being an evader by 21.6%, but has no impact on the level of evasion. Similarly, increasing redistribution of the tax-funded common pool reduces the probability of a subject evading tax by 6.8%, but has no effect on the amount of evasion. In other words, increasing redistribution makes subjects less likely to evade, but has no effect on subjects who do evade. Increasing audit probability has a negative and

[23] For a complete analytical description of the double hurdle econometric model, see Section 2.4.

[24] It can be argued that the wide scale 1 (never justified) to 10 (always justified) may be difficult to interpret for the responders. Given that Italians and Danes significantly differ at the extreme value of "never justified," we also conducted estimations in which the *Tolerance of Tax Evasion* variable takes the value 1 for a response that cheating on taxes is "never justified" and 0 otherwise. The main results remain robust.

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statistically significant in both the hurdles, with a greater impact on the first one. The effect size is remarkable: increasing the probability of being audited reduces the probability of a subject being an evader by 40.1%, which is almost twice the effect of increasing tax rates, and six times higher than the effect of increasing redistribution.

The effect of the dummy variable for Italy is negative and statistically significant in both hurdles, with a greater impact on the first one (the decision to evade). Italian subjects were less likely to evade tax than Danish subjects and, among those classified as evaders, Italians evaded by a lesser amount. Regarding effect size, Italians are 10.4% less likely to evade taxes than Danes.

More generally, we found that the amount of evasion decreases if subjects believed that the other subjects truthfully declared their income (see the variable *Perception* in Table 6). This is in line with previous survey-based research on the effect of perceived tax evasion by other citizens on individuals' tax morale (e.g. Torgler and Schneider, 2007).

More interestingly, we found that the (negative and statistically significant) impact of tax morale on actual evasion choices is relatively small in magnitude compared to that of perceived compliance by others and the experimental treatments. A one-unit change in the perception of others' compliance choices decreases the probability of tax evasion by 14.0%, against the 1.82% effect of a one-unit change in tax morale (see the variable *Tolerance of Tax Evasion* in Table 6). Moreover, the coefficient of *Tolerance of Tax Evasion* is not statistically significant in the second hurdle. This suggests that self-reported tax morale does not substantially predict actual tax behavior, if compared to the other explanatory variables.

In addition, the decision to evade was affected by risk aversion: the higher an individuals' risk aversion, the less likely s/he was to evade. Despite being statistically significant, this effect was relatively small in magnitude, if compared to other regressors such as perception about others' compliance choices. Indeed, a one-unit increase in individual risk aversion reduces the probability of tax evasion by 1.87%. Our finding here is similar to that of Cummings et al. (2009) from experiments in Botswana and South Africa. We also found that education level positively affects only the first hurdle, but not the second. This is partially consistent with Torgler et al. (2007), showing that higher education is positively correlated with tax evasion. Being male has a positive effect on both the probability and the level of evasion, whereas age has a negative and relatively small effect only on the first hurdle. With respect to the other individual characteristics, the gender effect is remarkable: being male increases the probability of tax evasion by 13.4%. This is in line with experimental findings on the role of gender in tax evasion choices (e.g., Bruner et al., 2017; D'Attoma et al., 2017).

All the regression models controlled for individual performance in the clerical task and subject pool size (see the variables *Rows* and *Pool Size*), but we found these variables had no impact on tax behavior. We also controlled for individuals' previous participation in experimental studies and found that subjects with no past experience in experiments were less likely to evade taxes; but among evaders, they evaded to a greater extent (see the variable *No Previous Participation*).

The estimates for the panel DH model (2) are almost similar to those from the pooled DH model (1), even if the effects are not always as sharp as in the pooled DH.[25] In particular, in the panel DH model (2) the coefficient of It*aly* is still negative in both hurdles, but no longer statistically significant. Similarly, in addition to being relatively small in magnitude, the coefficient of *Tolerance of Tax Evasion* is no longer statistically significant. The overall fit is slightly better in the panel DH model (2) than in the pooled DH model (1), as indicated by the values of σ_α and σ_ε.[26]

Models (3) and (4) show the estimates from additional regressions that add complexity to the DH models by considering the interaction terms *Perception*Italy* and *Tolerance of Tax Evasion*Italy*. In the pooled DH model (3), the coefficient of the dummy variable Italy is negative and statistically significant in the first hurdle. The dummy for *Italy* interacted with *Perception* shows a statistically significant coefficient positive in the first hurdle and negative in the second hurdle. This suggests that an increase in individual beliefs about others' compliance behavior had a smaller effect on evasion decisions for Italian subjects than for Danish subjects. In other words, interpersonal trust—measured as individuals' perception of compliance by others—had a greater negative effect on individual evasion choices among Danish subjects than Italians. This is consistent with survey-based studies revealing that Northern European countries show higher levels of interpersonal trust than Southern European countries, and this is related to their unwillingness to evade taxes.

The dummy for *Italy* interacted with *Tolerance of Tax Evasion* shows a positive coefficient, which is relatively small in magnitude, and statistically significant only in the first hurdle. This suggests that individual self-reported attitudes towards tax evasion do not substantially predict actual evasion choices.

The estimates for the panel DH model (4) are similar to those from the pooled DH model (3), although the coefficients of the interaction factors are not statistically significant. Possibly because of the difficulty in estimating the interaction effects given the size of the sample and the length of the panel,[27] the overall fit is better in the pooled DH model (4) than in the panel DH model (3), as indicated by the values of σ_α and σ_ε.

Finally, the positive and statistically significant constant terms in the first and second hurdles of the models in Table 6 confirm that Danish subjects were more likely to evade taxes at the baseline (i.e., with all the other explanatory

[25] The regressors in the first hurdle of the panel DH models do not include the variables *Tax Rate, Audit, Redistribution, Rows* and *Perception* because the panel DH regression model has only one outcome per subject.

[26] Residual analysis in the pooled DH model (1) shows the importance of individual-specific random effects α_i, which contributes to 50% of the total variance (or $\sigma_\alpha^2/(\sigma_\alpha^2+\sigma_\varepsilon^2)=0.5$). This measure slightly improves in the panel DH model (2), where individual-specific random effects contributes to 40% of the total variance.

[27] As in the panel DH basic model (2), the regressors in the first hurdle of the panel DH model (4) do not include the variables *Tax Rate, Audit, Redistribution, Rows* and *Perception* (because the panel DH regression model has only one outcome per subject).

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variables of this part of the model assumed to be zero); those who surpassed the first hurdle evaded a greater amount of taxes at the baseline.

Consistent across all the four DH models we tested is that self-reported attitudes towards tax evasion have a small, non-significant impact on actual evasion choices in most specifications, and Italians were less likely to evade taxes than Danes (although this effect is not statistically significant in the panel DH models). In contrast, the variables which *do* have a significant and substantial effect on individual evasion choices are the audit probability, tax rates and gender.

3.3. Robustness checks

Table 7 reports estimations from additional pooled and panel double-hurdle models, where we included the interaction terms *Risk Aversion*Italy* (in all models of *Table*), and *Male*Italy* (Models 7 and 8 of Table 7) as robustness checks. The main econometric specification captured in Table 7 can be described as in Eqs. (6), (7) and (8), with the only difference being that the regressor vector $\mathbf{z}_i$ includes the two additional interaction terms, i.e., *Risk Aversion*Italy* and *Male*Italy*. For the same reasons explained in Section 3.2, the overall fit is better in the pooled DH models than in the panel DH models, as shown by the values of σ_α and σ_ε.[28]

The result that Italian subjects were less likely to evade taxes than Danish subjects is robust: the coefficient for *Italy* remains statistically significant and negative in the first hurdles of the pooled DH models (5) and (7). Similar to the estimates in Table 6, the coefficient for *Italy* is not statistically significant in the panel DH models (6) and (8). In Table 7 we also report the average marginal changes in probability of evasion for each coefficient, in italics (i.e., the marginal effects of each regressor in the first hurdle). When controlling for both *Risk Aversion*Italy* and *Male*Italy*, we found that Italians were 34.4% less likely to evade taxes than Danes.

Also, the result that *Tolerance of Tax Evasion* does not predict evasion choices, but may oppose them, is robust. Indeed, the coefficient of *Tolerance of Tax Evasion* is not statistically significant, whereas the coefficient of the interaction term *Tolerance of Tax Evasion*Italy* is positive and statistically significant in the first hurdles of the pooled DH models (5) and (7). This confirms once again that individual self-reported attitudes towards tax evasion do not substantially predict actual evasion choices.

More interestingly, the interaction between *Risk Aversion* and *Italy* has a negative, statistically significant impact on evasion choices in the second hurdle of pooled DH models, but the effect is very small in magnitude (see Models 5 and 7 in Table 7). In addition, the coefficient for the variable *Risk Aversion* alone is no longer statistically significant. This is particularly relevant if compared to Cummings et al. (2009): since that study found no differences in the degree of risk aversion between Botswana and South Africa, the researchers argued that discrepancies in tax behavior were *only* driven by cultural differences.

In contrast, our findings foreground individual risk aversion and gender as key drivers of tax compliance. The interaction between *Male* and *Italy* is positive and significant in the first hurdle of the pooled DH model (7). This means that the gender effect in tax behavior is different between Italians and Danes: in the Italian sample, the fact of being male has a greater positive impact on tax evasion than in the Danish sample.

Finally, it is worth briefly reporting the results from the panel DH models, even if they do not fit the data as well as the pooled DH models. The coefficients for *Risk Aversion*Italy* are negative and weakly statistically significant (i.e., at 10% significance level) in the first hurdle of the panel DH models (6) and (8). The coefficient for *Male*Italy* (which is estimated only in the first hurdle equation because of convergence issues) is not statistically significant. These results are discussed in the next section.

4. Discussion and implications

This study contributes to a growing stream of research questioning long-held assumptions about attitude–behavior consistency in the realm of taxation (e.g., Halla, 2012). In fact, our regression analyses show that tax attitudes do not significantly predict tax behavior, and may actually oppose it. In comparing participants from Denmark and Italy, this study also contributes to an emerging literature challenging "culturalist" arguments about tax morale and compliance (e.g., Zhang et al., 2016). By showing that Danes are highly non-compliant as taxpayers, and that Italians are more compliant than Danes, this paper illustrates how misleading national stereotypes can be for both scholars and policy-makers (Andrighetto et al., 2016). Differences in tax behavior between the Italian and Danish samples are also driven by risk aversion (Italians are on average more risk averse than Danes) and gender (in the Italian sample, males are on average more likely to cheat on taxes than females).

Methodologically, the paper innovates in two ways. It provides the first experimental data on taxation gathered in Denmark, and sets it in cross-national comparison. Second, it contextualizes tax compliance (measured in the experimental rounds) with survey data on perceptions of *others*' compliance levels on both the extensive and intensive margins. In the following sections, we elaborate on the study's main results and policy implications, as well as the generalizability of our findings, and possible directions for future research.

[28] As in the panel DH basic models (2) and (4) in Table 6, the regressors in the first hurdle of the panel DH models (6) and (8) in Table 7 do not include the variables *Tax Rate, Audit, Redistribution, Rows* and *Perception* (because the panel DH regression model has only one outcome per subject).

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4.1. Implications for theory and practice

This study is positioned at a point of conflict between two streams of research literature. In answer to the question "are individuals' attitudes about paying taxes consistent with their behavior?" taxation research has posited continuity—e.g., that high tax morale drives high levels of tax compliance, and vice versa (Riahi-Belkaoui, 2004; Cummings et al., 2009; Halla, 2012). But this runs contrary to decades' worth of social scientific research indicating that in most contexts, attitude–behavior consistency is weak (LaPiere, 1934; Kutner et al., 1952; Deutscher, 1966; Liska, 1974). Why should we expect the empirical case of tax behavior to deviate from this long-standing pattern?

Our primary contribution to theory consists in examining this attitude–behavior linkage more closely, to see whether tax morale and tax compliance are related in the direction predicted by previous taxation research, or in the direction implied by the broader social science literature. Our results align with the latter, adding to an emerging stream of work that challenges long-standing assumptions in tax research (Barone and Mocetti, 2009; Casal and Mittone, 2016). Secondarily, our work calls into question the "culturalist" approach to taxation, joining a group of very recent studies that undermine national stereotypes that have historically classified Italians as cheaters (Andrighetto et al., 2016; Zhang et al., 2016; Alm et al., 2017; Ottone et al., 2018).

From a practical point of view, our findings are quite encouraging for policy-makers. They suggest that traditional tax enforcement measures—including audits—along with redistribution policies and perception of others' compliance rates, have the most significant effects on individuals deciding whether to fulfill their fiscal obligations to states. Coupled with other recent studies, particularly Kleven et al. (2011), the results of this study support continued investment in detecting and sanctioning tax evasion.

In addition, our results suggest that institutions shape tax behavior. Individuals are strongly influenced both by pure economic incentives (e.g., probability of being audited) and by their perceptions of others behavior. In our experiment, the background and institutions that subjects experience in the real world—and that are likely to affect their answers to the survey questions—do not affect their behavior in the tax experiment where the use of the money collected through taxes is totally transparent. Italians are known to have a lower level of trust in their institutions than Danes. For this reason, they may be more prone to justify evasion in the real world. However, when facing the same institutional environments, Italians are more likely to comply with their fiscal obligations than Danes. This is an encouraging signal for governments and policy makers: institutions matter and cross-country differences in tax compliance can be mitigated by providing more transparent and clear taxation contexts.[29]

Denmark, it seems, is not a special case of tax compliance culture that cannot be replicated elsewhere; nor is Italy a hopeless case. Kleven et al. (2011) found in a field experiment that Danes substantially evade their taxes when given the opportunity to do so; the study showed that what makes Denmark exceptional is not its culture or its tax morale, but the dominance of third-party reporting of income, which makes evasion nearly impossible. As for Italians, both Alm et al. (2017) and Zhang et al. (2016) found no differences between Italians, on the one hand, and American or British subjects on the other, in terms of propensity to evade tax in an experimental setting. This further supports the conclusion, implied by our own results, that policy instruments (such as redistribution and the probability of being audited) are far more significant in explaining Danes' and Italians' real-world patterns of tax compliance than culture or tax morale.

4.2. External validity and generalizability

With all laboratory experiments in social science, questions arise as to the validity of extrapolating findings to the real world.[30] Our research design sought to address these concerns. For example, to contend with the argument that lab settings are too artificial and abstract, our design included two features to make the tax evasion decision as realistic as possible. First, we used actual tax terminology and non-neutral terms to describe evasion. Second, we ensured that participants expended real effort in the experiment, and were rewarded with real money in return—as well as being fined in real money when they were caught evading tax. Thus, we created a reasonable proxy of real-world labor (Carpenter and Huet-Vaughn, 2017) and tax reporting (Doerrenberg and Duncan, 2014).

Some might question whether the stakes in the experiment were perceived by participants as being too small to elicit realistic responses. However, as Doerrenberg and Duncan (2014) have shown, many real-world evasion decisions made by individuals involve relatively small amounts of money. Moreover, the average payoffs in both Italy and Denmark were calibrated to approximate the average hourly wage for student employment in the local context. Specifically, the average earnings of EUR 10.64 in Bologna and DKK 191.80 in Copenhagen correspond to at least two full lunch meals in the student canteens respectively at the University of Bologna and Copenhagen University. So while those amounts might not be significant for some individuals, they were meaningful in the context of our sample.

In relation to the sample, size and representativeness might be a concern. But considered against other experimental research on tax evasion, the subject pool of 180 participants used in this study—106 from Italy and 74 from Denmark—is at or above average. For comparison: Coricelli et al. (2010) recruited 48 subjects at the Groupe d'Analyse et de Théorie

[29] For a similar argument, see also Pampel et al. (2018).

[30] Among others, see Doerrenberg and Duncan (2014) who offer a rebuttal of most concerns.

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Economique (GATE) in Lyon (France); Kogler et al. (2016) recruited 126 students at the Social Science Research Lab at the Faculty of Psychology at the University of Vienna; and Alm et al. (2017) recruited 170 subjects, of which 92 in the U.S. and 78 in Italy. Finally, concerns about the use of students as representatives of taxpayer behavior have been addressed in a stream of recent research showing that behavioral responses of students are largely the same as those of nonstudents in identical tax experiments (e.g. Doerrenberg and Duncan, 2014; Alm et al., 2015, 2017).

Some have raised questions about the validity of the post-experimental questionnaires, and the potential of responses to be influenced by participants' behavior in the preceding experiment. Specifically, the prediction is that individuals' questionnaire responses would be biased toward alignment with and moral justification of their evasion behavior in the experimental rounds (Halla, 2012). We find no evidence of this. In fact, we find that Italians, despite evading significantly less, were on average more tolerant of tax evasion than Danes. The regression results further show that tax morale does not significantly predict actual evasion choices. In other words, our findings are the reverse of what we would expect to find if participants regarded the post-experimental questionnaire as an opportunity to justify themselves in their own eyes. Thus, there is a basis for confidence that the questionnaire data are valid and not biased by being collected after the experiment.

Finally, some might argue that the "positive" result in the tax experiment for the Italian case is influenced by the fact that the experimental sessions were conducted in Bologna, which is known to be a region in Italy distinguished by high levels of social capital and tax morale (Putnam et al., 1994; Bigoni et al., 2016). But recent research on tax evasion in different areas of Italy suggests that this should not be a reason for concern in terms of evaluating the results of our study. For example, Andrighetto et al. (2016) conducted a tax experiment similar to ours in Rome, Bologna, and Milan; the findings show no significant differences in tax behaviours among those three cities. In particular, the difference in mean compliance between Bologna (BLESS lab) and Rome (LUISS lab) samples was 2.5% and not statistically significant. Moreover, D'Attoma (2018) conducted tax compliance experiments in Capua (a town close to Naples) and found no difference in tax compliance between subjects from the North and from the South. These findings suggest no reason to anticipate different results if we had conducted our experiments in other parts of Italy.

4.3. Directions for future research

Some unexpected findings and alternative interpretations of our results suggest directions for future research. For example, we were surprised to find that participants with no previous participation in experimental research showed a reduced propensity to become tax evaders; yet the magnitude of evasion was not affected by this variable. A second surprise was the finding that the size of our experimental groups had no impact on evasion—a result that contrasts with the group size effect identified in experiments on public goods (e.g. Isaac and Walker, 1988). These findings deserve further investigation, to strengthen experimental research on taxation and refine researcher control over contextual factors. In addition, the differences in actual tax evasion during the experiment may be due to different evaluations about when it is justifiable, or efficient, to evade taxes (e.g., Ottone et al., 2018). For example, with respect to Italians, Danes evade more when taxes are inefficient ("no redistribution" treatment) or when they are used for pure redistribution purposes ("redistribution" treatment). On the other hand, they evade less when taxes are used to finance a public good ("redistribution $\times$ 2" treatment). To test whether these decisions reflect intrinsic tax morale, it would be necessary to know from participants the reasons underlying their evasion choices. To this aim, it is crucial for future experimental studies to include post-experimental questions related to participants' decisions during the experiment.

Building on this point, an interesting direction for future studies would be to refine and test strategies for measuring attitudes towards tax evasion. Researchers could do this by comparing different scales of tax morale (e.g., alternatives to the 1–10 scale used in the EVS/WVS). For example, a 1–3 scale or even a binary choice may work better than a 1–10 scale: it may be less difficult to interpret by respondents and, in turn, more straightforward to analyze by researchers. An alternative would be to continue using a 1–10 scale, as in the EVS/WVS, but analyze tax morale *both* at the average and at the tails of the distribution, as we did for our descriptive statistics. Future research could also test the impact of having observers punish evasion—a topic of growing interest among norms researchers (e.g., Andrighetto et al., 2013). Finally, future experimental research could analyze whether and to what extent loss aversion—which is an important determinant of tax evasion (e.g., Dhami and al-Nowaihi, 2007), but mostly overlooked in tax experiments—influences evasion choices.[31]

Another promising avenue for future research would be to delve further into the implications of our experimental findings compared to those of Kleven et al.'s (2011) field experiment. Taken together, they suggest that even individuals from countries with vanishingly small rates of income tax evasion will evade to a great extent when given the opportunity. A valuable contribution to knowledge would lay in replicating such results in other countries with low tax evasion rates: conduct field and laboratory experiments providing opportunities to cheat, and see whether they are taken up as robustly as they were in Denmark. Other Scandinavian countries, such as Norway and Sweden, which have evasion rates of similarly small magnitude to Denmark's (e.g., Bäckman, 2008), would offer an obvious starting point.

An even more valuable contribution would be to apply such an experimental strategy to countries where evasion and self-employment (rather than third-party reporting of income) are more common, such as the US and Italy (Rubin, 2011). If our policy-centric hypothesis is correct, then increasing opportunities to cheat should work the same way in those en-

[31] We thank an anonymous referee for these suggestions.

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vironments as in Denmark. The lab experiment (coupled with a post-experimental questionnaire, as in this study) would establish a baseline of tax morale and compliance, while the field experiment would consist of interventions to verify income or increase perceived audit probability, as in Kleven et al. (2011). The objective would be to see whether the field interventions could "move the needle" on compliance, morale, or both. In addition to advancing scholarly knowledge, this would further validate the case for policy-based interpretations of tax behavior, as opposed to "culturalist" accounts.

Generally, taxation research would benefit from continued cross-national comparative research designed to tease apart the sources of tax compliance. Our study represents an important first step in moving away from assumptions about attitude–behavior consistency. We hope this will provide a foundation for future studies of the social bases for fiscal support of government, clarifying how states sustain themselves and garner cooperation from the governed.

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Appendix

Table 2
Risk attitude test (adapted from Holt and Laury, 2002).

Decision	Option A			Option B			EV(B) − EV(A)
	Pr. of winning 20 points	Pr. of winning 16 points	EV(A) (σ^2)	Pr. of winning 38.5 points	Pr. of winning 1 points	EV(B) (σ^2)	
1	10%	90%	16.4 (1.44)	10%	90%	4.75 (126.6)	−11.65
2	20%	80%	16.8 (2.56)	20%	80%	8.5 (225)	−8.3
3	30%	70%	17.2 (3.36)	30%	70%	12.25 (295.3)	−4.95
4	40%	60%	17.6 (3.84)	40%	60%	16 (337.5)	−1.6
5	50%	50%	18 (4)	50%	50%	19.75 (351.6)	1.75
6	60%	40%	18.4 (3.84)	60%	40%	23.5 (337.5)	5.1
7	70%	30%	18.8 (3.36)	70%	30%	27.25 (295.3)	8.45
8	80%	20%	19.2 (2.56)	80%	20%	31 (225)	11.8
9	90%	10%	19.6 (1.449)	90%	10%	34.75 (126.6)	15.15
10	100%	0%	20 (0)	100%	0%	38.5 (0)	18.5

Notes: Columns 4, 7, and 8 did not appear in the instructions handed out to participants. "Pr" is an abbreviation that stands for "Probability". "EV()" stands for expected value and "σ^2" is the variance of a specific lottery.

Table 3
Subject-pool characteristics, by country.

Characteristics	Denmark	Italy	Difference	p-value (H_0: difference = 0)
Male	0.649 (0.055)	0.462 (0.048)	0.186** (0.073)	0.013
Age (mean in years)	23.95 (0.552)	23.68 (0.332)	0.266 (0.609)	0.662
No previous participation (%)	0.162 (0.042)	0.255 (0.042)	−0.092 (0.060)	0.138
Rows	7.698 (0.079)	6.056 (0.048)	1.641*** (0.087)	0.000
Risk aversion	5.054 (0.204)	5.585 (0.143)	−0.530** (0.241)	0.029
Perception	3.352 (0.057)	3.552 (0.044)	−0.199*** (0.071)	0.005
Tolerance of tax evasion	3.135 (0.073)	3.320 (0.063)	−0.185* (0.097)	0.057
Pool size	10.040 (0.378)	23.132 (0.213)	−13.091*** (0.406)	0.000
Education level				
• High school	0.635 (0.055)	0.557 (0.048)	0.078 (0.073)	0.292
• Bachelor's degree (3-year degree)	0.324 (0.054)	0.274 (0.043)	0.050 (0.069)	0.462
• Postgraduate master's degree (5-year degree)	0.41 (0.022)	0.142 (0.033)	−0.100** (0.040)	0.026
• Master's degree (6-year degree)	0.00 (0.00)	0.19 (0.013)	−0.019 (0.013)	0.234
• PhD (7-year degree or more)	0.00 (0.00)	0.09 (0.009)	−0.009 (0.009)	0.402
Observations	74	106		

Notes: Mean coefficients and proportions are reported for each subject characteristic and for each country. "Difference" refers to difference in means (for continuous variables) and proportions (for dummy variables). *, **, and *** indicates that the corresponding p-value is less than 10%, 5%, and 1%, respectively. We tested for differences in subject characteristics between the Danish and Italian samples by using tests (tests on the equality of means) for continuous variables and pr tests (tests on the equality of proportions) for dummy variables. Standard errors are in parenthesis. Observations indicates the number of observations in the subject pools.

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Table 4
Summary statistics of evasion rates and Wilcoxon rank sum test, by country and round.

Stage	Round	Pooled (%)	Denmark (%)	Italy (%)	Difference DK−IT (%)	Non-parametric test Wilcoxon rank sum test	
						z-statistics	p-value
1	No redistribution	58.85	71.65	49.92	21.73	3.435	0.0006
		(43.10)	(39.78)	(43.24)	(6.340)		
	Redistribution	46.24	58.35	37.79	20.55	3.157	0.0016
		(44.82)	(44.03)	(43.60)	(6.63)		
	Redistribution × 2	25.21	28.68	22.78	5.89	0.628	0.5301
		(39.66)	(41.96)	(37.98)	(6.00)		
2	Tax rate 5%	33.53	40.96	28.34	12.62	1.715	0.0864
		(44.24)	(48.07)	(40.79)	(6.65)		
	Tax rate 30%	52.82	67.04	42.89	24.15	3.765	0.0002
		(44.05)	(42.21)	(42.74)	(6.44)		
	Tax rate 50%	54.14	64.26	47.08	17.18	2.723	0.0065
		(44.60)	(42.37)	(44.95)	(6.65)		
3	Audit prob 5%	50.73	64.29	41.26	23.02	3.434	0.0006
		(45.52)	(44.88)	(43.72)	(6.69)		
	Audit prob 30%	19.24	23.61	16.20	7.41	1.489	0.1364
		(33.98)	(35.92)	(32.37)	(5.13)		
	Audit prob 50%	8.783	5.454	11.11	−5.65	−1.035	0.3006
		(26.14)	(19.67)	(29.71)	(3.94)		
Average		38.83	47.14	33.04	14.10	6.245	0.000
		44.33	1.78	1.36	(2.21)		
Observations		180	74	106			

Notes: Mean and standard deviations in bracket of evasion rates in percentage by country and round. The column "p-value" reports the p-value of the non-parametric Wilcoxon rank-sum test for differences in evasion rates (H_0: no differences) between the two subject pools, for each round (i.e., for each tax-treatment). Observations indicates the number of observations in the subject pools.

Table 5
Pairwise comparisons of multiple tax-treatments, pooled across countries.

Pairwise comparisons	DI (%)	*p*-values				
		Unadjusted	Multiplicity adjusted			
		List et al. (2016, Remark 3.1)	List et al. (2016, Theorem 3.1)	List et al. (2016, Remark 3.7)	Bonferroni (1935)	Holm (1979)
No redistribution vs redistribution	12.608	0.010	0.010	0.010	0.031	0.010
No redistribution vs redistribution × 2	33.641	0.000	0.000	0.000	0.001	0.001
Redistribution vs redistribution × 2	21.033	0.000	0.000	0.000	0.001	0.000
Tax rate 5% vs tax rate 30%	19.292	0.000	0.000	0.000	0.001	0.001
Tax rate 5% vs tax rate 50%	20.617	0.000	0.000	0.000	0.001	0.000
Tax rate 30% vs tax rate 50%	1.325	0.776	0.776	0.776	1	0.776
Audit prob 5% vs audit prob 30%	31.482	0.000	0.000	0.000	0.001	0.001
Audit prob 5% vs audit prob 50%	41.943	0.000	0.000	0.000	0.001	0.000
Audit prob 30% vs audit prob 50%	10.461	0.000	0.000	0.000	0.002	0.000

Notes: For each of the nine pairwise comparisons among the treatments, Table 5 displays the following five quantities: column 2 displays the difference in evasion rates (in percentage terms) between the treatments ("DI (%)"); column 3 displays a (multiplicity-unadjusted) *p*-value computed using List et al.'s (2016) Remark 3.1 for comparison purposes; column 4 displays a (multiplicity-adjusted) *p*-value computed using List et al.'s (2016) Theorem 3.1; column 5 displays a (multiplicity-adjusted) *p*-value computed using List et al.'s (2016) Remark 3.7; column 6 displays a (multiplicity-adjusted) *p*-value obtained by applying Bonferroni's (1935) adjustment to the *p*-values in column 3; column 7 displays a (multiplicity-adjusted) *p*-value obtained by applying Holm's (1979) adjustment to the *p*-values in column 3. Data are pooled across countries. Similar results hold when considering each country individually.

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Table 6
Determinants of evasion.

Variables	Model (1), pooled DH		Model (2), panel DH with random effects		Model (3), pooled DH		Model (4), panel DH with random effects	
	1st hurdle	2nd hurdle	1st hurdle	2nd hurdle	1st hurdle	2nd hurdle	1st hurdle	2nd hurdle
Italy	−0.403* *−0.104*	−0.093*	−1.090 *−0.197*	−0.082	−1.270*** *−0.325*	−0.012	−0.988 *−0.175*	−0.196
	(0.211)	(0.052)	(0.832)	(0.167)	(0.322)	(0.075)	(0.960)	(0.198)
Tax rate	0.838** *0.216*	0.028		0.386***	0.816** 0.209	0.033		0.385***
	(0.341)	(0.090)		(0.107)	(0.342)	(0.090)		(0.107)
Audit	−1.557*** *−0.401*	−0.227**		−0.958***	−1.577*** *−0.403*	−0.217**		−0.958***
	(0.294)	(0.109)		(0.113)	(0.296)	(0.110)		(0.113)
Redistribution	−0.264*** *−0.068*	−0.006		−0.111***	−0.263*** *−0.067*	−0.006		−0.111***
	(0.082)	(0.020)		(0.026)	(0.083)	(0.020)		(0.026)
Male	0.519*** *0.134*	0.160***	0.801** *0.145*	0.194***	0.474*** *0.121*	0.166***	0.786** *0.140*	0.191***
	(0.079)	(0.021)	(0.319)	(0.063)	(0.081)	(0.021)	(0.315)	(0.063)
Age	−0.042*** *−0.010*	−0.004	−0.076* *−0.014*	−0.003	−0.043*** *−0.011*	−0.004	−0.075* *−0.013*	−0.004
	(0.012)	(0.003)	(0.040)	(0.009)	(0.012)	(0.003)	(0.040)	(0.009)
Education	0.243*** *0.062*	0.023	0.681*** *0.123*	0.023	0.236*** *0.060*	0.025*	0.655** *0.116*	0.030
	(0.061)	(0.015)	(0.253)	(0.050)	(0.061)	(0.015)	(0.255)	(0.047)
No previous participation	−0.259*** *−0.067*	−0.008	−1.186*** *−0.214*	0.143*	−0.262*** *−0.067*	−0.007	−1.221*** *−0.217*	0.156**
	(0.094)	(0.028)	(0.318)	(0.078)	(0.094)	(0.029)	(0.315)	(0.078)
Rows	−0.014 *−0.004*	−0.001		−0.003	−0.013 *−0.003*	−0.001		−0.002
	(0.023)	(0.005)		(0.011)	(0.024)	(0.005)		(0.011)
Risk aversion	−0.073*** *−0.019*	−0.012**	−0.196* *−0.035*	−0.022	−0.069*** *−0.018*	−0.011*	−0.188* *−0.033*	−0.022
	(0.025)	(0.006)	(0.102)	(0.020)	(0.025)	(0.006)	(0.102)	(0.020)
Perception	−0.543*** *−0.140*	−0.058***		−0.245***	−0.657*** *−0.168*	−0.040***		−0.249***
	(0.034)	(0.010)		(0.014)	(0.053)	(0.014)		(0.017)
Tolerance of tax evasion	0.071*** *0.018*	0.003	0.061 *0.011*	0.007	0.019 *0.005*	0.003	0.146 *0.026*	−0.016
	(0.019)	(0.005)	(0.099)	(0.014)	(0.033)	(0.008)	(0.236)	(0.022)
Pool size	0.007 *0.002*	0.003	0.035 *0.006*	0.003	0.003 *0.001*	0.003	0.041 *0.007*	0.002
	(0.015)	(0.004)	(0.058)	(0.011)	(0.015)	(0.004)	(0.059)	(0.011)
Tolerance of tax evasion*Italy					0.081* *0.021*	0.002	−0.078 *−0.014*	0.036
					(0.042)	(0.011)	(0.251)	(0.030)
Perception*Italy					0.189*** *0.048*	−0.036**		0.006
					(0.065)	(0.018)		(0.022)
Constant	2.841***	0.963***	2.756**	1.263***	3.495***	0.907***	2.476*	1.343***
	(0.420)	(0.098)	(1.301)	(0.246)	(0.469)	(0.106)	(1.467)	(0.253)
σ_α		0.267***		0.309***		0.266		0.307***
		(0.007)		(0.023)		(0.007)		(0.022)
σ_ε		0.267***		0.374***		0.266		0.374***
		(0.007)		(0.011)		(0.007)		(0.010)
Transformed ρ				−0.164				−0.185
				(0.378)				(0.369)
χ^2	673.873	163.688	43.370	881.326	677.257	166.971	48.399	885.976
(Prob > χ^2)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
χ^2 overall	694.657		883.060		698.576		889.368	
(Prob > χ^2)	(0.000)		(0.000)		(0.000)		(0.000)	
Log likelihood	−808.128		−803.723		−799.500		−802.984	
Num. obs.	1620		1620		1620		1620	
Num. groups	NA		180		NA		180	

Standard errors are in parentheses and the marginal effects of the coefficients in the 1st hurdles are in italics; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Table 7
Robustness checks.

Variables	Model (5), pooled DH		Model (6), panel DH with random effects		Model (7), pooled DH		Model (8), panel DH with random effects	
	1st hurdle	2nd hurdle	1st hurdle	2nd hurdle	1st hurdle	2nd hurdle	1st hurdle	2nd hurdle
Italy	-0.974**	0.139	1.512 *0.255*	-0.241	-1.355***	0.191*	1.507 *0.254*	-0.241
	−0.249				*−0.344*			
	(0.430)	(0.097)	(1.672)	(0.281)	(0.450)	(0.107)	(1.720)	(0.281)
Tax rate	0.819**	0.042		0.384***	0.801**	0.049		0.384***
	0.209				*0.203*			
	(0.343)	(0.090)		(0.107)	(0.344)	(0.090)		(0.107)
Audit	-1.582***	-0.239**		-0.957***	-1.517***	-0.248**		-0.957***
	−0.405				*−0.385*			
	(0.296)	(0.110)		(0.113)	(0.297)	(0.110)		(0.113)
Redistribution	-0.265***	-0.007		-0.111***	-0.251***	-0.008		-0.111***
	−0.068				*−0.064*			
	(0.083)	(0.020)		(0.026)	(0.083)	(0.020)		(0.026)
Male	0.476***	0.170***	0.781**	0.188***	0.154 *0.039*	0.201***	0.775 *0.131*	0.188***
	0.122		*0.132*					
	(0.081)	(0.021)	(0.316)	(0.062)	(0.134)	(0.034)	(0.576)	(0.062)
Age	-0.045***	-0.005*	-0.101**	-0.003	-0.042***	-0.006*	-0.101**	-0.003
	−0.011		*−0.017*		*−0.011*		*−0.017*	
	(0.012)	(0.003)	(0.044)	(0.009)	(0.012)	(0.003)	(0.045)	(0.009)
Education	0.240***	0.028*	0.740***	0.028	0.237***	0.029*	0.740***	0.028
	0.061		*0.125*		*0.060*		*0.125*	
	(0.062)	(0.015)	(0.267)	(0.048)	(0.062)	(0.015)	(0.270)	(0.048)
No previous participation	-0.272***	-0.013	-1.331***	0.160**	-0.254***	-0.016	-1.331***	0.160**
	−0.065		*−0.225*		*−0.064*		*−0.225*	
	(0.094)	(0.029)	(0.326)	(0.077)	(0.095)	(0.029)	(0.327)	(0.077)
Rows	-0.011	-0.000		-0.002	-0.014	-0.001		-0.002
	−0.003				*−0.003*			
	(0.024)	(0.005)		(0.011)	(0.024)	(0.005)		(0.011)
Risk aversion	-0.039	0.002	0.117 *0.012*	-0.029	-0.048	0.004	0.117 *0.020*	-0.029
	−0.010				*−0.012*			
	(0.038)	(0.008)	(0.192)	(0.026)	(0.038)	(0.008)	(0.192)	(0.026)
Perception	-0.657***	-0.038***		-0.250***	-0.682***	-0.034**		-0.250***
	−0.168				*−0.173*			
	(0.053)	(0.014)		(0.017)	(0.055)	(0.014)		(0.017)
Tolerance of tax evasion	0.016 *0.004*	0.003	0.245 *0.041*	-0.019	0.012 *0.003*	0.003	0.245 *0.041*	-0.019
	(0.034)	(0.008)	(0.215)	(0.021)	(0.033)	(0.008)	(0.216)	(0.021)
Pool size	0.001 *0.000*	0.003	0.035 *0.006*	0.001	0.002 *0.000*	0.003	0.035 *0.006*	0.001
	(0.015)	(0.004)	(0.060)	(0.011)	(0.015)	(0.004)	(0.060)	(0.011)
Tolerance of tax evasion*Italy	0.082**	0.000	-0.189	0.038	0.083**	-0.000	-0.189	0.038
	0.021		*−0.032*		*0.021*		*−0.032*	
	(0.042)	(0.011)	(0.233)	(0.030)	(0.041)	(0.011)	(0.234)	(0.030)
Perception*Italy	0.191***	-0.030*		0.007	0.205***	-0.033*		0.007
	0.049				*0.052*			
	(0.065)	(0.018)		(0.022)	(0.066)	(0.018)		(0.022)
Risk aversion*Italy	-0.052	-0.030**	-0.410*	0.010	-0.043	-0.031**	-0.410*	0.010
	−0.0133		*−0.069*		*−0.012*		*−0.069*	
	(0.050)	(0.012)	(0.229)	(0.036)	(0.051)	(0.012)	(0.229)	(0.036)
Male*Italy					0.498***	-0.051	0.008	
					0.126			
					(0.164)	(0.043)	(0.657)	
Constant	3.394***	0.856***	1.282	1.374***	3.663***	0.827***	1.284	1.374***
	(0.478)	(0.107)	(1.462)	(0.256)	(0.489)	(0.110)	(1.470)	(0.256)
σ_α		0.266***		0.308***		0.265***		0.308***
		(0.007)		(0.022)		(0.007)		(0.022)
σ_ε		0.266***		0.374***		0.265***		0.374***
		(0.007)		(0.011)		(0.007)		(0.011)
Transformed ρ				-0.235				-0.235
				(0.309)				(0.310)
χ^2	685.946	173.701	52.701	891.165	691.518	175.953	52.730	888.164
(Prob > χ^2)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
χ^2 overall	707.332		895.796		713.843		895.847	
(Prob > χ^2)	(0.000)		(0.000)		(0.000)		(0.000)	
Log likelihood	-796.001		-801.425		-790.735		-801.425	
Num. obs.	1620		1620		1620		1620	
Num. groups	NA		180		NA		180	

Standard errors are in parentheses and the marginal effects of the coefficients in the 1st hurdles are in italics; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Table 8
List of variables.

Variables	Description	Value labels
Dependent variable		
ER	Evasion rate = 1 – reporting compliance rate, where the latter is the ratio of declared income to earned income.	[0, 1]
Independent variables		
Italy	Country of origin	1 if Italy, 0 if Denmark
Tax rate	Tax rate	{0.05, 0.3, 0.5}
Audit	Probability of being audited	{0.05, 0.3, 0.5}
Redistribution	Redistribution of taxes paid by participants	{0, 1, 2}
Male	Gender	1 if male, 0 if female
Age	Age	positive integer discrete, [0, 5]:
Education	Level of education	0 = junior high school 1 = high school 2 = Bachelor's degree 3 = Master's degree 4 = Master 5 = Ph.D.
No previous participation	No previous participation in experimental studies	1 if no previous participation, 0 otherwise
Rows	Number of rows correctly copied in each clerical task	discrete
Risk aversion	Individual degree of risk aversion, measured as the total number of "Option A" choices in the post-experimental risk elicitation task.	discrete, [0, 10]
Perception	Individual belief about others' compliance choices, measured in each round via the following question: "In your opinion, how many participants in this room declared their true earnings for tax purposes?"	discrete, [0,5]: 0 = none; 1 = less than a half; 2 = about a half; 3 = more than a half; 4 = almost everyone; 5 = everyone
Tolerance of tax evasion	Self-reported attitude towards tax evasion, measured in the post-experimental questionnaire via the following question: "Can cheating on tax if you have the chance always be justified, never be justified, or something in between?"	discrete, [1 (never be justified), 10 (always be justified)]
Pool size	Number of participants per session	Discrete

Table 9
Summary statistics of tolerance of tax evasion; European Values Survey (1999/2000).

Tolerance of tax evasion	Denmark		Italy	
	No.	%	No.	%
Never justifiable (1)	667	65.6	1,114	56.6
2	94	9.2	243	12.4
3	99	9.7	185	9.4
4	38	3.7	99	5.0
5	63	6.2	133	6.8
6	21	2.1	59	3.0
7	8	0.8	40	2.0
8	15	1.5	34	1.7
9	2	0.2	17	0.9
Always justifiable (10)	10	1.0	43	2.2
Total	1,017	100.0	1,967	100.0

Source: Data from European Values Study 1981–2008, Longitudinal data file. GESIS Data Archive, Cologne, ZA4804 data file Version 2.0.0, doi:10.4232/1.11005.
Notes: The variable "Tolerance of tax evasion" is measured via the following survey question: "Can cheating on tax if you have the chance always be justified, never be justified, or something in between?". The responses are used to produce a 10-point scale index of tax morale, with the extreme values "never justifiable" (1) and "always justifiable" (10).

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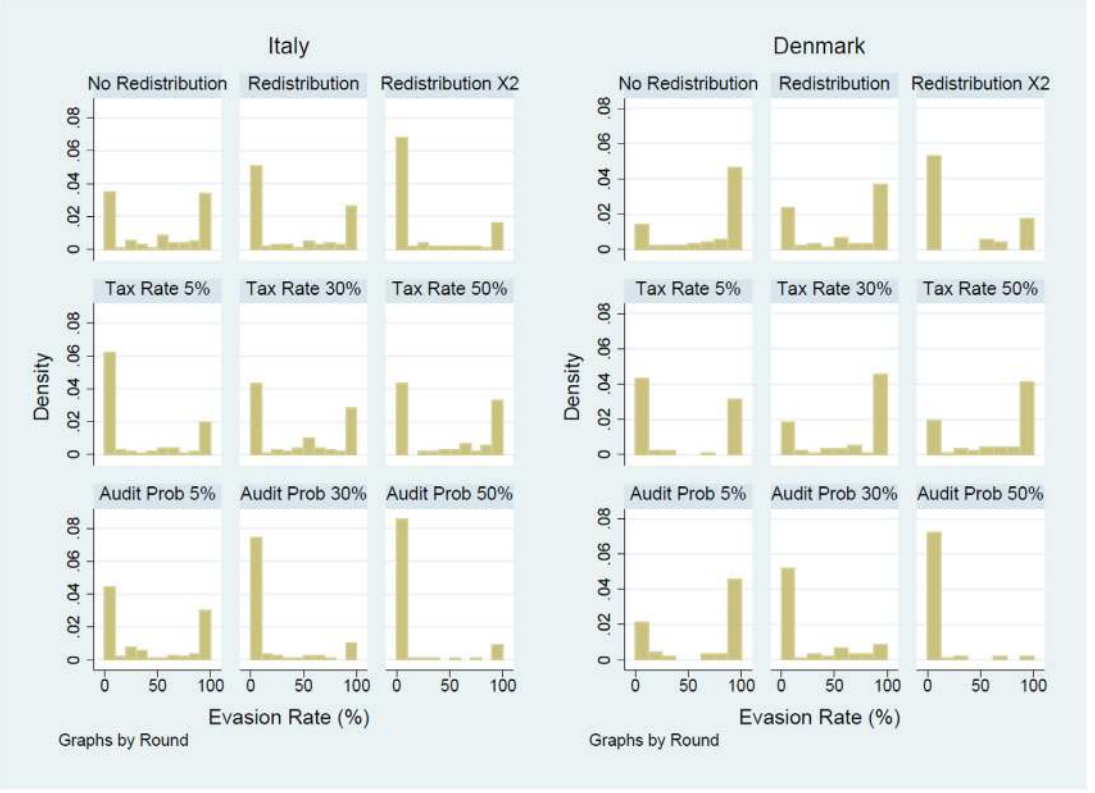

Fig. 1. Distribution of evasion rates, by country and rounds.

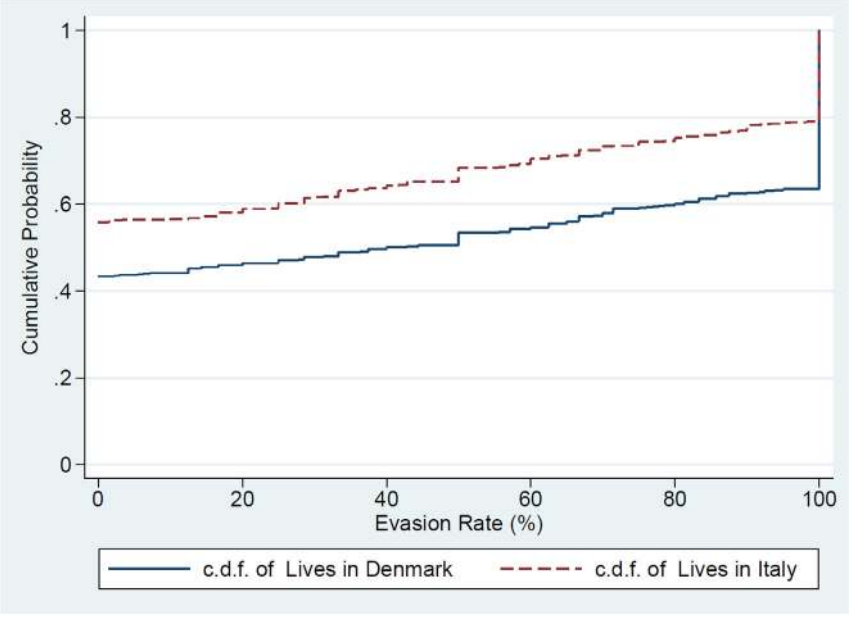

Fig. 2. Cumulative distributions of evasion rate, by country.

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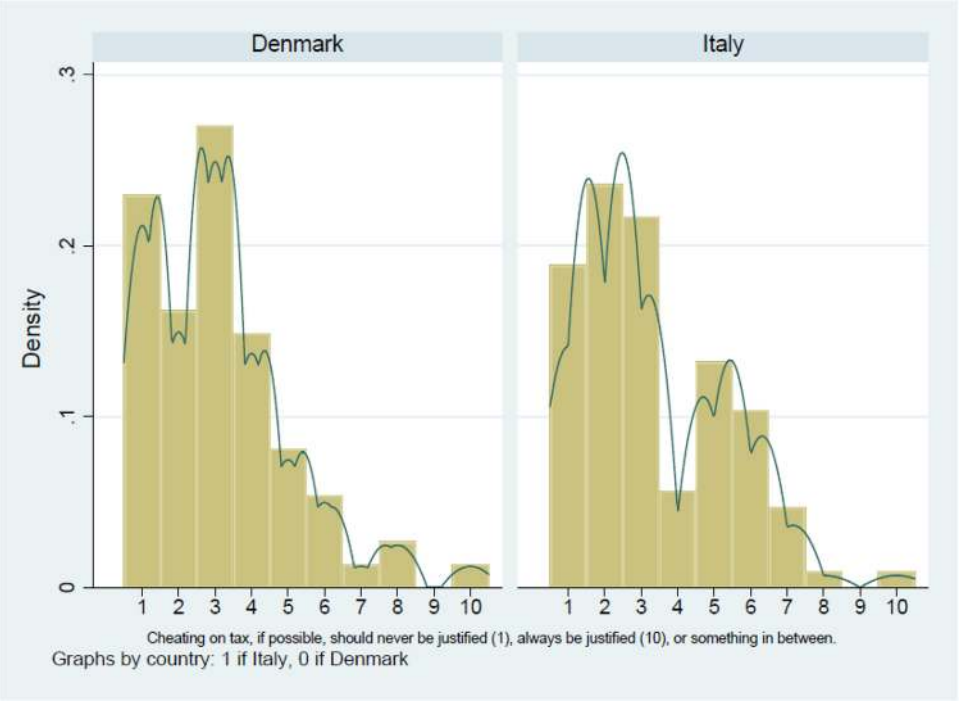

Tolerance of Tax Evasion	Denmark		Italy	
	No.	%		
never justifiable (1)	17	23.0	20	18.9
2	12	16.2	25	23.6
3	20	27.0	23	21.7
4	11	14.9	6	5.7
5	6	8.1	14	13.2
6	4	5.4	11	10.4
7	1	1.4	5	4.7
8	2	2.7	1	0.9
9	0	0.0	0	0.0
always justifiable (10)	1	1.4	1	0.9
Total	74	100.0	106	100.0

Fig. 3. Tolerance of tax evasion, by country.
Notes: The values of the variable "Tolerance of tax evasion" plotted in the histogram are also reported in the following table:

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Supplementary materials

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