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Tax Compliance by African Businesses: What Matters and What Doesn't

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Abstract

Small- and medium-sized enterprises in Africa are considered a high-risk group for tax noncompliance. This is so because they have to self-assess and self-report their taxable income, which literally implies ”paying taxes from their pockets”, unlike other groups such as individuals and big corporations. This study seeks to identify the factors that affect tax compliance levels by small- and medium-sized enterprises in Africa, especially those factors that are related to the macro-institutional environment. We attempt to answer three fundamental questions: (i) What determines tax compliance by African businesses? (ii) What macro-institutional factors are important for tax compliance levels? And (iii), what is the relationship between tax compliance levels and the productivity and propensity of a firm to innovate? We use conditional probability regression models to analyse firm-manager responses in different waves of the World Bank Enterprise Surveys for five countries. After controlling for potential econometric problems arising from concerns about the “truthfulness” and “missingness” of the responses, the findings show that what matters for tax compliance of businesses in Africa are the firm’s legal status, the tax administration system, corruption perception, licenses and permit ,customs and trade regulations, and the complexity of the tax system. Interestingly, our results show that firms that indulge in tax evasion are the same firms that are less likely to innovate, although this conclusion is nuanced in many cases.

Keywords:Tax compliance,Firms,Macro-institutional factors
JEL Classification:

1 Introduction

Tax compliance rates and the quality of tax administration are two important factors that determine a countries' fiscal capacity, and the ability of government to mobilize domestic resources and fulfil its social contract of spreading prosperity to its people. Unfortunately, according to a recent IMF study (see IMF, 2015), tax compliance rates are lowest in developing countries, especially countries in sub-Saharan Africa and fragile states. Sadly, too, these low compliance rates are accompanied by several undesirable consequences for social and economic policy in Africa. For example, tax non-compliance creates distributional injustice as the tax burden is reallocated from tax evaders to patriotic taxpayers; it also creates gross inefficiency as it erodes government revenue and prevents it from providing public goods, inclusive institutions, and infrastructure; and, more economically destabilizing, it creates allocation problems by diverting resources to less productive economic activities in the informal sector in a bid to stay "underground". All of these factors work to slow down economic and social progress, especially through the stunting of capital accumulation, stifling of productivity and innovation by firms, and inequitable distribution of economic prosperity (Andreoni, Erard and Feinstein, 1998; Slemrod, 2007)

To help address these problems, there have been several studies seeking to understand the motivations behind tax compliance and tax evasion (Abdixhiku, Krasniqi, Pugh and Hashi, 2016; Joulfaian, 2005; Nur-tegin, 2008). However, most of these studies seem to primarily focus on developed economies, and especially on individuals and big corporations, neglecting small and medium-sized businesses (see Gokalp, Lee and Peng, 2017). And even when small and medium-sized businesses are considered, the focus has mainly been on the traditional determinants of tax compliance (Abdixhiku et al., 2016). This is rather unfortunate because the greater proportion of taxes collected in many countries are paid by firms; and thus, firms are important agents in any tax system (Kamleitner, Korunka and Kirchler, 2012). But more than that, it is the peculiar nature of the tax environment that small businesses face that makes them an important group to study. First, unlike other groups of taxpayers—for example, employees whose taxes are deducted from the source—small business owners often have to self-assess and self-report their taxable income and literally "pay taxes from their pocket". Second, the situation is further complicated because they often have to account for various kinds of taxes: collect value-added taxes (VAT); withhold personal income taxes; pay property taxes; and for larger businesses, pay corporate taxes. Thus, small businesses are more likely to cheat than other groups of taxpayers and this is why they are considered a high-risk group in terms of tax compliance (OECD, 2013).

Our aim in this paper is to delve into this hitherto neglected domain of research on tax compliance by small and medium-sized businesses in Africa and to identify both the traditional and, seemingly irrelevant, non-traditional factors that influence the attitude to

tax compliance by small businesses in Africa. We focus especially on those factors that are related to the macro-institutional and socio-cultural environment. Specifically, we use survey responses from small and medium-sized enterprises to attempt to answer three fundamental questions: (i) What are the direct and indirect determinants of tax compliance by African businesses? (ii) To what extent does the country-level macro-institutional environment affect tax compliance? And (iii) what is the effect of tax compliance levels on a firm's productivity and ability to innovate—that is, the effect at the intensive margin.

We endeavour to answer these questions using firm-level responses from 6,624 owner-managers of small and medium-sized enterprises from a sample of five carefully selected African countries: DRC, Egypt, Kenya, Nigeria, and Zimbabwe. The data is based on different waves of the World Bank Enterprise Surveys (WBES) between 2013 and 2018 for these countries. The baseline empirical strategy involves the estimation of conditional probability models—that is, ordered logit and probit regressions—which seek to identify important factors that drive the attitude to tax compliance by firms, controlling for potential problems of "truthfulness" and "missingness" that may be present in observations of our measure of tax compliance (including problems related to measurement error, self and sample selection biases by using the heckit two-step strategy).

A study on tax compliance and the factors that explain attitude to tax compliance by African firms is especially important for several reasons. First, because many African economies are undergoing structural transformation, which involves going through economic, institutional, and cultural change, these changes, in turn, may affect tax compliance levels and the ability of government to mobilize revenue to pursue development projects. Thus, it is important to identify and distinguish factors that deter tax compliance and factors that further (or encourage) tax compliance rates by firms, especially given the peculiar and dynamic circumstances that African businesses currently face.

Second, although there are a few closely related studies on tax evasion in transition and developing economies, see for examples, Hibbs and Piculescu (2010); Nur-tegin (2008) and Joulfaian (2005), the results and policy insights from these studies cannot easily be generalized to the African context because of the peculiar circumstances that African businesses face. Moreover, these studies arrive at contradictory conclusions and admit some weaknesses in the empirical strategy adopted. To some extent, these acknowledged shortcomings in the literature are addressed in the present study. One potential explanation for the contradictory results found in the literature is the omission of important but seemingly irrelevant variables in previous studies. Our study attempts to deal with the omitted variable problem by including macro-institutional variables (for example, corruption perception, tax rate, tax administration), psychological variables (for example, measures of morale, education, and knowledge), and the usual firm characteristics (for example, age of a firm, legal status, and ownership structure) to help better understand the attitude of African businesses to tax compliance.

Lastly, from an econometric point of view, our approach controls for potential problems of "truthfulness" and "missingness" that may be present in observation of the dependent variable, and hence we are able to provide more reliable estimates of the determinants of tax compliance. In particular, we control for potential self- and sample-selection biases by adopting the Heckman two-step strategy and using exclusion restrictions when appropriate. Furthermore, in addition to the cross-sectional dimension, we also exploit the time dimension of the WBES database, by focusing on firm-level surveys conducted in five African countries between 2013 and 2018. Accounting for the time dimension avails two advantages: first, we are able to control for the effect of cross-group, time-specific common shocks; and second, we are able to provide insights into the changing attitude of African businesses towards tax compliance in recent times.

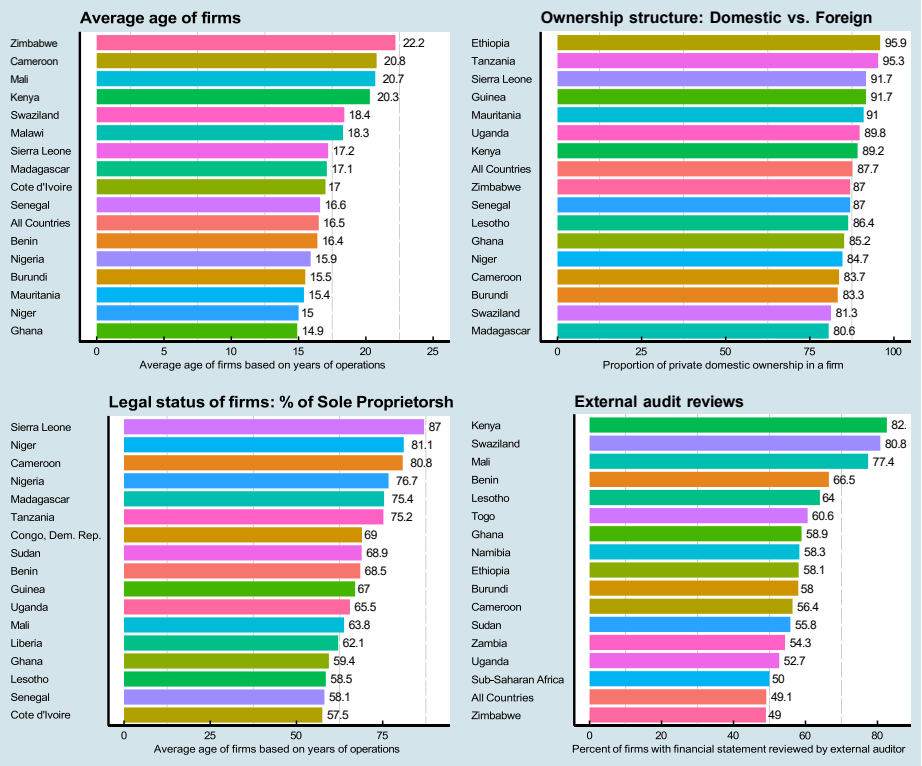
The rest of the paper is organized as follows. In Section 2, we provide a detailed discussion on the nature of African businesses with focus on three areas. We begin by examining the standard firm characteristics, after which we investigate their major obstacles and lastly, try to gain insights into the nature of the macro-institutional environment in which they operate. In section 3, we get in contact with the tax compliant literature by establishing a model of the tax-evading firm and the corrupt bureaucrat which is accompanied by the tax compliance and macro-institutional model in section 4. Section 5 outlines the empirical strategy employed in achieving the objectives of the study.We present the results and findings in section 6 and conclude the paper in section 7.

2 Understanding the anatomy of African businesses

To identify the factors that influence the tax compliance attitude of African businesses, it is important to understand the profile, characteristics, obstacles, and the environment within which African businesses (small, medium and large) function. In this section, we endeavour to provide some stylized facts from the World Bank Enterprise Surveys conducted in Africa since 2011. First, we try to understand the firm-level characteristics of African businesses. In Figure 1, we plot selected firm-level characteristics for the top 15 countries and compare them to the global average and the sub-Saharan Africa average.

In Panel 1 of Figure 1,we plot the age of African businesses in terms of the number of years of operation. We observe that there is significant variability in the distribution of the age of African firms, with the average age of firms in some countries doubling the all-Africa average of 10 years, for example, Zimbabwe (22.2), Cameron (20.8), Mali (20.7), and Kenya (20.3). These countries, on average, have firms that are about four years older than the average age of a firm in all countries of the world. Thus, in terms of years of operation, several African businesses are well established, although these older firms can be seen as regional outliers when compared to the Africa wide average age of less than 10 years old. South Sudan, Rwanda, and the Gambia have the youngest firms in the region, only as old

Figure 1: Firm-level characteristics of African businesses

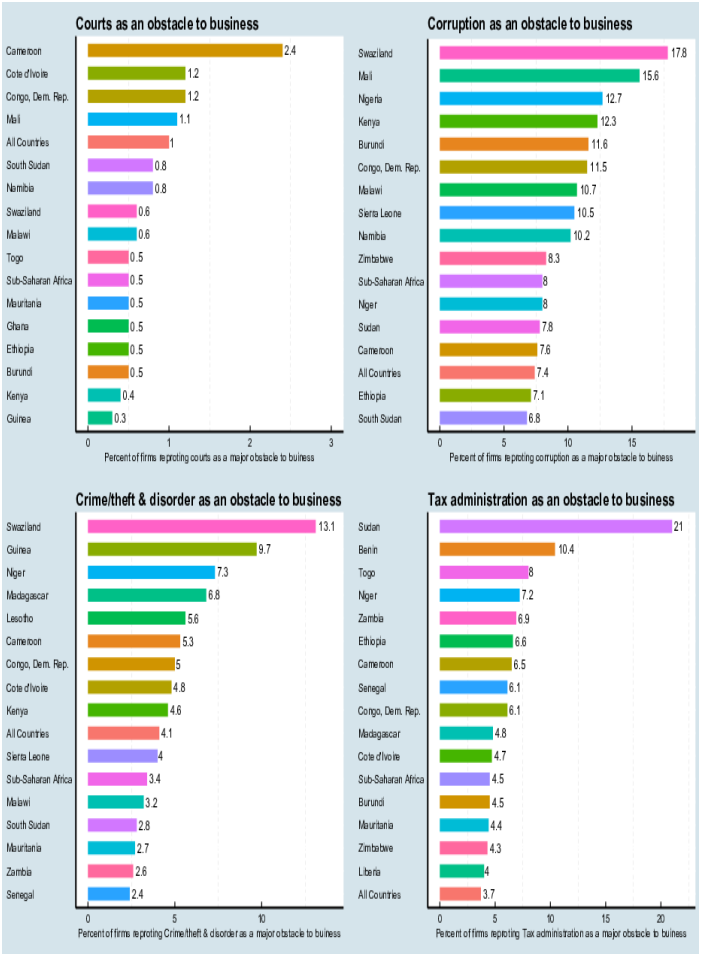


Source: Authors' computation from World Bank Enterprise Survey (various years)

as between 4 and 9 years. Panel 2 of Figure 1 indicates that the ownership structure of African businesses is mostly monolithic, with the average proportion of private domestic ownership of firms being above 80 percent, with a few exceptions such as in Sudan (35), Botswana (58), and Angola (59). In Panel 3 of Figure 1, we observed that on an average, about 70 percent of African firms are self-owned with only a few proportions of businesses legally owned by large corporations or partnerships. The percentage of businesses with books reviewed by external auditors is x-rayed in panel 4 of Figure 1.Kenya,Swaziland and Mali top the charts as firms in these countries are exposed to external checks compared to countries like Zimbabwe.

In Figure 2, we plot the top 15 countries with the highest percentage of firms reporting that macro-institutional factors such as the courts, corruption by public officials, crime and theft, and the tax administration are major obstacles to their businesses. Generally, in relation to the global average, about half a percentage point of firms report that courts are a major obstacle to their business. Panel 1 of Figure 2 shows that the court system is most inhibiting for businesses in Cameroon, Cote d'Ivoire, DRC, and Mali. In panel 2 of Figure 2, we observe that corruption is a critical obstacle for firms in Africa than elsewhere. On average, 8 percent of firms in sub-Saharan Africa report that corruption is a major obstacle to their businesses, compared to the global average of 7.4 percent. Lastly, the tax administration system is also more cumbersome in sub-Saharan Africa, as about

Figure 2: Obstacles faced by African businesses

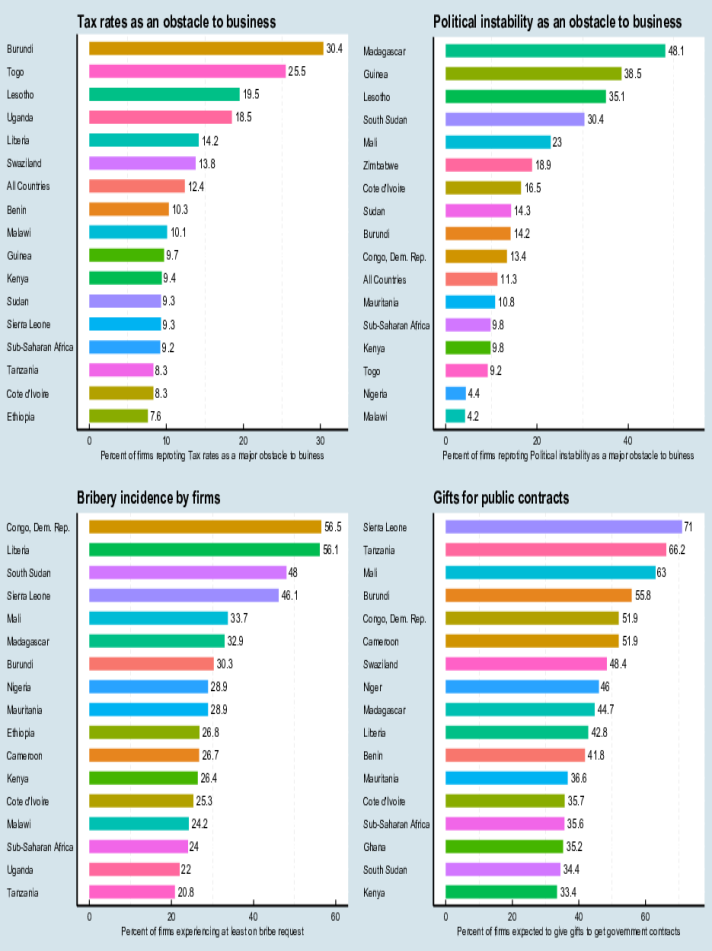


Source: Authors' computation from World Bank Enterprise Survey (various years)

4.5 percent of firms report that tax administration is a major obstacle to their businesses. Panel 4 in Figure 2 shows that tax administration is more problematic for businesses in Sudan, Benin, and Togo.

Lastly, in Figure 3, we plot the percent of firms reporting incidences that relate to the influence of the macro-institutional environment on their businesses. From Panel 1 of Figure 3, we observe that the tax rate in itself is not a significant obstacle to African businesses. In particular, an average of 9.2 percent of firms reports that tax rates are a major obstacle to their businesses, which is three percentage points less than the global average of 12.4 percent. This pattern of influence is also observed for political instability. On average, about 24 percent of firms encounter at least one bribe request. The situation is worse in DRC, Liberia, and South Sudan with 57, 56 and 48 percent of firms reporting at least one bribe request, respectively. About 35 percent of sub-Saharan African firms report that they are expected to give gifts to get a government contract, this is above the

Figure 3: Macro-institutional environment faced by African businesses



Source: Authors' computation from World Bank Enterprise Survey (various years)

global average of less than 30 percent, and it is extreme in Sierra Leone (71), Tanzania (66) and Mali (63) percent.

3 Contact with the tax compliance literature

The literature on tax compliance is quite robust—an authoritative treatment is provided by Andreoni et al. (1998) in a Journal of Economic Literature article, among others such as Kamleitner et al. (2012) and Richardson and Sawyer (2001). There are two main issues that make tax compliance by small and medium-sized firms an interesting and complicated issue. The first is that because small business owners are often responsible for collecting, as well as remitting taxes, they have a higher probability to try to evade taxes without the

right incentives. Second, because there is a lower probability of detection for tax-evading firms, this works to discourage tax compliance making it even more difficult to understand the set of incentive-compatible frameworks that can boost domestic resource mobilization in these kinds of environment. In our review of the literature, we focus on issues related to the incentives and how they impact the probability for firms to evade taxes, and, secondly, how to boost domestic resource mobilization from firms.

From a theoretical perspective, the work of Allingham and Sandmo (1972) provide the foundation for most of the economic theorizing on tax compliance (Abdixhiku et al., 2016), The classic tax compliance model by Allingham and Sandmo (1972) tries to explain tax compliance behaviour by weaving together elements of the economics of criminality within an optimal portfolio decisions framework with the economics of uncertainty. Specifically, the model assumes that the decision-maker is risk-averse and is a rational taxpayer who makes tax reporting decision just like any other rational consumer, but with an inclination to dishonesty. This factors in the psychological aspects, assuming that the rational taxpayer is isolated from the environment, state influence, regret, guilt, or even shame. Over the years, this workhorse model has been criticized for its simplicity and its ambiguous prediction of the effect of tax rates on evasion—mainly the occurrence of both an income effect (i.e., increasing tax rates make people poorer and with decreasing absolute risk aversion, they evade taxes), and a substitution effect (i.e., raising taxes means that the return from evasion is also rising, therefore the taxpayer would prefer the risky choice to the safer choice). More recent theoretical formulations extend the model by incorporating the role of institutions, individual characteristics, morality, ethics, culture, and social stigma (Torgler, 2007).

The psych, morale, and sentiments that directly impact the decision of firms to comply with tax regulations have received a lot of attention from economic psychologists. For example, Kamleitner et al. (2012), recognizing the peculiar situation that small businesses face, identify three different characteristics that shape the attitude of small business owners towards taxation: (i) perceived opportunity, which is due to self-reporting and limited control over underlying money flows. As a result, they have increased the opportunity for non-compliance. (ii) Knowledge requirement—due to the obligation to deal with different kinds of taxes and because of self-reporting, they require substantial knowledge of both the tax system and some cognitive abilities in order to understand the rules and comply, And (iii) decision frames—due to receiving gross sums that are then partly passed on to the tax authorities, they face differential possibilities for framing taxes.

Although the psychological characterization of small business owners' attitude toward tax compliance focuses more on intrinsic individual traits of business owners, other studies in the literature acknowledges other important factors such as inter-individual characteristics, for example, risk-seeking, age and gender (see Kasper, Kogler and Kirchler, 2015; Kastlunger, Dressler, Kirchler, Mittone and Voracek, 2010; Wahl, Kastlunger and Kirchler, 2010);

situational factors such as line of business, industry, or sector (see Engström and Holmlund, 2009); relevant social norms and networks (see Rothengatter, 2005). Others include the form of the business, the jurisdiction of operation, and the prevailing culture (see Engstrom and Holmlund, 2009; Rothengatter, 2005).

The economic-psychological view of tax compliance can be summarized under the altruistic approach and the "Kantian" approach (see Abdixhiku et al., 2016; Torgler et al., 2010). The altruistic approach describes a taxpayer who complies with tax regulations not only because she is interested in her own welfare, but also because she is interested in the general welfare of the society. On the other hand, the Kantian approach describes a taxpayer based on her morality, feelings of anxiety, guilt, and inferiority, especially if her share of taxes paid is lower than what is defined as fair. (Franzoni, 2004) describe a tax compliance epidemic, a situation where as more people cheat on taxes, the stigma effect weakens and tax evasion spreads to an even larger segment of the society. Along the same lines, Andreoni et al. (1998) discuss how the fairness of the tax system affects the psychology of individuals willingness to comply. The fairness of the tax system is mostly perceived as the "equity of the trade"—the benefits that accrue from a unit of tax paid, and the "equity of the burden"—the amount of tax an individual pays in reference to what others with similar circumstances pay.

Recently, there is more emphasis on trying to explain tax compliance levels as a function of the taxpayers' perception of government sincerity and performance or the lack of it, which in turn affects trust in government and its institutions(Feld and Frey, 2002). The idea is that there is reciprocity in tax compliance attitudes. Studies by (Feld and Frey, 2002), (Tyler, 1997) argue that the way people are treated by the tax authorities affect their willingness to cooperate—essentially if taxpayers feel like partners, their compliance rates would be higher compared to when they are made to feel like victims. Torgler et al. (2010) illustrated how a commitment technology by the government can boost the perception of institutions by taxpayers. In particular, they argue that governments that pre-commit to a democratic process of imposing constraints on their own power serves as a signal that taxpayers are seen as responsible partners in the development process. These signals serve as a social capital stock that inspires taxpayers to comply with tax regulations since they know that they can influence policy or government through their votes. As described in (Hanousek and Palda, 2004); Tirole (1996), the refusal to comply with tax laws are a means by which taxpayers express their vote-of-no-confidence or discontent against the government and local institutions.

To summarize the insight from the literature, we present a summary of the economic-theoretic factors that are known to affect tax compliance rates and the a prior expectation of the direction of influence in Table 1.

Table 1: Economic-theoretic predictions on the determinants of tax compliance

Traditional determinants	
Tax Rate	*Ambiguous*
Apprehension rate	*Positive*
Penalty rate	*Positive*
Non-traditional determinants	
Quality of judicial system	*Positive*
Morality	*Positive*
Socio-Cultural	*Ambiguous*
Fairness	*Positive*
Institutional trust	*Positive*
Compliance Costs	*Negative*
Firm characteristics	*Ambiguous*

4 A model of tax compliance and macro-institutional environment

4.1 The tax evading firm

In this section, we describe a typical firm and the process by which it is able to evade taxes. Firms are able to evade taxes by operating partly or wholly in the informal sector. They are endowed with fixed stocks of capital $\bar{K}$ and variable labour L, which are nonexclusively used for production in the formal sector y_o—that is subject to taxation—and the informal sector y_u that evades taxation. A firm's total output, y_T, is the sum of its official output, y_o, and its unofficial output, y_u.

Reported official production by firms follow a Cobb-Douglas type constant returns to scale production technology

$$y_o = B^{\delta}(\kappa\bar{K})^{\alpha}L_o^{\beta} \qquad \alpha+\beta+\delta=1, \quad \alpha,\beta,\delta>0 \tag{1}$$

where B denotes the productive value of the macro-institutional environment available only to official activity, such as protection by police and the judiciary, contract enforcement, official banking services and access to subsidies and incentives. κ denotes the fraction of capital used for official production, L_o denotes labour employed officially, and α, β, and δ are the share parameters for the production inputs. Note that the productive contribution of B would generally depend on the firm-specific characteristics—such as age, size, ownership, managerial sophistication—and country specific quality of macro-institutional services Hibbs and Piculescu (2010).

The production of unofficial, untaxed output y_u does not benefit from government institutional services, although the goods produced in the formal and informal sectors are

goods of the same kind and quality. But to operate in the informal sector and employ capital and labour underground, and avoid confiscation of informal output by omniscient bureaucrats, firms engaged in the informal sector must engage in corrupt practices with enforcement officials—e.g., tax administrators, quality inspectors, and so on. Therefore, production of unofficial output requires a bureaucratic corruption input, C, that goes into the production technology thus

$$y_u = C^{\delta}\ (1-\kappa)\,\bar{K}^{\ a} L_u^{\beta} \tag{2}$$

Unlike the specification of the production technology for the informal sector in many studies, for example, Johnson, Kaufmann, Shleifer, Goldman and Weitzman (1997), that model corruption and bribery as forces that drive firms out of the official production into the underground economy, Eq. (2) rather suggest that the "grabbing hands" of corrupt bureaucrats serve as "helping hands" for firms to exploit profitable opportunities by producing in the informal sector.

The problem of the profit maximizing firm is to decide how much labour to employ officially and unofficially, how to allocate its capital between the two modes of production, and how much corruption to buy from corruptible bureaucrats subject to the resource and production constraints. Thus

$$\max_{\kappa, L_o, L_u, C} \pi = (1-\tau)[y_o - (1+\tau_\omega)\omega L_o] + [y_u - \omega L_u - m \cdot C] \tag{3}$$

$$s.t. \quad Eq.\ (1) - Eq.\ (2); \quad \kappa \in (0,1); \text{and } C, L_o, L_u \geq 0 \tag{4}$$

where τ, τ_ω are the tax rates on official output and official labour employed, respectively; and m denotes the unit price of corruption.

4.2 The corrupt tax bureaucrat[1]

In any given constituency, there is a market for corruption. Corruption is monopolistically supplied by a representative public official—the bureaucrat— whose responsibility it is to enforce tax laws and regulations. The bureaucrat is assumed to be omniscient and able to accurately detect a firms unofficial activity, although with some illegal financial indulgence (or bribery) is willing to overlook. The bureaucrat receives a salary S, and could get additional income equal to $m \cdot C$ from bribes if not apprehended. If apprehended, the bureaucrat losses employment and pay S, and pays a penalty P. So that the bureaucrat's

[1]The description in this section draws generously from the works of Hibbs and Piculescu (2010); Rose-Ackerman (2013)

expected income is

$$\mathsf{E}(y_b) = \theta(S + m \cdot C) - (1 - \theta)P \tag{5}$$

where $(1 - \theta)$ is the probability of apprehending the bureaucrat in the act of corruption.

The probability θ of not being caught is determined by an exogenous mechanism for exposing corruption

$$\theta = e^{-\mu C}, \qquad \mu > 0 \tag{6}$$

The effectiveness of the anti-corruption mechanism for discovery is governed by μ, which tend to vary with firm-specific characteristics that affect the visibility of transactions in the corruption market.[2] If the anti-corruption mechanism is effective, then the more units of corruption sold the higher the chances $(1 - \theta)$ of apprehension. However, if the exposure mechanism is weak (i.e., μ is small), then the probability of being caught would still be small even when the supply of corruption, C, by the bureaucrat is high.

The problem of the corrupt tax bureaucrat is to choose the price of bribery m per unit of corruption that maximizes the expected income in Eq. (5), subject to the anti-corruption mechanism Eq. (6), and the demand for corruption by businesses. The solution to the tax official's problem yields the optimal supply of corruption thus (see Hibbs and Piculescu (2010) for a proof)

$$m = \frac{\mu(S + P)}{1 - \mu \cdot C} \tag{7}$$

The optimal solution of the tax official in Eq. (7) implies that the tax enforcement bureaucrat will supply corruption and overlook tax evasion only when firms are willing to pay a bribe m higher than a minimum defined by $\underline{m} = \mu(S + P)$. This minimum acceptable bribe rises as the bureaucrat's salary increases, as the mechanism for exposing corruption becomes more effective (i.e., as μ increases), and as punishment becomes more stringent (i.e., and P increases). Thus, the higher μ, S, and P, the more costly it is for firms to induce tax bureaucrats to supply corruption.

The hypothesis in this study therefore is that in additional to institutional that directly enter the production activity of firms in the official sector, it is the national realizations of macro-institutional conditions such as the anti-corruption mechanism (μ), the compensation of tax bureaucrats (S), and the penalty from corruption (P) that explain the attitude of African businesses to tax compliance. This theoretical model helps to inform the selection

[2]Two important firm characteristics affecting visibility and hence the magnitude of μ are the size of the firm—it is difficult for firms with large capital and labour employed to go underground—and the nature of business. Also note that the more units of corruption sold by the tax bureaucrat, the higher the chances $(1 - \theta)$ of being caught and penalized because $\partial\theta / \partial C = -\mu e^{\mu C} < 0$.

of the variables that are considered in the empirical regressions specifications described in the next section.

5 Empirical strategy

5.1 Detecting factors that matter for tax compliance

To identify the factors that matter for tax compliance by small- and medium-sized enterprises, we use a simple regression equation as specified in (Abdixhiku et al., 2016; Nur-tegin, 2008)

$$\begin{aligned} Y_{ijs} = \alpha + \beta_1[\text{Macro-institutional factors}] + \beta_2[\text{Traditional determinants}] + \\ \beta_3[\text{Non-traditional factors}] + \beta_4[\text{Control Variables}] + \epsilon_{ijs} \end{aligned} \tag{8}$$

where *i, j*, and *s* are indices for firms, sector (manufacturing), and state of operation across all countries and years. Depending on which empirical question we are investigating, we use probit regressions when the dependent variable is binary, for example, in Q3 we use innovation as the explanatory variable.Ordered logit is used when the dependent variable is categorical and ordered, for example, in Q1 and Q2, we employ tax compliance as the response variable.

Generally, the variables used for analysis include measures of taxation and regulation, infrastructure, informality, corruption, crime, innovation, trade, firm characteristics, and firm performance; and all information is collected at the firm and state environment level.

5.2 Data and variable construction

The primary source of data used for the analysis is the World Bank's Enterprise Survey Database, collected for the periods 2013 through 2018.The data set represents at least two waves of survey for 5 African countries including the Democratic Republic of Congo, Egypt, Kenya, Nigeria, and Zimbabwe[3]. Since our study is focused on small and medium-sized enterprises, information on large firms was dropped from the analysis. Firm-level responses with erroneous entries were also omitted from the dataset. After cleaning the data, the pooled cross-sectional data comprise of 2,510 firm-level responses collected from the countries of interest. The questions in the survey deal mainly with managers' perception of the extent to which the business environment in which they operate is accommodating

[3]Our selection process is motivated by three factors. First is the availability of significant and coherent responses to the primary questions of interest (i.e., Qj4 and Qj5) which also served as our response variable. Second, is uniformity in the survey questions across countries. We ensured that countries selected were issued similar questionnaires irrespective of the interview year and geographical location. Lastly, to ensure even representation across Africa, countries selected need to serve as a regional representative of the Economic Commission for Africa(ECA)

or constraining. Specifically, the survey deals with questions on regulation, taxation, informality, infrastructure, and access to finance by small and medium businesses. This information connects the business environment characteristics with firm productivity and performance. However, the main questions of interest in the survey are Qj4 and Qj5 (in the 2013 to 2018 survey), which asks: "Over the last year, how many times was this establishment either inspected by tax officials or required to meet with them?" And "In any of these inspections or meetings was a gift or informal payment expected or requested?" These questions were both combined to obtain information on the tax compliance attitude of firms in Africa. This study also exploits the cross-sectional feature of the data for analysis. In Table 2, we present details of the variables used in the regression analysis, the framing of the questions from the WBES instrument, the description of the variables, the unit of measurement and what we use them to proxy for.

Table 2: Variable definition and construction

Variables	**Proxies**	**Question framing**	**Unit of measurement and variable classification**
Tax Compliance	WBES Instruments, QJ4 and QJ5	J.4: Over the last year, how many times was this establishment either inspected by tax officials or required to meet with them?	Number of inspections and visits from tax officials
		J.5 In any of these inspections or meetings was a gift or informal payment expected or requested?	Dummy variable: 1 for Yes; and 0 for No
Age of Firm	No of years in existence	B.5. In what year did this establishment begin operations?	Years since existence (continuous variable)
Foreign Ownership	The place of origin of the main investor (whether domestic or foreign)	B.2 What percentage of this firm is owned by each of the following:	Dummy variable defined as follows: businesses with 100% foreign ownership structure were coded 1 i.e. foreign while others were coded as 0 i.e. domestic.

Table 2: Variable definition and construction

Variables	Proxies	Question framing	Unit of measurement and variable classification
Legal Status	Form of registration of the business	B.1 What is this firm's current legal status?	Dummy variable coded as follows: corporations=1 (omitted category), sole proprietorship=2; and partnership=3
Tax Rate	Tax rate	Q j.30 Using the response options in the card to what degree is/are tax rate an obstacle to the current operations of this establishment?	Categorical variable: No Obstacle=0; Minor Obstacle = 1; Moderate Obstacle = 2; Major Obstacle = 3; and Very Severe =4
Tax Administration	Tax Administration	Q j.30b Using the response options in the card to what degree is/are tax administration an obstacle to the current operations of this establishment?	Categorical variable: No Obstacle=0; Minor Obstacle = 1; Moderate Obstacle = 2; Major Obstacle = 3; and Very Severe =4
Licensing and Permits	Licensing and Permits	Q j.30c Using the response options in the card to what degree is/are business licensing and permits an obstacle to the current operations of this establishment?	Categorical variable: No Obstacle=0; Minor Obstacle = 1; Moderate Obstacle = 2; Major Obstacle = 3; and Very Severe =4
Political Instability	Political Instability	Q j. 30e Using the response options in the card to what degree is/are political instability an obstacle to the current operations of this establishment?	Categorical variable: No Obstacle=0; Minor Obstacle = 1; Moderate Obstacle = 2; Major Obstacle = 3; and Very Severe =4

Table 2: Variable definition and construction

Variables	Proxies	Question framing	Unit of measurement and variable classification
Corruption	Corruption	Q j.30f Using the response options in the card to what degree is/are corruption an obstacle to the current operations of this establishment?	Categorical variable: No Obstacle=0; Minor Obstacle = 1; Moderate Obstacle = 2; Major Obstacle = 3; and Very Severe =4
Court System	Court System	Q h30 Using the response options in the card to what degree is/are court system an obstacle to the current operations of this establishment?	Categorical variable: No Obstacle=0; Minor Obstacle = 1; Moderate Obstacle = 2; Major Obstacle = 3; and Very Severe =4
Crime, Theft and Disorder	Crime, Theft and Disorder	Q i.30 Using the response options in the card to what degree is/are crime, theft and disorder an obstacle to the current operations of this establishment?	Categorical variable: No Obstacle=0; Minor Obstacle = 1; Moderate Obstacle = 2; Major Obstacle = 3; and Very Severe =4
Electricity	Electricity	QD.30 Using the response options in the card to what degree is/are electricity an obstacle to the current operations of this establishment?	Categorical variable: No Obstacle=0; Minor Obstacle = 1; Moderate Obstacle = 2; Major Obstacle = 3; and Very Severe =4
Transportation	Transportation	QD30a Using the response options in the card to what degree is/are transportation an obstacle to the current operations of this establishment?	Categorical variable: No Obstacle=0; Minor Obstacle = 1; Moderate Obstacle = 2; Major Obstacle = 3; and Very Severe =4

Table 2: Variable definition and construction

Variables	Proxies	Question framing	Unit of measurement and variable classification
Customs and Trade Regulations	Customs and Trade Regulations	QD30b Using the response options in the card to what degree is/are political instability an obstacle to the current operations of this establishment?	Categorical variable: No Obstacle=0; Minor Obstacle = 1; Moderate Obstacle = 2; Major Obstacle = 3; and Very Severe =4[4]
Compliance cost	Complexity of the tax system	Q.j2 In a typical week over the last year, what percentage of total senior management's time was spent on dealing with requirements imposed by government regulations?	continuous variable in the limit between 1 and 100
Innovation		QH.1 During the last three years, has this establishment introduced new or significantly improved products or services?	Dummy variable: coded as 1 if response is Yes and 0 if response is No
Research and Development		During the last three years, did this establishment spend on formal research and development activities, either in-house or contracted with other companies	Dummy variable: coded as 1 if response is Yes and 0 if response is No
Missingness	Experience of Top manager	How many years of experience working in this sector does the Top Manager have?	Dummy. Top managers with 5 or less years of experience=0 (likely to give incomplete information). Those with 5 years experience and above =1

[4]Responses categorized as "no obstacle" or "minor obstacle" were re-coded as "0" in the regression analysis while "moderate obstacle", "major obstacle" and "severe obstacles" were re-coded as "1" to avoid erroneous results and ensure clarity of result

Table 2: Variable definition and construction

Variables	Proxies	Question framing	Unit of measurement and variable classification
Truthfulness	Audits	Did this establishment have its annual financial statements checked and certified by an external auditor	Dummy variable: coded as 1 if response is Yes and 0 if response is No

One of the most important variables in our study is the measure of tax compliance. It is expected that because of the sensitive nature of this variable it would be difficult to elicit responses from the respondents in a direct manner. Besides, the WBES instrument does not pose any direct question to the respondents about tax compliance levels. Thus, our strategy was to deduce tax compliance levels by identifying and using indirect and implied questions that could serve as pointers to tax compliance levels. We choose questions Qj4 and Qj5, which seek to ask questions about the frequency of inspection visits by tax administrators and whether a gift or bribe was requested during such visits. We assume that if a firm is visited by a tax official and it is not requested to pay any bribe or give gifts, it must be because such a firm is highly taxed compliant and so there is no incentive for the bureaucrat to request a bribe. On the other hand, if a firm is visited by a tax bureaucrat for less than five times in a year and is requested to pay any form of bribe or give gifts during such visits, then that firm is assumed to be moderately tax compliant and hence the incentive for the bureaucrat to visit more than once in a year and to request bribes. Finally, the third categories of firms are those with low tax compliance. We identify these firms by the frequency of visits by the tax administrator, if it is more than five times in a year, and if gifts are requested during such visits, then we classify the firm as a low tax compliant firm. The rationale is that the high frequency of visits and the request for bribes and gifts by the tax administrator are good indicators of the low compliance level of the firm. We discuss this further in the empirical results section.

5.3 Dealing with identification and sample selection issues

The estimable equation of the relationships we are interested in is specified in Eq. 8. This can be summarized in a linear regression model as

$$y_i = \boldsymbol{X}'\beta + \epsilon \tag{9}$$

By the nature of the dependent variable for this research question, which ask firms to reveal delicate information on the degree of tax evasion by their peers (and, inexplicitly,

themselves too), it raises concerns about possible sample selection bias problems. This sample selection bias problem would compromise the validity of the econometric results when misrepresentation by firms is systematic in either direction of the dependent variable.

To deal with this kind of econometric issue, that is, sample selection bias, we estimate the baseline regressions according to the two-stage procedure proposed by Heckman (1976) and often referred to as the *heckit* model thus

$$\begin{aligned} y_i &= \boldsymbol{X}'\beta + \epsilon \\ h_i^* &= \boldsymbol{Z}'\gamma + \nu \end{aligned} \tag{10}$$

Where the bottom expression in Eq. (10) is called the selection equation. The variable y_i is believed to be the true representation of firms' views, but it can only be observed when h_i^* in the selection equation crosses a threshold, say zero.

$$\begin{pmatrix} \epsilon_i \\ \nu \end{pmatrix} \sim N\left(0, \begin{pmatrix} \sigma & \rho\sigma \\ \rho\sigma & \end{pmatrix}\right) \tag{11}$$

As for the error terms in Eq. (10), they are assumed to be correlated and jointly normally distributed and also homoeostatic, i.e., the representation in Eq. (11)

But since h_i^* is not directly observed, a dichotomous variable h_i is observable with the property that

$$h_i = \begin{cases} 1, & \text{if } h_i^* > \\ 0 & 0, \quad \text{if } h_i^* \leq 0 \end{cases} \tag{12}$$

Consequently, the model in Eq. (10) can be written as $y_i = \boldsymbol{X}'\beta + \rho\sigma\mu + \eta$. So that the conditional expectation of y_i given that its true value is observed, is

$$\mathrm{E}\left[y_i | h_i^* > 0\right] = \boldsymbol{X}'\beta + \rho\sigma\left[\phi(\boldsymbol{Z}'\gamma)/\Phi(\boldsymbol{Z}'\gamma)\right] \tag{13}$$

where $\phi(\boldsymbol{Z}'\gamma)/\Phi(\boldsymbol{Z}'\gamma)$ is the so-called inverse Mills ratio.

The algorithm of the two-step heckit model is to first acquire an estimate of γ by logit regression of the selection equation in Eq. (10) which is then used to calculate the inverse Mills ratio. The second stage involves inserting the calculated inverse Mills ratio into the main regression which assumes the form of Eq. (13) with an appended residual. This treatment then permits the estimation of the parameters of the regression β, σ consistently by OLS. In estimating the the two-step heckit model, we consider an exclusion restriction, a variable that affects the probability of being selected at the logit stage, but has no effect on the main dependent variable (see Cameron and Trivedi, 2005; Wooldridge, 2010).

The two exclusion variables included in the selection model are "Missingness" and "Truthfulness" each of which are entered separately on the selection equation as we try to

estimate factors that affect one variable but do not affect the other. The" Missingness" variable asks about the years of experience of top managers. It is assumed that top managers with less than 5 years of experience are likely to provide incomplete information as longer working experience translates to better working knowledge. On the other hand, managers with more than 5 years of experience are assumed to have sufficient knowledge about the firm. It is expected that compared to line staff and managers with less than five years of experience, top managers who have worked for five years and above are attuned with the general workings of the firm and would be able to provide complete information about the firm's operation; including her level of compliance. The selection variable "Missingness "only serves as a proxy to determine the willingness to provide responses on very sensitive issues regarding the firm. The expected sign of the dummy variable "missingness" in the selection equation is positive. The "truthfulness" variable asks to know if the annual financial statements were checked and certified by an external auditor. We assume that this behaviour would impact on the firm's decision to provide truthful responses that could serve as pointers to tax compliance. Unlike corporations, small and medium firms are less likely to subject their books to external audits in order to conceal any invasive behaviour. The expected sign of the selection equation is negative.

To further ensure the robustness of our results, we do not only rely on the two-step heckit procedure, but we also estimate the extended two stage Heckman Selection procedure which estimates the Probit regression in the first stage and Tobit regression in the second stage. This is also referred to as the full information Maximum Likelihood (FIML)procedure. This method mitigates the issue of standard error notably encountered when using the Heckman two step approach. Under the extended FIML procedure, the correlation of the error terms across the two equations is corr(ϵ, ν) = ρ. If ρ = 0, then there is sufficient evidence to assume that there is no sample selection bias (Abdixhiku et al., 2016).

6 Results and findings

6.1 What matters for tax compliance by African businesses

We begin with the presentation of results from the cross-sectional regression of tax compliance levels on a wide range of potential tax compliance determinants. The pooled regression for both small- and medium-sized firms is presented in Table 3. Table 4 zooms in on the macro-institutional and environmental factors necessary for tax compliance while the relationship between tax compliance and innovation is outlined in Table 5. The Heckit FIML and two-step estimates are presented in the Appendix of Tables 7 and 8.

Table 3 reveals a positive relationship between the legal structure of firms and tax compliance in Africa. The signs and magnitude of sole proprietorship and partnership

are positively significant for small and medium-sized firms analyzed at the pooled cross-

sectional level.Panel 4 of table 3 indicates that a unit increase in the number of firms owned or managed by sole proprietors or partners increases the probability of being in the highly compliant category by 8 percent and 6.6 percent respectively. Similar result is also evident in Egypt and Nigeria,but particularly among small firms when examined at country-specific levels as indicated in Table 6. This reveals that a unit increase in the number of firms owned or managed by partners increases the log odds of becoming highly compliant by 93 percent and 16.9 percent respectively.

Also, as predicted, tax administration negatively correlates with tax compliance in the countries invested. The result shows that the probability of being in a highly compli-ant category decreases by 9 percent for every additional time a firm perceives tax administration to be an obstacle to their business operations. This Indicates that firms are more inclined to exhibit low or moderate compliant behaviours as tax administration becomes more problematic. In Table 6, the country-level estimates reveals that for every time the tax administration is perceived to be an obstacle, the log odds of moving to a higher compliant category decrease by 75 percent for small manufacturing firms operating in Nigeria.

The signs and magnitude of licenses and permits are mixed across countries and firms. Table 3 reveals that small business owners tend to exhibit high compliant attitude and are less likely to display low or moderate compliant attitudes as the process of obtaining business licenses and permits increases by one percent. This result is similar across small firms in DRC, Egypt, Kenya, and Zimbabwe. A percent increase in firms perception of how licenses and permits are obtained translates to a 4 percent increase in the likelihood of being highly compliant for small firms at the pooled cross-sectional stage. A positive relationship is also observed across medium firms in DRC and Zimbabwe, as well as small firms in Nigeria.

Corruption perception negatively affects firms' compliance behaviour when analyzed at the pooled cross-sectional level. The probability of being highly compliant decreases by 9 percent as corruption perception increases by a unit while the likelihood of exhibiting low or moderate compliance behaviour increases by 3 percent and 6 percent respectively. Similar evidence is observed across small and medium-sized firms. The regression result also reveals that a unit increase in the long odds of corruption decreases the probability of being in the high compliant category by 28.6 percent and 73.6 percent respectively for small firms operating in Kenya and Nigeria.

The signs and values for electricity vary across firms. There is a positive relationship between electricity and tax compliance when analyzed for small firms pooled across the se-lected African countries. The estimate is however negative across medium-sized firms. Panel 9 and 12 of table 3 reveals that a level increase in firms' perception of electricity increases the probability of becoming highly compliant by 4.6 percent for small firms but declines by 2.3 percent for medium-sized firms. This implies that small firms tend to comply whether or not

They are hindered by the lack of electricity.

Customs and trade regulations have a significant positive effect on tax compliance at the pooled cross-sectional level and across small firms in Africa. The marginal effect reveals that the probability of being a low or moderate compliant firm declines by 27 percent and 14 percent respectively as custom and trade regulations rise by one unit but increases the likelihood of being a high compliant firm by 4 percent. Similar results are evident among small firms. However, medium firms tend to react differently to challenges posed by customs and regulations as they appear to be less likely to comply as custom and trade regulations become problematic. The result further reveals that small firms in Nigeria and medium firms in Egypt are compliant even during this challenge as a unit increase in the long odds of customs and trade regulations leads to a 61 percent and 13 percent probability of transiting to a high compliant category respectively. Interestingly, an increase in the cost of compliance affects tax compliance level positively. However, this is only evident in Egypt as the reverse seem to be the case in Nigeria.

Table 3: What matters for tax compliance: Cross-country estimates and marginal effects from ordered logit regressions

	Pooled across countries and firms				Pooled across small firms				Pooled across medium firms			
	Estimates	ME: Low	ME: Moderate	ME: High	Estimates	ME: Low	ME: Moderate	ME: High	Estimates	ME: Low	ME: Moderate	ME: High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Ownership: Sole Proprietor	0.759***	-0.052***	-0.053***	0.08***	0.868***	-0.075***	-0.032***	0.107***	0.672***	-0.052***	-0.023***	0.075***
	(0.18)	(0.01)	(0.01)	(0.02)	(0.23)	(0.03)	(0.01)	(0.03)	(0.29)	(0.02)	(0.01)	(0.03)
Ownership: Partnership	0.6201***	-0.044***	-0.023***	0.066***	0.693**	-0.063***	-0.026***	0.089***	0.672***	-0.052***	-0.023***	0.075***
	(0.195)	(0.015)	(0.008)	(0.023)	(0.252)	(0.023)	(0.009)	(0.032)	(0.320)	(0.025)	(0.010)	(0.035)
Age	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.004)	0.000	0.000	0.000	(0.005)	0.000	0.000	0.000	(0.007)	0.000	0.000	0.000
Tax rate	-0.130	0.020	0.006	-0.016	-0.348	0.025	0.013	-0.039	0.386	-0.027	-0.014	0.041
	(0.261)	(0.019)	(0.009)	(0.029)	(0.327)	(0.024)	(0.013)	(0.036)	(0.465)	(0.033)	(0.017)	(0.050)
Tax administration	-0.83***	0.059***	0.031***	-0.090***	-0.777**	0.056**	0.029**	-0.086**	-0.429**	0.064**	0.032**	-0.096**
	(0.248)	(0.018)	(0.001)	(0.028)	(0.313)	(0.023)	(0.012)	(0.035)	(0.380)	(0.030)	(0.015)	(0.046)
Business License and Permits	0.221	-0.016	-0.009	0.025	0.311*	-0.0225*	-0.012*	0.034*	-0.012*	-0.023*	-0.012	0.034
	(0.158)	(0.011)	(0.006)	(0.017)	(0.188)	(0.014)	(0.007)	(0.021)	(0.307)	(0.022)	(0.011)	(0.033)
Political Instability	0.024	-0.001	0.001	0.002	0.039	-0.003	-0.002	0.004	-0.216	0.015	0.008	-0.023
	(0.200)	(0.015)	(0.008)	(0.022)	(0.236)	(0.017)	(0.009)	(0.026)	(0.396)	(0.028)	(0.014)	(0.042)
Corruption	-0.819***	0.061***	0.032***	-0.092***	-0.734**	0.053**	0.028**	-0.081**	-1.259**	0.089**	0.045**	-0.134**
	(0.262)	(0.019)	(0.010)	(0.029)	(0.302)	(0.022)	(0.012)	(0.033)	(0.578)	(0.041)	(0.021)	(0.061)
Court system	0.004	0.000	0.000	0.000	0.169	-0.012	-0.006	0.019	-0.316	0.022	0.011	-0.034
	(0.139)	(0.010)	(0.005)	(0.015)	(0.172)	(0.012)	(0.007)	(0.019)	(0.248)	(0.018)	(0.009)	(0.026)
Crime, Theft and Disorder	-0.197	0.015	0.008	-0.023	-0.118	0.009	0.005	-0.013	-0.055	-0.004	0.002	-0.006
	(0.135)	(0.010)	(0.005)	(0.015)	(0.116)	(0.008)	(0.004)	(0.013)	(0.141)	(0.009)	(0.005)	(0.015)
Foreign Ownership	-0.150	0.011	0.006	-0.016	-0.271	0.019	0.010	-0.030	0.095	-0.007	-0.004	0.010
	(0.342)	(0.025)	(0.013)	0.038	(0.388)	(0.028)	(0.015)	(0.043)	(0.800)	(0.057)	(0.028)	(0.085)
Electricity	0.235	-0.020	-0.010	0.030	0.415**	-0.030**	-0.016**	0.046**	-0.218**	0.015**	0.008**	-0.023**
	(0.174)	(0.013)	(0.007)	(0.019)	(0.212)	(0.016)	(0.008)	(0.024)	(0.311)	(0.021)	(0.011)	(0.033)
Transportation	-0.008	0.000	0.000	0.000	-0.139	0.010	0.005	-0.015	0.194	-0.014	-0.007	0.021
	(0.166)	(0.012)	(0.006)	(0.018)	(0.208)	(0.015)	(0.008)	(0.023)	0.278	(0.019)	(0.009)	(0.029)
Land and Permits	0.026	-0.003	-0.002	0.005	0.056	-0.004	-0.002	0.006	0.110	-0.008	-0.004	0.012
	(0.135)	(0.010)	(0.005)	(0.015)	(0.086)	(0.006)	(0.003)	(0.010)	0.132	0.009	0.005	0.014
Customs and Trade Regulations	0.36**	-0.027**	-0.014**	0.04**	0.519**	-0.038**	-0.019**	0.058**	-0.081***	0.006**	0.003**	-0.009**
	(0.149)	(0.011)	(0.006)	(0.017)	0.182	(0.013)	(0.007)	(0.020)	(0.259)	(0.018)	(0.009)	(0.028)
Compliance Cost	0.007**	0.000	0.000	0.000	0.006*	0.000*	0.000*	0.000*	0.000*	0.000	0.000	0.000
	(0.003)	0.000	0.000	0.000	(0.003)	0.000	0.000	0.000	(0.005)	0.000	0.000	0.000
Gender	0.205	-0.015	-0.008	0.028	0.134	-0.009	-0.005	0.015	0.387	-0.027	-0.014	0.041
	(0.202)	(0.015)	(0.008)	(0.022)	(0.240)	(0.017)	(0.009)	(0.027)	(0.381)	(0.027)	(0.014)	(0.040)

Notes: ME is short for marginal effects. Standard errors are in parenthesis, and significance levels for rejection of null hypothesis are: *** for 1 %, ** for 5% , and * for 10% levels respectively. This table shows the pooled regression estimates of small- and medium-sized manufacturing firms operating in the five(5) African countries considered in this paper.

Table 4: Macro-institutional factors necessary for tax compliance in African businesses

	Pooled across countries and firms				Pooled across small firms				Pooled across medium firms			
	Est	ME: Low	ME: Moder-ate	ME: High	Est	ME: Low	ME: Moder-ate	ME: High	Est	ME: Low	ME: Moder-ate	ME: High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Tax rate	0.001	0.001	0.001	0.001	-0.224	0.016	0.009	-0.026	0.48	-0.034	-0.017	0.05
	(0.257)	(0.019)	(0.010)	(0.029)	(0.322)	(0.024)	(0.013)	(0.037)	(0.449)	(0.032)	(0.017)	(0.049)
Tax Administration	-0.0721***	0.053 ***	0.028***	-0.082***	-0.611**	0.045**	0.024**	-0.070**	-0.927**	0.066**	0.033**	-0.10**
	(0.246)	(0.018)	(0.001)	(0.027)	(0.308)	(0.023)	(0.012)	(0.035)	(0.422)	(0.03)	(0.015)	(0.045)
Political Instability	0.142	-0.011	-0.005	0.016	0.188	-0.014	-0.008	0.022	-0.129	0.009	0.004	-0.014
	(0.195)	(0.014)	(0.007)	(0.009)	(0.231)	(0.017)	(0.009)	(0.026)	(0.381)	(0.027)	(0.013)	(0.041)
Court System	0.095	-0.007	0.007	0.011	0.290*	-0.022*	-0.011*	0.033*	-0.311*	0.022*	0.011*	-0.033*
	(0.131)	(0.010)	(0.005)	(0.015)	(0.165)	(0.012)	(0.007)	(0.018)	(0.235)	(0.016)	(0.008)	(0.025)
Crime, Theft and Disorder	-0.136	0.01	0.005	-0.015	-0.051	0.004	0.002	-0.006	-0.194	0.016	0.007	-0.021
	(0.127)	(0.009)	(0.004)	(0.014)	(0.113)	(0.008)	(0.005)	(0.012)	(0.216)	(0.015)	(0.008)	(0.0230)
Corruption	-0.785***	0.057***	0.031***	-0.089***	-0.667**	0.050**	0.027**	-0.076**	-1.256**	0.090**	0.046**	-0.136**
	(0.261)	(0.019)	(0.010)	(0.029)	(0.298)	(0.022)	(0.012)	(0.034)	(0.576)	(0.041)	(0.021)	(0.062)
Year Dummies												
2014	-16.978				-16.978				-17.315			
	(772.582)				(772.582)				(1309.638)			
2016	-16.235				-16.235				-15.677			
	(772.582)				(772.582)				(1309.628)			
2018	1.160				1.160				-0.209			
	(928.915)				(928.915)				(1483.911)			

Notes: ME is short for marginal effects. Standard errors are in parenthesis, and significance levels for rejection of null hypothesis are: *** for 1 %, ** for 5% , and * for 10% levels respectively.This table shows the pooled regression estimates of small- and medium-sized manufacturing firms operating in the five(5) African countries considered in this paper.

The macro-institutional factors important for tax compliance are reported in Table 4. The findings reveal that tax administration and corruption perception are the major macro-institutional factors hindering tax compliance in Africa. Firms with high compliance attitude are negatively influenced by the complexity of the tax administration as observed in columns 2, 8 and 12 of Table 4. The magnitude of this effect shows an 82 percent decline in the number of highly compliant firms as tax administration increases by 1 percent and 89 percent deduction in the number of high compliant firms as corruption increases at the pooled cross-sectional level. A percent increase in firms' perception of corruption reduces the probability of belonging to a high compliant level by 76 percent and 13.6 percent for small and medium firms respectively. Estimates of the court system for small firms show that a percentage increase in firms' perception of the court system reduces the likelihood of becoming a low and moderate compliant firm by 22 percent and 11 percent respectively but increases the probability of being highly compliant by 33 percent. The signs are, however, the reverse for medium-sized firms.

6.2 The relationship between tax compliance and innovation by firms

The relationship between tax compliance and firms' innovation is presented in table 6. The result reveals that tax compliance does not necessarily influence innovation in these countries. This is implied by the insignificant values of the tax compliance variables. Nigeria is the only exception to this finding as results from the country-specific analysis reveals that a unit increase in low compliant firms decreases the probability of being innovative by 34 percent.

Research and development have a positive relationship with innovation when analyzed at the cross-sectional level. The result indicates that a unit increase in R and D investment leads to a 14 percent rise in innovation. Meanwhile, electricity supply is statistically significant across firms in Egypt, Nigeria, and Kenya. The magnitude of this effect shows that firms are 7 times more likely to innovate as the challenge posed by lack of electricity increases by 1 percent. Also, the amount of productive time spent with tax officials influence firms' innovative behaviour. Although compliance cost is positively significant across firms. Its impact seems to be infinitesimal considering the magnitude of the variable. Hence, an increase in the amount of productive time spent by firms with tax officials increases the probability of innovation by 2 percent in Egypt but decreases the level of innovation in Nigeria by 1 percent

Table 5: Relationship between tax compliance levels and innovation

	Dependent variable: Innovation					
	Pooled	DRC	Egypt	Kenya	Nigeria	Zimbabwe
	(1)	(2)	(3)	(4)	(5)	(6)
Moderate Compliance	-0.017	0.189	0.644	0.236	-0.184	0.002
	(0.045)	(0.420)	(0.809)	(0.161)	(0.171)	(0.165)
Low Compliance	-0.045	0.779	-0.346	0.156	-0.314**	0.002
	(0.032)	(0.247)	(0.514)	(0.147)	(0.126)	(0.165)
Research and Development	0.144***	0.958***	2.337***	0.231***	-0.164	1.056***
	(0.021)	(0.285)	(0.297)	(0.059)	(0.106)	(0.184)
Land and Permits	-0.018	0.103	0.111	0.039*	-0.005	0.537
	(0.019)	(0.243)	(0.276)	(0.020)	(0.094)	(0.212)
Electricity	0.077***	-0.057	0.216*	0.038*	0.358**	0.379
	(0.024)	(0.247)	(0.131)	(0.022)	(0.123)	(0.154)
Transportation	-0.002	0.239	-0.259	0.013	0.084	-0.207
	(0.021)	(0.243)	(0.262)	(0.024)	(0.113)	(0.118)
Compliance Cost	0.000	-0.028	0.022**	0.001	-0.001***	-0.005
	(0.000)	(0.022)	(0.004)	(0.001)	(0.001)	(0.001)
Political Instability	0.098***	-0.236	-0.259	0.035*	0.151***	0.462
	(0.024)	(0.257)	(0.496)	(0.020)	(0.078)	(0.109)

Notes: The dependent variable for this regression is a dummy variable that codes whether a firm introduced a new product or service. Standard errors are in parenthesis, and significance levels for rejection of null hypothesis are: *** for 1 %, ** for 5%, and * for 10% levels respectively. This table shows the pooled and country-level regression estimates of small- and medium-sized manufacturing firms operating in the five (5) African countries considered in this paper.

Table 6: What matters for tax compliance: Country-level estimates from ordered logit regressions

	DRC		Egypt		Kenya		Nigeria		Zimbabwe	
	Small	Medium	Small	Medium	Small	Medium	Small	Medium	Small	Medium
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Ownership: Sole Proprietor	-17.655	5.24	1.307***	0.966*	-0.83	-0.876	1.115***	0.829	-0.785	-0.043
	(2324.993)	(4.651)	(0.510)	(0.514)	(0.665)	0.801	(0.347)	(0.539)	(0.633)	(1.024)
Ownership: Partnership	-17.7	0.314	0.931**	0.558	-0.39	-0.758	0.169***	0.008	-0.85	0.695
	(2324.993)	(2.748)	(0.431)	(0.455)	(0.660)	0.682	(0.428)	(0.014)	(0.638)	(1.325)
Age	0.019	-0.040*	-0.003	-0.003	-0.027*	0.006	0.000	0.026	0.008	0.049*
	(0.03)	(0.05)	(0.01)	(0.01)	(0.02)	0.02	(0.01)	(0.80)	(0.01)	(0.03)
Tax rate	0.86	3.694	0.57	0.506	-0.316	-0.387	-0.565	-1.001	-16.836	1.082
	(0.56)	(3.52)	(0.55)	(0.67)	(0.21)	0.75	(0.44)	(0.76)	(1275.54)	(8892.58)
Tax administration	-0.233	-2.266	-0.489	-0.812	0.215	-0.148	-0.752*	-0.104	0.245	-18.782
	(0.610)	(2.799)	(0.505)	(0.608)	(0.209)	0.274	(0.443)	(0.430)	(1.408)	(8234.195)
Business License and Permits	-1.152**	3.129*	-1.197**	-0.014	-0.070*	1.052	0.896***	-0.104	0.225	2.592*
	(0.480)	(2.123)	(0.497)	(0.499)	(0.219)	0.624	(0.231)	(0.430)	(0.656)	(1.519)
Political Instability	0.436	-16.854	-14.779	-0.039	-0.136	0.122	0.141	-0.234	-0.909	-16.303
	(0.555)	(8.102)	(858.107)	(1.593)	(0.190)	0.810	(0.260)	(0.435)	(0.796)	(5872.110)
Corruption	-0.655	-24.092	0.193	-14.948	-0.286***	-2.426	-0.736**	-1.017	-1.52	-0.753
	(0. 653)	(2903.07)	(0.73)	(961.00)	(0.18)	0. 800	(0.36)	(0.64)	(0.97)	(7303.02)
Court system	0.427	7.0437	-0.059	-0.867**	0.005	0.632	0.04	0.345	0.767	-0.719
	(0.557)	(3.392)	(0.389)	(0.450)	(0.226)	(0.561)	(0.224)	(0.355)	(0.534)	1.471
Crime, Theft and Disorder	0.154	9.727	0.001	0.009	0.26	-0.462	-0.521**	-0.875**	-1.038***	-0.133
	(0.491)	(5.109)	(0.235)	(0.256)	(0.263)	(0.634)	(0.222)	(0.344)	(0.694)	(0.900)
Foreign Ownership	0.784	17.194	-0.422	0.338	-0.947	1.804	-0.05	-0.431	0.283	-1.37
	(0.875)	(8.496)	(1.166)	(1.162)	(0.676)	(1.169)	(0.530)	(1.158)	(1.196)	(1.636)
Electricity			0.622	0.087	0.198	-0.84	0.227	-2.192**	1.242*	-15.005
			(0.392)	(0.432)	(0.208)	0.583	(0.318)	(1.092)	(0.669)	(4928.443)
Transportation	-0.222	-2.57	-0.920**	-0.095	0.271	0.061	0.059	0.752*	0.651*	0.42
	(0.53)	(1.25)	(0.43)	(0.44)	(0.22)	0.28	(0.28)	(0.45)	(0.61)	(1.38)
Land and Permits	-0.357	8.189	1.054**	1.013	-0.338	0.871	0.278	0.443	0.438	-0.701
	(0.522)	(4.332)	(0.461)	(0.493)	(0.190)	(0.597)	(0.207)	(0.347)	(0.549)	0.861
Customs and Trade Regulations	-0.136	0.741	0.396	0.130**	-0.029	0.493	0.611**	-0.245	-0.237	-20.431
	(0.461)	(2.166)	(0.420)	(0.428)	(0.180)	(0.598)	(0.229)	(0.391)	(0.611)	(5987.395)
Compliance Cost	-0.009	0.31	0.017	0.042**	0	0.004	0.006*	0.005	-0.023	-0.004
	(0.022)	(0.278)	(0.011)	0.020	(0.011)	(0.013)	(0.004)	(0.005)	(0.023)	0.041
Gender	1.375	3.017	-1.922***	-1.531**	-0.575	1.092	-0.479*	-0.433	0.222	19.009
	(0.839)	(2.233)	(0.631)	(0.673)	(0.475)	(0.945)	(0.252)	(0.343)	(0.660)	9577.045

Notes: Standard errors are in parenthesis, and significance levels for rejection of null hypothesis are: *** for 1 %, ** for 5% , and * for 10% levels respectively.

Finally, in estimating the exclusion variable of "missingness" and "truthfulness", we focused on two indicator variables for interpretation; Rho and lambda which represents the coefficient of correlation of the error terms across the equation and the inverse mills ratio respectively.

Tables 7 and 8 provide sample selection results for "missingness" and truthfulness" respectively. In table 7, the FIML estimation reveals that the coefficient of rho is not significant at level. Implying that under the assumption of having good identifying variables, we reject Ho: there is no relationship between the error terms. This further suggests that the exemption of the" missingness" variable does not pose any problem of selection bias on the overall result. The coefficient of the inverse mills ratio originating from the Heckman two-step estimates is also not significant at level supporting the hypothesis that sample selection bias resulting from the inverse mills ratio does not yield significant bias, hence using OLS on the selected sample without including the inverse mills ratio will give a correct result. On the other hand, the value of our exclusion variable is significant and positively signified in both the FIML and Heckman two-step regression. This conforms with our apriorism expectation that managers with more than five years of experience are more likely to provide answers to sensitive questions compared to other categories of workers or owners. Also, since there appears to be no systematic difference between this observation and the rest of the observations, we therefore conclude that there is no issue of bias present in the sample.

The signs and values of the exclusion variables" missingness" and "truthfulness" are somewhat similar. For the" truthfulness" variable, rho and lambda are not significant implying that ceteris paribus, assuming the existence of no sample selection bias, there is a high chance of making a type one error by rejecting Ho: there is zero correlation between error terms. Therefore, the problem of sample selectivity emerging from "truthfulness" is not present in the dataset. The result reveals that our exclusion restriction variable "truthfulness" is negatively significant at 1 percent level in both the two-step Heckman and FIML estimates indicating that small firms are less likely to subject their books to external audits. This validates the inclusion of the "truthfulness" variable in the heckit regression.

7 Concluding remarks

This study sought to identify both traditional and seemingly irrelevant; non-traditional factors influencing tax compliance by small and medium-sized businesses in Africa, and especially those macro-institutional factors necessary for tax compliance.

The findings draw some important conclusions. One of which is the need for a reformed tax administration across Africa. Given the obstacles posed by the tax administration system, there is need to initiate strategic policies targeted at small and medium firms in order to regain their confidence, boost morale and discourage evasive behaviour. The introduction

of an electronic tax system has been a useful tool for revenue collection across countries like Botswana and should be experimented in most African countries coupled with the provision of efficient enforcement mechanisms. In addition to reducing evasive behaviour, this will further curb the administrative bottlenecks involved in filing tax records and remitting taxes, reduce number of visits by tax officials and invariably eliminate the activities of corrupt bureaucrats. Due to the nature of small firms which enables them to collect and remit taxes, it is expected that taxpayers are adequately equipped with information on the tax processes and types (Kamleitner et al.2012).

Our finding also contradicts the assertion of Abdixhiku et al., (2017) which affirms that corporations and partnerships are more compliant than individual firms. The compliance attitude of sole proprietors and partners suggests that compliance attitude is largely motivated by an individual's perception and knowledge of the tax laws, and not necessarily by the number of persons involved in decision making regarding taxes. Hence, it could be argued that the compliance attitude may be borne out of morality, ethics, social stigma and some individual characteristics as emphasized by Torgler (2017). Again, the magnitude of tax compliance likely to emanate from sole proprietors of small firms in Africa indicate their importance in the tax revenue process.

The impact of customs and permits shows that firm owners view the obstacle associated with custom and trade regulations differently. Unlike medium-sized firms, small firms do not consider these regulations as a major obstacle to their business operations. This finding also supports the empirical claims of Hibbs and Piculescu (2010) and could be attributed to factors such as the size of the firm, source of material and the sector of employment. Similarly, it is possible that the activities conducted by the small firms involve little or no custom checks which influence their responses.

Interestingly, small firms do not seem demotivated by inadequate supply of electricity considering their level of compliance. Several reasons may influence this decision. One of such is the reliance on alternative sources of power supply which may be cheaper and easier to regulate. Also, the nature of work done by small firms may not require the use of large equipment which consumes energy. Secondly, small firm owners perceive that by paying taxes and being highly compliant, government may be inclined to reciprocate by providing the required facilities needed to boost the growth of small businesses. On the contrary, medium-sized firm owners might consider the supply of electricity as a major operational necessity. Unfortunately, unlike small firms, medium firms channel huge monies into the provision of alternative sources of energy which constitutes a huge operation cost to them. In order to meet up with the profit margin, medium firms may have no choice but to evade. It is therefore expedient on the government to provide key infrastructures for business to strive favorably.

The court system is a major macro-institutional variable necessary for compliance. A good judiciary system plays a vital role in ensuring compliance as they tend to impose fines and penalties on non-compliant firms, hence deterring others from evading taxes.

Firms in Nigeria exhibiting low compliance attitude tend to be less innovative most likely because their evasive behaviour affects the ability of government to invest in public goods and services that promotes innovation. On the other hand, innovation requires the use of new materials and techniques which might not be easily accessible by smaller firms. These challenges might ignite firms focusing on tax avoidance especially if the expected benefits from lack of compliance outweigh the expected cost.

Research and development are major innovation. The positive and significant coefficient of research and development across countries shows that this factor plays a vital role in the development of new products lines and the expansion of businesses. It is expected that firms who spend more on R and D can discover new approaches and processes for the production and provision of goods and services. Firms may opine that in order to remain relevant; they need to try out new methods and techniques of production.

The positive relationship between electricity and innovation, especially at the cross-sectional level again, suggests that the lack of electricity does not hinder innovation. The adoption of alternative sources of energy such as solar power and biofuels now serves as sustainable options for firms operating in Africa

Finally, countries in Africa seem to record accelerating growth in innovation even during political unrest. This could be motivated by the activities of domestic firms, as it is predicted that political instability discourages foreign and large-scale investment. Hence, smaller firms capitalize on the fall out of multinationals to expand their businesses, try new product techniques and dominate the local market space which overtime being occupied by these foreign firms. Hence, existing firms who are either willing to stay in business or increase their market share would have no option but to innovate.

Due to the nature of the dependent variables considered for this study, it is important to interpret the findings with caution, as a misinterpretation may convey a different meaning from what is intended and hence lead to wrong conclusions.

The findings from this study draw some important recommendations for future reference. In particular, it would help tax agencies to better understand the determinants of tax compliance behaviour by firms and hence, design effective reforms to induce higher

compliance

rates;secondly, It would facilitate focused institutional upgrading that is tailored to the African environment; and thirdly, it would help inform policies that facilitate innovation, productivity, and growth of African businesses.

References

Abdixhiku, L., Krasniqi, B., Pugh, G. and Hashi, I. (2016). Firm level determinants of tax evasion in transition economies, *Economic Systems* .

Allingham, M. G. and Sandmo, A. (1972). Income tax evasion: A theoretical analysis, *Journal of Public Economics* **1**(3-4): 323–338.

Andreoni, J., Erard, B. and Feinstein, J. (1998). Tax compliance, *Journal of Economic Literature* **36**(2): 818–860.

Cameron, A. C. and Trivedi, P. K. (2005). *Microeconometrics: Methods and Applications*, Cambridge university press.

Engström, P. and Holmlund, B. (2009). Tax evasion and self-employment in a high-tax country: evidence from sweden, *Applied Economics* **41**(19): 2419–2430.

Feld, L. P. and Frey, B. S. (2002). Trust breeds trust: How taxpayers are treated, *Economics of Governance* **3**(2): 87–99.

Franzoni, L. A. (2004). Discretion in tax enforcement, *Economica* **71**(283): 369–389.

Gokalp, O. N., Lee, S.-H. and Peng, M. W. (2017). Competition and corporate tax evasion: An institution-based view, *Journal of World Business* **52**(2): 258–269.

Hanousek, J. and Palda, F. (2004). Quality of government services and the civic duty to pay taxes in the czech and slovak republics, and other transition countries, *Kyklos* **57**(2): 237–252.

Heckman, J. J. (1976). The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator for such models, *Annals of Economic and Social Measurement, Volume 5, number 4*, NBER, pp. 475–492.

Hibbs, D. A. and Piculescu, V. (2010). Tax toleration and tax compliance: How government affects the propensity of firms to enter the unofficial economy, *American Journal of Political Science* **54**(1): 18–33.

IMF (2015). *Current Challenges in Revenue Mobilization: Improving Tax compliance*, International Monetary Fund, , Washington D.C.

Johnson, S., Kaufmann, D., Shleifer, A., Goldman, M. I. and Weitzman, M. L. (1997). The unofficial economy in transition, *Brookings papers on economic activity* **1997**(2): 159–239.

Joulfaian, D. (2005). Bribes and business tax evasion, *The European Journal of Comparative Economics* **6**(2): 227–244.

Kamleitner, B., Korunka, C. and Kirchler, E. (2012). Tax compliance of small business owners: A review, *International Journal of Entrepreneurial Behavior & Research* **18**(3): 330–351.

Kasper, M., Kogler, C. and Kirchler, E. (2015). Tax policy and the news: An empirical analysis of taxpayers' perceptions of tax-related media coverage and its impact on tax compliance, *Journal of Behavioral and Experimental Economics* **54**: 58–63.

Kastlunger, B., Dressler, S. G., Kirchler, E., Mittone, L. and Voracek, M. (2010). Sex differences in tax compliance: Differentiating between demographic sex, gender-role orientation, and prenatal masculinization (2D: 4D), *Journal of Economic Psychology* **31**(4): 542–552.

Nur-tegin, K. D. (2008). Determinants of business tax compliance, *The BE Journal of Economic Analysis & Policy* **8**(1).

OECD (2013). *Compliance Risk Management: Managing and Improving Tax Compliance*, Centre for Tax Policy and Administration, Organisation for Economic Co-operation and Development, Paris.

Richardson, M. and Sawyer, A. J. (2001). A taxonomy of the tax compliance literature: further findings, problems and prospects, *Australian Tax Forum* **16**: 137.

Rose-Ackerman, S. (2013). *Corruption: A study in political economy*, Academic Press.

Rothengatter, M. R. (2005). Social networks and tax (non-) compliance in a multicultural nation: emerging themes from a focus-group study among ethnic minorities in australia, *International Journal of Entrepreneurial Behavior & Research* **11**(4): 280–314.

Slemrod, J. (2007). Cheating ourselves: The economics of tax evasion, *Journal of Economic Perspectives* **21**(1): 25–48.

Tirole, J. (1996). A theory of collective reputations (with applications to the persistence of corruption and to firm quality), *The Review of Economic Studies* **63**(1): 1–22.

Torgler, B. (2007). *Tax compliance and tax morale: A theoretical and empirical analysis*, Edward Elgar Publishing.

Tyler, T. R. (1997). The psychology of legitimacy: A relational perspective on voluntary deference to authorities, *Personality and social psychology review* **1**(4): 323–345.

Wahl, I., Kastlunger, B. and Kirchler, E. (2010). Trust in authorities and power to enforce tax compliance: An empirical analysis of the "Slippery Slope Framework", *Law & Policy* **32**(4): 383–406.

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*, MIT press.

A Results Appendix

Table 7: Controlling for sample selection bias arising from ”missingness” of responses

	Heckman FIML		Heckman two-step	
	Main Tobit	Selection Probit	Main OLS	Selection Probit
Ownership: Sole Proprietor	0.162***	0.265***	0.170***	0.264***
	(0.038)	(0.091)	(0.046)	(0.091)
Ownership: Partnership	0.120***	-0.341***	0.108*	-0.341***
	(0.040)	(0.089)	(0.060)	(0.090)
Age	0.000	0.002**	0.000	0.002
	(0.001)	(0.002)	0.000	(0.002)
Tax rate	-0.011	-0.339	-0.02	-0.341**
	(0.050)	(0.136)	(0.061)	(0.136)
Tax administration	-0.162***	0.059	-0.161***	0.058
	(0.045)	(0.114)	(0.046)	(0.114)
Business License and Permits	0.063*	0.118	0.067*	0.119
	(0.034)	(0.090)	(0.037)	(0.090)
Political Instability	-0.02	-0.123	-0.023	-0.123
	(0.047)	(0.111)	(0.049)	(0.111)
Corruption	-0.127**	0.423***	-0.114*	0.424***
	(0.051)	(0.118)	(0.069)	(0.118)
Court system	-0.006	-0.114	-0.009	-0.114
	(0.031)	(0.079)	(0.033)	(0.079)
Crime, Theft and Disorder	-0.056*	-0.160**	-0.061**	-0.160**
	(0.029)	(0.076)	(0.033)	(0.076)
Foreign Ownership	-0.017	-1.061***	-0.062**	-1.060***
	(0.087)	(0.124)	(0.183)	(0.124)
Electricity	0.058	-0.402***	0.046	-0.402***
	(0.037)	(0.091)	(0.055)	(0.091)
Transportation	-0.008	0.047	-0.007	0.047
	(0.035)	(0.087)	(0.035)	(0.087)
Land and Permits	0.000	0.134*	0.004	0.133*
	(0.030)	(0.075)	(0.034)	(0.075)
Customs and Trade Regulations	0.088***	-0.225***	0.082**	-0.225***
	(0.032)	(0.083)	(0.040)	(0.083)
Compliance Cost	0.002***	0.005***	0.002**	0.005***
	(0.001)	(0.002)	(0.001)	(0.002)
Audits				
Gender		-0.13	0.037	-0.129
		(0.105)	(0.046)	(0.105)
Missingness		0.163*		0.163*
		(0.095)		(0.095)
Year Dummy				Yes
2014	1.523***		1.523***	
	(0.093)		(0.093)	
2016	1.864***		1.866***	
	(0.132)		(0.133)	
2018	0.005		0.005	
	(0.131)		(0.131)	
lambda				0.13
Rho		0.048		(0.370)
		(0.160)		
Observations	2510			

Notes: Standard errors are in parenthesis, and significance levels for rejection of null hypothesis are: *** for 1 %, ** for 5% , and * for 10% levels respectively.

Table 8: Controlling sample selection bias arising from truthfulness of respondents

	Heckman FIML		Heckman two-step	
	Main Tobit	Selection Probit	Main OLS	Selection Probit
Ownership: Sole Proprietor	0.163***	0.131	0.170***	0.13
	(0.038)	(0.094)	(0.040)	(0.094)
Ownership: Partnership	0.117**	-0.352***	0.098**	-0.353***
	(0.040)	(0.090)	(0.048)	(0 .089)
Age	0.000	-0.001	0.000	0.003
	(0.001)	(0.003)	0.000	(0.002)
Tax rate	-0.013	0.002**	-0.027	-0.348**
	(0.050)	(0.346)	(0.055)	(0.137)
Tax administration	-0.161***	0.016	-0.160***	0.017
	(0.045)	(0.115)	(0.046)	(0.115)
Business License and Permits	0.064	0.131	0.070**	0.131
	(0.034)	(0.091)	(0.036)	(0.091)
Political Instability	-0.02	-0.054	-0.022	-0.055
	(0 .047)	(0.113)	(0.047)	(0.113)
Corruption	-0.124**	0.428***	-0.105*	0.429***
	(0.051)	(0.428)	(0.058)	(0.118)
Court system	-0.007	0.119	-0.012	-0.13
	(0.030)	(0.079)	(0.032)	(0.079)
Crime, Theft and Disorder	-0.057**	-0.144*	-0.064**	-0.142*
	(0.029)	(0.076)	(0.031)	(0.076)
Foreign Ownership	-0.029	-1.080***	-0.098	-1.080***
	(0.082)	(0.124)	(0.129)	(0.124)
Electricity	0.054	-0.412***	0.036	-0.411***
	(0.036)	(0.090)	(0.045)	(0.090)
Transportation	-0.008	0.033	-0.007	0.033
	(0.035)	(0.088)	(0.035)	(0.088)
Land and Permits	0.001	0.107	0.006	0.108
	(0.030)	(0.075)	(0.031)	(0.076)
Customs and Trade Regulations	0.086***	-0.222***	0.076**	-0.223***
	(0.032)	(0.083)	(0.035)	(0.084)
Compliance Cost	0.002***	0.005***	0.009***	0.005***
	(0.001)	(0.002)	(0.001)	(0.002)
Audits		-0.382***		-0.380***
		(0.079)		(0.079)
Gender	0.039	-0.164	0.031	-0.161
	(0.044)	(0.105)	(0.046)	(0.105)
Missingness				
Year Dummy				
2014	1.525***		1.530***	
	(0.093)		(0.093)	
2016	1.858***		1.843***	
	(0.132)		(0.134)	
2018	-0.001		-0.015	
	(0.132)		(0.133)	
lambda				0.204
Rho		0.092		(0.225)
		(0.112)		
Number of observations 2510				

Notes: Standard errors are in parenthesis, and significance levels for rejection of null hypothesis are: *** for 1 %, ** for 5% , and * for 10% levels respectively.There is no λ variable included in the Heckman FIML presented in tables 7 and 8 since the estimator is not least squares (Abdixhiku et al., 2016).

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