

WIDER Working Paper 2018/12

## **On asymmetric information and tax morale in developing countries**

Salim Nuhu Ahmed<sup>1</sup> and John M. Musah<sup>2</sup>

January 2018

**Abstract:** Our paper investigates the implications of asymmetric non-tax revenue information for tax morale using micro data from thirty-six African countries. We utilize a model in which agents form their perceptions about the sufficiency of government non-tax revenue for development financing under asymmetric information conditions. We then construct a composite index of information access that generates predictions about these perceptions and tax morale at the household level. Two important predictions emerge: (i) in the presence of asymmetric information, households overestimate the ability of non-tax revenues alone to finance development, which (ii) has significant negative effects on household-level tax morale. Our findings—which are robust across specifications and controls of cross-country fixed differences in tax morale—provide evidence that improvement in government information supply regarding the use of non-tax revenues, beyond annual budget readings and households tax obligations, could significantly enhance tax morale and compliance.

**Keywords:** Tax morale, mediation analysis, asymmetric information, principal component analysis

**JEL classification:** H26, H31, P35

---

<sup>1</sup> Department of Agriculture and Resource Economics, Michigan State University, USA; corresponding author, email: [nuhuahme@msu.edu](mailto:nuhuahme@msu.edu). <sup>2</sup> Department of Economics, Western Michigan University, USA.

This study has been prepared within the UNU-WIDER project on '[The economics and politics of taxation and social protection](#)'.

Copyright © UNU-WIDER 2018

Information and requests: [publications@wider.unu.edu](mailto:publications@wider.unu.edu)

ISSN 1798-7237 ISBN 978-92-9256-454-4 <https://doi.org/10.35188/UNU-WIDER/2018/454-4>

Typescript prepared by Ans Vehmaanperä.

The United Nations University World Institute for Development Economics Research provides economic analysis and policy advice with the aim of promoting sustainable and equitable development. The Institute began operations in 1985 in Helsinki, Finland, as the first research and training centre of the United Nations University. Today it is a unique blend of think tank, research institute, and UN agency—providing a range of services from policy advice to governments as well as freely available original research.

The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland, Sweden, and the United Kingdom as well as earmarked contributions for specific projects from a variety of donors.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

The views expressed in this paper are those of the author(s), and do not necessarily reflect the views of the Institute or the United Nations University, nor the programme/project donors.

## 1 Introduction

The need for alternative development financing methods in the wake of the decline in donor support has informed a renewed interest in understanding the effectiveness of existing tax systems and the factors that underline tax compliance or evasion thereof in developing countries (Besley and Persson, 2014; Jahnke, 2017; Pomeranz, 2015; Torgler, 2005). However, a survey of the literature reveals asymmetric information as a fundamental challenge to voluntary tax compliance (Park and Hyun, 2003; Reinganum and Wilde, 1985). Specifically, the extant literature has argued that ineffective tax systems largely exist in developing countries because tax authorities, at best, imperfectly observe transactions for the purposes of taxation—often because of large informal sectors, low capacity of tax administrators to monitor transactions and enforce compliance laws among others (Hoopes et al., 2015; Pomeranz, 2015). Our paper brings a new perspective to the debate by investigating the effects of asymmetric information on tax morale at the household level using non-experimental survey data.

In this paper, we will argue that the effects of asymmetric information on household tax morale is mediated through perceptions about the size of government's non-tax revenue (*hence non-tax revenue*). Specifically, we ask, how does deficiency in information on non-tax revenues that government collects, affect tax morale and tax compliance in developing countries? In the presence of information asymmetry, do households overestimate or underestimate revenues from other resources? And does it act as an incentive or disincentive for tax morale and consequently tax compliance? How do these results vary when households have imperfect information regarding their own tax obligations? We examine these questions by constructing a model in which agents choose their perceptions of non-tax revenues without perfect information. We then construct a novel composite index of information access at the household level. But households obtain information from a variety of sources. Consequently, choosing an optimal measure of information in this kind of analysis becomes a fundamental consideration. To accommodate the variations in the methods of information access, while noting the most important sources of information across the sample, we use the principal component analysis to factor scores to the standard sources of information. Based on these factor scores, a composite index is created for each case that measures the individual's frequency of information access. The index is then used as a predictor for individual's perceptions regarding the sufficiency of non-tax revenues for development financing in their home country. This yields an important prediction: individuals in African countries (most of whom are resource-rich) tend to overestimate non-tax revenues. Using mediation analysis with robust standard errors, we then test the empirical effects of the predicted asymmetric perceptions on various measures of tax morale with the data on thirty-six African countries from the 2016 Afrobarometer survey.

This paper makes several unique contributions to the existing literature. Firstly, we estimate household tax morale propensities, for the first time in the literature, as a function of asymmetric information on the part of government. Secondly, we test these implications of this model in resource-rich African countries which by default means focusing on economies with a narrow revenue base (Gordon and Li, 2009) and thus are able to generate relevant policy recommendations for expanding the current revenue base of these economies. The remainder of the paper covers the data and methodology adopted for this paper, proceeds to discuss results and findings, and offer policy recommendations.

## 2 Data sources and estimation strategy

This paper uses data from the 6<sup>th</sup> round (2016) of the Afrobarometer survey. The survey collects information on governance, economic reform, civil society, and quality of life. Respondents are selected using random selection methods at every stage. Several topics are covered which are useful for our study. The survey provides information on 53,935 individuals from thirty-six African countries. The summary statistics of the data used are provided in Table 10 in the appendix whilst Table 11 details the countries covered in this survey.

### 2.1 Estimation strategy

This paper follows the approach of Jahnke (2017) who uses the Baron and Kenny (1986) mediation estimation to examine the direct and mediated effects of asymmetric information on tax morale. To do this we first run equation (1) which is our most parsimonious model:

$$\ln\left(\frac{\theta}{1-\theta}\right) = \lambda + \beta\varphi_i + \sigma' \sum_i^n X_i + \varepsilon_i \dots (1)$$

Where  $\theta$  is the tax morale of an individual  $i$ . Following Jahnke (2017) we construct  $\theta$  as a dichotomous variable out of a four-level categorical variable that captures an individual's view of tax evasion. Responses that suggest that tax evasion is 'not wrong at all' or 'wrong but understandable' are coded as low tax morale and otherwise as 'high tax morale'. Thus, the variable can be taken to mean whether an individual has high tax morale whilst  $\mathbf{X}$  is a vector of individual and community-level covariates that determine tax morale based on the literature. The variable interest  $\varphi$  on the other hand, is a measure of asymmetric non-tax revenue information such that the equation (2) holds. Asymmetric non-tax revenue information is defined as the perception that government's non-tax revenue alone is enough to finance development as captured in question 44B of the Afrobarometer survey.

$$\ln\left(\frac{\theta}{1-\theta}\right) = \lambda + \beta(1 - \emptyset_i) + \varepsilon_i \dots (2)$$

Equation (2) suggests that the variable of interest,  $\varphi$  is determined by the amount of information  $\emptyset$  that the individual possesses at the time of choosing his perception which is inadequate as  $(1 - \emptyset_i) < \emptyset_i$ . This situation yields (3); where  $Y$  is the aggregate government revenue from other resources,  $\delta_i$  is taxes from individuals and  $\bar{\varphi}y$  is the average perceived resource revenues. As can be seen in (3), under conditions of imperfect information  $(1 - \emptyset_i)$ ,  $\bar{\varphi}y$  is more than the aggregate actual government revenue.

$$\left(Y + \sum_i^n \delta_i\right) - \sum_{i=0}^n \bar{\varphi} y < 0 \dots \dots (3)$$

### 2.2 Constructing the information index

To obtain an exogenous predictor of  $\varphi$ , we compute the composite information index  $\theta_i$  for each case in our sample. The index is computed using the factor component analysis. Specifically, we obtain the principal components of the index by estimating the matrix below, where  $\gamma_i$  is the  $i$ th principal component.

$$\begin{bmatrix} \gamma_i \\ \cdot \\ \cdot \\ \cdot \\ \gamma_n \end{bmatrix} = \begin{bmatrix} X_{11} & \dots & \dots & X_{1n} \\ \cdot & \dots & \dots & \cdot \\ \cdot & \dots & \dots & \cdot \\ \cdot & \dots & \dots & \cdot \\ X_{m1} & \dots & \dots & X_{mn} \end{bmatrix} \begin{bmatrix} \alpha_i \\ \cdot \\ \cdot \\ \cdot \\ \alpha_n \end{bmatrix}$$

To obtain the variables that enter our principal component analysis, we construct dichotomous variables out of categorical variables that measure how frequently an individual obtains information from radio, television, newspapers, internet, and social media. Responses that suggest that the individual obtains information from a source every day or a few times a week are coded as ‘source’ and ‘not a source’ if otherwise. Furthermore, internet and social media sources are condensed into one variable before entering the principal component analysis. The eigenvectors from the correlation matrix of these variables provide the weights for each of the variables. By its mechanics, the first principal component is structured such that it explains the largest amount of possible variation subject to the constraint that the sum of the squared weights,  $(\alpha_1^2 + \dots + \alpha_n^2) = 1$ . The eigenvalues of these eigenvectors also give the variance of the principal components. Since the explanation of the variation in the original data diminishes with each additional component, we use the Kaiser rule to select the optimal number of components needed to capture the common information required for our composite information index,  $\emptyset$  (Vyas and Kumaranayake, 2006). The factor scores for each variable under each principal component are reported in Table 2. We also show the scree plot of the principal component analysis in Figure 1. Table 1 provides a summary of the components of our composite index of information access. As can be seen, the mean of 0.7 suggests that the most common source of information across the sample is radio news. However, internet and social media remain as very low sources of information relative to television and even newspapers. Furthermore, it indicates that effective dissemination of government resource revenue information in sub-Saharan Africa requires heavy use of radio and television media. In Table 2, we present the eigenvalues of each of the factors in explaining the variations in the sources of information access. The first two factors have eigenvalues above 1 and cumulatively explain about 67 per cent of the variation in the original variables.

Table 1: Summary of Statistics on Asymmetric Information Factors

Source of Information	Obs.	Mean	Std.	Dev.	Min
Radio	53,935	0.71	0.45	0	1
Television	53,935	0.52	0.50	0	1
Newspaper	53,935	0.22	0.41	0	1
Internet	53,935	0.21	0.41	0	1
Social Media	52,868	0.13	0.34	0	1

Source: Authors' calculations based on 2016 Afro barometer survey.

Table 2: Results of Factor Component Analysis: Unrotated

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	2.34	1.32	0.47	0.47
Factor 2	1.02	0.30	0.20	0.67
Factor 3	0.72	0.12	0.14	0.82
Factor 4	0.60	0.28	0.12	0.94
Factor 5	0.32	-	0.06	1.00
<b>Obs. = 52,434</b>	LR test: independent vs. saturated: $\chi^2 (15) = 5.9^{***}$			

Source: Authors' calculations based on 2016 Afro barometer survey.

Based on the Kaiser (1958) varimax criterion, the first two components are selected as they have eigenvalues  $> 1$ . This is because there is very little marginal benefit from including a factor that explains less variance than is contained in one individual indicator. The Cattell (1966) scree plot also shown in Figure 1 in the appendix confirms our selection of the first two factors.

The factor scores are presented in Table 3. These are generated by a normalization process which leaves each component with a zero mean and a unit variance (Hamilton, 2012). We then generate the composite index as weighted linear combination of the principal components using the factor scores as weights.

Table 3: Rotated Factor Loadings and Unique Variances

Variable	Factor 1	Factor 2	Uniqueness
Radio	-0.02	0.92	0.15
Television	0.55	0.44	0.50
Newspaper	0.64	0.34	0.48
Internet	0.88	0.03	0.23
Social Media	0.84	-0.07	0.29

Source: Authors' calculations based on 2016 Afro barometer survey.

We see that social media, internet, and newspaper loads most heavily on factor one. Thus, factor 1 appears to have an 'advanced information source' dimension whereas radio and television loads most heavily on factor 2. Thus, giving it an 'common information source' dimension. The factor loadings plot presented in Figure 2 of the appendix shows these distinctions a lot more clearly. The factor rotation matrix presented in Table 4 shows a low correlation of -0.33 which suggests that the scores on factor 1 have low negative impact on scores on factor 2. We then compute a parsimonious index based on the two factors which capture much of the common variation.

Table 4: Factor Rotation Matrix

	Factor 1	Factor 2
Factor 1	0.94	-0.33
Factor 2	-0.33	0.94

Source: Authors' calculations based on 2016 Afro barometer survey.

### 2.3 Estimating the direct and mediated effects

Having obtained  $\emptyset$ , we then estimate the mediated and direct effects by running model (4) below following the approach of Baron and Kenny (1986);

$$\ln\left(\frac{\theta}{1-\theta}\right) = \lambda + \beta\varphi_i + p'\emptyset_i + \sum_{i=0}^n X_i + \varepsilon_i \dots \dots (4)$$

Our a priori expectation is that more information access will lower asymmetric information on government revenue. We also control for other factors such as educational attainment of the individual, whether the individual is employed in the public sector, lives in an area that has public amenities that may affect perceptions about the use of government non-tax revenues in line with Daude et al. (2012).

## 3 Discussion of results

The first wave of estimations, presented in Table 5, suggests that asymmetric information in all its forms negatively affects tax morale. Specifically, without controlling for country-level fixed effects, we find that difficulty in obtaining information on how much tax to pay, lowers tax morale by 5 per cent. However, asymmetric non-tax revenue information has a higher negative impact on tax morale—lowering it by as much as 17 per cent. We also find that public sector workers tend to have higher tax morale than non-public sector workers.

Table 5: Effects of Asymmetric Information on Tax Morale

	(1)	(3)
Tax Morale	Marginal Effects	Marginal Effects
Information Difficulty	-0.046*** [0.01]	
Asymmetric Information	-	-0.176*** [0.005]
Demographic		
Age	0.001*** [0.0002]	0.001*** [0.0001]
Secondary	0.003 [0.01]	-0.002 [0.005]
Post-Secondary	0.027*** [0.007]	0.023*** [0.007]
Female	- 0.021**** [0.0001]	-0.018*** [0.005]
Public Affairs	-0.019*** [0.01]	-0.021*** [0.006]
Employer		
NGO Staff	-0.032** [0.02]	-0.022 [0.017]
Public Sector	0.030*** [0.01]	0.027*** [0.009]
View of the Economy		
Bad	-0.007 [0.002]	-0.006 [0.005]
Sample Size	41,603	47,616
Pseudo R <sup>2</sup>	0.0040	0.0229

Source: Authors' calculations based on 2016 Afro barometer survey.

More precisely, being employed in the public sector increases an individual's morale by roughly 3 per cent on average. Also, individuals with higher education tend to have tax morale that is about 3 per cent higher than those who do not. We do not find an individual's negative view on the present state of the economy to be a significant determinant of tax morale although it has a negative effect. However, older individuals seem to have higher tax morale albeit of a very small magnitude. These findings are in line with Daude et al. (2012) who found education and people with formal employment to have more positive attitudes towards tax payment. This is because these individuals tend to have a deeper understanding of the role of taxation in nation building. Again, in line with the literature, we find females to have higher tax morale relative to males whose tax morale tend to be relatively 2 per cent lower on average.

### *Information access and tax morale*

Table 6: Effect of Information on Tax Morale

Tax Morale	Marginal Effects	Standard Errors
Information Index	0.012***	[0.002]
<hr/>		
Demographic		
Age	0.001***	[0.0002]
Secondary	-0.002	[0.006]
Post-Secondary	0.013**	[0.008]
Female	0.018***	[0.005]
Public Affairs	0.018***	[0.006]
<hr/>		
Employer		
NGO Staff	-0.031**	[0.017]
Public Sector	0.029***	[0.009]
<hr/>		
View of the Economy		
Bad	-0.007	[0.005]
Sample	46,797	
Pseudo R <sup>2</sup>	0.0032	

Source: Authors' calculations based on 2016 Afro barometer survey.

In Table 6 we run a test of the impact of information access on tax morale to test for the direct path relationship. We find positive effects of information access on tax morale. Specifically, a unit increase in the information index, increases the probability of having a high tax morale by roughly 1 per cent on average, all things equal. This result is significant at the 1 per cent level. Being female, having higher education or working in the government sector all appeared to have significant positive impacts on tax morale. However, those with secondary education only, tend to have lower tax morale relative to those without any education.

### **3.1 Test of mediation: information access and asymmetric information**

The results presented in Table 7 suggest that access to information significantly reduces the level of information asymmetry regarding how much taxes an individual is required to pay and their views on sufficiency of non-tax revenues. Specifically, a unit increase in the information access index reduces asymmetric resource revenue information by approximately 7 per cent and the difficulty in obtaining tax information by about 15 per cent. The mediation analysis also reveals some of the factors that affect the degree of asymmetric information. For example, higher education has significant negative impact on both resource revenue asymmetry and tax information difficulty, lowering it by 6 per cent and 25 per cent effectively. As expected, being a public-sector worker also has a negative effect on asymmetric information, lowering difficulty in accessing tax information by as much as 30 per cent as compared to non-public sector workers. To test for threshold effects of subjective economic conditions, we include whether the state of the economy is considered 'fairly bad' or 'very bad'. Both tend to have significant but varying impacts on asymmetric resource revenue. When an individual considers the state of the economy to be 'fairly bad' they are less likely to perceive resource revenue to be sufficient whereas those who view the economy as 'very bad' tend to be more likely to perceive resource revenue to be

sufficient. Thus, beyond a certain threshold, the state of the economy could have deleterious impact on tax morale.

Table 7: Mediation Analysis

	<b>Asymmetric Information</b>	<b>Tax Information Difficulty</b>
Information Index	-0.073*** [0.008]	-0.154*** [0.009]
Primary Education	0.168*** [0.028]	0.161*** [0.033]
Secondary Education	-0.095*** [0.030]	-0.112*** [0.034]
Post-Secondary	-0.062 [0.039]	-0.254*** [0.042]
Public Sector	-0.128*** [0.039]	-0.302*** [0.038]
NGO	0.150*** [0.071]	-0.165** [0.075]
Private Sector	0.089*** [0.027]	-0.272*** [0.029]
Age	-0.003*** [0.001]	-0.004*** [0.001]
Bad	-0.082*** [0.022]	-0.299*** [0.023]
Very Bad	0.099** [0.044]	-0.387*** [0.047]
<b>N</b>	49,532	42,102
<b>Pseudo R<sup>2</sup></b>	0.23	0.61

Source: Authors' calculations based on 2016 Afro barometer survey.

### 3.2 Direct and mediated effects

Table 8 presents the results from our estimation of the direct and mediated effects. In model (1) the asymmetric information variable is the ‘whether the individual thinks that non-tax revenues are sufficient for development financing’ whereas in model (2) asymmetric information is measured by whether the ‘difficulty in knowing the right amount of tax to pay’. Following Newsom (2002) we conclude that the effects of information access on tax morale is partially mediated through a reduction in asymmetric information regarding non-tax revenue since there exists no zero-order relationships in any of our estimations.

Table 8: Estimation of Direct and Mediated Marginal Effects

Tax Morale	(1)	(2)
Asymmetric Information	-0.173*** [0.005]	-0.043*** [0.005]
Information Index	0.010*** [0.002]	0.011*** [0.002]
Age	0.001*** [0.0002]	0.001*** [0.0002]
Secondary Education	-0.011** [0.006]	-0.006 [-0.006]
Post-Secondary Education	0.006 [0.008]	0.009 [0.008]
Female	0.016*** [0.005]	0.019*** [0.005]
Not Interested in Public Affairs	-0.018*** [0.006]	-0.015** [0.006]
NGO Staff	-0.024 [0.018]	-0.035** [0.018]
Public Sector Employment	0.025*** [0.009]	0.028** [0.009]
Bad	-0.003 [0.005]	-0.004 [0.005]
Wealth Status	0.017*** [0.002]	0.019*** [0.002]
Country Fixed-Effects	Yes	Yes
Sample Size	46,797	40,801
Pseudo R <sup>2</sup>	0.0228	0.0057

\*\*\*Significant at 0.01, \*\*Significant at 0.05

Source: Authors' calculations based on 2016 Afro barometer survey.

Specifically, we find a partial mediation effect where a unit increase in the access to information index increases tax morale by approximately 1 per cent, whereas having asymmetric information on government non-tax revenues decrease tax morale by approximately 17 per cent and remained highly significant. Similar effects are found when the difficulty in access to tax information is used as a proxy for asymmetric information. It reduces tax morale by close to 4 per cent whereas access to information enhances tax morale by about 1 per cent though very significant. In these new sets of estimations, we introduce a measure of wealth status as an extra control. We find significant positive impact of wealth on tax morale. Specifically, a unit increase in wealth index, increases tax morale by about 17 per cent in the first model and 19 per cent on average in the second model. All other controls that entered this estimation from the first round of estimations turned out with the same signs and similar magnitudes.

### **3.3 Robustness checks: other measures of tax morale**

We test the robustness of our findings in Table 9, with a different measure of tax morale; willingness to pay more taxes for increased health spending for model 1, whilst model 2 uses the original measure of tax morale with extra controls. Our findings are consistent across these specifications with information access increasing willingness to pay extra tax by about 2 per cent. The partial effect of information asymmetry however continued to negatively impact tax morale; lowering it by about 11 per cent on average, all things equal. In model 2, we control for trust in the tax administration department in line with the literature. The findings remained consistent in this specification as well with trust in the tax department increasing tax morale by about 9 per cent. This finding is consistent with the literature which has argued that individuals are likely to comply with tax laws if they believe expends taxes in a trustworthy manner (Riahi-Belkaoui, 2004; Torgler, 2004; Torgler and Schneider, 2009). Following Torgler (2006), we also include a measure of religiosity; the frequency with which an individual practice their faith. Our results suggest that religious practice and information access have similar impact on tax morale; increasing it by roughly 1 per cent on average, all things equal.

Table 9: Robustness Checks with Extra Controls

	Tax Morale 1	Tax Morale 2
<b>Asymmetric Information</b>	-0.112*** [0.005]	-0.168*** [0.005]
<b>Information Index</b>	0.02*** [0.002]	0.016*** [0.002]
<b>Age</b>	0.0001*** [0.0001]	0.001*** [0.0001]
<b>Secondary Education</b>	-0.011** [0.006]	0.006 [0.006]
<b>Post-Secondary Education</b>	-0.057*** [0.008]	0.032*** [0.008]
<b>Female</b>	-0.013** [0.005]	0.017*** [0.005]
<b>Not Interested in Public Affairs</b>	-0.015*** [0.006]	-0.013** [0.006]
<b>NGO Staff</b>	0.015 [0.017]	-0.024 [0.018]
<b>Public Sector Employment</b>	0.020** [0.009]	0.022** [0.009]
<b>Bad</b>	-0.060*** [0.005]	0.010** [0.005]
<b>Wealth Status</b>		0.015*** [0.002]
<b>Trust in Tax Department</b>		0.089**** [0.005]
<b>Religious Practice</b>		0.010*** [0.001]
<b>Country Fixed-Effects</b>	No	Yes
<b>Sample Size</b>	47,901	43,545
<b>Pseudo R<sup>2</sup></b>	0.0123	0.0295

\*\*\*Significant at 0.001, \*\*Significant at 0.05

Source: Authors' calculations based on 2016 Afro barometer survey.

#### **4 Policy implications and recommendations**

This paper has several useful implications for policy. First, tax morale has been identified as a key component of nation building (Daude et al., 2012). Again, our findings are consistent after controlling for country-level fixed effects—such as long-term political and socio-economic conditions which may have default implications for tax morale—and thus have a cross-country policy validity. But most importantly, our study suggests that an increased supply of information—above current levels, on both government non-tax revenues and citizens’ tax obligations—is fundamental to improving domestic revenue mobilization. Tax payers ought to be briefed beyond period budget presentations on how non-tax revenues—especially those coming from natural resources—are used. This has a double-edged effect: direct improvement of tax morale and improving trust in the tax administration. Furthermore, developing countries should make additional efforts to enhance trust in the tax administration. Even though several reforms such as the African Tax Forum have made some progress, Mascagni et al. (2014) note that the gains have been modest at best. National tax administrations need to be more transparent with information on tax revenue mobilization and institute incentives that enhance tax compliance.

#### **5 Conclusion**

In a deviation from the standard literature, we flip the problem of information asymmetry to the government side of the tax morale and compliance equation. More precisely, we investigate the implications for tax morale when individuals make assumptions about sufficiency of non-tax government revenue with imperfect information. We achieve this by building a model in which agents can form their perceptions about non-tax revenue in the presence of information asymmetry. We then test the predictions of this model when agents have information with data from over 54,000 households from thirty-six African countries. Two important results emerge: (i) agents overestimate government non-tax revenue under asymmetric information conditions, which in turn (ii) lowers tax morale. Our findings are consistent across different specifications with different measures of tax morale and even after controlling for country-level fixed effects and thus provide evidence applicable to all the countries under study.

## References

- Baron, R. M., and Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of personality and social psychology*, 51(6), 1173.
- Besley, T., and Persson, T. (2014). Why do developing countries tax so little? *The Journal of Economic Perspectives*, 28(4), 99–120.
- Cattell, R. B. (1966). The screen test for the number of factors. *Multivariate behavioral research*, 1(2), 245–76.
- Daude, C., Gutiérrez, H. & Melguizo, Á. 2012, “What drives tax morale?” *OECD Publishing*. OECD Development Centre Working Paper, no. 315.
- Gordon, R., and Li, W. (2009). Tax structures in developing countries: Many puzzles and a possible explanation. *Journal of public economics*, 93(7), 855–66.
- Hamilton, L. C. (2012). *Statistics with Stata: version 12*: Cengage Learning.
- Hoopes, J. L., Reck, D. H., and Slemrod, J. (2015). Taxpayer search for information: Implications for rational attention. *American Economic Journal: Economic Policy*, 7(3), 177–208.
- Jahnke, B. (2017). How does petty corruption affect tax morale in sub-Saharan Africa? An empirical analysis. Working Paper 2017/8. Helsinki: UNU-WIDER.
- Kaiser, H. F. (1958). The varimax criterion for analytic rotation in factor analysis. *Psychometrika*, 23(3), 187–200.
- Mascagni, G., Moore, M., and McCluskey, R. (2014). Tax Revenue Mobilization in Developing Countries: Issues and Challenges. Brussels: European Union. Retrieved in May 2016 from <https://www.ids.ac.uk/files/dmfile/TaxRevenueMobilisationinDevelopingCountries.pdf>
- Newsom, J. (2002). Testing mediation with regression analysis. Retrieved in May 2016 from [http://www.ioa.pdx.edu/newsom/usp534/ho\\_mediation.doc](http://www.ioa.pdx.edu/newsom/usp534/ho_mediation.doc).
- Park, C.-G., and Hyun, J. K. (2003). Examining the determinants of tax compliance by experimental data: A case of Korea. *Journal of Policy Modeling*, 25(8), 673–84.
- Pomeranz, D. (2015). No taxation without information: Deterrence and self-enforcement in the value added tax. *The American economic review*, 105(8), 2539–69.
- Reinganum, J. F., and Wilde, L. L. (1985). Income tax compliance in a principal-agent framework. *Journal of public economics*, 26(1), 1–18.
- Riahi-Belkaoui, A. (2004). Relationship between tax compliance internationally and selected determinants of tax morale. *Journal of International Accounting, Auditing and Taxation*, 13(2), 135–43.
- Torgler, B. (2004). Tax Morale, trust and corruption: Empirical evidence from transition countries. *Center for Research in Economics, Management and the Arts (CREMA), Working Paper*, 5, 2004–2005.

- Torgler, B. (2005). Tax morale in latin america. *Public Choice*, 122(1-2), 133–57.
- Torgler, B. (2006). The importance of faith: Tax morale and religiosity. *Journal of Economic Behavior and Organization*, 61(1), 81-109.
- Torgler, B., and Schneider, F. (2009). The impact of tax morale and institutional quality on the shadow economy. *Journal of Economic Psychology*, 30(2), 228–45.
- Vyas, S., and Kumaranayake, L. (2006). Constructing socio-economic status indices: how to use principal components analysis. *Health Policy and Planning*, 21(6), 459–68.

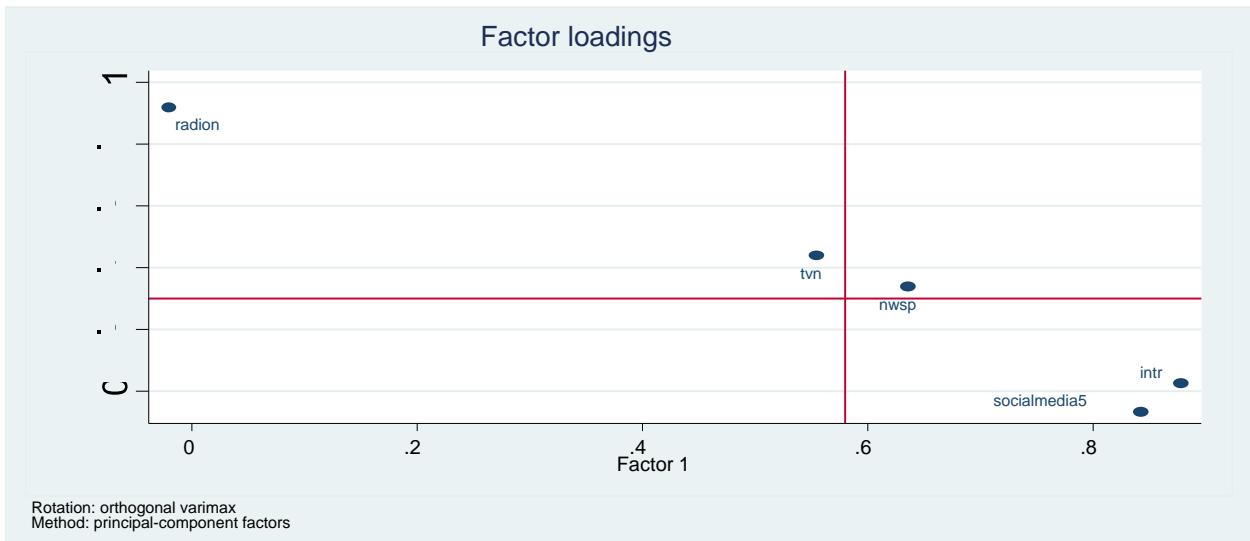
## Appendix

Table 10: Summary Statistics

	Sample size	Mean	Std. Dev.	Min	Max
Tax Morale	<b>51,051</b>	<b>0.56</b>	<b>0.50</b>	<b>0</b>	<b>1</b>
Tax Morale 2	52,315	0.43	0.49	0	1
Asymmetric Information	53,935	0.34	0.47	0	1
Tax Information Difficulty	45,525	0.66	0.47	0	1
Information Index	52,868	0.00	1.41	-2.08	2.89
Age	53,600	37.22	14.45	18	90
Primary	53,780	0.29	0.45	0	1
Secondary	53,780	0.36	0.48	0	1
Post-Secondary	53,780	0.16	0.36	0	1
Female	53,935	0.50	0.50	0	1
Disinterested in Public Affairs	53,448	0.22	0.41	0	1
NGO Staff	50,938	0.02	0.13	0	1
Public Sector	50,938	0.08	0.28	0	1
Bad	53,935	0.27	0.44	0	1
Very Bad	53,935	0.05	0.22	0	1
Wealth Index	53,634	0.00	1.41	-2.74	2.27
Trust in Tax Administration	49,254	0.48	0.50	0	1
Religious Practice Frequency	51,215	3.74	1.82	0	6

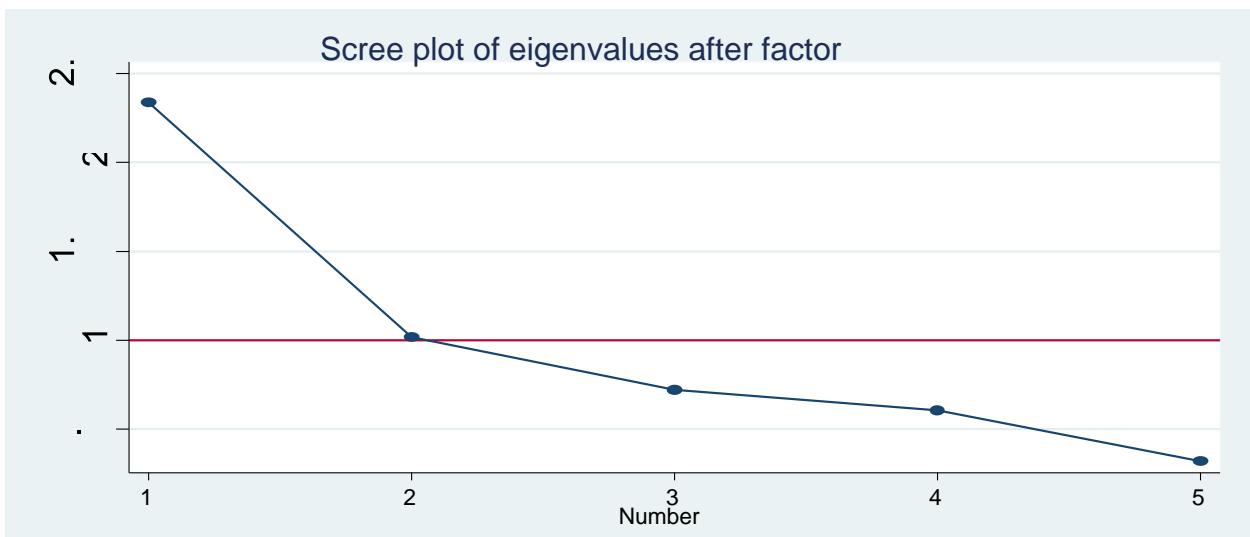
Source: Authors' calculations based on 2016 Afro barometer survey.

Figure 1 : Factor loadings



Source: Authors' calculations based on 2016 Afro barometer survey.

Figure 2: Scree plot of eigenvalues after factor



Source: Authors' calculations based on 2016 Afro barometer survey.

Table 11: List of Countries in Our Study And their Sample Sizes

<b>Country</b>	<b>West Africa</b>	<b>East Africa</b>	<b>Southern Africa</b>	<b>North Africa</b>	<b>Central Africa</b>
<b>Benin</b>	1,200				
<b>Burkina Faso</b>	1,200				
<b>Cape</b>	1,200				
<b>Ivory Coast</b>	1,199				
<b>Ghana</b>	2,400				
<b>Guinea</b>	1,200				
<b>Liberia</b>	1,199				
<b>Niger</b>	1,200				
<b>Nigeria</b>	2,400				
<b>Senegal</b>	1,200				
<b>Sierra Leone</b>	1,191				
<b>Mali</b>	1,200				
<b>Togo</b>	1,200				
<b>Burundi</b>		1,200			
<b>Kenya</b>		2,397			
<b>Tanzania</b>		2,386			
<b>Uganda</b>		2,400			
<b>Botswana</b>			1,200		
<b>Lesotho</b>			1,200		
<b>Madagascar</b>			1,200		
<b>Malawi</b>			2,400		
<b>Mauritius</b>			1,200		
<b>Mozambique</b>			2,400		
<b>Namibia</b>			1,200		
<b>South</b>			2,390		
<b>Zambia</b>			1,199		
<b>Zimbabwe</b>			2,400		
<b>Swaziland</b>			1,200		
<b>Algeria</b>				1,200	
<b>Egypt</b>				1,198	
<b>Morocco</b>				1,200	
<b>Sudan</b>				1,200	
<b>Tunisia</b>				1,200	
<b>Cameroon</b>					1,182
<b>Gabon</b>					1,198
<b>Sao Tomé</b>					1,196
<b>Total</b>	17,989	8,383	17,989	5,998	3,576

Source: Authors' calculations based on 2016 Afro barometer survey.