CESifo
CONFERENCES 2019

11th Norwegian-German Seminar on Public Economics

Munich, 6 – 7 December 2019

The Customer is King: Evidence on VAT Compliance in Tanzania

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The Customer is King:

Evidence on VAT Compliance in Tanzania*

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Abstract

Value Added Tax (VAT) has emerged as one of the main modes of raising tax revenue worldwide, but has significantly underperformed as a revenue source in African countries. To improve compliance, Tanzania has introduced Electronic Fiscal Devices (EFDs), which automatically transmit information about business transactions to the tax administration. However, VAT collection has not improved as expected. In this paper, we examine EFD compliance and identify factors that influence it. An innovation in this study is the direct observation of EFD usage: our enumerators waited for customers departing from business premises, and then checked their receipts, interviewed them and interviewed the businesses. This design enabled us to observe each business's actual compliance in issuing EFD receipts, thus mitigating the problem of dishonest reporting of compliance, which is common in self-reported survey data. We find that EFD compliance is strongly associated with the customer's perception of detection and

Acknowledgements: Helpful comments on earlier drafts were received from Marius van Oordt, Armin von Schiller and Ragnar Torvik. Earlier versions were presented at the ICTD Annual Conference in Entebbe, Uganda, 16-18 October 2017, and at the Joint Steering Committee (JSC) Meeting of the Tanzania Revenue Authority and donors, Dar es Salaam, 29 November 2017. We appreciate very constructive comments and feedback from participants at these meetings. The paper was prepared with financial support from the International Centre for Tax and Development and the Norwegian Embassy in Tanzania. Points of view and possible errors are entirely our responsibility.

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penalty risks, and with the business's perception of other businesses' compliance and satisfaction with public services.

Keywords: Taxation; Tax Compliance; VAT; Africa; Tanzania
JEL: H2, H26, O23

Highlights

- We study businesses' compliance with issuing EFD (VAT) receipts in transactions with customers.
- We directly observe whether the business issues a receipt by interviewing customers.
- EFD compliance is strongly associated with the customer's perception of detection and penalty risks.
- EFD compliance is also strongly associated with the business's perception of other businesses' compliance and satisfaction with public services.

1 Introduction

Value Added Tax (VAT) has emerged as one of the main modes of raising tax revenue worldwide, but has significantly underperformed as a revenue collection tool in African countries, and non-compliance remains a major challenge (Cnossen, 2015; Moore, Prichard, & Fjeldstad, 2018). A serious barrier to the empirical study of compliance is that it is generally not observed. Instead, existing research relies on indirect measures of VAT compliance, typically changes in VAT revenues (Alm & McClellan, 2012; Alm, McClelland, & Schulze, 1992).

In this paper, we study how VAT compliance links with key factors identified in the literature: the perceived risk of detection and punishment, tax morale and fairness of the tax, beliefs about others' compliance, and satisfaction with public services (Alm et al., 1992; Andreoni, Erard, & Feinstein, 1998; Cowell, 1990; McKerchar & Evans, 2009). We directly measure VAT compliance at the business level by observing whether businesses issue VAT receipts or not. A major advantage of our approach is that we are able to investigate both sides of a transaction and study how the characteristics of both customers and businesses explain VAT compliance. This allows us to differentiate between voluntary compliant businesses, which issue a receipt without the customer asking, and businesses that are induced to be compliant by customers asking for a receipt.

In our sample, 75 per cent of the businesses issued a VAT receipt for the observed transaction. Out of the compliant businesses, 70 per cent issued a receipt voluntarily, whereas the remaining 30 percent had to be prompted to do so by the customer.

Our main finding is that businesses are much more likely to comply (a mean increase in compliance of 24 percentage points) when they transact with a customer who is aware of her legal obligation to obtain VAT receipts, and thinks that there is a real risk of punishment if detected without a receipt. This result highlights the importance of the customers' awareness and perceptions in explaining businesses' VAT compliance.

In terms of the characteristics of the salespersons making the transactions, we find that their views about other businesses' compliance is the factor most strongly associated with a

business's own compliance: salespersons who believe that other businesses in their area never avoid paying VAT are 20 percentage points more likely to issue a VAT receipt. We also find that female salespersons are more likely to issue a VAT receipt without being prompted by the customer, and receipts are more likely to be issued to female customers without them asking for it. Finally, using machine learning to estimate a classification tree, we observe that the salespersons' satisfaction with public services and with the administration seem to mitigate the direct effects of the customers' perception.

The paper relates to the large literature on tax compliance originating with Allingham and Sandmo (1972). Their model is the basis of the "deterrence approach" to taxpayer behavior, which posits that tax compliance increases with the probability of audit and severity of punishment. Lab and field experiments generally confirm that increasing the taxpayer's perceived detection probability, or the severity of sanctions, increases compliance. However, the deterrence approach cannot fully explain observed levels of tax compliance. Given the prevailing probabilities of audit and severity of sanctions, the model predicts more evasion than we actually observe, at least in rich countries (Alm, 2012; Dwenger, Kleven, Rasul, & Rincke, 2016; Hallsworth, 2014). Because of this, the "non-deterrence approach", which suggests that taxpayer behavior is additionally influenced by factors such as social norms, morale, fairness considerations and public service provision, is increasingly common in tax compliance research (Hallsworth, 2014, p. 665). The overall evidence on the importance of such factors is, however mixed.

We contribute to this literature on tax compliance in four ways. First, we show that it is possible to directly measure EFD compliance of businesses, which represents a major improvement compared to existing studies which mainly rely on laboratory outcomes or indirect measures such as reported sales. Second, we link the observed compliance to deterrence and non-deterrence factors. Third, we investigate these factors at both sides of the transaction. Our results show that knowledge about the obligation to obtain a receipt and perceptions about detection and punishment on the customer side play a decisive role in explaining final

compliance. On the business side, the salesperson's perception about other businesses' compliance is the most important factor associated with compliance. Finally, as Torgler (2007), Alm and McClellan (2012), Hallsworth (2014) and OECD (2019) point out, the non-deterrence literature has mainly focused on the tax compliance of individuals, not organisations or businesses. We contribute to the literature on non-deterrence by investigating these factors from the perspective of the businesses.

Our paper is also related to a growing literature focusing on third-party reporting as an alternative to tax audits as an enforcement strategy (Dwenger et al., 2016; Gordon & Li, 2009; Kopczuk & Slemrod, 2006; Kumler, Verhoogen, & Frías, 2015). When employers, banks or trading partners directly provide the government with information about taxable income and transactions, the taxpayer may have little or no opportunity to evade tax, even when the probability of being audited is very low (Carrillo, Pomeranz, & Singhal, 2017; Kleven, Knudsen, Kreiner, Pedersen, & Saez, 2011). Supporting this idea, Kleven et al. (2011) find significantly higher compliance among individuals for whom income was reported by a third party compared to individuals who self-reported income. Thus, improvements in third-party information have the potential to significantly increase tax compliance.[1]

The structure of the VAT gives businesses the incentive to provide the government with information essential to enforcement: It is levied on all sales of commodities at every stage of production. It is added on the purchase price for the buyer, and the seller gains tax credits to offset any taxes previously paid on inputs. Because the sellers can only realise tax credits on their inputs if they have an invoice for the taxes paid, VAT gives sellers the incentive to collect the tax and pay it to the government, and to trade with other formalised firms (Cnossen, 2015; Keen & Lockwood, 2010). This creates a paper trail for transactions along the production chain and provides the government with essential third-party information. Because of this incentive for businesses to demand receipts from their suppliers, VAT is often referred to as "self-enforcing" (Kopczuk & Slemrod, 2006; Pomeranz, 2015). However, the self-enforcing

[1]However, the enforcement capacity of the tax administration, which is often limited in lower-income countries, has been found to be crucial (Carrillo et al., 2017).

property of VAT often breaks down at the final stage of the supply chain, where a sale is made to an end customer that cannot claim a deduction on taxes paid and does not have an incentive to ask for the receipt, as this will commonly imply a higher price. If a receipt is not issued at this final stage, the government cannot observe and enforce the tax, the seller does not have an incentive to ask for a receipt on inputs from suppliers, and non-compliance trickles up the supply chain. This is referred to as the "last mile problem" of the VAT (Cowell, 2004; Marchese, 2009; Naritomi, 2019).

The evidence we present contributes to the literature on third-party reporting of information and the VAT by demonstrating that the customer's knowledge about the law and perceptions about deterrence are crucial to businesses' compliance. These characteristics of the customer turn out to be more important than the business's characteristics and business-peoples' perceptions in explaining EFD compliance. In line with Naritomi (2019), who shows that the introduction of monetary incentives for customers (receipt lottery) significantly increased sales reported by businesses in Brazil, our findings highlight the important role of the final customer in solving the "last-mile problem" of VAT compliance.

The rest of the paper is structured as follows: in the next section, we describe the context of the study in greater detail. Thereafter, the research design is presented in section 3, followed by a discussion of the results in section 4. Section 5 concludes.

2 Context

First introduced in France in 1948, VAT is now in place in more than 150 countries (Ebeke, Mansour, & Rota-Graziosi, 2016). Because it is such an efficient means of extracting tax revenue in countries with good written or electronic records of economic transactions, VAT has facilitated trade liberalisation by replacing import and export taxes, and also contributed strongly to the steady increases in governments' shares of rising national incomes. Currently, around 80 per cent of the countries in sub-Saharan Africa levy a VAT, typically raising about one-quarter of all tax revenue (Keen, 2012, p. 3). However, VAT has under-performed as a

revenue collection tool in Africa. VAT was introduced, mainly at the urging of the International Monetary Fund (IMF) in the context of structural adjustment programmes in the 1980s and 1990s. It was intended to replace revenues that would be lost through large cuts in import and export duties (Gillis, 1990, p. 77-78), but it has not yet replaced those lost revenues (Baunsgaard & Keen, 2010; Keen, 2012). The productivity of the tax - the ratio of actual to potential collections - is much lower for sub-Saharan Africa than for any other continent. VAT systems in many African countries are so riddled with exemptions and zero rates on domestic goods that they resemble extended excise tax systems, while the standard rate is mainly confined to luxury goods (Cnossen, 2015). These exemptions have been actively defended - and sometimes expanded - through lobbying by the beneficiaries. From an administrative perspective, VAT can also be demanding for both tax administrators and taxpayers (Fjeldstad, 2014, p. 184). Yet, VAT is in Africa to stay. It is unlikely that any government would want to relinquish a tax that has such a high revenue collection potential (Moore et al., 2018).

Like governments in many other African countries, the Government of Tanzania has been striving to improve the effectiveness of its VAT regime and have tried to reduce evasion through a combination of measures, including improved tax legislation and more effective administrative processes (TRA, 2018). A key initiative was the introduction of Electronic Fiscal Devices (EFDs) in 2010.[2] The EFDs record and transmit data on sales transactions directly to the tax administration. The aim of their implementation was to reduce administrative and compliance costs for both the Tanzania Revenue Authority (TRA) and for businesses, and to improve VAT compliance through ensuring more accurate reporting of VAT. By 2012, 22,000 EFDs were in use by VAT-registered taxpayers across the country (TRA, 2018).

The legislation under The Value Added Tax (Electronic Fiscal Device) Regulation orders all businesses with a turnover above a certain threshold to acquire and use EFDs (URT, 2010, 2012). Initially, the legislation covered only VAT-registered businesses with a turnover of TZS

[2]The introduction of EFDs only applies to mainland Tanzania and does not include Zanzibar. Various circumstances, including a national general election that took place over the proposed implementation period, resulted in a slower than planned deployment pace. Thus, effective implementation of EFDs did not begin until January 2011 (Casey & Castro, 2015).

[Tanzanian Shilling] 40 million and above. In 2015 the VAT threshold was increased to TZS 100 million (TRA, 2018). Further, the requirement to use EFDs was extended to non-VAT-registered businesses with an annual turnover of TZS 14 million and above (ibid.). The purpose of the extension was to capture the businesses' turnover and to more precisely estimate their tax obligations.[3][4] The legislation requires businesses to acquire and use the EFD to issue receipts or invoices in their daily business transactions. The TRA regularly conducts audits of businesses by paying them unannounced visits. Non-compliant businesses are liable to a fine of not less than three million TZS or to imprisonment for a term not exceeding twelve months, or both (URT, 2012, p.21). The legislation also requires customers to demand and retain receipts, and to report if they have been denied a receipt upon payment (URT, 2012). TRA conducts audits of customers by approaching individuals carrying goods on the street, and asking them to see the receipt. Customers detected without a receipt are asked where they purchased the goods. If the business is identified to be EFD-eligible, the customer is liable to pay a penalty of twice the evaded tax or the goods are seized, and the business is penalized as described above. In the cases where the business from which the customer purchased their goods is not identified, penalties cannot be imposed.[5] TRA regularly informs and educates customers and businesses on various tax laws, regulations and procedures using different media including posters, leaflets, seminars, radio and television sessions.

By using EFDs, businesspeople, in principle, are able to prepare and file their VAT returns in time to meet deadlines. The use of EFDs also reduces the time required for preparation of VAT returns, as compared to previously when VAT returns were prepared manually. However, the take-up and use of EFDs by enterprises remains a major challenge for the TRA as the VAT collection has not improved as expected.[6] The annual growth in VAT revenue collection

[3]Only VAT-registered businesses are included in the present study.

[4]In August 2018, TZS 40 million (USD 17,500), TZS 100 million (USD 43,700) and TZS 14 million (USD 6,100)(USD amounts were calculated using www.xe.com/currencyconverter, December 2018).

[5]TRA does not share records of the exact numbers of audits conducted. The aim is to conduct audits one day a week in each tax block in each tax district, but due to staff shortage this goal is not always achieved.

[6]In all the annual budget speeches since 2014, the Minister of Finance has pointed at "underutilisation of EFDs" as a major challenge for domestic revenue mobilisation.

was between 13.5 and 21.7 per cent in the period from 2010/11 to 2016/17.[7] The average annual growth has been 16.8 per cent, which is below the projected rate of 18 per cent. This experience is not unique for Tanzania. Casey and Castro (2015) find that the introduction of EFDs did not increase VAT revenues, measured as share of GDP, in any of the nine countries they studied (including Tanzania).[8]

3 Research design

The purpose of this study is to examine EFD (non-)compliance behavior and to identify the factors that influence it. To achieve this, we develop a direct measure of EFD compliance among Tanzanian businesses. Both government authorities and researchers have requested more precise information about the extent of the non-compliance problem. In addition, the compliance measure can be linked to standard factors that are expected to influence businesses' behavior, measured at both the business and the customer level, to improve our understanding of EFD compliance.

The study was designed and conducted in collaboration with the Research, Policy and Planning Department (RPPD) of the TRA. The data collection was implemented in June-July 2017 in Dar es Salaam Region, the commercial centre of Tanzania. It covered five tax centres: Upanga, Kariakoo, Buguruni, Tegeta and Mwenge. The selection of these centres was based on the following two criteria: (a) the centre has a large number of VAT-registered taxpayers, and (b) belongs to the busiest centres in Dar es Salaam. The data was collected by surveying a random sample of business representatives ("taxpayers") in the five selected tax centres and one customer on each of the businesses' premises. The final sample contains a total of 314 business-customer pairs.

[7] TRA flash reports dated 2017 and authors' calculations (also see TRA (2018)).

[8] Eilu (2018) provides an overview of findings from studies of the use of EFDs in Kenya and Tanzania.

3.1 Innovative measurement of tax compliance

One of the main challenges facing tax compliance studies is to observe actual compliance behavior and to identify the factors that influence it. A major innovation in this study is that the design of the survey allowed us to identify the EFD users who complied as well as those who did not. To do this, enumerators approached the first customer who departed from a business and asked whether they were automatically given a receipt by the business representative. If not, they were asked whether they had demanded one. If so, they were asked whether they eventually received a receipt. The enumerators visually inspected whether each of the interviewed customers had a VAT receipt issued by an EFD. The study was designed such that the business owners and the customers would not know that the receipts would be checked. It is essential that we measure their normal behavior (as it would be without the study). This is also why we have only one observation per business, since it is likely that their behavior in a second observation would have been affected by the fact that we checked the receipt of a previous customer. This design enabled us to observe each business's actual compliance in issuing VAT receipts, thus mitigating the problem of dishonest reporting of compliance, which is common in self-reported survey data.

Based on these observations, we constructed three complementary measures of EFD compliance.

1. Voluntary compliance: a business is defined as voluntarily compliant if it issued a VAT receipt without being requested to do so by the customer.

2. Induced compliance: a business is defined as having been induced to comply if it issued a VAT receipt when requested to do so by the customer.

3. Total compliance: a business is defined as having a total compliance equal to 1 in our calculations if it issued a VAT receipt, either automatically or because the customer requested a receipt.

After surveying the customers, the enumerators approached the businesses to interview

the business representatives, i.e. the EFD users.

3.2 Factors explaining compliance

In addition to the questions about compliance, we collected information about the business representatives and customers on factors that might explain EFD (non-)compliance. We followed the literature on tax compliance in selecting those variables (Ali, Fjeldstad, & Sjursen, 2014; Hallsworth, 2014; Luttmer & Singhal, 2014). For the business representatives, we use measures of perceived risk of punishment, tax morale and fairness, beliefs about other businesses' compliance, and satisfaction with public services and tax administration. For customers, we use knowledge about the law that they can be fined for not having a receipt, and the perceived probability of detection.

We define the variables in the following way. "Business: low punishment risk" is a binary variable equal to 1 if the business representative believes that the probability of being punished when avoiding paying VAT is lower than 20 per cent (the median risk in the sample). "Higher tax morale" is a binary variable equal to 1 if the business's representative states that it is "wrong and punishable" to avoid paying taxes (compared to "not wrong" or "wrong but understandable"). "VAT rate is fair" is equal to 1 if the representative states that the rate of VAT is fair. "Other firms never evade VAT" is equal to 1 if the representative reports that the other businesses in their area never avoid paying VAT (compared to "rarely", "sometimes", "often" and "always"). "Satisfaction with public services" is an index of overall satisfaction with public services and "satisfaction with tax and admin" is an index of overall satisfaction with tax and administration. Both are standardised with mean 0 and standard deviation equal to 1, and are derived using principal component analysis on the question "To what degree are the following issues an obstacle to the current operations of this firm?".

When explaining whether the customer asks for a receipt and assessing the total compliance, we define the following customer-level variables: "Customer: low punishment risk", which is a binary variable taking the value of 1 if the customer knows she can be fined if she

does not get a receipt (i.e. answers "yes" to the question: "Is it true that TRA can fine you if you do not get a receipt when you buy an item or a service?"), and perceives the probability of being punished to be 0 (i.e. answers "0" to the question "Out of 100 people not having a TRA receipt, how many do you think are punished?"). "Customer: high punishment risk" is a binary variable equal to 1 if the customer knows she can be fined if she does not get a receipt and perceives the probability of being punished to be larger than 0. The missing category is comprised of the customers who think that there is no fine.

We summarise the compliance measures and the other variables collected in the next section.

4 Results

We start by decomposing the compliance process and the interaction between the businesses and the customers. Then we present the summary statistics of the other variables, before showing the associations between the compliance measures and the factors that could explain compliance. Finally, we investigate interaction effects using a machine learning approach.

4.1 The compliance process

Figure 2 illustrates the compliance process and the findings on compliance behavior. The green boxes show the cases in which a VAT receipt is eventually issued and the red boxes indicate the cases where there is no record of the transaction (no receipt or a non-TRA receipt). The dashed boxes indicate the dependent variables used in our regression analysis. The compliance process is decomposed as follows: we start with all the 314 business-customer transactions in the box farthest to the left, and first follow the upper path showing that for more than half of these transactions (190), the business voluntarily issue a VAT receipt. Out of these transactions, our enumerators are able to verify 163 as genuine VAT receipts issued by an EFD. We refer to the businesses conducting these transactions as "voluntarily compliant" and our

first dependent variable is an indicator equal to 1 if the business is voluntarily compliant and to 0 otherwise. The remaining 27 receipts could not be verified (either because the customer refused to show their receipt, or because the receipt was not issued by an EFD).

We next turn to the lower path showing that for 124 of the transactions, a receipt is not issued voluntarily. Among the customers who do not initially receive a receipt, 93 request one, whereas the remaining 31 customers do not. This gives us our second dependent variable, "Customer asks for receipt": an indicator equal to 1 if the customer asks for a receipt and to 0 otherwise. Continuing along the lower path, the figure shows that among the 93 businesses who are asked by their customer to provide a receipt, 84 give one (whereas 9 do not). However, following the path to the end, we see that only 72 of these are verified VAT receipts. Our third dependent variable is equal to 1 if the business give a receipt when asked for one. We refer to this as "induced compliance".

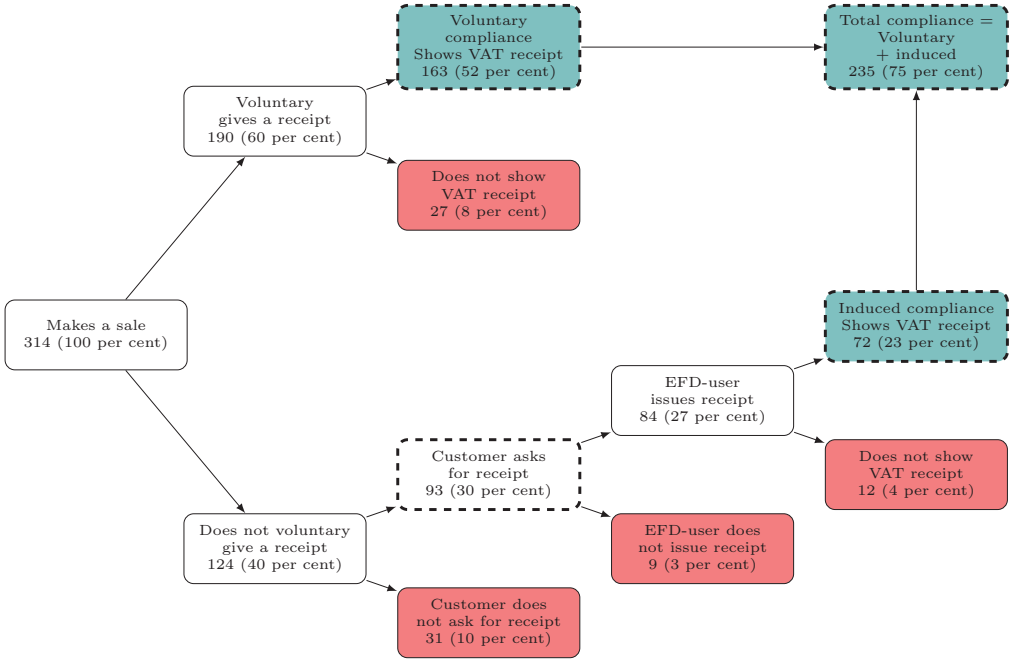
Finally, the figure illustrates that over all, a VAT receipt is issued for 75 per cent of the business-customer transactions, which is in line with the estimates from TRA. This observation gives us our last dependent variable, "total compliance", which is equal to 1 if a receipt is issued (either because the business gave it automatically, or because the customer requested and obtained one).

4.2 Summary of the factors that affect compliance

In Table 1, we present a summary of the compliance measures, as in Figure 2, and of the main variables that we use to test the factors that explain different compliance levels.

On the business side, we see that the perceived risk of punishment for avoiding VAT is low: 48 per cent of the businesses state that it is below 20 per cent. Half of the businesses report that it is "wrong and punishable" to avoid paying taxes and are labelled as holding "higher tax morale". Only 19 per cent think that the rate of VAT is fair. The businesses report that 87 per cent of the other businesses in the area "never" evade paying VAT (compared to "rarely", "sometimes", "often", or "always"). This is plausibly exaggerated, but the difference between

Figure 1: The compliance process and summary of results.



Note: The figure illustrates the compliance process for business to customer transactions obtained using data from the customer survey.

those who say "never" and those who admit higher frequencies is still informative. The indices of satisfaction with public services and with the administration are standardised and have a mean of 0 and a standard deviation of 1 by definition.

On the customer side, the majority of respondents, 69 per cent, believe that there is no risk or a very small risk of punishment if they make purchases without a VAT receipt. 30 per cent report a high risk of punishment.

Table 1: Summary of the main variables.

Variable	Mean	Median	Std. dev.	Min.	Max.	Count
Outcome variables						
Business voluntarily compliant	0.52		0.5	0	1	314
Customer asks for receipt	0.62		0.49	0	1	151
Business gives receipt if asked	0.77		0.42	0	1	93
Total compliance	0.75		0.43	0	1	314
Explanatory variables						
Business: low punishment risk	0.48		0.5	0	1	314
Higher tax morale	0.5		0.5	0	1	314
VAT rate is fair	0.19		0.39	0	1	314
Other businesses never evade VAT	0.87		0.33	0	1	314
Satisfaction with public services	0	0.48	1	-3.36	0.48	314
Satisfaction with tax and admin	0	0.74	1	-2.77	0.74	314
Customer: no punishment risk	0.42		0.49	0	1	314
Customer: low punishment risk	0.27		0.45	0	1	314
Customer: high punishment risk	0.30		0.46	0	1	314

We give some basic background descriptions of the businesses surveyed in Table 2. They have eight employees on average, 75 per cent of them do exclusively business-to-customer sales (B2C). One fourth are part of a larger company, the rest being stand-alone businesses. The majority of the individuals surveyed are women (59 per cent) with some level of higher education (46 per cent).

Table 2 further shows that 39 per cent of the customers are women, and that the customer spent TZS 747,000 on average (USD 324), and the maximum amount spent was TZS 80 million (USD 34,745).

Table 2: Summary of the main covariates.

Variable	Mean	Median	Std. dev.	Min.	Max.	Count
Business side						
Business: more educated	0.46		0.5	0	1	314
Business: woman	0.59		0.49	0	1	314
Part of larger firm	0.24		0.43	0	1	314
B2C	0.75		0.44	0	1	314
Full-time employees	7.96	3	19.84	0	280	314
Customer side						
Item cost (TZS 1,000)	781.59	54	5,504.99	0.6	80,000	300
Woman customer	0.39		0.49	0	1	314

4.3 Associations between the compliance process and the characteristics of the businesses and of the customers

To estimate the correlations between the different compliance measures and the characteristics of the businesses and of the customers, we use the following specification:

$$Y_{ij} = \alpha + \beta \times F_i + \gamma \times C_j + \epsilon \tag{1}$$

Where Y_{ij} is the outcome observed in the transaction between business i and customer j (voluntary compliance, customer asks for receipt, induced compliance and total compliance, respectively), F_i is a vector of characteristics of business i (Business: low punishment risk; Higher tax morale; VAT rate is fair; Other firms never evade VAT; Satisfaction with public services; Satisfaction with tax and admin), and C_j a vector of characteristics of customer j (Customer: low punishment risk; Customer: high punishment risk). We present the results with the different characteristics included one at a time in the model, and also all together. We use robust standard errors.

In our presentation of the results, we follow the compliance process outlined above. We first look at the voluntary compliance in Table 3. Then Table 4 reports whether the customer requests a receipt when she is not given one, Table 5 examines the response of the business to

that request, and Table 6 concludes with the total compliance measure.

We report the linear probability model estimates in the text and the logit estimates in Appendix B. We also report the results with additional covariates in Appendix A. The results are consistent across estimations and the choice between the different specifications does not affect our conclusions.

As we will show, the likelihood of total compliance is influenced by characteristics of both parties, the customer and the business representative. It seems therefore natural to ask whether those characteristics also interact to determine the compliance (e.g. what happens when a "compliant" customer meets a "non-compliant" business, and vice-versa?). This is however challenging to do in a linear or logistic regression framework given the total number of potential interactions and the limited sample size. To avoid this problem and still answer the question, we chose to fit a classification tree where a machine learning algorithm is used to determine endogenously which interactions are considered in the final model (Breiman, Friedman, Olshen, & Stone, 1984). The classification tree is reported in Section 4.4.

4.3.1 Voluntary compliance

Two compliance motives stand out when we study the voluntary compliance in model (5), Table 3: beliefs about the other businesses' behavior and satisfaction with the tax administration. We observe that the rate of voluntary compliance is 28 percentage points larger when the business believes that others also comply. Furthermore, a 1 standard deviation increase in the "satisfaction with the administration" index is associated with a 6 percentage point higher likelihood of the firm being compliant. In line with the deterrence approach, there is also a significant correlation between perceived risk of punishment and compliance in model (1), but not when all the motives are included. Table 7 in Appendix A reports regressions of voluntary compliance where a range of background variables are included. It shows that the main findings are robust to the inclusion of background variables. It also shows that the business is more likely to be voluntarily compliant when the business representative is a woman

and when the customer is a woman.

Table 3: The business is voluntarily compliant.

	(1)	(2)	(3)	(4)	(5)
Firm: low punishment risk	-0.126**				-0.086
	(0.056)				(0.056)
Higher tax morale		0.074			0.059
		(0.057)			(0.056)
VAT rate is fair		-0.051			-0.002
		(0.073)			(0.070)
Other firms never evade VAT			0.308***		0.281***
			(0.075)		(0.077)
Satisfaction with public services				0.005	-0.015
				(0.030)	(0.030)
Satisfaction with tax and admin				0.071**	0.061**
				(0.031)	(0.030)
Constant	0.580***	0.491***	0.250***	0.519***	0.286***
	(0.039)	(0.043)	(0.069)	(0.028)	(0.082)
Observations	314	314	314	314	314
R^2	0.016	0.007	0.042	0.021	0.070

Note: Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Ordinary least squares regressions of voluntary compliance (=1 if the business gave a receipt to their customer without being asked to do so) as the dependent variable. *Business: low punishment risk*: binary variable equal to 1 if the business believes that the probability of being punished when avoiding paying VAT is lower than 20 per cent (the median risk in the sample). *High tax morale*: binary variable equal to 1 if the business states that it is *wrong and punishable* to avoid paying taxes (compared to *not wrong* or *wrong but understandable*). *VAT rate is fair*: is equal to 1 if the business states that the rate of VAT is fair. *Other businesses never evade VAT* is equal to 1 if the business reports that the other businesses never avoid paying VAT. *Satisfaction with public services* is the standardised principal component for satisfaction with electricity, water supply, roads, health services, education/qualification of staff, law and order, sewage and street lighting. *Satisfaction with tax and admin* is the standardised principal component for tax rates, tax administration, business licensing and permits, political intervention and corruption.

4.3.2 The customer's behavior

Next, we investigate the factors determining whether the customer asked for a receipt in Table 4. When the customers have not received a receipt spontaneously, those who believe that the risk of punishment is low request a receipt in a significantly higher proportion (28 percentage points), compared to those who believe that there is no risk of punishment. The difference

is similar in the group that believes that there is a high risk of punishment (21 percentage points). Table 8 in Appendix A reports regressions with controls. It shows that the effect of the low punishment perception is robust to the inclusion of background variables, but the effect of the high punishment perception is not.

Table 4: The customer asks for a receipt.

	(1)
Customer: low punishment risk	0.280***
	(0.086)
Customer: high punishment risk	0.214**
	(0.103)
Constant	0.500***
	(0.056)
Observations	151
R^2	0.070

Note: Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Ordinary least squares regressions of if the customer asks for a receipt (=1 if the customer asks for a receipt and to 0 otherwise). *Customer: low punishment risk* is an indicator variable equal to 1 if the customer believes that the risk of being punished if caught without a receipt is low. *Customer: high punishment risk* is an indicator variable equal to 1 if the customer believes that there is a risk of being punished if caught without a receipt. The omitted category is comprised of the customers who think that there is no fine.

4.3.3 Induced compliance

We now turn to the businesses' induced compliance in Table 5. Ninety-three customers requested a receipt. The table shows that the perceived fairness of the VAT rate is the dominant factor explaining induced compliance. On average, the businesses who state that the rate is fair, print VAT receipts when requested to do so 22 percentage points more often than the businesses who say that the rate is unfair (and too high). This factor was not correlated with the voluntary measure of compliance, but seems to influence the choice of those businesses that are not voluntarily compliant when faced with a demanding customer. On the other hand, the factors that explained the voluntary compliance do not significantly affect the decisions of the businesses that did not voluntarily comply. As shown in Table 9 in Appendix A, these results

are robust to the inclusion of background variables, none of which are significantly correlated to induced compliance.

Table 5: The business gives a receipt when asked (induced compliance).

	(1)	(2)	(3)	(4)	(5)
Firm: low punishment risk	-0.031				-0.039
	(0.088)				(0.088)
Higher tax morale		-0.005			-0.020
		(0.088)			(0.092)
VAT rate is fair		0.204**			0.224**
		(0.079)			(0.091)
Other firms never evade VAT			0.049		0.109
			(0.125)		(0.127)
Satisfaction with public services				0.037	0.034
				(0.053)	(0.051)
Satisfaction with tax and admin				-0.046	-0.043
				(0.045)	(0.047)
Constant	0.791***	0.739***	0.733***	0.772***	0.670***
	(0.063)	(0.067)	(0.115)	(0.044)	(0.141)
Observations	93	93	93	93	93
R^2	0.001	0.036	0.002	0.013	0.057

Note: Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Ordinary least squares regressions of induced compliance (=1 if the business issued a receipt after the customer asked for it). See Table 3 for definitions of the explanatory variables.

4.3.4 Total compliance

Finally, we turn to the businesses' total compliance in Table 6. Among all the factors that we are testing, only two are strongly correlated with total compliance: the customer's beliefs about the risk of punishment and the business's belief about other businesses' behavior. As shown in Table 10 in Appendix A, these findings are robust to the inclusion of background variables.

Table 6: Total compliance.

	(1)	(2)	(3)	(4)	(5)	(6)
Firm: low punishment risk	-0.086*					-0.005
	(0.049)					(0.051)
Higher tax morale		0.035				0.022
		(0.049)				(0.047)
VAT rate is fair		-0.001				0.026
		(0.064)				(0.060)
Other firms never evade VAT			0.256***			0.203**
			(0.083)			(0.085)
Satisfaction with public services				0.022		-0.004
				(0.028)		(0.027)
Satisfaction with tax and admin				0.047*		0.035
				(0.027)		(0.027)
Customer: low punishment risk					0.174***	0.150**
					(0.061)	(0.062)
Customer: high punishment risk					0.278***	0.243***
					(0.053)	(0.057)
Constant	0.790***	0.731***	0.525***	0.748***	0.617***	0.443***
	(0.032)	(0.039)	(0.079)	(0.024)	(0.042)	(0.096)
Observations	314	314	314	314	314	314
R^2	0.010	0.002	0.039	0.018	0.076	0.108

Note: Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Ordinary least squares regressions of total compliance (=1 if the customer received a TRA receipt). See Tables 3 and 4 for definitions of the explanatory variables.

4.4 Classification model

The regression models show that the customer's characteristics strongly predict VAT compliance when a specific sale is made. Some of the business characteristics also seem to play a role. In this section, we examine how those different characteristics interact in predicting compliance. Because of the high number of potential interaction terms and the limited sample, we choose the machine learning approach and estimate a classification tree (Breiman et al., 1984). We use recursive binary splitting to grow a classification tree and use the classification error rate to make the splits.[9]

We start the estimation with all the variables included in Table 6. The classification procedure only retains five variables: *Customer: high punishment risk* and *Customer: low punishment risk* on the customer side, *Satisfaction with tax and admin*, *Satisfaction with public services* and *Firm: low punishment risk* on the business side. The tree has 9 terminal nodes, a residual mean deviance of 0.92 and a misclassification error rate of 0.22.

The tree is drawn in Figure 2. In each terminal node, we have noted the number of observations that fall into this category and the proportion of those observations comply with VAT (an EFD receipt is given to the customer). For instance, the final node on the right side tells us that in 43 of our observations, the customer perceived a high risk of punishment, the business was rather satisfied with the public services and an EFD receipt was issued in 98% of those 43 sales.

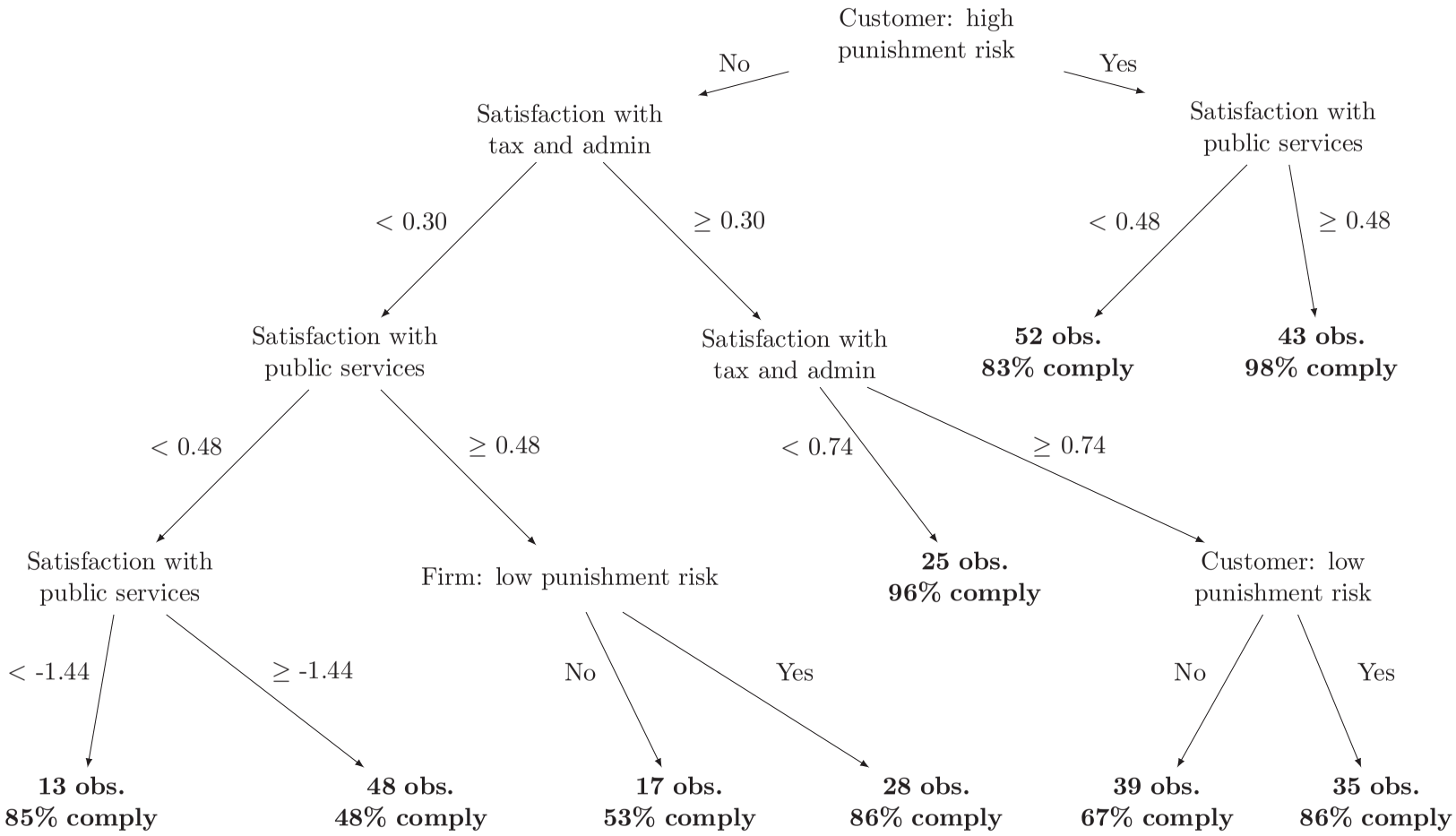
The tree first confirms our conclusion that the customer is key in determining compliance. The algorithm selected it as the first and most important variable, and again as a third order variable in one of the branches.

The tree also reveals the importance of the business's satisfaction with the public services and with the tax authorities and the administration. The interaction of the customer's perceived punishment risks and the business's level of satisfaction strongly predicts the outcome of their interaction. Based on the customer's perception, the business satisfaction will act as

[9]We estimated the tree using R's *tree* package

a moderator in determining the outcome of the process.

Figure 2: Regression tree predicting the likelihood of compliance.



Note: A classification tree for predicting the likelihood of total compliance. For instance, the split at the top of the tree results in two large branches. The left-hand branch corresponds to *Customer: high punishment risk = No*, and the right-hand branch corresponds to *Customer: high punishment risk = Yes*. The tree has eight internal nodes and nine terminal nodes. The numbers in each terminal node indicate the number of observations in that node and, among these observations, the proportion that have a VAT receipt.

5 Conclusions and implications for policy

In order for VAT to be self-enforcing, consumers and businesses at the final stage of the VAT chain have to ask for/issue receipts, but typically neither have the incentive to do so (Cowell, 2004; Marchese, 2009; Naritomi, 2019). The present study has shed more light on this "last-mile problem" of VAT compliance. By using a novel measure of the businesses' EFD compliance and tying it to survey information about the business, the salesperson and the customer with whom the transaction is made, we were able to measure actual EFD compliance and its important determinants.

We find that EFD compliance is strongly associated with the customer's perception of detection and punishment risks, and with the business representative's perception of other businesses' compliance behavior. Compliance does not correlate with the business person's perception about detection and punishment risk, tax morale and fairness, or satisfaction with public services, all factors that are commonly seen in the literature as crucial to explaining tax compliance. We see three potential explanations for this apparently contradicting finding. First, the divergence with the findings from other studies may be due to the fact that we directly observe compliance instead of relying on self-reported behavior. Second, the large majority of existing research focuses on individuals', not businesses' taxpaying behavior (Alm, 2012; OECD, 2019). While decisions of businesses are made by individuals, and their attitudes and perceptions may affect the tax decisions, other factors such as tax advisors, company size and structure are also likely to be important. There is limited evidence on whether and how factors such as fairness of the tax system and satisfaction with public services shape the tax behavior of businesses, especially in developing countries (OECD, 2019). The divergences may therefore also be because we use a sample of businesses. The third explanation is linked to the second: we interview businesspeople and measure the business compliance; there may be a disconnect between what the individuals privately believe and their behavior when they act on behalf of the firm.

A main finding of the study is that the customer is king. Requesting a receipt is crucial

to increasing compliance, and customers who know about the law are more likely to request a receipt when not given one. If customers never ask for a receipt, we estimate that EFD compliance in the study areas would be reduced by one-third.

Based on this finding, the following policy recommendations derive from the study: taxpayer education programs and information campaigns should emphasize customers' rights and obligations to get a proper VAT receipt when they purchase goods and services. Moreover, business compliance can be improved by strengthening detection probabilities and enforcing penalties for non-compliance on the customer's side. Other interventions that incentivize customers to request receipts (such as VAT lotteries) are expected to have similar beneficial effects on EFD use and VAT compliance. Whether some particular interventions (e.g. information campaigns or VAT lottery) are more efficient than others in improving compliance is an important open question that requires further enquiry to be answered.

One limitation of the study is that we can only report whether a receipt was printed or not, and whether the transaction was recorded by the EFD. We could not control whether the amount stated on the customers' receipts was correct. It is possible (and likely) that some businesses reduce their VAT payments by recording lower amounts on the receipt than the price paid. This form of non-compliance could not be measured here and total compliance is therefore probably lower than what we have estimated in this study. Further, the study was limited to five tax centres in Dar es Salaam. Businesses and customers were located in areas that were relatively easy to access by the enumerators. It is reasonable to assume that the compliance rate in these locations is higher than in other areas.

Another limitation of our data is that we cannot know why different customers hold different beliefs about the risk of punishment. This is an important question that requires further inquiry. Understanding how customers' beliefs are formed and whether they can be influenced would allow for making firmer recommendations.

The study provides us with some directions for further research. In particular, empirical investigations of exogenous changes in the incentives that the customers face, for example

through information campaigns or customer lotteries, could be used to confirm and inform our interpretations.

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Appendices

A OLS tables with background variables

In this Appendix, we report the estimates shown in Tables 3, 4, 5 and 6 with the inclusion of the covariates from Table 2. Because the cost of the purchase is missing for 14 customer-business pairs, the number of observations is 300 in the tables reported here.

In all tables, we report robust standard errors in parentheses and we indicate the level of statistical significance as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The main variables are defined in Table 3. *Firm: more educated* is equal to 1 if the business representative has completed lower secondary schooling or higher. *Firm: woman* is equal to 1 if the business representative is a woman. *Part of larger firm* is equal to 1 if the business is part of a larger firm. *B2C* is equal to 1 if the business makes business-to-customer transactions only. *Employees>median* is equal to 1 if the business's number of employees is higher than the median number of employees in the sample (3). *Cost above median* is equal to 1 if the cost of the purchase is higher than the median in the sample (TZS 50,000 (approximately USD 22 in December 2018, according to xe.com). *Woman customer* is equal to 1 if the customer is a woman.

Table 7: The business is voluntarily compliant (with covariates).

	(1)	(2)	(3)	(4)	(5)
Firm: low punishment risk	-0.126**				-0.090
	(0.057)				(0.057)
Higher tax morale		0.076			0.071
		(0.059)			(0.058)
VAT rate is fair		-0.028			0.028
		(0.076)			(0.073)
Other firms never evade VAT			0.298***		0.290***
			(0.081)		(0.080)
Satisfaction with public services				-0.007	-0.018
				(0.031)	(0.031)
Satisfaction with tax and admin				0.068**	0.060*
				(0.032)	(0.032)
Firm: more educated	0.026	0.052	0.050	0.038	0.033
	(0.058)	(0.058)	(0.057)	(0.058)	(0.057)
Firm: woman	0.123**	0.125**	0.132**	0.123**	0.145**
	(0.059)	(0.060)	(0.059)	(0.059)	(0.059)
Part of larger firm	-0.002	-0.010	-0.004	-0.021	0.005
	(0.069)	(0.071)	(0.068)	(0.069)	(0.068)
B2C	0.041	0.039	0.022	0.042	0.002
	(0.066)	(0.068)	(0.067)	(0.067)	(0.066)
Employees>median	0.035	0.024	0.038	0.037	0.024
	(0.059)	(0.061)	(0.059)	(0.060)	(0.059)
Cost above median	0.049	0.039	0.053	0.059	0.066
	(0.058)	(0.059)	(0.058)	(0.059)	(0.059)
Women customer	0.172***	0.171***	0.167***	0.158***	0.170***
	(0.059)	(0.060)	(0.059)	(0.060)	(0.059)
Constant	0.377***	0.285***	0.051	0.314***	0.071
	(0.094)	(0.095)	(0.113)	(0.088)	(0.123)
Observations	300	300	300	300	300
R^2	0.057	0.048	0.077	0.059	0.106

Table 8: The customer asks for a receipt (with covariates).

	(1)
Customer: low punishment risk	0.238***
	(0.089)
Customer: high punishment risk	0.118
	(0.110)
Firm: more educated	0.219***
	(0.080)
Firm: woman	-0.098
	(0.079)
Part of larger firm	0.004
	(0.093)
B2C	0.010
	(0.094)
Employees>median	-0.086
	(0.087)
Cost above median	0.077
	(0.084)
Women customer	-0.129
	(0.088)
Constant	0.543***
	(0.134)
Observations	139
R^2	0.118

Table 9: The business gives a receipt when asked (induced compliance) (with covariates).

	(1)	(2)	(3)	(4)	(5)
Firm: low punishment risk	-0.052				-0.072
	(0.098)				(0.094)
Higher tax morale		-0.018			-0.042
		(0.089)			(0.093)
VAT rate is fair		0.230**			0.253**
		(0.097)			(0.114)
Other firms never evade VAT			0.036		0.110
			(0.119)		(0.137)
Satisfaction with public services				0.032	0.039
				(0.060)	(0.057)
Satisfaction with tax and admin				-0.034	-0.030
				(0.048)	(0.049)
Firm: more educated	-0.120	-0.102	-0.102	-0.105	-0.134
	(0.098)	(0.085)	(0.088)	(0.088)	(0.098)
Firm: woman	-0.053	-0.113	-0.058	-0.071	-0.099
	(0.089)	(0.090)	(0.090)	(0.088)	(0.091)
Part of larger firm	0.044	0.037	0.037	0.024	0.022
	(0.092)	(0.091)	(0.096)	(0.095)	(0.087)
B2C	-0.054	-0.034	-0.056	-0.044	-0.042
	(0.088)	(0.087)	(0.083)	(0.090)	(0.086)
Employees>median	-0.008	-0.011	-0.006	0.012	0.028
	(0.088)	(0.089)	(0.089)	(0.095)	(0.096)
Cost above median	0.066	0.082	0.069	0.066	0.118
	(0.088)	(0.092)	(0.091)	(0.090)	(0.103)
Women customer	-0.013	0.005	-0.016	-0.005	-0.010
	(0.096)	(0.096)	(0.097)	(0.104)	(0.103)
Constant	0.903***	0.837***	0.841***	0.863***	0.776***
	(0.137)	(0.114)	(0.157)	(0.115)	(0.206)
Observations	90	90	90	90	90
R^2	0.041	0.083	0.038	0.045	0.103

Table 10: Total compliance (with covariates).

	(1)	(2)	(3)	(4)	(5)	(6)
Customer: low punishment risk					0.127**	0.106*
					(0.062)	(0.063)
Customer: high punishment risk					0.225***	0.187***
					(0.055)	(0.060)
Firm: low punishment risk	-0.084*					-0.022
	(0.049)					(0.051)
Higher tax morale		0.038				0.032
		(0.050)				(0.049)
VAT rate is fair		0.031				0.059
		(0.065)				(0.062)
Other firms never evade VAT			0.210**			0.183**
			(0.088)			(0.089)
Satisfaction with public services				0.011		-0.005
				(0.028)		(0.027)
Satisfaction with tax and admin				0.047*		0.037
				(0.027)		(0.028)
Firm: more educated	0.050	0.066	0.065	0.057	0.038	0.039
	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.048)
Firm: woman	-0.004	-0.006	0.003	-0.003	-0.011	0.003
	(0.050)	(0.051)	(0.050)	(0.050)	(0.050)	(0.051)
Part of larger firm	0.011	0.007	0.010	-0.001	-0.002	0.009
	(0.056)	(0.058)	(0.056)	(0.058)	(0.056)	(0.055)
B2C	0.010	0.010	-0.004	0.009	0.019	-0.008
	(0.057)	(0.058)	(0.057)	(0.057)	(0.056)	(0.056)
Employees>median	-0.014	-0.021	-0.012	-0.013	-0.014	-0.020
	(0.050)	(0.052)	(0.050)	(0.050)	(0.049)	(0.050)
Cost above median	0.080	0.076	0.083	0.093*	0.072	0.090*
	(0.052)	(0.052)	(0.051)	(0.052)	(0.050)	(0.051)
Women customer	0.050	0.053	0.047	0.038	0.052	0.053
	(0.049)	(0.050)	(0.049)	(0.050)	(0.049)	(0.049)
Constant	0.730***	0.664***	0.503***	0.688***	0.591***	0.434***
	(0.084)	(0.082)	(0.112)	(0.079)	(0.087)	(0.127)
Observations	300	300	300	300	300	300
R^2	0.025	0.018	0.040	0.030	0.066	0.094

B Logistic regressions

In this Appendix, we report logit estimates, instead of ordinary least squares, corresponding to Tables 3, 4, 5 and 6.

Table 11: The business is voluntarily compliant (logit).

	(1)	(2)	(3)	(4)	(5)
Firm voluntary compliant					
Firm: low punishment risk	-0.509**				-0.357
	(0.228)				(0.238)
Higher tax morale		0.299			0.256
		(0.227)			(0.235)
VAT rate is fair		-0.204			-0.011
		(0.292)			(0.303)
Other firms never evade VAT			1.333***		1.248***
			(0.385)		(0.389)
Satisfaction with public services				0.021	-0.062
				(0.126)	(0.129)
Satisfaction with tax and admin				0.291**	0.261*
				(0.130)	(0.134)
Constant	0.324**	-0.035	-1.099***	0.075	-0.978**
	(0.159)	(0.171)	(0.366)	(0.114)	(0.408)
Observations	314	314	314	314	314
Pseudo R^2	0.012	0.005	0.032	0.016	0.052

Table 12: The customer asks for a receipt (logit).

	(1)
Customer asks receipt	
Customer: low punishment risk	1.269***
	(0.439)
Customer: high punishment risk	0.916*
	(0.475)
Constant	0.000
	(0.222)
Observations	151
Pseudo R^2	0.054

Table 13: The business gives a receipt when asked (induced compliance) (logit).

	(1)	(2)	(3)	(4)	(5)
Firm gives receipt if asked					
Firm: low punishment risk	-0.176				-0.254
	(0.503)				(0.507)
Higher tax morale		-0.029			-0.125
		(0.513)			(0.523)
VAT rate is fair		1.741			1.883
		(1.076)			(1.161)
Other firms never evade VAT			0.266		0.653
			(0.649)		(0.726)
Satisfaction with public services				0.206	0.161
				(0.275)	(0.270)
Satisfaction with tax and admin				-0.279	-0.254
				(0.284)	(0.298)
Constant	1.329***	1.044***	1.012*	1.240***	0.672
	(0.377)	(0.365)	(0.587)	(0.253)	(0.763)
Observations	93	93	93	93	93
Pseudo R^2	0.001	0.042	0.002	0.012	0.062

Table 14: Total compliance (logit).

	(1)	(2)	(3)	(4)	(5)	(6)
Final compliance						
Firm: low punishment risk	-0.460*					-0.055
	(0.263)					(0.295)
Higher tax morale		0.186				0.121
		(0.262)				(0.278)
VAT rate is fair		-0.007				0.152
		(0.336)				(0.369)
Other firms never evade VAT			1.172***			0.964**
			(0.349)			(0.387)
Satisfaction with public services				0.106		-0.022
				(0.129)		(0.142)
Satisfaction with tax and admin				0.231*		0.190
				(0.126)		(0.144)
Customer: low punishment risk					0.854***	0.746**
					(0.320)	(0.328)
Customer: high punishment risk					1.665***	1.513***
					(0.380)	(0.403)
Constant	1.326***	1.000***	0.100	1.109***	0.475***	-0.325
	(0.193)	(0.196)	(0.317)	(0.132)	(0.179)	(0.465)
Observations	314	314	314	314	314	314
Pseudo R^2	0.009	0.001	0.031	0.015	0.071	0.097