Consumers as VAT "evaders"

Incidence, social bias, and correlates in Colombia[*]

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Abstract

Tax evasion lies at the core of the relationship between citizens and the state: it reflects the level of trust in the state and compliance with society's implicit 'social contract.' However, empirically analyzing it is challenging, particularly because there are few direct and reliable measures. We conduct list experiments on a large sample of households to estimate how frequently consumers are willing to be complicit in value-added tax (VAT) evasion, as well as the extent of social desirability bias in respondent answers. Around 20% of respondents agree to make purchases without a receipt in order to avoid paying VAT; surprisingly, they are not ashamed to admit this openly. Evasion is more prevalent in places with more informality and less physical presence of the state, as well as among poorer, less-educated individuals, and those who disregard the rule of law.

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1 Introduction

This paper examines tax evasion, a phenomenon that is key to understanding the nature of the state and democratic institutions. Tax evasion not only refers to a specific type of crime. Decisions about whether or not to pay taxes are also influenced by levels of general trust in the state and compliance with society's implicit 'social contract': citizens pay taxes, and the state in turn delivers public goods. A long tradition in the social sciences also relates state capacity to the development of an effective tax capacity.[1] The incidence of tax evasion thus captures the state's ability to enforce collection and mobilize resources, as well as citizens' level of resistance against the state. In other words, it is related to the state's *consensual strength* (Acemoglu, 2005). Consensually strong states do not simply have *power*, as many dictatorships might. They have *legitimate power*, because their actions address citizens' needs and demands.

Despite its importance, examining tax evasion empirically is challenging. Given the nature of the behavior, measures are often noisy, too aggregate, or simply unavailable. Survey questions may also fail to elicit honest answers from respondents. To address these concerns, we apply list experiments to a large sample of households to measure consumer participation in value-added tax (VAT) evasion. Our data is drawn from the 2013 round of the *Encuesta Longitudinal Colombiana de la Universidad de los Andes (Elca)* (Bernal et al., 2014), the first large-scale household panel survey in Colombia, with roughly 10,000 households that are representative of urban Colombia and five rural macro regions.

The study has three main objectives. First, we estimate consumer participation in VAT evasion while avoiding possible biases in citizen responses. Our list experiments do not directly ask respondents whether they evade taxes. Instead, we randomly assign part of our sample to a treatment group of consumers that is asked about the *number* of activities in which they regularly engage to save money, from a list that includes accepting a sale without a receipt to evade VAT. A control group is given a similar prompt and list, except that evasion is not one of the alternatives. Since respondents are randomly assigned, the gap in the number of actions reported by each group estimates the proportion that prefers transactions without a receipt to evade VAT. We find that nearly one in five people engage regularly in this practice.

We pursue our second objective by *directly* asking a (randomly) selected sample of our respondents a similar question, and comparing the resulting incidence

[1] See Besley and Persson (2009) for a discussion.

with that from the list experiments. The difference between these two sets of responses measures the extent of social desirability bias, which reflects how willing respondents are to admit to engaging in the sensitive behavior when asked directly as opposed to indirectly. Surprisingly, our sample shows no significant social desirability bias. Since this type of bias is plausibly non-random (Gonzalez-Ocantos, de Jonge, Meléndez, Osorio, & Nickerson, 2012), we also verify that the absence of bias holds overall as well as across a number of individual characteristics. We can thus confidently use answers to direct questions to examine evasion.[2]

Our third objective is to analyze the resulting correlates for tax evasion, guided both by the existing literature and a simple conceptual framework that helps organize our discussion. Whereas previous studies have focused on firms as the key actor in decisions about whether to participate in VAT evasion (since firms are responsible for VAT reporting) we examine *consumers'* decisions. We discuss how consumers weigh the moral and psychological costs of VAT evasion (and other benefits of a formal transaction with a paper trail that facilitates VAT enforcement) against the potential price discounts of agreeing to an informal transaction. The parameters that influence this cost–benefit balance shape consumer decisions. But consumer behavior is one aspect of achieving equilibrium in a game in which other characteristics also matter, such as firms' motivations. This influences our interpretation of the results when using consumer responses to examine some of the key covariates of this phenomenon. For example, a correlation with low state presence could indicate low consumer tax "morale," but it could also be the result of weak enforcement.

Our findings indicate that individuals with less favorable views about the rule of law (those who believe that bribing, resorting to violence, or taking justice into their own hands may be justified, as well as those who feel that it may be acceptable for authorities to violate the law in order to capture criminals) engage more in VAT evasion. Some of these correlations, in particular acquiescing to bribery, correspond to those found in the literature on "tax morale," which emphasizes the costs of tax evasion beyond strict economic cost–benefit calculations. Negatively

[2] We recognize, however, that our questions cannot measure *actual* behavior when asked either directly or indirectly. They refer to respondents' *stated* behavior and must therefore be interpreted with caution, particularly when making comparisons to evasion estimates that depend on equilibrium actual behavior. That said, since we find no difference between consumer responses to direct questions and the list experiment, this suggests that consumers have no reservations about telling the truth. This finding also makes it more likely that any deviation from the actual incidence reflects errors (for example, from imperfect recall) rather than systematic attempts to misguide the surveyor.

reciprocal citizens (those who like to seek revenge on others for wrongdoings) also evade taxes more frequently, perhaps because they respond to an inefficient state by not paying taxes; interestingly, we find no correlation with positively reciprocal individuals (those wanting to return favors to others).

Multiple dimensions of individual wealth and income – including household assets or land ownership, higher levels of education, the per capita value of household expenditures, and not being affected by negative economic shocks – are correlated with lower levels of VAT evasion. We also find an independent negative correlation between VAT evasion and the average size and extent of formality of local businesses. We find that residents of areas with a more visible state presence are less likely to avoid paying taxes; evasion is more likely where levels of guerrilla activity have been high (since they are plausibly beyond the state's control). Likewise, belief in democracy (measured as defending elections as the preferred means of selecting political leaders) is negatively correlated with tax evasion. Finally, beliefs about how actively the government should be involved in individuals' lives (i.e., in maintaining individuals' welfare and combatting inequality) were not linked to opinions about tax evasion.

These empirical patterns shed some light on the likely motives underlying VAT evasion, which is important for three main reasons. First, many countries have introduced the VAT in recent decades, and it is often hailed for its positive impact on fiscal revenue (see, for example, Keen and Lockwood (2010)). Particularly in countries with prevailing poverty, high levels of income inequality, and weak tax administration, indirect taxation (and VAT in particular) is an important source of revenue (De Jantscher, 1986; Besley & Persson, 2014).

Second, while VAT was often introduced partly to cope with evasion and administrative difficulties, evasion of this tax is widespread. We estimate that in Colombia, nearly one out of every five people regularly avoids paying VAT when purchasing goods. Although calculated using a different methodology, this share of VAT evaders is roughly in line with estimates of the amount of tax evaded in Colombia, at somewhat more than 20% of potential collection.[3] While the extent of VAT evasion varies around the world, figures for other countries are similarly significant. In Latin America, it is typically widespread, with estimates reaching

[3] Avila and Cruz (2007) show that VAT evasion declined from 31.8% in 1998 to 23.5% in 2006. Parra and Patiño (2010) report a figure of 20% for 2008, which is roughly in line with Corbacho, Fretes, and Lora (2013), who estimate it slightly below 25% in 2008 and slightly above 25% in 2010. These numbers are similar to the roughly 20% of evaders that we find. Of course the comparison with our figures is just suggestive, not only given our remark in footnote 2 above, but also because if evaders engage in unusually large (or small) transactions, the share of evaders will not directly coincide with the share of lost revenue.

21.2% in Argentina in 2006, 11.0% in Chile in 2005, and 20% in Mexico in 2006 (Gómez-Sabaini & Jiménez, 2011).

Third, VAT has been said to facilitate enforcement by creating a third-party reported paper trail on transactions between firms. Sales made to final consumers are therefore the "Achilles heel" of VAT enforcement (Slemrod, 2007), since these customers do not need a receipt to deduct input costs from their VAT bill. Pomeranz (2015)'s field experiment involving Chilean firms found that VAT evasion is most common in final sales.[4] Naritomi (2016) studies the role of consumers as whistleblowers of firm's final sales transactions in Brazil, in exchange for monetary rewards as part of an anti-tax evasion program.[5] Our analysis focuses on this key last step – consumer decisions to avoid paying VAT beyond their potential role as "tax auditors." Understanding this decision more broadly is relevant both directly, since not all countries provide this type of consumer incentive, as well as indirectly because the nature of underlying consumer motivations to pay VAT will influence the effectiveness of this kind of anti-evasion program. Consistent with a large literature on behavioral economics showing that economic incentives may crowd out social preferences (Bowles & Polania-Reyes, 2012), Fabbri and Wilks (2016) find that in Portugal, monetary incentives crowd out some citizens' willingness to engage in voluntary third-party enforcement. Our finding that several variables likely capturing individual's feelings of civic duty are robustly associated with a decision to evade taxes thus resonates with Fabbri and Wilks (2016)'s conclusion that these policies may be less effective over the long run, as they may displace social norms of tax compliance.

More generally, our dataset and method helps move the evasion literature forward. As Slemrod and Yitzhaki (2002, p. 1440) explain, citing Harvey Galper, "Regression analysis of tax evasion is straightforward, except for two problems: you can't measure the left-hand side variable, and you can't measure the right-hand side variables!" Researchers thus have to creatively devise unavoidably imperfect strategies to measure tax evasion. While our method is not without limitations, it complements existing approaches.

Much of the literature on the hidden economy (and particularly tax evasion) uses a macro approach that compares actual and potential revenue to determine the overall extent of evasion (Gemmell & Hasseldine, 2012).[6] These comparisons

[4] Letters indicating an increased audit probability generated an increase in VAT payments, but this effect was much weaker on transactions between firms, where the paper trail is present, than on sales to final consumers, where there is no VAT paper trail.

[5] Marchese (2009), Arbex and Mattos (2014), and Fabbri (2015) theoretically examine these types of incentives to promote the role of consumers as tax enforcers.

[6] For a discussion, see also Khlif and Achek (2015).

rely on extensive behavioral assumptions about what would have happened under stricter enforcement or additional revenue, when of course higher taxes and enforcement might change the structure of the economy and the behavior of different actors, including tax compliers and tax evaders. Moreover, using a macro approach makes it inherently difficult to study these potential behavioral responses, as it is unclear whether certain types of people are more likely to evade. As Slemrod and Weber (2012) note, there are challenges related to interpreting estimates of the informal economy and its determinants based on more complex aggregate empirical approaches at the country level (using information about traces of true income, traces of non-compliance, and measures of official GDP).

A number of approaches rely, like us, on rich microeconomic data to overcome some of these limitations. One line of research relies on random audits. For instance, Kleven, Knudsen, Kreiner, Pedersen, and Saez (2011) analyze the effect of threat-of-audit letters on over 40,000 individual income tax filers in Denmark, and Hallsworth, List, Metcalfe, and Vlaev (2017) implement field experiments using administrative data from over 200,000 individuals in the United Kingdom. While more promising than the macro approaches, these studies are less focused on determining the level and nature of evasion; their goal is to help identify tax returns that are more likely to feature evasion in an effort to guide enforcement efforts (Slemrod, 2016, p. 13). Randomized control trials (RCTs) evaluating the effect of messages other than audit or threat-of-audit probabilities on compliance[7] have received considerable attention. Until very recently there was a serious lack of empirical evidence about how theory-based prescriptions for increasing compliance translate into the real world (e.g. Del Carpio, 2013); the rise in field and lab experiments (Mascagni, 2017) has changed the landscape (Hallsworth, 2014).[8]

Many previous studies emphasize the role of tax morale in facilitating compliance, an issue we highlight in our analytical framework and empirical results. RCTs can potentially have difficulties in "scaling up" the effects of interventions, given general equilibrium effects or because pilot studies might not be feasible or credible at broader scales. Studies using observational data to infer evasion levels may overcome these limitations, especially when combined with "natural" experiments that provide plausibly exogenous variation in evasion determinants.[9]

[7] See reviews in Hallsworth (2014); Luttmer and Singhal (2014); Slemrod (2016); Mascagni (2017).

[8] For example, Hallsworth (2014) finds that the number of natural field experiments analyzing tax compliance doubled between 2012 and 2014.

[9] For instance, Fisman and Wei (2004) compute the "evasion gap" in China's imports from Hong

While these studies avoid some of the external validity concerns of RCTs, it is often harder to draw conclusions about causality.[10]

In short, the microeconomic nature of our data is one of its main advantages, since it helps identify the determinants of evasion or undeclared income given the richness of the demographic information available (Andreoni, Erard, & Feinstein, 1998, p. 837). The main challenge of relying on individual responses is social desirability bias (Slemrod, 2007). But since our method tackles this issue directly, in effect we have the best of both worlds: (1) a very comprehensive survey with a wealth of information from survey respondents with which to examine the drivers of this sensitive behavior and (2) responses that are not hampered by reporting biases.[11] Our method also permits direct estimations of the degree of social desirability bias, which is a magnitude of interest in itself, as it reveals the extent to which citizens internalize the notion that tax evasion is an illegal and/or socially undesirable behavior. The absence of social desirability bias in our sample suggests that these concerns are not sufficiently embedded in society, which may be one key obstacle to effective tax collection. The main limitation of our analysis is that we focus on correlations, so we are careful not to overstate any causal interpretation. However, we use a systematic sensitivity analysis to verify that the robust correlations we present are not sensitive to model selection. More generally, our method can be combined with randomized interventions or natural sources of variation in tax determinants to identify causal impacts.

While list experiments and related survey techniques have been used to examine a number of sensitive behaviors, to the best of our knowledge our paper is the first to examine tax evasion. Other corrupt behaviors studied include vote buying and fraud (Corstange, 2010, 2012; Gonzalez-Ocantos et al., 2012; Fergusson, Molina, & Riaño, 2017; Holbrook & Krosnick, 2010), bureaucratic corruption (Gingerich, 2010), citizen corruption (e.g., bribing policemen Corbacho, Gingerich, Oliveros, and Ruiz-Vega (2016)), and the general willingness to obey the law and

Kong by comparing Hong Kong's reported exports and China's reported imports of the same products, and then explore the impact of varying tax rates. Gorodnichenko, Martinez-Vazquez, and Sabirianova Peter (2009) analyze the effects of Russia's 2001 flat rate income tax reform on consumption.

[10] As Slemrod (2016, p. 15) notes, two research designs in observational studies that hold particular promise and have been widely exploited recently in empirical tax analyses are regression discontinuity and analysis of kinks and notches in policy. These studies rely on compelling identification strategies, though their external validity is compromised because they estimate very local effects around the policy kinks.

[11] Given the broad absence of desirability bias in our study data, we were able to explore the correlates of evasion using direct questions. Yet even where social desirability bias is present, the list experiment is a reliable measure of evasion.

perform civic duties (including paying taxes) (Ronconi & Zarazaga, 2015).[12]

The paper proceeds with a brief examination of the empirical methods. Section 2.1 describes the key questions and validates the underlying assumptions, and Section 2.2 explains the "extreme bounds methodology," a sensitivity analysis approach we implement to assess the robustness of the correlations in our data. Section 3 discusses some key conceptual issues to help interpret the results. Section 4 reports the main results on the incidence of VAT evasion and documents the absence of social desirability bias in our survey responses. Section 5 presents the main findings, using the existing literature as a guide to study the most salient features of the data, and describes the robust correlates of evasion. Section 6 concludes.

2 Empirical methods

2.1 List experiments

To measure VAT evasion, we randomly assigned respondents to one of three groups. In the *Treatment* group, households were told "I will read a list of five (5) actions that people follow to save money when shopping. I want you to tell me how many of these five things you do regularly. Do not tell me WHICH, ONLY HOW MANY." Then respondents were handed a card with the following options:

1. You choose the cheapest brand even if it is of lower quality,
2. You wait for sales on the best brands,
3. You buy in cheaper outlets even if they are far from your home,
4. **You accept buying without a receipt, to avoid paying VAT**,
5. You buy in bulk.

In the first control group (*Control 1*), respondents were presented with a similar prompt and list, without the sensitive item (in bold above for emphasis, but not on the list used in the survey). Following the application of the list experiment,

[12] Other topics studied using list experiments are discrimination against African Americans (Kuklinski, Cobb, & Gilens, 1997; Kuklinski, Sniderman, et al., 1997; Gilens, Sniderman, & Kuklinski, 1998; Sniderman & Carmines, 1997; Flavin & Keane, 2010; Redlawsk, Tolbert, & Franko, 2010; Heerwig & McCabe, 2009; Brueckner, Morning, & Nelson., 2005; Martinez & Craig, 2010) and other minority or marginalized groups (Kane, Craig, & Wald, 2004; Janus, 2010; Streb, Burrell, Frederick, & Genovese, 2008; Rayburn, Earleywine, & Davison, 2003; Corstange, 2009), attitudes towards food (Woodside, 1972), risky sexual behaviors (LaBrie & Earleywine, 2000), and sensitive or illegal actions unrelated to tax evasion (Coutts & Jann, 2011; Biemer & Brown, 2005).

those in *Control 1* (who did not see the sensitive item) were asked directly: "Could you tell me if you normally accept buying without a receipt, to avoid the VAT?" A third group, *Control 2* was not presented with the list experiment; respondents in this group were *only* asked this question directly, in case observing the control list biases responses.[13]

The premise of the experiment is that when asking indirectly by using a list, individuals are willing to answer truthfully even if social norms suggest that there is a "correct" answer. Since respondents in the *Treatment* condition only differ from those in *Control 1* in that they are presented with tax evasion as an option on the list, the difference in the number of actions reported by the two groups estimates the proportion of individuals that regularly avoids paying VAT.

The key assumption that individuals responding to the treatment and control questions are similar must hold in order for our experiment to be valid. While this should be the case by design, since the groups were assigned randomly, we used the baseline survey from 2010 to verify balance on a number of observable baseline characteristics. Also, since randomization could fail in the field, we double checked balance on covariates in the follow-up 2013 survey when the list experiments were conducted. Online Appendix Tables B-2 and B-3 show that there are no systematic differences between the treatment and control groups, suggesting that their composition is unlikely to contaminate our results.

Additional assumptions underlie the ability of list experiments to faithfully capture the behaviors of interest (Blair & Imai, 2012). The first main assumption is that there are no *design effects* – i.e., that the addition of a sensitive item does not affect the response on the sum of control items. The second assumption is that respondents answer truthfully to the sensitive item (i.e., that there are no liars). With these two assumptions, the difference in means between the treatment and control groups is an unbiased estimator of the incidence of the sensitive behavior.

Table 1 takes a first broad view of the results for the treatment and control lists. The average number of actions taken to save money in purchases is 1.68 in the control and 1.82 in the treatment group, which produces an estimated incidence of tax evasion of 13.68%.

This simple difference in means can also be computed for subsets of the population in order to study possible correlates of the sensitive behavior. However, this is not statistically efficient, and Imai (2011) and Blair and Imai (2012) propose maximum-likelihood estimators to efficiently explore the role of correlates of the

[13] Since we do not find significant differences in responses to the direct question between *Control 1* and *Control 2* in either experiment, we include both groups throughout when examining the direct questions.

Table 1: Response frequency for treatment and control lists
Tax evasion

	(1)	(2)	(3)	(4)
	Control group		**Treatment group**	
Response value	**Frequency**	**Proportion (%)**	**Frequency**	**Proportion (%)**
0	120	4.5	123	4.1
1	1,129	42.1	1,165	38.5
2	1,009	37.6	1,098	36.3
3	330	12.3	454	15.0
4	95	3.5	144	4.8
5			42	1.4
Average	1.68		1.82	

Notes: The table lists the frequency of actions people take to save money when making purchases. The treatment list includes the same options as the corresponding control list, plus the following sensitive item: "You accept buying without a receipt, to avoid paying the VAT."

sensitive behavior as well as of the extent of social desirability bias in survey responses. We follow these approaches in our empirical investigation. Finally, the 'no design' and 'no liar' assumptions can also be tested following Blair and Imai (2012). In Appendix B.3, we fail to reject the null hypothesis of no design effects, and of the most common sources of untruthful answers: ceiling and floor effects.

We next explain the method we use to identify the most robust correlates of tax evasion in our data.

2.2 Uncovering robust correlates

To systematically establish which variables are most robustly correlated with evasion, we use the extreme bounds methodology (Leamer, 1985), which allows us to estimate different models for the outcome of interest on a key covariate of interest and various permutations of additional controls. This process produces an entire distribution of estimated coefficients β_j for the key covariate of interest. Sala-i Martin (1997) proposes finding the cumulative density function of this distribution to the left and right of zero. The largest of these two (hereafter $CDF(0)$) is the proportion of interest because it indicates where the coefficient is concentrated. Such densities can be recovered from the mean and standard deviation of the coefficient's distribution assuming normality, and weights proportional to some goodness-of-fit measure (like the adjusted R-squared or the integrated likelihood) can be used to compute such moments. However, with endogenous covariates the unweighted version may be preferable since endogenous regressions will have a better fit. The normality assumption can also be relaxed by computing $CDF(0)$ for each regression and then finding the (weighted) average $CDF(0)$.

Using this approach, variables that appear to be "significantly" correlated with the outcome are those with a (weighted) $CDF(0)$ larger than 0.95, or another benchmark confidence level. Although our method helps us uncover correlations that are not sensitive to model selection, we remain cautious and do not provide causal interpretations of our findings. We focus on the average (weighted and unweighted) coefficient, and the cumulative density (both assuming and relaxing normality).[14]

3 Analytical preliminaries

Focusing on the consumer's decision to evade requires some discussion. After all, firms are responsible for paying VAT, and it might seem more natural to model (and measure) evasion at the firm level. Indirect tax evasion has thus previously focused on firm behavior, at least since Marrelli (1984)'s seminal work (Virmani, 1989; Yaniv, 1988; Arias, 2005). However, given the potential for collusion between the buyer and seller, features of both may be important in determining the extent of indirect tax (particularly VAT) evasion.[15] Some argue that buyers always prefer the cheaper "tax free" option, and therefore the only relevant level is the firm. Yet a consumer's decision to avoid paying VAT is not necessarily costless: it may involve relinquishing some benefits (such as a warranty on the product, which is only valid with a receipt), facing risks (like carrying more cash, to more easily conceal the evasion), or paying a psychological or social moral cost (as the literature on tax morale discussed below suggests).

The role of consumers has not been completely neglected. Naritomi (2016) found that the Brazilian government has recognized its potentially crucial role by incentivizing consumers to denounce firm evasion – effectively making consumers "tax auditors." But even when this is not the case, consumers may choose whether to be complicit in the evasion decision. Since VAT is explicit on the final sale

[14] We also report Leamer's extreme bounds at the 95% level. The lower extreme bound is simply the lowest value of $\beta_j - \tau\sigma_j$, and the upper extreme bound is the largest value of $\beta_j + \tau\sigma_j$; τ denotes the critical value for the confidence level and σ_j the standard error for β_j. If both bounds have the same sign, then the corresponding variable is a robust correlate of tax evasion. However, this criteria is overly conservative, since it could declare a correlation fragile on the basis of a single model.

[15] Yaniv (1988) studies tax withholding more generally, particularly firms' decisions to under-report the amount of tax withheld from employees, and finds that withholding makes it hard for employees and firms to evade taxation without colluding. But a firm may still risk remitting to the government less than the amounts withheld, especially for wage earners who are not required to file an income tax return (which the tax authorities could use for comparison). VAT evasion creates similar interactions between the firm and its buyers.

receipt, consumers and firms collude by conducting transactions without a receipt: the consumer might get a cheaper product and the firm may increase the quantity sold and remain under the radar of the tax authorities.

Campaigns from tax authorities have therefore long urged consumers to demand a receipt in order to avoid being complicit with VAT evasion. An example from a 1999 Colombian TV commercial[16] displays a striped shirt bought "with a receipt," yet as it zooms out the shirt is actually a prisoner's shirt with handcuffs and the sign changes to "without a receipt." A voiceover says, "If you buy without a receipt you are complicit in evasion and are violating the law (...) Don't cheat on Colombia. Always demand a receipt." Venezuela, Spain, Bolivia, and Chile have released similar messages.[17] It is therefore not surprising that our tax evasion question was familiar to respondents, who realized the tax avoidance implications of not demanding a receipt, even though they are not nominally responsible for transferring the amount owed to the authorities.

Appendix A illustrates an extremely simplified model of evasion.[18] Consumers may derive some utility from paying VAT (that is, demanding a transaction with a valid receipt and tax), which could be the pure moral benefit of abiding by the law, or additional benefits such as the possibility of returning a damaged item or other consumer warranties.[19] In this context, only consumers who value these benefits sufficiently will opt for formal, VAT-paying transactions. Trivially, a higher tax rate and a weaker "tax morale" incentivizes consumer evasion. The impact of other parameters, like those affecting consumers' purchasing power (income and the pre-tax price) have subtler, ambiguous impacts that depend on the exact modeling

[16] Available in https://www.youtube.com/watch?v=Ai-c_4xI1bI.

[17] See, for instance, Venezuela (https://www.youtube.com/watch?v=PLpuSoq38Jk), Spain (https://www.youtube.com/watch?v=gVLLMrmFYs), and Bolivia (https://www.youtube.com/watch?v=kZZC7fgjGCw).

[18] Optimal VAT design and/or enforcement has been studied, among others, by Boadway and Sato (2009), Keen (2008) and De Paula and Scheinkman (2010). As in previous studies, we note that goods can be traded through either formal/VAT-paying transactions or informal/VAT-avoiding exchanges. Since our focus is not on the self-enforcing features of VAT or comparing its efficiency and general equilibrium implications relative to other forms of commodity taxation, unlike these studies we do not study the rich set of intermediate transactions that are essential to VAT or include any other forms of taxation.

[19] Culiberg and Bajde (2014) and Chang and Lai (2004) note that the literature on tax evasion has examined issues of ethics and morality, but the focus has been almost exclusively on tax reporters. Yet other participants also participate in the deception. We ignore incentives to pay taxes based on the individual's expectation to receive public goods in return. Our emphasis is most closely related to that of Naritomi (2016), yet we do not consider a monetary reward from the government when consumers act as whistle-blowers, but rather the moral rewards (like those the commercials alluded to above) or other consumer benefits from the formal transaction itself. Monetary rewards could produce interactions between incentives, for instance if monetary motivations crowd out other moral motives to pay taxes (Frey & Jegen, 2001).

assumptions. For instance, in the simple model in the appendix with a single good, changes in prices and income result from balancing two forces: the resulting changes in levels of consumption, and their impact on marginal utility. An increase in purchasing power (due to either an increase in income or a reduction in price) increases consumption with or without taxation. But since it increases non-VAT consumption more, it encourages evasion. However, a higher level of consumption reduces the marginal utility of consumption, which discourages evasion. The net effect depends on the curvature of the utility function. So, for instance, it is not clear *a priori* whether more expensive goods or richer households are associated with more or less evasion.

As is often the case in models of tax evasion, comparative statics with respect to fundamental parameters are very sensitive to the modeling assumptions – even if we ignore the interaction with firms' behavior. Incorporating the supply side adds further nuances and implications. Our model in the appendix assumes that firms have incomplete information about consumers' level of "tax morale" (more broadly, of benefits to the consumer of obtaining a receipt). If firms allow informal/VAT-avoiding transactions, they might sell at a lower price, but may also risk being punished by the tax authorities.[20] Thus, if the government improves its monitoring capacity or increases the penalties for evading, firms' behavior will discourage VAT-avoiding transactions.

While these interactions can be enriched along a number of dimensions, some crucial messages for our analysis emerge even in this simple setting. First, even though consumers are not directly responsible for VAT, in practice evasion involves their complicity. Avoiding VAT might save them some money, but it entails a moral cost and forsakes other potential benefits of a formal transaction such as a product warranty. Covariates affecting these benefits and costs will influence the evasion decision. Second, both consumer- and firm-level features influence consumer decisions about whether to pay VAT. Thus, analyzing consumer decisions requires looking at the role of household observables as well as variables capturing the broader economic environment that motivates firms to facilitate (or not) these types of transactions.

Chang and Lai (2004) present a richer model that facilitates a similar logic of what they call "collaborative" tax evasion. In our question, a consumer is willing to engage in cash transactions or accept illegal (or no) receipts to facilitate the

[20] In the model in the appendix, this assumption is motivated both by our measurement of "evasion and no receipt" and by the examples above. We assume that a transaction with a receipt guarantees full enforcement in order to simplify the analysis. Of course, the key assumption is that transactions with a receipt improve enforcement more than those without.

firm's VAT evasion in exchange for a price discount.[21] This collusive behavior, however, imposes psychological costs on the consumer, which Chang and Lai (2004) relate to social norms.[22]

Though we present a simpler model, its emphasis on social norms relates closely to our examination of social desirability bias in consumer responses. Indeed, since social norms are enforced via collective punishment and mutual expectations of equilibrium behavior, if there existed a norm against collusive behavior for evasion, one would expect respondents to feel embarrassed to admit having uses receipt-less transactions to avoid paying VAT. Our results therefore suggest the absence of such a norm.

4 Incidence and (no) social desirability bias

According to Colombia's national tax agency (*Dirección de Impuesto y Aduanas Nacionales*, DIAN), the taxes collected in 2015 amounted to about 15% of the country's GDP,[23] and despite an increase of at least 6 percentage points since 1990, this percentage is still slightly lower than the Latin American average (Gómez-Sabaini & Jiménez, 2011). We focus on VAT, since it is the best-known and most important indirect tax (representing 28.69% of all government revenues in 2015).[24] Corporate taxes are of course limited to formal entrepreneurs, while direct taxes like income and property taxes are reserved for the relatively wealthy and collection of income and property taxes is particularly weak in Colombia (Comisión de expertos para la equidad y la competitividad tributaria, 2015). Moreover, as discussed above VAT evasion is an important concern in Colombia, with DIAN campaigns urging consumers to demand a receipt and pay the VAT.

[21] Other authors, like Gordon (1990), have also observed firms' incentives to choose cash-based, informal transactions over formal ones that leave a paper trail. However, instead of emphasizing collusion with buyers to split the gains from trade for cash sales, he explores the role of these arrangements as a form of price discrimination by firms.

[22] This creates interesting interactions that we ignore in our simplified presentation. In particular, since social norms are enforced by the expectation that others will behave in a particular way, there may be snowballing effects as some consumers facilitate evasion. Relatedly, imposing fines is effective at reducing evasion only if enough consumers follow the "social norm" of tax paying. For "venal" consumers, this may be counterproductive by creating room for sellers and buyers to gain from trade via collaborative tax-evading activities. This can increase rather than deter evasion, thus further consolidating the perverse social norm.

[23] DIAN, Estadísticas Cifras de la gestión y logros de la entidad, Recaudo de los tributos administrados por la DIAN. Available at `http://www.dian.gov.co/contenidos/cifras/estadisticas.html`, last accessed on February 24, 2017.

[24] Compared to the most developed countries in Latin America, VAT in Colombia during 2010 represented 5.3% of GDP, lower than Argentina (8.1%), Brazil (13%), and Chile (8.1%) and higher than Mexico (3.8%) (Corbacho et al., 2013).

Figure 1 plots the basic incidence of tax evasion and reveals the absence of social desirability bias.[25] When asked directly, 19.3% (SE = 0.005) of respondents reported that they had purchased an item without receiving a receipt to avoid paying VAT. The incidence of avoidance was higher in rural areas (21.7%) than in urban areas (17.2%). The results from the list experiment are very close, and the point estimate for social desirability bias is very small and not statistically significant (-1.3 percentage points in urban areas and -1.2 percentage points in rural areas). Table 2 investigates the possible determinants of social desirability bias and finds that only a handful of individual traits are significant; in these cases, there is typically little bias and the point estimates are usually negative. We conclude that respondents are willing to openly report that they avoid paying VAT. One possible explanation is that they are comfortable enough with survey officers, having been visited by the organization three years earlier for the baseline survey and answering a long questionnaire, to provide honest answers. But as discussed in Section 3, this finding may reflect a broad acceptance of tax evasion in Colombia more generally.

5 Correlates

In this section we present the main correlates of tax evasion, implementing the methodology described in Section 2.2.[26] Table 3 reports descriptive statistics. Definitions and sources for the latter are in Table B-1. To help identify the magnitude of the correlations, we standardize all variables in the regression analysis.

Our general discussion from Section 3 guides our inclusion of relevant variables and the interpretation of our results: we look for variables that may affect consumers' incentives to save on purchases, their moral or other costs of colluding in an informal transaction, as well as contextual features influencing the firms' desire to promote these transactions. We also rely on the available literature (even if it refers to income tax) and attempt to draw useful lessons for indirect taxation.[27]

[25] Estimates control for the set of individual characteristics in Table 2, though average incidence is not sensitive to changes in these controls.

[26] Appendix B.4 also reports simple alternative bivariate and multivariate regressions, which produce similar conclusions.

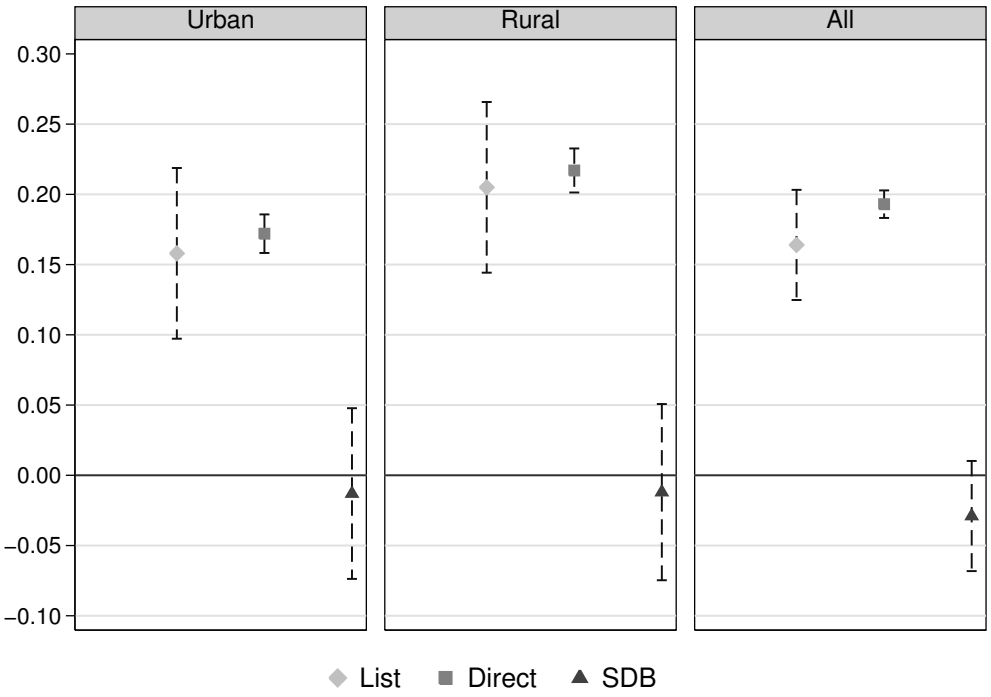
[27] Allingham and Sandmo (1972) developed the seminal economic model of tax evasion, which, along with its successors, produces a number of theoretical predictions that are hard to test given the inherent difficulties of measuring tax evasion. In addition, the predictions on some key variables (such as the tax rate or the contributors' income levels) are often ambiguous, depending on the modeling assumptions. For instance, one key aspect is whether the tax authority is modeled as exogenously determining enforcement or as playing a game with taxpayers. This is also important empirically: it reminds us that models in which tax policy variables are taken as

Table 2: No social desirability bias: tax evasion

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Urban sample			**Rural sample**			**Full sample**		
Variables		*List*	*Direct*	*SDB*	*List*	*Direct*	*SDB*	*List*	*Direct*	*SDB*
Age	(18,40]	0.149***	0.181***	-0.032	0.254***	0.226***	0.028	0.184***	0.200***	-0.017
		(0.041)	(0.012)	(0.043)	(0.058)	(0.014)	(0.060)	(0.033)	(0.009)	(0.035)
	(40,55]	0.135***	0.179***	-0.043	0.154***	0.207***	-0.053	0.128***	0.192***	-0.063**
		(0.046)	(0.011)	(0.047)	(0.042)	(0.012)	(0.043)	(0.027)	(0.008)	(0.029)
	>55	0.180***	0.143***	0.037	0.198***	0.222***	-0.023	0.182***	0.186***	-0.004
		(0.065)	(0.014)	(0.066)	(0.056)	(0.015)	(0.058)	(0.041)	(0.011)	(0.043)
Education	Primary or less	0.200***	0.185***	0.014	0.214***	0.228***	-0.014	0.202***	0.214***	-0.012
		(0.053)	(0.013)	(0.055)	(0.034)	(0.009)	(0.036)	(0.028)	(0.008)	(0.029)
	Secondary	0.110***	0.181***	-0.071*	0.136**	0.185***	-0.049	0.102***	0.181***	-0.079**
		(0.040)	(0.011)	(0.041)	(0.059)	(0.016)	(0.061)	(0.030)	(0.009)	(0.032)
	College	0.157***	0.138***	0.018	0.236	0.172***	0.064	0.141***	0.141***	0.001
		(0.059)	(0.013)	(0.061)	(0.277)	(0.045)	(0.281)	(0.054)	(0.013)	(0.056)
Gender	Men	0.114***	0.164***	-0.050	0.185***	0.206***	-0.021	0.142***	0.186***	-0.044
		(0.043)	(0.012)	(0.044)	(0.042)	(0.012)	(0.044)	(0.029)	(0.008)	(0.030)
	Women	0.171***	0.176***	-0.006	0.210***	0.227***	-0.017	0.173***	0.198***	-0.025
		(0.036)	(0.009)	(0.037)	(0.041)	(0.011)	(0.043)	(0.026)	(0.007)	(0.027)
Employment	No	0.165***	0.173***	-0.008	0.189***	0.197***	-0.008	0.160***	0.185***	-0.025
		(0.052)	(0.013)	(0.053)	(0.051)	(0.013)	(0.052)	(0.034)	(0.009)	(0.035)
	Yes	0.144***	0.171***	-0.027	0.203***	0.227***	-0.024	0.162***	0.197***	-0.035
		(0.034)	(0.008)	(0.035)	(0.039)	(0.010)	(0.040)	(0.023)	(0.006)	(0.024)
Frequency of voting	Low	0.151***	0.189***	-0.038	0.213***	0.185***	0.027	0.151***	0.187***	-0.036
		(0.044)	(0.013)	(0.045)	(0.067)	(0.018)	(0.069)	(0.033)	(0.010)	(0.035)
	High	0.151***	0.163***	-0.012	0.196***	0.224***	-0.028	0.164***	0.195***	-0.031
		(0.038)	(0.008)	(0.039)	(0.033)	(0.009)	(0.034)	(0.023)	(0.006)	(0.024)
Vote for the same party	No	0.137***	0.169***	-0.032	0.192***	0.195***	-0.003	0.146***	0.179***	-0.033
		(0.033)	(0.008)	(0.034)	(0.046)	(0.010)	(0.047)	(0.025)	(0.007)	(0.026)
	Yes	0.187***	0.180***	0.007	0.206***	0.242***	-0.036	0.186***	0.219***	-0.032
		(0.053)	(0.014)	(0.055)	(0.040)	(0.012)	(0.042)	(0.031)	(0.009)	(0.033)
Secret ballot	No	0.169***	0.175***	-0.006	0.274***	0.251***	0.023	0.200***	0.207***	-0.007
		(0.046)	(0.012)	(0.047)	(0.062)	(0.016)	(0.064)	(0.036)	(0.010)	(0.037)
	Yes	0.141***	0.170***	-0.030	0.170***	0.204***	-0.035	0.143***	0.187***	-0.045*
		(0.036)	(0.009)	(0.037)	(0.033)	(0.009)	(0.035)	(0.022)	(0.006)	(0.023)
Religion	None or other	0.168***	0.168***	0.000	0.363***	0.228***	0.135	0.236***	0.190***	0.046
		(0.056)	(0.015)	(0.058)	(0.083)	(0.021)	(0.086)	(0.047)	(0.012)	(0.049)
	Catholic	0.147***	0.173***	-0.026	0.170***	0.215***	-0.046	0.143***	0.194***	-0.051**
		(0.034)	(0.008)	(0.035)	(0.033)	(0.009)	(0.034)	(0.022)	(0.006)	(0.022)
Skin color	White	0.135***	0.163***	-0.028	0.159***	0.211***	-0.052	0.137***	0.185***	-0.048*
		(0.033)	(0.009)	(0.035)	(0.038)	(0.010)	(0.040)	(0.024)	(0.007)	(0.025)
	Black	0.182***	0.190***	-0.008	0.266***	0.227***	0.039	0.204***	0.209***	-0.004
		(0.050)	(0.013)	(0.052)	(0.050)	(0.013)	(0.051)	(0.033)	(0.009)	(0.035)
Shock	No	0.123**	0.141***	-0.018	0.221***	0.190***	0.030	0.149***	0.162***	-0.013
		(0.055)	(0.011)	(0.056)	(0.060)	(0.015)	(0.062)	(0.036)	(0.009)	(0.037)
	Yes	0.165***	0.188***	-0.023	0.190***	0.227***	-0.038	0.166***	0.207***	-0.041*
		(0.034)	(0.009)	(0.035)	(0.035)	(0.010)	(0.036)	(0.023)	(0.007)	(0.024)
Wealth	Below median	0.149***	0.217***	-0.068*	0.202***	0.237***	-0.035	0.188***	0.227***	-0.039
		(0.036)	(0.011)	(0.038)	(0.038)	(0.011)	(0.039)	(0.027)	(0.008)	(0.028)
	Above median	0.152***	0.131***	0.021	0.194***	0.194***	0.001	0.129***	0.154***	-0.025
		(0.047)	(0.009)	(0.048)	(0.049)	(0.011)	(0.050)	(0.028)	(0.007)	(0.029)

Notes: For each area, rural, urban, and the full sample, the table shows the average incidence of tax evasion using the *list* experiment (with methods as described in Section 2.1), the *direct* question (using a logit model), and the difference between the two or social desirability bias (SDB). Standard errors are computed using Monte Carlo simulations, and estimations control for the set of variables listed in the table. * is significant at the 10% level, ** is significant at the 5% level, *** is significant at the 1% level. See Table B-1 for a description of all variables.

Figure 1: Incidence and social desirability bias: Tax evasion



Notes: For each area, the figure shows the incidence of VAT evasion as implied by the list experiment (diamond), direct question (square), and the difference between these two measures, capturing the extent of social desirability bias (SDB, triangle). Lines mark 95% confidence bounds. Estimates in this figure control for the set of individual characteristics listed in Table 2.

Indeed, despite the recent advances referred to in the introduction, there is an important gap between research on direct and indirect tax evasion (Hallsworth, 2014; Slemrod, 2016; Mascagni, 2017). Most theoretical and empirical analyses (in both observational and experimental settings) focus on income tax evasion. As several authors have noted, indirect tax evasion has been comparatively neglected (Marrelli, 1984; Virmani, 1989; Matthews & Lloyd Williams, 2001).[28] This is unfortunate, since indirect taxation (and VAT evasion in particular) is a pressing issue in many countries. As it receives more attention, empirical analyses should ideally build on theoretical predictions, yet Andreoni et al. (1998, p. 836) complain that this has not been the case: "recent empirical work is... only loosely connected with theory... and, partly as a result, few of the recent empirical findings have led

exogenous can be misspecified (Andreoni et al., 1998).

[28] The main surveys of the literature clearly reveal this bias. VAT is not discussed in the recent reviews of Khlif and Achek (2015) and Hanlon and Heitzman (2010). Likewise, Andreoni et al. (1998)'s survey on tax compliance does not mention VAT. Slemrod and Yitzhaki (2002) only note that VAT has been favored by the tax authorities due to the difficulty of avoiding it, incentives for self-policing, and as a complement to cross information to raise income taxes (Alt, 1983).

Table 3: Summary statistics

	(1)	(2)	(3)	(4)	(5)	(6)
	Observations	**Mean**	**Median**	**Std. Dev.**	**Min**	**Max**
Panel A. Dependent variable						
Tax evasion	5,372	0.192	0.000	0.394	0.000	1.000
Panel B. Covariates						
Age	5,372	46.509	46.000	12.651	15.000	89.000
Agree with bribery	5,372	0.137	0.000	0.343	0.000	1.000
Authorities violate law	5,372	0.343	0.000	0.475	0.000	1.000
Catholic	5,372	0.814	1.000	0.389	0.000	1.000
Commerce sector	5,372	0.437	0.000	0.496	0.000	1.000
Education	5,372	0.459	0.000	0.498	0.000	1.000
Employment firms 2+	5,372	0.584	0.524	0.194	0.206	0.961
Evangelical/Pentecostal	5,372	0.127	0.000	0.333	0.000	1.000
Fractionalization	5,372	0.622	0.641	0.102	0.422	0.813
Gov. against inequality	5,372	0.935	1.000	0.247	0.000	1.000
Government role	5,372	0.887	1.000	0.316	0.000	1.000
Guerrillas	5,372	0.218	0.000	1.636	0.000	21.085
HH expenses	5,372	0.092	0.000	0.154	0.000	1.000
Homicide rate	5,372	26.712	18.349	25.587	0.000	163.159
Independent	5,372	0.161	0.000	0.368	0.000	1.000
Justice into own hands	5,372	0.294	0.000	0.456	0.000	1.000
Lands	5,372	0.035	0.000	0.184	0.000	1.000
Negative reciprocity	5,372	0.192	0.000	0.394	0.000	1.000
Neighbor cell phones	5,372	0.117	0.000	0.321	0.000	1.000
Neighbor loans	5,372	0.193	0.000	0.395	0.000	1.000
Other religion	5,372	0.023	0.000	0.148	0.000	1.000
Own welfare	5,372	0.951	1.000	0.216	0.000	1.000
Paramilitaries	5,372	1.445	0.000	7.245	0.000	68.367
Polarization	5,372	0.833	0.852	0.091	0.582	1.000
Pop. density	5,372	0.001	0.000	0.002	0.000	0.013
Popular vote	5,372	0.953	1.000	0.211	0.000	1.000
Positive reciprocity	5,372	0.972	1.000	0.165	0.000	1.000
Rural population	5,372	0.348	0.394	0.274	0.002	0.954
Shock	5,372	0.693	1.000	0.461	0.000	1.000
State presence	5,372	0.023	0.025	0.014	0.000	0.081
Use of violence	5,372	0.203	0.000	0.402	0.000	1.000
Wealth	5,372	-0.238	-0.584	2.621	-5.296	5.887
Win margin	5,372	0.158	0.131	0.113	0.001	0.476
Woman	5,372	0.587	1.000	0.492	0.000	1.000
Workers by firm	5,372	3.064	2.023	1.853	1.263	21.970
Working for government	5,372	0.061	0.000	0.240	0.000	1.000

Notes: *Tax evasion* is a dummy variable that equals 1 if the respondent normally accepts buying items without a receipt, to avoid paying VAT. Covariates in Panel B, and their sources, are described in Table B-1. The sample of respondents is the set of individuals in groups *Control 1* and *Control 2* as described in Section 2.1 (those asked directly about tax evasion).

to productive new theorizing." Our micro data provide a unique opportunity to move forward, by combining rich individual data with direct evidence of a lack of reporting biases.

5.1 Indirect tax evasion

We start with a brief discussion of key insights from the literature on indirect tax evasion in order to guide the analysis of our data.[29] Below, we discuss the determinants of tax evasion that may apply to any type of tax obligation (or that were designed to analyze income tax evasion but may also apply to indirect taxation).

Models of indirect tax evasion produce quite divergent results depending on the specific assumptions (Arias, 2005). According to Marrelli (1984), the key question is the extent to which a monopolistic firm under-reports income on sales in order to evade taxes. In addition to the expected result that harsher penalties – and an increase in the probability of getting caught – increase the declared tax base, two key predictions are that larger firms declare a greater fraction of the tax base, and that changes in the tax rate have ambiguous effects. Finally, when comparing the indirect tax to a profit tax of equal yield, the former is evaded to a lesser extent with decreasing risk aversion. The literature has examined a number of variations of this benchmark model. For instance, Arias (2005) highlights the following: market competition (competitive, monopolistic), tax function (*ad valorem*, specific, withholding, profit), cost functions, attitudes toward risk (averse, neutral), probability of detection function (fixed, variable), and tax evasion as a percentage or amount.

Gordon (1990) complements this analysis by noting how "under the counter" (discounted) cash sales produce unrecorded income, thus facilitating income tax evasion, which may also interest firms. Hence, cash sales provide a link between direct and indirect taxation, which Gordon describes as particularly prevalent in the services sector. Some empirical papers use macro estimates of tax evasion at the sector level and find, consistent with Gordon (1990), more evasion in the restaurant/take-out and hairdressing sectors than in the clothing/footwear and furniture/floor-covering sectors (Matthews & Lloyd Williams, 2001). Zídková (2014), using data from 24 EU member states, however, finds a smaller VAT gap in countries with larger restaurant and hotel services sectors, which she associates more generally with tourism.

This literature invites an examination of the characteristics of the consumer economic environment (e.g., are consumers likely to interact with larger or smaller firms? Or firms in certain sectors?). Table 4 (row 9) illustrates that respondents living in municipalities where more formal employment is in establishments with

[29] Key references in the literature include Marrelli (1984); Wang and Conant (1988); Yaniv (1988); Virmani (1989); Cremer and Gahvari (1993); Yaniv (1995).

two or more employees are significantly less likely to avoid paying tax. Similarly, tax evasion is lower where more workers are formally employed (row 18). The correlation with the importance of the commerce sector (row 23), while positive, is somewhat less robust.[30]

Below we examine the correlation between buyers who avoid paying VAT to save on expenses and household and individual features.

Table 4: Tax evasion
Robust correlates

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Leamer's		**Coefficient**		**Standard error**		**CDF(0)**		
	Variables	*Lowest*	*Upperest*	*Weighted*	*Unweighted*	*Weighted*	*Unweighted*	*Weighted**	*Weighted*	*No weighted*
1.	Wealth	-0.175	-0.037	-0.114	-0.114	0.023	0.023	1.000	1.000	1.000
2.	Use of violence	0.018	0.105	0.071	0.071	0.014	0.014	1.000	1.000	1.000
3.	Lands	-0.067	-0.015	-0.044	-0.044	0.010	0.010	1.000	1.000	1.000
4.	Agree with bribery	0.019	0.096	0.064	0.064	0.014	0.014	1.000	1.000	1.000
5.	Guerrillas	0.021	0.108	0.067	0.067	0.014	0.014	1.000	1.000	1.000
6.	Justice into own hands	0.011	0.099	0.067	0.067	0.014	0.014	1.000	1.000	1.000
7.	Negative reciprocity	0.009	0.101	0.064	0.064	0.015	0.015	1.000	1.000	1.000
8.	Rural population	-0.033	0.173	0.082	0.082	0.024	0.024	0.997	1.000	1.000
9.	Employment firms 2+	-0.167	0.031	-0.080	-0.080	0.024	0.024	0.996	0.999	0.999
10.	Education	-0.087	0.009	-0.042	-0.042	0.013	0.013	0.996	0.999	0.999
11.	Other religion	-0.079	0.001	-0.027	-0.027	0.011	0.011	0.994	0.994	0.994
12.	Win margin	-0.042	0.131	0.047	0.047	0.018	0.018	0.993	0.995	0.995
13.	State presence	-0.076	0.009	-0.037	-0.037	0.015	0.015	0.991	0.993	0.993
14.	Shock	-0.003	0.054	0.027	0.027	0.012	0.012	0.987	0.988	0.988
15.	HH expenses	-0.072	0.017	-0.036	-0.036	0.015	0.015	0.984	0.994	0.994
16.	Popular vote	-0.058	0.003	-0.028	-0.028	0.014	0.014	0.979	0.980	0.980
17.	Authorities violate law	-0.022	0.064	0.032	0.032	0.014	0.014	0.978	0.990	0.990
18.	Workers by firm	-0.124	0.059	-0.054	-0.054	0.019	0.019	0.968	0.998	0.998
19.	Evangelical/Pentecostal	-0.121	0.031	-0.022	-0.022	0.013	0.013	0.958	0.963	0.963
20.	Working for government	-0.046	0.017	-0.019	-0.019	0.011	0.011	0.946	0.956	0.956
21.	Fractionalization	-0.152	0.131	-0.034	-0.034	0.018	0.018	0.946	0.967	0.967
22.	Catholic	-0.109	0.057	0.017	0.017	0.013	0.013	0.897	0.901	0.901
23.	Commerce sector	-0.037	0.072	0.019	0.019	0.016	0.016	0.861	0.880	0.880
24.	Own welfare	-0.043	0.017	-0.014	-0.014	0.013	0.013	0.857	0.858	0.858
25.	Age	-0.060	0.020	-0.014	-0.014	0.013	0.013	0.855	0.869	0.869
26.	Independent	-0.018	0.042	0.013	0.013	0.013	0.013	0.842	0.844	0.844
27.	Woman	-0.020	0.056	0.016	0.016	0.016	0.016	0.841	0.843	0.843
28.	Polarization	-0.153	0.113	0.006	0.006	0.019	0.019	0.755	0.614	0.614
29.	Pop. density	-0.052	0.099	0.002	0.002	0.017	0.017	0.751	0.544	0.544
30.	Neighbor cellphones	-0.026	0.048	0.009	0.009	0.015	0.015	0.728	0.730	0.730
31.	Neighbor loans	-0.044	0.032	-0.006	-0.006	0.014	0.014	0.673	0.672	0.672
32.	Homicide rate	-0.079	0.056	0.005	0.005	0.020	0.020	0.669	0.593	0.592
33.	Gov. against inequality	-0.039	0.029	-0.006	-0.006	0.015	0.015	0.646	0.646	0.646
34.	Paramilitaries	-0.043	0.035	-0.004	-0.004	0.014	0.014	0.615	0.608	0.608
35.	Positive reciprocity	-0.029	0.032	0.003	0.003	0.014	0.014	0.587	0.586	0.586
36.	Government role	-0.036	0.036	0.002	0.002	0.014	0.014	0.566	0.544	0.543

Notes: The table reports statistics based on the extreme bounds methodology described in Section 2.2. The dependent variable of interest is a dummy indicating whether the respondent normally accepts buying items without a receipt, to avoid paying VAT. The independent variable of interest is indicated in each row. In each case, a sensitivity analysis is conducted by also including all possible permutations of up to three of the additional covariates listed in the table. Region fixed effects are always included, and standard errors are clustered at the community level. Lowest and Upperest are Leamer's lowest and upper extreme bounds for the coefficient of interest (that is, for the resulting coefficient of the variable listed in each row) at the 95% confidence level. The adjusted R-squared is used to weight statistics where indicated. The $CDF(0)$ measures the largest accumulated density of the resulting coefficients of interest to the left or right of zero (whichever is largest). Column 7 reports the weighted CDF(0) assuming no normality, while Column 8 (9) reports the weighted (unweighted) CDF(0) assuming normality. See Table B-1 for a description of all variables.

[30] To easily identify the most important correlates, variables are sorted from most to least robustly (or "significantly") correlated with tax evasion.

5.2 Institutional and contextual factors

In the classical model of tax evasion (Allingham & Sandmo, 1972), citizens who under-report their income do so at the risk that the government will find out and impose a penalty, which leads to the prediction that equilibrium evasion decreases with the likelihood of an audit and the size of the penalty. Research on income tax evasion has found support for both predictions (Andreoni et al., 1998; Christie & Holzner, 2006; Fortin, Lacroix, & Villeval, 2007; Coricelli, Joffily, Montmarquette, & Villeval, 2010). Where information about the likelihood of an audit and/or punishment is not available, measures of state capacity are frequently used as proxies.[31] But state capacity may indicate more than just the probability of being audited; it also contributes to the general control of taxpayers: more efficient tax administration and information facilitates compliance (Kirchler, 2007). Political uncertainty and instability may also affect levels of tax avoidance: individuals may be more willing to hide their funds (or transactions) from the tax authorities when there is more uncertainty about the tax policies of future governments (Katz & Owen, 2013).

When we explore measures of state capacity and political uncertainty in our data we find some support for these basic predictions. A measure of municipality state presence (Table 4, row 13) is indeed negatively and very robustly correlated with VAT evasion. Examining violence and the crime rate is another way to gauge the role of state effectiveness and capacity, and we find that areas with more guerrilla activity (row 5) have higher levels of tax evasion. Yet neither the presence of paramilitaries (row 34) nor the homicide rate (row 32) correlates robustly with evasion.[32] Political competition, however, is negatively and robustly correlated with evasion (rows 12 and 21). The fractionalization index based on electoral returns correlates negatively with evasion and positively with the win margin. This finding could be interpreted as reflecting the role of political uncertainty and thus conflicting with the prediction in Katz and Owen (2013), yet it may also capture the influence of other factors measured by this variable, such as a healthier local democracy.[33] Indeed, tax evasion is less prevalent among respondents who believe that it is important that leaders are elected by popular vote (row 16).

[31] For example, Christie and Holzner (2006) apply a *judicial/legal effectiveness index* to a panel of 29 European countries between 2000 and 2003, and Picur and Riahi-Belkaoui (2006) find that better legal systems are associated with lower levels of tax evasion.

[32] Informality and enforcement in general may also be weaker in rural areas, and indeed there is a positive and robust correlation, in row 8, between these variables and tax evasion. More densely populated areas exhibit less evasion, on average, but this correlation is not robust (row 29).

[33] The polarization index (row 28), which may be more relevant for uncertainty, is instead positively correlated with evasion, yet the coefficient is not significant.

The existence (and size) of an underground economy is also important, as it makes it easier to avoid paying taxes (Slemrod & Yitzhaki, 2002). A perhaps unsurprising, yet related, finding is that income tax evasion is common among the self-employed (Fiorio & D'Amuri, 2006; Kirchler, 2007). Self-employment may facilitate cheating for several reasons, including less access to information sources relative to employees for tax authorities, a higher proportion of cash transactions, and, especially in developing countries, a higher incidence of informality that reduces both records for the government and taxpayers' perceived benefits from the government, thus discouraging compliance (Slemrod, 2007). Along the same lines, using a list experiment from Latin American countries, Ronconi and Zarazaga (2015) find that informal workers who do not receive legally mandated benefits due to employer non-compliance have a negative perspective on both their employer and the state. Such workers believe the state does not protect their rights, and hence feel less obliged to comply with their duties as citizens.

While this focus is mostly relevant for income tax evasion, informality can also influence VAT evasion via individual perceptions about perceived benefits and monitoring: transactions are not registered in informal markets, and, as our tax evasion question shows, not producing a receipt is often an essential component of non-compliance. Zídková (2014) finds a positive relationship between the VAT gap and the size of the shadow economy as a percentage of GDP. This is in line with the negative correlation in our data with formal employment in the municipality (row 18). For individual self-employment, we also find a positive (but weak) correlation on average (row 26); the $CDF(0)$ is under 95%.

5.3 Tax morale

In Section 3 we noted that psychological costs, potentially connected to social norms, are at the center of consumer collusion in VAT evasion. These costs are likely to be important in practice. For example, simulations and laboratory experiments have shown that, at realistic levels of penalties and detection probabilities the classical model of tax evasion (Allingham & Sandmo, 1972) predicts much more evasion than we observe in practice (Kleven et al., 2011), which suggests that the model misses important aspects of the real-world reporting environment. More broadly, the economic psychology of tax evasion emphasizes that cheating may have costs beyond monetary consequences, that subjective perceptions may play a larger role than objective probabilities, that individual and social norms are relevant factors, and that individual behavioral characteristics such as motivation

and behavior control are important (Kirchler, 2007). This has inspired a very broad literature on "tax morale" (Slemrod, 1998), which Luttmer and Singhal (2014) broadly define as all non-pecuniary motivations for tax compliance and factors outside the standard, expected utility framework, including: intrinsic motivation to pay taxes, feelings of guilt or shame, reciprocal motivations, influence of peer behavior, cultural or social norms interacting with these motivations, and deviations from standard expected utility maximization, such as loss aversion.

Tax morale thus includes a number of determinants operating through different mechanisms, many of which have been tested empirically, often experimentally.[34] Previous studies have shown that guilt and shame are particularly important and may improve the fit of the baseline – purely economic – model. Taxpayers may anticipate guilt from under-reporting despite escaping detection, and experience shame if they are caught, which in turn influences their behavior (Andreoni et al., 1998; Erard & Feinstein, 1994; Grasmick & Bursik Jr, 1990).[35] While we do not have information on variables such as guilt or shame, we do have a number of individual responses on moral views and beliefs that relate to some of these hypotheses. Citizens with certain views evade more: those who agree that sometimes it is necessary to pay a bribe (row 4), think that sometimes authorities should violate the law to capture criminals (row 17), agree that using violence is sometimes justified (row 2), and agree with taking justice into their own hands (row 6). Thus, individuals who are more open to accepting anti-social or illegal behavior are more prone to avoid paying taxes.

Since taxation is at the heart of the social contract between citizens and the government, beliefs about potential breaches of the deal may justify and encourage evasion (Kirchler, 2007; Slemrod, 2007). Litina and Palivos (2016) model a potentially vicious circle of political corruption and tax evasion: "corruption may corrupt" when politicians embezzle and citizens evade taxes. This may be

[34] Some experiments that provide information to individuals attempt to exploit these mechanisms to increase collection. For instance, Blumenthal, Christian, Slemrod, and Smith (2001) send normative appeals to taxpayers, yet fail to affect aggregate tax compliance behavior. Instead, Bott, Cappelen, Sørensen, and Tungodden (2014) experiment by sending a moral appeal or information about the probability of evasion detection, and find a large positive impact in both cases (reported income almost doubled): the moral appeal affected the *amount* reported, while the probability of evasion detection increased the *incidence* of tax payment.

[35] Experimental evidence from Coricelli et al. (2010) reveals that the risk of exposure (which involves publicly displaying the evader's picture) deters evasion and arouses subjects' emotions. Evasion and monetary sanctions also stir respondents' emotions before they submit their decision, yet the low fines encourage (rather than deter) evasion. Perez-Truglia and Troiano (2015) randomize the information sent in letters to tax delinquents, finding that "shaming" (increasing the visibility of delinquency status) increases compliance by some individuals. Castro and Scartascini (2015) also study taxpayer responses to "tax morale" treatments.

yet another reason why a stronger state or legal system, and better-functioning institutions more generally, may facilitate compliance. These mechanisms seem consistent with the correlation reported above between evasion and municipal state capacity and guerrilla presence.[36] Also along these lines, if taxpayers believe the tax system (the code and/or its enforcement) is unfair, compliance may fall. As Andreoni et al. (1998) put it, "in psychological terms, an unfair tax system could lead people to 'rationalize' cheating" (p. 851), a prediction that is consistent with the findings in Richardson (2006). More generally, lower levels of trust in the government (Torgler, 2003; Richardson, 2008; Levi & Stoker, 2000), a higher prevalence of corruption and a more inefficient bureaucracy (Picur & Riahi-Belkaoui, 2006), and a higher prevalence of crime and less individual economic freedom (Riahi-Belkaoui, 2004) may encourage cheating.

Taxpayers who feel cheated because they believe their tax dollars are not well spent may reciprocate by not fully complying with their obligations (Spicer & Lundstedt, 1976; Smith, 1992). Indeed, experiments suggest that subjects more willingly pay taxes when they receive benefits from a public good (Alm, Jackson, & McKee, 1992) and when they report higher levels of satisfaction with laws and the government (Webley, 1991). Complementary to this logic is the idea that individuals who are more reciprocal will be more responsive and engage less in evasion when they think the government will act in their interests and that other citizens are paying taxes (Slemrod, 2007). Ronconi & Zarazaga's (2015) results discussed above follow a similar logic.

Our data reveal that respondents who exhibit negative reciprocity (row 7) are more likely to avoid paying VAT. This correlation is extremely robust, but is weak with positive reciprocity (row 35). Since there is generally a poor perception of the state in Colombia, this may reflect that more (negatively) reciprocal voters rationalize cheating. To look at this more directly, we interact the measures of reciprocity with the measure of municipal state capacity, and expect reciprocal citizens to reduce the level of evasion when the state is more present. Table 5 shows that this is the case with positive reciprocity, but not with negative reciprocity. We also find that tax evasion is less prevalent among respondents who believe that it is important for leaders to be elected by popular vote (row 16).[37] We also explore if depending on the state for income (measured as working

[36] Neither the variables that capture beliefs on the role that the government (as opposed to the people) plays in determining individual welfare ("Government role" and "Own welfare") nor the views on how actively the state must combat inequality ("Gov. against inequality") is robustly correlated with evasion. This is perhaps surprising, as some argue that those who support a stronger role for the government might be more willing to pay taxes.

[37] We also interact this variable with the reciprocity measures to examine if they are especially

for the government, row 20) decreases evasion: this variable is indeed negatively correlated with evasion, and the CDF(0) is close to 95%.

Peer influence is another important factor, particularly when considering social norms. Citizens may find it less costly to under-report income if their peers are used to doing so (Gordon, 1989; Alm, Bloomquist, & McKee, 2017); some theories include a utility payoff from behaving honestly and adhering to the standard pattern of peers' behavior (Myles & Naylor, 1996). As a rough approximation in our data, the number of neighbors' cell phone numbers respondents know and the number of neighbors to whom they can reach out for loans (rows 30 and 31) are not robustly correlated with evasion. Examining peer effects requires however a more careful study.[38]

Table 5: Tax evasion
Interaction terms

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Leamer's		Coefficient		Standard error		CDF(0)		
	Variables	*Lowest*	*Upperest*	*Weighted*	*Unweighted*	*Weighted*	*Unweighted*	*Weighted**	*Weighted*	*Unweighted*
1.	State presence × Positive rec.	-0.043	0.002	-0.022	-0.022	0.010	0.010	0.986	0.986	0.986
2.	State presence × Negative rec.	-0.022	0.036	0.007	0.007	0.013	0.013	0.715	0.715	0.715
3.	Popular vote × Positive rec.	-0.021	0.034	0.007	0.007	0.013	0.013	0.697	0.697	0.697
4.	Popular vote × Negative rec.	-0.025	0.033	0.005	0.005	0.014	0.014	0.626	0.626	0.626

Notes: The table reports statistics based on the extreme bounds methodology described in Section 2.2. For each row, we run a set of regressions varying all possible groups of up to three covariates (see Table 4) in addition to the interaction listed in the row, the lower-order direct terms, and region fixed effects. The dependent variable of interest is a dummy indicating whether the respondent normally accepts buying items without a receipt, to avoid paying VAT. Standard errors are clustered at the community level. Lowest and Upperest are Leamer's lowest and upper extreme bounds for the coefficient of interest (that is, for the resulting coefficient of the variable listed in each row) at the 95% confidence level. The adjusted R-squared is used to weight statistics where indicated. The $CDF(0)$ measures the largest accumulated density of the resulting coefficients of interest to the left or right of zero (whichever is largest). Column 7 reports the weighted CDF(0) assuming no normality, while Column 8 (9) reports the weighted (unweighted) CDF(0) assuming normality. See Table B-1 for a description of all variables.

Other social norms may influence behavior. McGee (2011) focuses on culture and religion, documenting different religions' perspectives on paying taxes. Richardson (2006) finds no evidence that countries with higher percentages of Protestants, Catholics or Muslims have a different levels of tax evasion, though it is less common in countries where people are more likely to self-identify as

sensitive, but they do not appear to be.

[38] Fortin et al. (2007) propose a model with different social interaction effects, including both endogenous interactions (social conformity effects, i.e., deriving a psychic payoff from adhering to a pattern in the reference group) and exogenous interactions (like the fairness effects discussed above). They discuss the enormous empirical difficulties of disentangling these effects, given that there may also be social learning (e.g., learn less costly ways to evade taxes from peers) and correlated effects (since individuals in a given group have similar characteristics or share a similar environment). Moreover, Manski's reflection problem (Manski, 1993) (i.e., the simultaneity in the behavior of interacting agents introduces a collinearity between the mean outcome of the group and its mean characteristics) hinders the distinction between the endogenous and exogenous effects. In a laboratory experiment that attempts to overcome these difficulties, they find fairness effects but no conformity effects.

religious (Richardson, 2008). In our data, the results for Catholic (row 22), Evangelical/Pentecostal (row 19), and other religions (i.e., Mormons, Jews, Jehovah's Witness, row 11) indicate that except for Catholics, believers are less prone to evade than atheists or agnostics, the excluded category. Since Catholics constitute the largest religious group (81.5% in our data), it is likely that there is considerable variation within this group.

5.4 Other individual characteristics

Individuals' income, education, age, and gender have been found to correlate with evasion, though the direction and magnitude of the connections vary (Slemrod, 2007; Blumenthal et al., 2001; Richardson, 2006; Coricelli et al., 2010). The most robust finding is that women are more prone (or at least, not less prone) to comply than men.[39] Theoretically, however, it is not clear how these variables should correlate with evasion, and some may be indirectly capturing other influences such as moral views or peer effects (for instance, moral views or social networks transmitted through education). Income, of course, can play a role in the optimal (rational) level of tax evasion, but Section 3 revealed, in line with the literature, that predictions vary depending on the modeling assumptions used. In our data, neither age nor gender (rows 25 and 27) is robustly correlated with evasion. Instead, wealthier, more educated individuals, those who own land, and those with higher levels of expenditure are less likely to evade (rows 1, 10, 3, and 15, respectively), and those suffering a negative shock are more likely to avoid paying tax (row 14).[40] This suggests that paying taxes is a normal good that is consumed more by the relatively well off.

6 Conclusions

We measure levels of tax evasion, a critical behavior for democracies, using a large-scale and detailed household survey. Tax evasion lies at the core of the

[39] For example, Torgler and Valev (2010) find significantly greater aversion to corruption and tax evasion among women in a sample of eight Western European countries.

[40] The standard model of tax evasion views avoidance essentially as a gamble, so risk aversion (which may correlate with income) is potentially important. Since we lack good measures of risk aversion in our data, we leave this for future research. Allingham and Sandmo (1972) argue that the levels of risk aversion required to achieve compliance in equilibrium in the baseline model are excessive, and that other influences must be introduced to explain the data. For example, Bernasconi (1998) extends the baseline model by relaxing the differentiability of the preference function at low levels of risk, thus creating more risk-averse behavior and improving the model's fit with the data.

relationship between citizens and the state, yet it is difficult to empirically analyze. Coarse, indirect measures are often imprecise and/or not disaggregated enough to study the underlying behavioral motivations, while survey measures must deal with biases in stated responses. Using list experiments, we directly tackled the bias problem and estimated the extent to which consumers are willing to be complicit in VAT evasion, and provide direct evidence that social desirability bias in respondents' claims does not contaminate our measures. Moreover, we examined the resulting incidence and main correlates of tax evasion, reviewing the literature to guide the analysis.

Despite a growing interest in recent years and key insights from a variety of approaches, the theoretical and empirical work on indirect tax evasion, and VAT evasion in particular, remains relatively underdeveloped compared to direct tax evasion. This is an important limitation, since many countries rely heavily on revenue from indirect taxes on goods and services. The available (mostly indirect, macro) estimates suggest that indirect tax evasion is important in practice. As noted, these aggregate measures preclude evaluating individual behavioral responses, which may help account for the relative stagnation of the theory and evidence on indirect tax evasion.

Our rich micro-level data, together with direct evidence that individuals' responses are not contaminated by reporting biases, avoids these problems and is therefore more informative regarding the incidence and correlates of evasion, and will help develop and test new theories. Ours is the first list experiment applied in the area of tax evasion, yet the method can be implemented elsewhere and extended to study other forms of tax evasion. Our design combines direct questions on a random sample of respondents to measure the extent of (and variation in) social desirability bias in evasion, which are important findings. Presumably, one key step in consolidating the legitimacy of the state and its ability to enforce tax collection is convincing citizens that taxes *ought* to be paid. The absence of social desirability bias in our sample suggests that this "social norm" is not embedded in Colombian society. Examining whether this is also the case in other countries with prevalent VAT (or other forms of tax) evasion is therefore important. List experiments can be used for this purpose. Our data is sufficiently fine-grained that a careful examination of the mechanisms involved and forces at play is possible; our findings can apply to other countries.

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A Appendix: A simple model of (consumer) tax evasion

Consider a consumer who derives utility from consuming a good x. He can buy the good at price p in the market, without a sales receipt and VAT, or at $p(1+\tau)$, with VAT. Let $\phi = 1$ denote the decision to abide by the law (not to evade), and $\phi = 0$ otherwise. Not evading produces a non-pecuniary "moral" benefit of m that is private information for the consumer and follows a (common knowledge) continuous probability distribution $f(m)$ over $[\underline{m}, \overline{m}]$.[41] The consumer solves:

$$\max_{x,\phi} u(x) + \phi m, \text{ subject to } y = p(1+\phi\tau)x,$$

where $u(x)$ is a continuous function with $u'_x > 0$ and $u''_x < 0$. Demand for x is trivially $\frac{y}{p(1+\phi\tau)}$, and the individual evades if and only if:

$$\Delta V \equiv u(y/p) - u(y/(p(1+\tau))) - m > 0.$$

The personal decision to evade in this extremely simplified model is only a function of "tax morale" (m) and the utility difference for the varying levels of consumption with and without a receipt. This difference is affected by relevant parameters, namely income, the price of the good, and the tax rate. However, except with respect to the tax rate ($\Delta V'_\tau > 0$ so the proportion of evaders increases) and, trivially, tax morale, comparative statics are ambiguous. Changes in prices and income balance two forces: the resulting changes in levels of consumption, and their impact on marginal utility. Writing the demand as a function of the purchasing power $\mathbf{y} \equiv y/p$:

$$\Delta V'_{\mathbf{y}} = u'(\mathbf{y}) - u'(\mathbf{y}/(1+\tau))(1/(1+\tau)) \lesseqgtr 0.$$

An increase in purchasing power (either an increase in income or a reduction in price) increases consumption with or without taxation. But since it increases non-VAT consumption more, it encourages evasion. However, a higher level of consumption reduces the marginal utility of consumption, which discourages evasion. The net effect depends on the curvature of the utility function.[42]

[41] One potentially relevant extension of this model is recognizing that moral concerns are only relevant when a minimum level of consumption of goods has been reached, for instance by letting the morale term be $(\dot{m} + m)^\gamma$ for fixed $\dot{m}$.

[42] For example let $u(x)$ be defined by the CRRA function as follows:

$$u(x) = \begin{cases} (x^{1-\sigma} - 1)/(1-\sigma) & if \quad \sigma > 0 \text{ and } \sigma \neq 1 \\ log(x) & if \qquad \sigma = 1 \end{cases}$$

Therefore, $\Delta V'_{\mathbf{y}} = \mathbf{y}^{-\sigma}[1 - (1+\tau)^{\sigma-1}]$ and there is less (more) evasion as the purchasing power increases and as long as $\sigma > 1$ ($\sigma < 1$). Note also that when $\sigma = 1$, $u(x) = log(x)$ and both effects cancel out and evasion is merely a function of the tax rate.

Before examining the supply side, summarize the consumer strategy as:

$$\phi^*(\hat{m}) = \begin{cases} 1 & \text{if } \Delta V(\hat{m}) < 0 \\ 0 & \text{if } \Delta V(\hat{m}) > 0, \end{cases} \tag{1}$$

where $\hat{m}$ is the moral threshold that makes the consumer exactly indifferent between evading or not.

To model the supply side, consider the very simple case of a firm facing a problem of incomplete information. It does not know the type of consumer m that it will meet (an honest, receipt-demanding type, or a dishonest, VAT-evader type). When facing an honest consumer $\phi^*(m) = 1$, the transaction for x is conducted at $p(1+\tau)$, and we assume that with these transactions the firm must transfer tax resources to the government (in line with the idea that a final sales receipt provides an effective form of enforcement). Instead, if $\phi^*(m) = 0$, the firm evades and is audited with probability α, in which case it pays the tax liability τpx plus a proportional penalty of θ. Therefore, it chooses x to maximize expected profit, which simplifies to (assuming quadratic production costs for convenience):

$$\max_x \mathbb{E}\left[px - cx^2 - \alpha(1-\phi^*(m))(1+\theta)\tau px\right].$$

Using the distribution of types the problem becomes

$$\max_x \left\{ \int_{\underline{m}}^{\overline{m}} \left[px - cx^2 - \alpha(1-\phi^*(m))(1+\theta)\tau px\right] f(m)dm \right\}.$$

Moreover, given (1) the problem reduces to

$$\max_x \left\{ \left[1 - \alpha(1+\theta)\tau F(\hat{m})\right] px - cx^2 \right\}.$$

Therefore the supply of x is given by $x^s = \frac{p(1-\alpha(1+\theta)\tau F(\hat{m}))}{2c}$.

We can now define an equilibrium in this game as a tuple $\{x^*, p^*, \phi^*\}$ such that: (i) At price p^*, market clears at x^* (i.e. $x^* = x^d = x^s$), (ii) Given x^* and the parameters in the model, the strategy rule ϕ^* is a best response for the consumer.

To solve for the equilibrium, consider the price and quantities that clear the market when the consumer decides to evade ($\phi = 0$):

$$p^*_{\phi=0} = \left(\frac{2yc}{1-\alpha(1+\theta)\tau F(\hat{m})}\right)^{\frac{1}{2}}, \tag{2}$$

$$x^*_{\phi=0} = \left(\frac{y(1-\alpha(1+\theta)\tau F(\hat{m}))}{2c}\right)^{\frac{1}{2}}. \tag{3}$$

Likewise, without evasion we get:

$$p^*_{\phi=1} = \left(\frac{2yc}{(1+\tau)(1-\alpha(1+\theta)\tau F(\hat{m}))} \right)^{\frac{1}{2}}, \tag{4}$$

$$x^*_{\phi=1} = \left(\frac{y(1-\alpha(1+\theta)\tau F(\hat{m}))}{2(1+\tau)c} \right)^{\frac{1}{2}}. \tag{5}$$

To ensure $\phi^*(m)$ is a best response for the consumer, $\hat{m}$ must solve:

$$u\left(\left[\frac{y(1-\alpha(1+\theta)\tau F(\hat{m}))}{2c} \right]^{\frac{1}{2}} \right) - u\left(\left[\frac{y(1-\alpha(1+\theta)\tau F(\hat{m}))}{2(1+\tau)c} \right]^{\frac{1}{2}} \right) - \hat{m} = 0. \tag{6}$$

Which could be written as $G(\hat{m}) = 0$, where $G(\hat{m}) = 0$ is a continuous function in $\hat{m}$ since both $u(x)$ and $F(\hat{m})$ are continuous functions in their arguments. Also, because $F(\hat{m})$ is bounded in the interval $[0,1]$, it is easy to show that $\lim_{\hat{m}\to-\infty} G(\hat{m}) \times \lim_{\hat{m}\to\infty} G(\hat{m}) < 0$, which (along with the continuity of the function) is enough to prove the existence of the equilibrium.[43]

We can now study the implications of tax evasion, as captured by the fraction of people evading in equilibrium (which is simply $F(\hat{m})$, an increasing function of $\hat{m}$).

To illustrate (recall that the features of the utility function influence comparative static implications) let us assume that $u(x) = x^\beta$. In this simple case:

$$G(\hat{m}) = \left[1 - (1+\tau)^{-\frac{\beta}{2}} \right] \left[\frac{y(1-\alpha(1+\theta)\tau F(\hat{m}))}{2c} \right]^{\frac{\beta}{2}} - \hat{m}$$

which is a strictly decreasing function in $\hat{m}$ because $\beta > 0$ (and thus $G'_{\hat{m}} < 0$). Using the implicit function theorem, for $i = \alpha, \theta$, and τ:

$$\frac{d\hat{m}}{di} = -\frac{G'_i}{G'_{\hat{m}}}.$$

Since G'_α, G'_θ are both negative, state presence (via more monitoring or a more severe evasion penalty) reduces the marginal propensity to evade in this society.

[43] Note, however, that $G(\hat{m})$ is not necessarily a monotonous function in $\hat{m}$, and thus, the uniqueness of the equilibrium requires additional assumptions. In the case of the CRRA function for example (see footnote 42), $G(\hat{m})$ is a strictly decreasing function only if $\sigma < 1$.

B Online appendix (Not for publication)

B.1 Variable definition and sources

Table B-1: Variable definition and sources

Variable	Description
Age	Respondent's age in years.
Agree with bribery	Equals 1 if respondent "totally agrees" or "agrees" with the statement: "As things are, sometimes paying a bribe is justified."
Authorities violate the law	Equals 1 if respondent "totally agrees" or "agrees" with the statement: "To capture criminals, authorities should sometimes violate the law."
Catholic	Equals 1 for Catholics (self-declared).
Commerce sector	Equals 1 if commerce is one of three sectors generating more formal employment in the municipality (2012). *Source*: Ministry of Health and Social Protection.
Contributes to social security	Equals 1 if respondent pays contributions to the social security system (thus excluding members of the subsidized social security system).
Dark	Respondent's skin color based on color palette (assessed by interviewer). The palette is numbered from 1 to 11 (1 = lightest color). *Dark* Equals 1 for colors greater than or equal to 5.
Education	Educational attainment. Equals 1 if respondent has some secondary education or more.
Employed household head	Equals 1 if household head was employed in the week preceding the survey.
Employment	Equal 1 if respondent was employed the week preceding the survey.
Employment firms 2+	Total formal employment in firms with two or more employees as a proportion of total formal employment (2012). *Source*: Ministry of Health and Social Protection.
Evangelical/Pentecostal	Equals 1 for Evangelical/Pentecostal (self-declared).
FEA	Equals 1 if household is a *Familias en acción* (main conditional cash transfer for the poor with school-age children) beneficiary.
Formal credit	Equals 1 if household has any formal credit.
Fractionalization	$F_j = 1 - \sum_{i=1}^{N} \pi_{ij}^2$, where π_{ij} is the vote share for the mayoral candidate (in 2011) i in municipality j. See Montalvo and Reynal-Querol (2005). *Pachón and Sánchez (2014)*.
Frequency of voting	Equals 1 if respondent "Always votes in elections" or "Votes in most elections," 0 otherwise ("Rarely votes in elections" or "Never voted").
Get help	Equals 1 if household answers "yes" to at least one of the following questions: "During the past 12 months, do any members of the household receive money or in-kind aid..." a."...from relatives or friends living in Colombia?", b."from relatives or friends living abroad?" c."for alimony?", d."from international organizations (WFP, UNICEF, ICRC)?", e. "from NGOs?", f. "from the church or other religious organizations?", g. "from other persons, entities or organizations?"
Gov. against inequality	Equals 1 if respondent "totally agrees" or "agrees" with the statement: "The government should implement strong policies to reduce inequality between rich and poor."
Government role	Equals 1 if respondent "totally agrees" or "agrees" with the statement: "Government is primarily responsible for ensuring the welfare of the people."

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Table B-1 – Variable definition and sources, continued from previous page

Variable	Description
Guerrillas	Number of violent events per year perpetrated by guerrillas per 100,000 inhabitants (average 2010–2012). *Sources*: Conflict analysis resource center (CERAC); Universidad del Rosario.
HH expenses	Per capita household expenses (Colombian pesos). See Bernal et al. (2014).
HH food expenses	Household funds spent on food (Colombian pesos). See Bernal et al. (2014).
Homeowner	Equals 1 if the household residence is "own, fully paid" or "own, being paid," Equals 0 otherwise ("rented" or "in usufruct or other type of tenure").
Homicide rate	Homicide rate per 100,000 inhabitants (average 2010–2012). *Source*: Medicina Legal.
Household with spouse	Equals 1 if household is inhabited by household head and spouse.
Independent	Equals 1 if working independently is the most important job during the previous month.
Justice into own hands	Equals 1 if respondent "totally agrees" or "agrees" with the statement: "When the government does not punish criminals, it is okay that people take justice into their own hands."
Land	Equals 1 if respondent reports owning land.
Male household head	Equals 1 if household head is male.
Neighbor cell phones	Equals 1 if person has the cell phone numbers of at least half of her neighbors.
Neighbor loans	Equals 1 if a person thinks that at least half of her neighbors would lend her money.
Negative reciprocity	Equals 1 if respondent "totally agrees" or "agrees" with the statement: "Whoever hurts me, pays for it."
No debts	Equals 1 if household has not any type of debt. Equals 0 otherwise ("debt without credit," "formal credit," "informal credit" or "formal-informal credit").
No sewage	Equals 1 if household dwelling has no sewage system.
Not in organization	Equals 1 if respondent does not belong to any organization (options included are *Juntas de acción comunal*, charity organization, community organization, religious organization, organizations supported or promoted by the state, ethnic organization, educational organization, labor union, cooperative of work or union of producers, organization of environment conservation, cultural or sports organization, other).
Nuclear family	Equals 1 ifhousehold is comprised of: household head and spouse, with or without children; or, household head without spouse but with children).
Other religion	Equals 1 for believers of religions other than Catholic, Evangelical, or Pentecostal (self-declared).
Overcrowded	Equals 1 if ratio of number of residents to number of bedrooms is greater than three in rural households, or greater than or equal to three in urban households.
Own welfare	Equals 1 if respondent "totally agrees" or "agrees" with the statement: "Each individual is responsible for their own welfare."
Paramilitaries	Number of violent events per year perpetrated by paramilitaries per 100,000 inhabitants (average 2010–2012). *Sources*: Conflict analysis resource center (CERAC); Universidad del Rosario.
People in household	Number of household residents.
Polarization	Reynal-Querol (2002) polarization index. $P_j = 1 - \sum_{i=1}^{N} \pi_{ij} \left(\frac{1/2 - \pi_{ij}}{1/2} \right)^2$, where π_{ij} is the vote share for the mayoral candidate (in 2011) i in municipality j. See Pachón and Sánchez (2014).
Pop. density	Population divided by total area (km^2) in the municipality.
Popular vote	Equals 1 if respondent "totally agrees" or "agrees" with the statement: "It is important that rulers are elected by popular vote."

Continued on next page

Table B-1 – Variable definition and sources, continued from previous page

Variable	Description
Positive reciprocity	Equals 1 if respondent "totally agrees" or "agrees" with the statement: "You always have to help those who help you."
Regions	Regions included in fixed effects. Urban regions in the survey are: *Atlántica*, *Oriental*, *Central*, *Pacífica*, *Bogotá*. Rural regions include: *Atlántica-Media*, *Cundi-Boyacense*, *Eje Cafetero*, *Centro-Oriente*.
Rural population	Proportion of rural population in the municipality (average 2006–2008). *Source*: DANE.
Savings	Equals 1 if respondent answers "yes" to: "Do you usually save some of the income you receive?"
Secret ballot	Equals 1 if respondent answers "yes" to: "Do you think that the ballot is secret?"
Send help	Equals 1 if household answers "yes" to at least one of the following questions: "During the past 12 months, did any members of the household send money or in-kind aid..." a."to relatives or friends who live in Colombia?", b."to relatives or friends who live abroad?", c."for alimony?" d. "to other persons, entities or organizations?".
Shock	Equals 1 if household reports any major destabilizing negative event during the previous three years.
Social program beneficiary	Equals 1 if household benefits from any of the following programs: *Familias en acción* (main conditional cash transfer for the poor with school-age children), programs for the elderly, *SENA* training programs, *Red Juntos - Unidos* (program that provides social services to displaced families with the lowest levels of poverty), *ICBF* programs for children, aid for displaced people, support to households affected by natural disasters, or "other programs."
Social security	Equals 1 if respondent is affiliated to social security.
State presence	Raw total of local state agencies, local municipality employees, and national-level municipality employees (per capita in 1995). *Acemoglu, Garcia-Jimeno, and Robinson (2015)*.
Stratum 1, 2	Socio-economic stratum, based on classification of household residence (used to target utility subsidies).
Use of violence	Equals 1 if respondent "totally agrees" or "agrees" with the statement: "Sometimes the use of violence is justified."
Vote for the same party	Equals 1 if respondent "Always votes for the same party" or "Almost always votes for the same party." Equals 0 otherwise ("Votes for different parties" or "Always votes blank").
Wealth	First principal component following a *principal component analysis* on a set of reported household assets and dwelling characteristics. See Bernal et al. (2014).
Win margin	Difference between the vote shares of the winner and runner-up in the 2011 mayoral election. See Pachón and Sánchez (2014).
Woman	Equals 1 if respondent is female.
Workers per firm	Average number of formal workers per firms by municipality (2012). *Source*: Ministry of Health and Social Protection.

Notes: Source is Elca 2013 unless otherwise stated at the end of each description.

B.2 Balance between treatment and control groups in list experiments

We corroborate that respondents assigned to treatment and control lists, and the direct question, have similar observable characteristics. For a set of observables **X**, we check both the bivariate relationship between group assignment and observables:

$$\Pr(T_i = m) = f(x_i \beta_m) \quad \text{with } x_i \in \mathbf{x},$$

and the multivariate regression,

$$\Pr(T_i = m) = f(\mathbf{x}' \beta_m),$$

where m represents each group (*Treatment*, *Control 1*, and *Control 2*). We estimate the marginal effects of multinomial probit models.

Since randomization was stratified at the regional level, in both types of regressions we include region fixed effects. We also estimated separate regressions for each region, with similar results, but present only these aggregate results to save space. Similarly, we also estimated simple probit and linear probability models for dichotomous indicators of each treatment condition as the dependent variable, and again found no systematic evidence of imbalance.

Table B-2 shows balance using observables in 2010 and Table B-3 in 2013 for the tax evasion experiment.

Table B-2: Balance on covariates at baseline (2010): Tax evasion list experiment

	Urban sample						Rural sample					
	Bivariate			Multivariate			Bivariate			Multivariate		
Variables	*Treatment*	*Control 1*	*Control 2*	*Treatment*	*Control 1*	*Control 2*	*Treatment*	*Control 1*	*Control 2*	*Treatment*	*Control 1*	*Control 2*
Age	-0.001	0.001	-0.000	-0.001	0.001	-0.000	-0.001	0.000	0.001	-0.001*	0.001	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Male household head	-0.001	-0.000	0.001	0.008	-0.022	0.014	0.002	-0.023	0.022	-0.004	-0.006	0.009
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Education	0.001	-0.002	0.001	0.001	-0.000	-0.000	-0.001	-0.000	0.001	-0.001	-0.000	0.002
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Employed household head	0.005	0.003	-0.007	-0.002	0.011	-0.009	-0.007	0.018	-0.011	-0.015	0.027	-0.012
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Savings	-0.004	-0.010	0.014	-0.009	-0.007	0.016	-0.018	-0.010	0.028	-0.018	-0.009	0.027
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Not in organization	0.000	-0.000	-0.000	0.000	0.000	-0.000	0.001	-0.000	-0.000	0.001	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Social security	0.024	0.001	-0.026	0.030	-0.006	-0.024	-0.007	-0.001	0.008	0.004	-0.003	-0.002
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Contributes to social security	-0.006	-0.000	0.006	-0.015	0.011	0.004	-0.038	0.013	0.026	-0.031	0.016	0.015
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.04)	(0.03)	(0.03)
Household with spouse	0.006	-0.015	0.009	0.006	-0.021	0.015	0.000	0.028	-0.028	-0.004	0.026	-0.022
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Wealth	0.003	-0.003	-0.000	0.007	0.004	-0.011	-0.010	0.008	0.002	-0.008	0.014	-0.006
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
People in household	0.001	0.002	-0.004	0.003	-0.000	-0.003	0.003	-0.005	0.002	-0.001	-0.003	0.004
	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Overcrowded	0.001	-0.019	0.018	0.004	-0.019	0.016	-0.021	0.006	0.015	-0.013	-0.008	0.022
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Homeowner	-0.002	-0.004	0.007	0.005	-0.013	0.008	-0.005	-0.013	0.018	0.006	-0.016	0.010
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
No debts	-0.018	0.024*	-0.006	-0.020	0.030*	-0.011	-0.018	0.006	0.012	-0.011	0.017	-0.006
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Shock	0.011	0.011	-0.022	0.009	0.015	-0.025	-0.021	0.013	0.008	-0.023	0.011	0.012
	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
HH expenses (log)	-0.002	-0.004	0.007	0.005	-0.013	0.007	0.014	-0.020*	0.006	0.002	-0.014	0.012
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
HH food expenses	-0.010	0.003	0.008	-0.022	0.013	0.009	0.022*	-0.019	-0.003	0.030	-0.006	-0.024
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Nuclear family	-0.005	0.002	0.002	-0.002	-0.001	0.002	-0.002	-0.000	0.003	-0.006	-0.000	0.007
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Formal credit	-0.008	0.011	-0.003	0.001	-0.005	0.003	-0.027	-0.005	0.032*	-0.027	-0.009	0.036*
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Get help	0.008	-0.004	-0.005	0.010	-0.007	-0.003	0.017	-0.016	-0.001	0.016	-0.010	-0.006
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Send help	0.005	-0.013	0.009	0.002	-0.016	0.014	-0.045	0.029	0.017	-0.052*	0.030	0.022
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Social program beneficiary	0.016	0.008	-0.024	0.028	0.018	-0.046**	0.010	-0.005	-0.005	-0.004	0.020	-0.016
	(0.02)	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
FEA	0.008	0.004	-0.012	-0.012	-0.022	0.034	0.013	-0.014	0.001	0.011	-0.030	0.019
	(0.02)	(0.02)	(0.02)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Stratum 1	-0.016	0.011	0.005	-0.035	0.035	-0.000						
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)						
Stratum 2	-0.003	0.021	-0.018	-0.018	0.037*	-0.019						
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)						
Wealth (rural): quintile 1							0.007	-0.013	0.006	0.007	-0.004	-0.002
							(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
Wealth (rural): quintile 2							0.013	0.022	-0.035*	0.015	0.027	-0.042
							(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.04)
Wealth (rural): quintile 3							0.021	-0.037*	0.017	0.016	-0.017	0.001
							(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Wealth (rural): quintile 4							-0.017	0.021	-0.004	-0.010	0.024	-0.015
							(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
No sewage							0.006	-0.023	0.018	0.010	-0.026	0.015
							(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)

Notes: The table reports marginal effects from multinomial probit models, with standard errors in parentheses. All regressions include region fixed effects. *Treatment* refers to respondents who were presented with the list that included the sensitive item, *Control 1* received the list without the sensitive item followed by the direct question, and *Control 2* was asked the direct question. For variable definitions, see Appendix Table B-1. * is significant at the 10% level, ** is significant at the 5% level, *** is significant at the 1% level.

Table B-3: Balance on covariates at follow-up (2013): Tax evasion list experiment

	Urban sample						Rural sample					
	Bivariate			Multivariate			Bivariate			Multivariate		
Variables	*Treatment*	*Control 1*	*Control 2*	*Treatment*	*Control 1*	*Control 2*	*Treatment*	*Control 1*	*Control 2*	*Treatment*	*Control 1*	*Control 2*
Age	-0.000	0.001	-0.000	-0.000	0.001*	-0.001	-0.001	0.000	0.001	-0.001	0.000	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Male household head	-0.001	-0.007	0.008	-0.007	-0.012	0.020	-0.001	-0.011	0.012	0.004	0.005	-0.009
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Education	-0.000	0.000	0.000	-0.001	0.002	-0.001	0.001	-0.002	0.001	0.001	-0.003	0.002
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Employed household head	0.011	-0.018	0.007	0.012	-0.014	0.002	0.015	0.005	-0.020	0.004	0.014	-0.018
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Savings	0.004	-0.018	0.014	0.006	-0.015	0.008	0.029	0.019	-0.048***	0.029	0.017	-0.046***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Not in organization	0.000	-0.020	0.020	-0.010	-0.017	0.027*	-0.011	-0.016	0.026*	-0.005	-0.020	0.025
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Social security	0.025	-0.038	0.013	0.034	-0.047*	0.013	0.046	-0.034	-0.012	0.042	-0.049	0.007
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
Contributes to social security	0.012	0.005	-0.016	0.031*	0.004	-0.035**	-0.024	0.006	0.018	-0.004	-0.015	0.019
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Household with spouse	-0.003	-0.007	0.010	-0.003	-0.021	0.024	0.010	0.023	-0.033*	0.004	0.045*	-0.049**
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Wealth	-0.005	0.002	0.003	-0.003	0.006	-0.003	-0.014*	0.011	0.003	-0.024	-0.014	0.038**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
People in household	0.005	0.001	-0.006	0.007	-0.003	-0.005	-0.002	-0.002	0.004	-0.004	0.002	0.002
	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)
Overcrowded	-0.038**	0.004	0.034**	-0.035*	0.008	0.027	-0.003	0.039*	-0.036	0.000	0.039*	-0.039
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)
Homeowner	-0.007	-0.008	0.015	-0.005	-0.020	0.025*	0.016	-0.016	-0.000	0.026*	-0.023	-0.004
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
No debts	0.016	-0.002	-0.013	0.050	-0.068**	0.018	0.014	-0.011	-0.003	0.039	-0.014	-0.025
	(0.02)	(0.02)	(0.01)	(0.03)	(0.03)	(0.03)	(0.01)	(0.02)	(0.01)	(0.03)	(0.03)	(0.03)
Shock	-0.019	-0.001	0.020	-0.023	-0.002	0.025*	0.009	-0.007	-0.002	0.006	-0.006	-0.000
	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
HH expenses (log)	-0.010	-0.001	0.011	-0.016	-0.021	0.037	-0.010	-0.001	0.012	-0.011	-0.019	0.030
	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
HH food expenses (log)	-0.010	0.012	-0.002	-0.011	0.029*	-0.018	-0.004	0.005	-0.001	0.010	0.022	-0.033
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Nuclear family	-0.009	0.010	-0.001	-0.005	0.001	0.004	-0.004	0.018	-0.013	-0.009	0.033*	-0.024
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Formal credit	0.003	0.018	-0.021	-0.031	0.075***	-0.044*	0.001	-0.008	0.007	-0.028	0.003	0.025
	(0.02)	(0.02)	(0.01)	(0.03)	(0.03)	(0.02)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)
Get help	0.008	-0.025*	0.017	0.010	-0.028*	0.018	0.005	-0.031**	0.026*	0.005	-0.026*	0.022
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)
Send help	0.019	0.007	-0.026*	0.012	0.010	-0.023	-0.001	-0.008	0.009	-0.005	-0.001	0.006
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Social program beneficiary	-0.006	0.018	-0.012	0.004	0.005	-0.009	0.009	0.002	-0.011	-0.018	0.015	0.003
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
FEA	-0.013	0.026	-0.013	-0.034	0.031	0.003	0.022	-0.007	-0.015	0.032	-0.012	-0.020
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Stratum 1	0.002	0.006	-0.008	-0.018	0.035	-0.017						
	(0.01)	(0.02)	(0.01)	(0.03)	(0.02)	(0.02)						
Stratum 2	-0.014	0.023*	-0.009	-0.030	0.043**	-0.014						
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)						
Wealth (rural): quintile 1							0.009	0.008	-0.017	-0.035	-0.090*	0.125**
							(0.02)	(0.02)	(0.02)	(0.05)	(0.05)	(0.05)
Wealth (rural): quintile 2							0.020	-0.025	0.005	-0.015	-0.102***	0.117***
							(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
Wealth (rural): quintile 3							0.015	-0.038**	0.023	-0.011	-0.105***	0.115***
							(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Wealth (rural): quintile 4							-0.026	0.002	0.024	-0.032	-0.064**	0.096***
							(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
No sewage							0.002	0.004	-0.005	0.013	-0.003	-0.009
							(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)

Notes: The table reports marginal effects from multinomial probit models, with standard errors in parentheses. All regressions include region fixed effects. *Treatment* refers to respondents who were presented with the list that included the sensitive item, *Control 1* received the list without the sensitive item followed by the direct question, and *Control 2* was asked the direct question. For variable definitions, see Appendix Table B-1. * is significant at the 10% level, ** is significant at the 5% level, *** is significant at the 1% level.

B.3 Testing the 'no design' and 'no liar' assumptions in list experiments

In this Appendix we test for the 'no design' and 'no liar' assumptions in our list experiments, following Blair and Imai (2012). The test for the former compares the predicted average difference in answers to control items under treatment vs. control. With $Y_i(0)$, $Z^{\star}_{i,J+1}$, Y_i and T_i specified as above, let $\pi_{yz} = \Pr(Y_i(0), Z^{\star}_{i,J+1} = z)$ represent the proportion of the population in each type $(Y_i(0), Z^{\star}_{i,J+1})$. If there are no design effects, these proportions can be computed for all $y = 0, ..., J$ as follows:

$$\pi_{y1} = \Pr(Y_i <= y | T_i = 0) - \Pr(Y_i <= y | T_i = 1),$$
$$\pi_{y0} = \Pr(Y_i <= y | T_i = 1) - \Pr(Y_i <= y - 1 | T_i = 0).$$

Proportions π_{y1} and π_{y0} always take positive values. But with design effects, estimated proportions can be negative (for example, see Table 5 in Blair and Imai (2012)). To test for design effects, one can therefore evaluate whether the proportion of the population in each type (π_{yz}) is jointly non-negative.[44] Panel A in Table B-4 shows that no single estimated proportion is negative for either experiment, so the test suggests there is no evidence to reject the null hypothesis of no design effects.

To test the 'no liar' assumption, we can evaluate the two most common sources of untruthful answers: ceiling and floor effects. These occur when the respondent engages in either none or all of the behaviors, and thus feels exposed if he or she answers truthfully. In Table 1, the bulk of the answers in the treated lists (94.5%) are larger than zero and smaller than the maximum (five) number of items people can list. This reflects the fact that the original instrument design included option items that are likely to be negatively correlated with each other, as well as at least one very frequent behavior.

We also test for floor and ceiling effects more formally by estimating the model under the no liar assumption, and comparing it to an alternative model allowing for floor and ceiling effects. Based on different information criteria, if the data supports the second model, there is evidence to reject the null of no floor or ceiling effects.[45] Panel B of Table B-4 reports the results. Regardless of the criterion used, Schwarz's BIC or Akaike's AIC, the preferred model includes no floor or ceiling effects, so this test fails to reject the null of no floor or ceiling effects. Furthermore, these results hold either with covariates (Columns 1 and 2) or when the basic set of covariates in Table 2 is included.[46]

[44] This test, however, has limitations: there can be design effects with positive π_{y1} and π_{y0}. Also, a higher probability of positive answers to the sensitive item reduces the likelihood of rejecting the null of no design effects.

[45] Since the model is identified under the no floor or ceiling effects assumption, we must make additional assumptions to estimate the alternative, allowing for these effects. To do so, we follow Blair and Imai (2012) and consider that respondents' truthful answers to the sensitive item are independent of their answers for control items, conditional upon the pretreatment covariates.

[46] We also find similar results using a different set of covariates.

Table B-4: Testing assumptions in the list experiments

	(1)	(2)	(3)	(4)
Panel A: No design effects				
	Estimated proportions with response y to control items and...			
Response value (y)	...not following sensitive behavior ($\hat{\pi}_{y0}$)		...following sensitive behavior ($\hat{\pi}_{y1}$)	
	Estimate	*Std. Error*	*Estimate*	*Std. Error*
0	0.041	0.004	0.004	0.005
1	0.381	0.010	0.040	0.013
2	0.323	0.012	0.053	0.010
3	0.097	0.008	0.026	0.006
4	0.021	0.004	0.014	0.002
Total	0.863		0.137	
P-value	1			
Panel B: No liar effects				
	Information criterion			
	BIC	*AIC*	*BIC*	*AIC*
No boundary	9863.88	10050.28	9873.01	9885.44
Ceiling	9875.50	10173.80	9897.23	9894.14
Floor	9894.20	10176.84	9899.40	9915.55
Ceiling-Floor	9896.91	10300.36	9927.55	9924.26
Covariates	No	No	Yes	Yes

Notes: Panel A reports the estimated proportion of respondent types as described in each column title. The design effects test evaluates whether the population proportions are jointly non-negative. For each experiment, the Bonferroni-corrected *P-value* for the null of no design effects is reported. Panel B reports Schwarz's (BIC) and Akaike's (AIC) information criteria when the model is estimated without including boundaries (*No boundary*), including ceiling effects (*Ceiling*), including floor effects (*Floor*) and including both ceiling and floor effects (*Ceiling-Floor*). In this panel, the first two columns estimate the models without covariates, while the final two columns include the set of characteristics listed in Table 2.

B.4 Simple regression analysis

In the main text, we focus on the extreme bounds methodology to examine which variables are robustly correlated with tax evasion. This section reports a simpler regression analysis, which produces similar conclusions.

Table B-5 runs linear regressions for VAT evasion on the same set of variables explored in the text. Odd columns, labeled "bivariate," show the resulting coefficient for regressions including only one covariate at a time (in addition to region fixed effects, which are always included). Even columns show the coefficient for a multivariate regression, which simultaneously includes all variables listed in the table. The reported significant correlations (and their magnitudes) fall in line with those that survive the sensitivity analysis with the extreme bounds methodology reported in the main text. Finally, in the main text we also explored the role of a few interactions between correlates of interest. In Table B-6 we show the results of including such interaction terms in regressions that include only region fixed effects and the relevant lower-order uninteracted terms (in the even, "bivariate" columns) as well as in regressions containing the full set of covariates (Table B-5). Again, there are few differences from the results using the extreme bounds methodology.

Table B-5: Correlates of tax evasion: Simple regression analysis

	(1)	(2)		(3)	(4)
Variables	**Bivariate**	**Multivariate**	*Variables*	**Bivariate**	**Multivariate**
Wealth	-0.111***	-0.0752***	Evangelical/Pentecostal	-0.0155	-0.0424
	(0.0154)	(0.0231)		(0.0120)	(0.0270)
Use of violence	0.0816***	0.0444***	Working for government	-0.0329***	-0.00193
	(0.0143)	(0.0150)		(0.0109)	(0.0111)
Lands	-0.0447***	-0.0332***	Fractionalization	-0.0275	0.0305
	(0.00979)	(0.00973)		(0.0180)	(0.0671)
Agree with bribery	0.0826***	0.0532***	Catholic	0.00331	-0.0345
	(0.0137)	(0.0137)		(0.0132)	(0.0307)
Guerrillas	0.0507***	0.0603***	Commerce sector	0.0715***	0.0825***
	(0.0157)	(0.0151)		(0.0169)	(0.0162)
Justice into own hands	0.0899***	0.0384**	Own welfare	-0.00987	-0.0115
	(0.0138)	(0.0154)		(0.0135)	(0.0131)
Negative reciprocity	0.0812***	0.0397**	Age	-0.0148	-0.0144
	(0.0141)	(0.0161)		(0.0132)	(0.0146)
Rural population	0.0871***	0.0659**	Independent	-0.00280	0.0192
	(0.0163)	(0.0301)		(0.0141)	(0.0128)
Employment firms 2+	-0.0518***	0.0979***	Woman	0.0141	0.0234
	(0.0158)	(0.0333)		(0.0153)	(0.0170)
Education	-0.0585***	-0.0158	Polarization	0.0479***	-0.0145
	(0.0150)	(0.0167)		(0.0156)	(0.0546)
Other religion	-0.0294***	-0.0404**	Pop. density	-0.0280*	0.0572***
	(0.0107)	(0.0158)		(0.0155)	(0.0203)
Win margin	-0.0121	0.0394	Neighbor cellphones	0.0436***	0.0189
	(0.0287)	(0.0496)		(0.0158)	(0.0159)
State presence	-0.0686***	-0.0728***	Neighbor loans	0.0309**	0.0111
	(0.0153)	(0.0158)		(0.0148)	(0.0148)
Shock	0.0528***	0.0282**	Homicide rate	-0.108***	-0.105***
	(0.0129)	(0.0121)		(0.0172)	(0.0137)
HH expenses	-0.0575***	-0.0124	Gov. against inequality	-0.0108	-0.00292
	(0.0151)	(0.0148)		(0.0145)	(0.0151)
Popular vote	-0.0264*	-0.0217	Paramilitaries	-0.00929	0.00219
	(0.0139)	(0.0139)		(0.0132)	(0.0158)
Authorities violate law	0.0436***	0.00529	Positive reciprocity	0.00796	0.00139
	(0.0138)	(0.0141)		(0.0141)	(0.0142)
Workers by firm	-0.0653***	-0.0565**	Government role	0.00495	-0.00538
	(0.0146)	(0.0256)		(0.0144)	(0.0144)

Notes: Ordinary least squares regressions. The dependent variable of interest is a dummy indicating whether the respondent normally accepts buying items without a receipt, to avoid paying VAT. Region fixed effects are always included, and standard errors are clustered at the community level. Odd columns, labeled "bivariate," show the resulting coefficient for regressions including only one covariate at a time. Even columns show the coefficient for a multivariate regression, simultaneously including all variables listed in the table. For variable definitions, see Appendix Table B-1. * is significant at the 10% level, ** is significant at the 5% level, *** is significant at the 1% level.

Table B-6: Tax evasion: interaction terms: Simple regression analysis

	(1)	(2)
Variables	**Bivariate**	**Multivariate**
State presence × Positive rec.	-0.0206**	-0.0178*
	(0.0102)	(0.0104)
State presence × Negative rec.	0.00652	0.00358
	(0.0130)	(0.0130)
Popular vote × Positive rec.	0.0117	0.00888
	(0.0129)	(0.0126)
Popular vote × Negative rec.	0.00823	0.00472
	(0.0139)	(0.0136)

Notes: Ordinary least squares regressions. The dependent variable of interest is a dummy indicating whether the respondent normally accepts buying items without a receipt, to avoid paying VAT. Standard errors are clustered at the community level. Region fixed effects are always included, and standard errors are clustered at the community level. Column 1 reports the coefficient of a "bivariate regression" containing only the region fixed effects, lower-order uninteracted terms, and the interaction of interest as regressors. Column 2 presents the results of a multivariate regression in which all variables in Table B-5 are also included. For variable definitions, see Appendix Table B-1. * is significant at the 10% level, ** is significant at the 5% level, *** is significant at the 1% level.