Fiscal capacity and tax revenues in Uganda

Research report

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October 2015

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FISCAL CAPACITY AND TAX REVENUES IN UGANDA

RESEARCH REPORT

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OCTOBER 2015

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Executive summary

Taxes are essential to finance public services and the functioning of State administrations. High-income countries have a tax-to-GDP ratio upward of 30% compared to about 20% on average in Sub-Saharan Africa. After a sharp increase in the 1990s, Uganda's ratio has stagnated around 12% for almost two decades – lower than in most of its East African counterparts. One reason is likely that the institutional environment leads to low compliance rates and less stringent enforcement of tax legislation.

The national agency responsible for the enforcement of taxation laws, and the assessment, collection and accounting of revenues is the Uganda Revenue Authority (URA). While the cost of collection—the ratio of the URA's annual budget to total collections—decreased by almost 50% during the last decade, URA still faces the challenge of increasing compliance and tax revenues. This report seeks to take stock of ongoing research focusing on the compliance gap and more precisely on the URA's audit system.

There is scope for improvement in both compliance rates and efficiency of all the main taxes used in Uganda. According to a recent IMF report,[1] the VAT compliance gap—the difference between potential VAT revenues under the current legislation and actual VAT revenues—could amount to 60%, or 6% of GDP. VAT compliance therefore appears to be a crucial area for the improvement of the fiscal situation in Uganda.

Our collaboration with the URA has enabled us to access data on tax returns (VAT, PAYE and Income Tax), VAT transactions and audit cases, and to conduct an auditors' survey on a wide range of characteristics of 180 auditors out of the approximately 200 working in the Compliance section of the Domestic Tax division of the URA. We use these data to try to answer two sets of research questions:
1) Which firms should be selected for audit in order to maximize audit yield? How can the assignment of auditors to audit cases be improved for better results? What type of auditors achieves the highest yield?
2) How can firm-to-firm transaction data be leveraged to enhance tax compliance?

From the survey, we learn several important characteristics of URA auditors. About 85% of them are based in Kampala stations, including the Large and Medium Taxpayers Offices (LTO and MTO), and only the remaining 15% in regional offices. About 60% of the auditors are male, their median age is 34 years and their median tenure at the URA is 6 years. A large majority of them studied Accounting, Finance or Economics for their undergraduate and post-graduate degrees, and they identify strongly with their occupation and with the institution. A set of questions on job-specific skills and raw logical reasoning shows a substantial amount of variation across auditors. Auditors believe that

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[1] IMF (2014) "Uganda – Revenue Administration Gap Analysis Program – The VAT Gap"

the URA should focus on monitoring taxpayers in the wholesale, retail and informal business sectors, and a majority considers that small firms should be the main targets of audits, although there are some who would focus on medium and large firms.

As a first step in our analysis, we use information from tax returns and the auditor survey in combination with URA data on audit cases to investigate which auditor and taxpayer characteristics correlate with a higher audit yield. We find that audits on larger firms, both in terms of turnover and especially employees, yield on average higher audit yields. This is consistent with the fact that audited firms are much bigger on average than non-audited ones. Across sectors, audits on construction and real estate and business services firms yield the largest returns. As expected, comprehensive audits obtain significantly higher audit yields, compared to issue and desk audits. Consistently across our different analyses, we find that auditors who completed postgraduate degrees tend to lead more successful audits, whether or not they completed a professional course. This suggests that the emphasis should not only be on professional courses in auditor hiring and training processes. The correlations of tenure at the URA and gender with audit yield are not consistently significant. In terms of personality traits, we observe a positive correlation of "conscientiousness" and a negative correlation of "extraversion" and "openness" with audit yield.

There are some important caveats to the interpretation of these results, which are discussed in more detail below. The results are correlations and do not imply causal relationships. With access to more complete data and a better understanding of the current audit selection process, we should be able to provide further results and avoid such caveats. Moreover, if the URA is interested in experimenting with the selection of auditors and/or taxpayers to audit, or how they are assigned to audit cases, we believe that these results could be used to increase audit yield.

As a second step in the analysis, we show how firm-to-firm transaction data extracted from VAT monthly reports can be used to identify inconsistencies in tax reporting. Such a methodology could help the URA detect risky taxpayers. Furthermore, firm-to-firm transaction data can also allow mapping production networks, enabling URA to better anticipate how auditing a specific firm will impact its trading partners. The main idea is to compare sales a firm self-declares (on which it owes VAT) to what other firms declare having bought from that firm. Consider a buyer Y reporting a domestic purchase from a seller X. Seller X should report the same transaction as a sale. If the amount reported by buyer Y is superior to the one reported by seller X, there is a potential revenue loss for the URA, because of misreporting and/or intentional tax evasion. This could be because seller X under-declares its sales to reduce its tax liabilities, or because buyer Y over-declares its purchases to increase its input tax credits. The latter is probably more rare because it is more risky and more complex.

We aggregate all transactions occurring within a 12-month period by pair of firms (seller-buyer) and by direction (from X to Y and from Y to X separately).

87% of the seller-firms in our sample declare amounts that are lower than those declared by the buyer. For 85% of them, the amounts declared are more than 10% smaller. 9,631 unique sellers are identified in these pairs with under-reporting of transaction amounts. The non-declared sales amount to 4,148 billion UGX. Applying a standard VAT rate of 18% unveils an estimated VAT compliance gap of 747 billion UGX. Most of the misreporting (which constitutes tax evasion) comes from firms not reporting at all some of their transactions rather than systematically decreasing the reported value of their sales. When we control for the declared number of transactions, keeping only pairs where seller and buyer report the same number of transactions, under-reporting is less substantial, yet it remains in 23% of the pairs, corresponding to 1,551 unique sellers, and for 836 sellers it is larger than 10%.

These figures represent an upper bound of revenue loss. For example, some transactions that are not reported in the VAT Schedules could actually be included in the computation of firms' aggregate sales and purchases, but we did not have access to these variables in the data used to elaborate this report. However, the figures give an idea of the order of magnitude of VAT misreporting, and of the sizeable amounts that could be recovered by implementing a compliance strategy building on this methodology.

Main recommendations

1 – Pilot Compliance Program

For the next phase of our research collaboration with the URA, we propose to test a pilot compliance program by which the information from the VAT Schedules would be used to identify non-compliant taxpayers, i.e. firms that are not reporting all of their sales (or also possibly firms that are reporting non-existent purchases). This pilot program would allow to measure with precision the impact of using this information on compliance and revenue collections. After the study, the methodology we propose could be automatized as part of the risk management process of the audit case selection.

2 – Education and training of auditors

Our survey has provided us with an overview of auditors' education and training. We learned that only 37 out of 180 completed the Postgraduate Diploma in Taxation and Revenue Administration (PODITRA). This is due to resource constraints, which led to the suspension of the program from 2006/07 until recently. Our econometric results do not show that audits carried out by auditors without a PODITRA training have lower yields, however, as already mentioned, these analyses have some limitations, and it should not be concluded that the course has no impact.

What we do find is that auditors who completed postgraduate education lead more successful audits on average. The URA could target auditors with postgraduate education in its hiring process, and/or support the completion of postgraduate education of auditors after they join the URA. This does not mean

that support to PODITRA or ACCA/CPA trainings should be suspended, since knowledge acquired through university and job skills developed in professional courses are complementary. It shows however that the emphasis should not only be on professional courses.

Finally, throughout skills-sharing workshops that were organised during our last visit to Kampala, we saw the URA staff's interest in becoming more proficient in statistical software. This concerns both auditors and URA researchers. We are happy to keep skills-sharing as a component of our collaboration with the URA. Yet, in case some would like to gain these skills more rapidly, we would like to mention to the URA the existence of online Stata courses. The first one is a six weeks course providing a methodical introduction to the software. For more information: http://www.stata.com/netcourse/intro-nc101/.

Acknowledgements

1. Introduction

The challenge of taxation in developing countries

High-income countries levy on average twice as much taxes as low-income countries, with a tax-to-GDP ratio upward of 30% compared to 13% on average in low-income countries.[2] Across Sub-Saharan Africa, the tax ratio is around 22.3% (15.3% when excluding revenues from natural resources).[3] Taxes are essential for the financing of public services and of the functioning of State administrations. Although much research in this realm remains to be done, we can tentatively classify the main features accounting for the tax gap across countries at different stages of development into three kinds of features, which are strongly interrelated. The first is the sectorial composition of output. For instance, developing countries often have large agricultural sectors - in some cases dominated by subsistence farmers - and large informal sectors, which are difficult to tax. Second, some of the difference stems from tax policies. For example, historical work has shown how trade liberalization policies implemented since the 1970's harmed the fiscal situation of developing countries, much more than that of today's developed countries when they implemented similar provisions.[4] The efficiency of tax exemptions and tax holidays – offered by many developing countries to attract investment – is hard to assess and results lead to ambiguous conclusions.[5] Finally, in developing countries, less experienced tax administrations and weak institutional environments tend to lead to lower compliance rates and less stringent enforcement of tax legislation. A study on Spanish data showed, for example, that the combination of monitoring efforts by the tax authority and traceability of firm information was necessary for effective tax enforcement, yet these conditions are often not in place in developing countries.[6] The importance of third-party reporting, of "tax education", and of deterrence overall have also been highlighted as key elements for improving compliance.[7] These recent developments shed light on specific features of the tax environment that are often challenging in developing countries, but at the same time they bear hope that informed research can point to practical solutions for improving compliance and thus revenue raising.

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[2] Cagé and Gadenne (2014) "Tax Revenues, Development, and the Fiscal Cost of Trade Liberalization, 1792-2006", PSE Working Paper.

[3] Sub-Saharan Africa averages for year 2010. Mansour (2014) "A Tax Revenue Dataset for Sub-Saharan Africa: 1980-2010", Ferdi Working Paper 19. Based on IMF GFS data and Article IV reports.

[4] Cagé and Gadenne (2014)

[5] Drummond et al. (2012) "Mobilizing Revenue in Sub-Saharan Africa: Empirical Norms and Key Determinants", IMF Working Paper 12/108.

[6] Almunia and Lopez-Rodriguez (2014) "Heterogeneous Responses to Effective Tax Enforcement : Evidence from Spanish Firms", Oxford University Centre for Business Taxation Working Paper 14/12.

[7] Another explanatory factor may be low wages and monetary incentives in the civil service and thus low motivation of the tax collectors. An experimental study carried out in Pakistan showed that using performance-pay schemes could substantially raise revenue collection: Khan et al (2014) "Tax Farming Redux: Experimental Evidence on Performance Pay for Tax Collectors", *Quarterly Journal of Economics,* forthcoming.

Overview of Uganda's fiscal situation

Uganda's fiscal situation illustrates the difficulties described above. The country does not fare well by regional standards (Figure 1.1). Its tax-to-GDP ratio of 11.74% in 2013/14[8] is lower than in all its East African counterparts, and far below the Sub-Saharan Africa average of 22.3%. After a sharp increase in the 1990s, Uganda's ratio has stagnated around 10-11% for almost two decades, increasing only by 0.2 percentage points per year on average in the past ten years. In 2013/14, tax collections financed 71.5% of the government's budget, an improvement compared to 2004/05's 58%.[9]
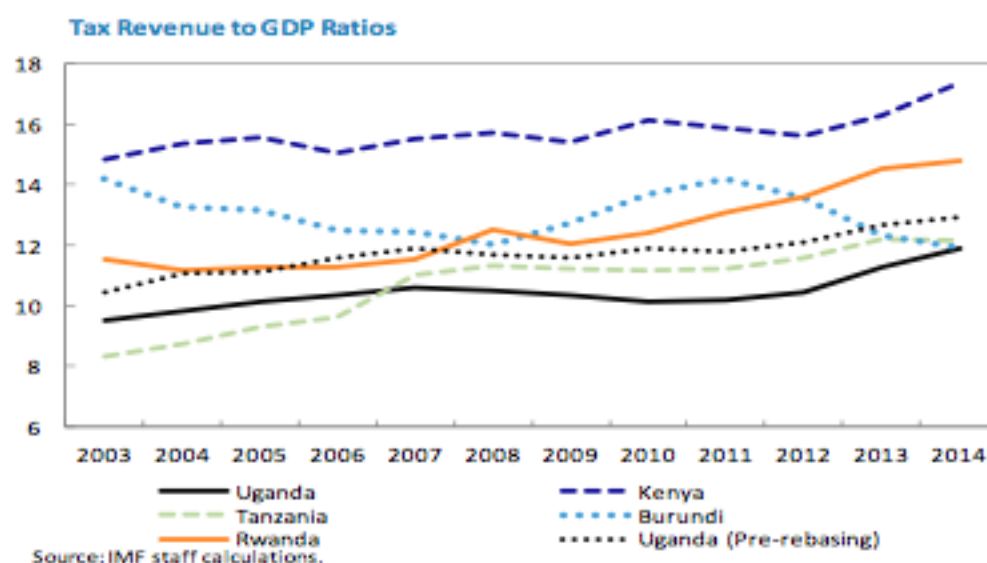
Figure 1.1 Tax-to-GDP ratios in East African countries. Source: IMF (2015) « Uganda – Staff Report for the 2015 Article IV Consultation ».

The fiscal instruments yielding the most revenue are taxes on international trade, income taxes,[10] and the VAT, in that order (Table 1.1).[11] However, the share of revenue from international taxes has decreased throughout the 2000s, from 56.84% in 2000/01 to 44.18% in 2013/14, responding to international obligations of reducing tariffs.[12] Mechanically, this was accompanied by an increase in the importance of domestic taxes, but more precisely it appears that income taxes have grown to a larger share of total revenues (from 24.13% in 2000/01 to 32.68% in 2013/14), while the weight of indirect taxes has remained

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[8] In 2014, the Ugandan Bureau of Statistics rebased the GDP series from calendar year 2002 to FY2009/10. As a result, the tax-to-GDP ratio experienced a significant decline.

[9] URA (2014) "URA Performance Brief FY 2004/05-2013/14"

[10] More precisely "Direct domestic taxes", which include the following taxes: PAYE, Corporate Tax, Other income taxes, Withholding tax, Tax on Bank interest, Casino and Lottery tax, Tax on agricultural products. The last three account for less than 2% of total revenues.

[11] The URA computes taxes on international trade inclusive of VAT on imports, the VAT revenues reported here being on domestic transactions only. The IMF usually combines domestic and import VAT, in that case total VAT revenues exceed taxes on international trade and the VAT is the second largest tax base after the income tax (IMF (2015) "Uganda – Staff Report for the 2015 Article IV Consultation").

[12] URA (2014) "URA Performance Brief FY 2004/05-2013/14"

rather stable. Income tax legislation stems from the Income Tax Act of 1997, which mainly sought to widen the tax base by scrapping some exemptions and reliefs, and to offer a clearer environment than the pre-existing complex accumulation of amendments to the 1974 Income Tax Decree. Civil servants' incomes became taxable, and the possibility for the Minister of Finance to grant exemptions was scrapped.[13] Personal income of employees is taxed through the Pay As You Earn scheme (PAYE), implemented in 1991. Three tax brackets exist for personal income – 10%, 20%, and 30%, and individuals earning less than 235,000 UGX a month[14] are exempted (this threshold was increased from the 1997 threshold of 130,000 UGX in 2012). The VAT was introduced in 1996, replacing the Commercial Transaction Levy and the Sales Tax, with a standard rate of 17% - now 18% - and with exemptions on essential goods and service (mainly unprocessed food, health and education services) and intermediate goods. Businesses with a turnover below 50 million UGX – 150 million UGX[15] since July 15th – are exempted from VAT registration. Several VAT exemptions were lifted in FY2014/2015,[16] following recommendations by the IMF to strengthen non-oil revenues as a way to better prepare the economy to the potential volatility in public finances triggered by oil exploitation. Overall, around 740,000 taxpayers are registered in Uganda[17] (i.e. have TINs), yet just under 3,000 of them account for 90% of revenue.[18] The breakdown of revenues by sector – and the comparison with each sector's importance in the economy – is revealing of some of the challenges that Uganda faces (Table 1.2). The main contributing sectors are manufacturing and wholesale/retail. Services also account for a substantial share of revenues, yet it is also in the service sector that is found the largest share of informality, and thus of revenue losses.[19] Finally, agriculture accounts for 23% of GDP, but only 0.8% of tax revenues. These structural features are an obstacle to the enlargement of the Ugandan tax base, as in other developing countries.

However, they are far from sufficient to explain the poor fiscal performance of the country: even when they are controlled for, the tax gap in Uganda remains one of the largest in Sub-Saharan Africa.[20] Inefficiencies exist for all main taxes, but are the highest for the VAT. Notably, the VAT compliance gap, i.e. the difference between potential VAT revenues under the current legislation and actual VAT revenues, amounts to 60% of potential VAT, and 6% of GDP,

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[13] IMF (2015) "Uganda – Staff Report for the 2015 Article IV Consultation".
[14] This corresponds to 78 USD a month, or 2,6 USD a day.
[15] The threshold for VAT registration matches the one for the presumptive taxation regime, which was also increased from 50 to 150 million UGX in July 2015.
[16] For a list of the goods for which exemptions and zero-rating were terminated see Ernst & Young (2014) "Uganda issues 2014-2015 budget".
[17] The Taxpayer Register Expansion Project (TREP) carried out jointly by the URA and the Kampala Capital City Authority and currently entering its third stage seeks to increase the number of registered taxpayers in Kampala. It already led to the registration of 24,000 new taxpayers since 2012.
[18] Source: http://www.theeastafrican.co.ke/business/Relief-for-small-businesses-in-proposed-Uganda-VAT-law/-/2560/2727568/-/g9cvqjz/-/index.html
[19] According to the Uganda National Bureau of Standards the informal sector is estimated at 52.4% of GDP in 2014, and employs over 70% of the labour force. Source: http://www.observer.ug/viewpoint/37810-informal-sector-is-threat-to-tax-revenue-collection
[20] IMF (2013) "Uganda- Staff Report for the 2013 Article IV Consultation".

according to a 2014 study by the IMF.[21] It has been revolving around 60% of potential VAT, but corresponds to an increasing share of GDP due to the increase of the potential VAT base. Compliance thus appears as a crucial area for the improvement of the Ugandan fiscal situation.

The national agency responsible for the enforcement of taxation laws, and the assessment, collection and accounting of revenues is the Uganda Revenue Authority. It was created in 1991, as the second Revenue Authority in Sub-Saharan Africa.[22] Before that, revenues were collected by four separate bodies within the Ministry of Finance, characterized by poor performance due to i) low staff morale and productivity; ii) corruption; iii) inefficiencies in revenue collection and revenue management; iv) lack of a tax-paying culture.[23] The rationale for the creation of the URA was thus to move revenue collection and administration away from civil service bureaucracy, by creating a more flexible and more independent body.

The URA is indeed a quasi-autonomous institution, with a Board of Directors appointed by and responsible to the Minister of Finance. The Directors are independent, although they depend on the Ministry of Finance for two key issues: the budget allocated to the URA, and the revenue targets as well as the way they should be split into the different tax bases. The URA was originally created with an explicit target of increasing revenues by one percentage point of GDP per year, and indeed results were impressive in the first years: the tax-to-GDP ratio reached around 12% in 1997, from 6.8% in 1991. Following the return of some of the previous organizational challenges, a modernization reform of the URA was implemented in 2004, including the automation of certain processes, and staff competency and integrity enhancement programs. A structural reform took place in 2012, strengthening and reorganizing the staff across divisions (around 2,400 persons work at the URA).[24] Throughout the last decade, the cost of collection – the ratio of the URA's annual budget to total collections – has decreased by almost 50% (Figure 1.2). This report seeks to take stock of ongoing research focusing on the compliance gap and more precisely on the URA's audit system.

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[21] IMF (2014) "Uganda – Revenue Administration Gap Analysis Program – The VAT Gap".
[22] Followed the Revenue Authorities of other East African countries, Kenya (1995), Tanzania (1996), Rwanda (1998), Burundi (2010).
[23] Kidd and Crandall (2006) "Revenue Authorities : Issues and Problems in Evaluating their Success", IMF Working Paper 06/240. Box n°3 "Uganda Revenue Authority".
[24] URA (2012) "The New URA Structure".

Table 1.1 Ugandan Government Revenue by Fiscal Instrument 2000-2014

Ugandan Government Revenue by Fiscal Instrument

	UGX Bn				% of total revenue				% of GDP			
	2000/01	2005/06	2010/11	2013/14	2000/01	2005/06	2010/11	2013/14	2000/01	2005/06	2010/11	2013/14
Total Revenue	1 075,16	2 231,05	5 114,30	8 031,03	100%	100%	100%	100%	10,44%	12,28%	10,86%	11,74%
Taxes on International trade (a)	611,07	1 127,84	2 534,02	3 548,00	56,84%	50,55%	49,55%	44,18%	5,94%	6,21%	5,38%	5,19%
Domestic Taxes	476,15	1116,64	2 704,93	4524,65	44,29%	50,05%	52,89%	56,34%	4,62%	6,15%	5,75%	6,62%
Direct domestic taxes (b)	200,12	604,62	1 665,12	2 624,45	18,61%	27,10%	32,56%	32,68%	1,94%	3,33%	3,54%	3,84%
Indirect domestic taxes	276,03	512,02	1 039,81	1 900,20	25,67%	22,95%	20,33%	23,66%	2,68%	2,82%	2,21%	2,78%
Value Added Tax	174,75	352,73	724,24	1 353,89	16,25%	15,81%	14,16%	16,86%	1,70%	1,94%	1,54%	1,98%
Excise duties	101,27	159,29	315,57	546,3	9,42%	7,14%	6,17%	6,80%	0,98%	0,88%	0,67%	0,80%
Fees and Licenses	22,94	75,35	111,26	146,56	2,13%	3,38%	2,18%	1,82%	0,22%	0,41%	0,24%	0,21%
Tax Refunds and payments (c)	-35,00	-88,78	-235,91	-188,18	-3,26%	-3,98%	-4,61%	-2,34%	-0,34%	-0,49%	-0,50%	-0,28%

(a) Includes VAT on Imports

(b) Includes PAYE, Corporate Tax, Other income taxes, Withholding tax, Tax on Bank interest, Casino and Lottery tax, Tax on agricultural products

(c) Tax Refunds and Government payments on behalf of private companies

Source: Authors using URA 2014 data

Table 1.2 Ugandan Government Revenue by Sector 2012-2014

Ugandan Government Revenue by Sector (percentage of total revenue)

Sector	Fiscal year	
	2012/13	2013/14
Agriculture	0,6%	0,80%
Industry	34,10%	31,40%
Manufacturing	25,20%	21,10%
Electricity, gas	3,80%	3,30%
Mining and quarrying	2,40%	3,40%
Construction	2,20%	3%
Water supply and waste management	0,50%	0,60%
Services	62,80%	65,20%
Wholesale and retail trade	26,10%	24,60%
Financial and insurance activities	9,80%	9%
Information and communication	9,70%	9%
Other service activities (a)	6,70%	8,70%
Public administration and defence	5,10%	7%
Transportation and storage	2,10%	2,50%
Human health and social work activities	1,70%	2,20%
Education	1,60%	2%
Unsectored	2,50%	2,60%
Total	100,00%	100,00%

(a) Each other service category contributing to less than 1,5% of total revenues.
Source: URA 2014

URA's cost of collection (in percent of collection)
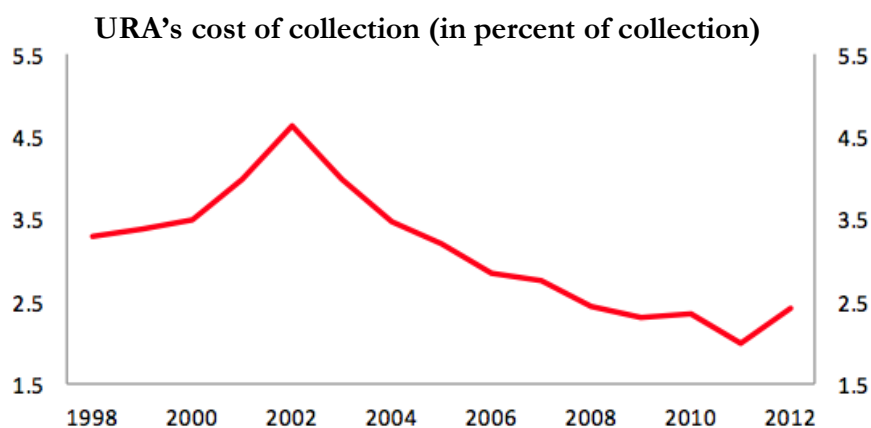
Figure 1.2 URA's cost of collection defined as the ratio of URA's annual budget to total collections. Source: IMF (2013) "Uganda - Staff Report for the 2013 Article IV Consultation"

Closing the compliance gap: main research questions

Our cooperation with the URA has enabled us to access data on tax revenues, firm-to-firm transactions and audits, and to conduct an auditors' survey. We first focus on auditors and audit cases address the following questions:

i.   Which firms should be selected for audit in order to maximize audit yield?

ii.   Which auditor characteristics seem associated with audit efficiency?

In a second stage, we use information from monthly VAT returns to address the following issues:

i.   How can firm-to-firm transaction data be used to reveal the VAT reporting gap?

ii.   How could such a methodology be used by the URA to improve compliance?

The data we received from the URA is presented in section 2. The current audit system, as we understand it, is described in section 3. Section 4 presents the descriptive results of the auditors' survey. Sections 5 and 6 show the results of the analyses so far: in Section 5 we investigate correlations between auditor/taxpayer characteristics and audit yield, and in Section 6 we show how firm-to-firm transactions data can be used to reveal the VAT reporting gap. In our conclusion we hint to future research possibilities.

2. URA data used in the report

We have received from the URA five different datasets, on Value Added Tax, income taxes, and audits. Additionally, we conducted an auditors' survey in the last quarter of 2014. The period covered by the data we received from URA is 2010-2014, though there are some gaps for some of the variables.

2.1. Value Added Tax data

VAT data comprises the information VAT-registered firms report in the "Monthly Value Added Tax Return" DT-2031 form. It is divided in two datasets, one for each part of the VAT declaration forms: first the summary monthly declarations, second all transactions (sales and purchases) carried out during the tax period. 14,061 different firms are observed in the data we received, between 2009 and 2014.

2.1.1. Monthly VAT declarations

This corresponds to sections A-H[25] of the Monthly VAT return form, indicating for each firm the total amounts of sales, purchases, and VAT due over the month. For months November 2009 – November 2013, we only have data from section H "Calculation of tax due", which is a summary of total output tax, total input tax that can be deducted, and total VAT payable. For months November 2013 – November 2014, we have data from sections A-D in addition to the summary variables of section H. Unfortunately, the inconsistencies across periods make it difficult to produce comprehensive statistical analyses, since for a given firm we can't compare the variables across all years. We are also missing some key elements for the period 2010-2013: we don't know the level of sales, only the VAT charged on sales. We also don't know the level of input costs, only the input tax credit allowed which is a complicated formula of the former. It would be crucial to receive these missing variables in order to complete our dataset and to carry out the most relevant analyses possible.

2.1.2. Firms' transaction data

This corresponds to the second half of the Monthly VAT forms (Schedules 1-4), where firms have to report all their transactions over the period concerned by the tax: sales to VAT-registered and non-registered firms, and purchases from VAT-registered firms, imports, and administrative expenses they claim credit for. We only have access to these data for a few years, which do not match the years for which we have complete data on sections A-H of the VAT returns. This is unfortunate as we are not able to compare total sales as reported in the Schedules to total sales reported in the summary section.

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[25] A "Taxpayer Information"; B "Filing Status"; C "Sales"; D "Purchases" ; E "For Investment Traders only"; F "Calculation of Input Tax allowed"; G "Details of VAT Withheld and Paid"; H "Calculation of Tax Due"

2.2. Income tax data

2.2.1. Corporate income tax

This dataset comprises information from the "Income Tax Return for a Non-Individual" DT-2002 form. We have 55,147 total observations, from 23,689 unique taxpayers between 2005 and 2014.

2.2.2. Personal Income Tax or "Pay As You Earn"

This dataset comprises information from the "PAYE Return" DT-2008 form. Our data cover the years 2009-2014, and concerns 13,783 unique taxpayers for a total of 44,375 observations.

2.3. Audit Cases

We have data on all audits that were carried out by the URA for domestic taxes between 2010 and 2014. This includes information on the audit team, on the duration of the audit process, on the amounts reassessed for each kind of tax, whether the taxpayer objected the amounts, and the amounts finally paid. Overall, we have data on 6,648 audit cases.

2.4. Auditors' survey

180 auditors were interviewed at the end of 2014. Information collected concerned experience at the URA and professional aspirations, other work experiences, educational background, household and family situation, financial situation, perception of the public service, and personality. In addition, accounting knowledge and problem-solving skills were tested through a short accounting questionnaire and the Raven's matrices tool.

3. Current audit system

In this section, we present the current URA audit system used by the Compliance division (Domestic Taxes), as we understand it. However, we remain with some uncertainties regarding specific aspects of the audit process. Any feedback or comments from URA staff helping us to improve our knowledge in this realm would be extremely valuable.

The planning stage

Each year, the National Audit Planning Team (NAPT) identifies some risky areas, based on inputs and data from different sections of the URA from the past year. These can be sectors, for example "wholesale", or more precise entries like "construction, cost of inputs". The NAPT ranks the different risks and indicates how many cases should be audited for each kind of risk. Discussions with the URA on available manpower allow some adjustments of these targets. Firms that display several of the identified risks are prioritized.

The risk score methodology

The URA compliance division builds a risk score based on the priority areas defined by the NAPT. The variables used to compute the risk score and their weights may change from year to year: there were 24 variables in 2010-2011 and 2011-2012, but only 19 were kept in fiscal years 2012-2013 to 2014-2015. For each of them, threshold values for the different levels of risk are determined, from 1 (lowest risk) to 5 (highest risk). For each variable, a taxpayer gets a 0-to-5 score (0 if it falls within none of the defined risky brackets). The values are then combined to form the final score for each taxpayer, from 0 to 100. See Appendix I for a more comprehensive presentation of the methodology.

Creation of the list of flagged taxpayers

Once the risk score criteria are set, the list of taxpayers with the highest scores is generated. Some manual adjustments to this overall audit plan may occur: if some risky areas seem to not have been fully reflected, some coefficients may be changed, and/or some taxpayers added, in an iterative process.[26] The final list indicates taxpayers flagged for audit and their associated risk score, the priority ranking (which is derived from the risk score and the number of risk score parameters taking the highest value) and the type of audit that should be carried out. Unfortunately, we have not had access to these final lists for this report. They would be very useful for the future steps of our research.

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[26] Therefore the risk score methodology is not strictly enforced.

Risk identification at station level

URA stations across the country receive the list of taxpayers they are asked to audit. Each station can add or remove some taxpayers that are considered particularly relevant in the area. There could be some differences in the criteria used by stations to select taxpayers compared to headquarters. This could be due to stations being subject to specific revenue objectives, while headquarters take a country-level strategy that puts more weight on deterrence and spillovers of all audit activities. Yet, stations may have relevant field information that the headquarters do not have, for example knowing if a taxpayer is about to leave the country, which makes it a risky taxpayer. The stations' choices must however be approved by the URA headquarters. As a result, and also because of the manual adjustments made to the overall audit plan, the final list of planned audits does not only comprise taxpayers that were identified by the risk score methodology. The URA Compliance Division is currently working on a way to make the risk score methodology more binding.

The actual audits

Stations then assign auditors to each audit case. The station head assigns auditors by teams, team leaders being chosen based on experience. At the end of each year they must report to the URA how many audits were completed and how many are ongoing.[27] The URA asks the stations to report the following information for each auditor: *Turnaround time – Total assessment – Number of completed cases over the year – Total recoveries – Amount objected to* (when taxpayers object high amounts it shows that the auditor was not able to "convince" them). However, there is no systematic computation of a success score. The URA Compliance Division is currently working on a new way to assess audit outcome, which would focus more on the behavioural impact. Therefore the aforementioned variables used to report audit success will be replaced by: *Revenue leakage blocked – Impact on current revenues – Impact on future revenues – Impact on taxpayer register* (when a taxpayer is audited, are his/her peers more likely to register for VAT?). The compliance division is working on ways to measure these. There could be scope for cooperation on these issues, if the URA compliance division thinks it could be useful (see also section 6.5).

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[27] Auditors rotate stations every 2 to 3 years, and they do not chose their station. The URA would like to have them all switch at the same time, but it is costly to organise the shifts so it actually happens by waves. There was a wave in 2014 and there might be one in 2015. Auditors are distributed according to their skills and experience, to avoid having only new auditors in one station.

4. Results from the auditors' survey

The survey that was carried out led to the collection of information on a wide range of characteristics of 180 auditors out of the 200[28] working in the Domestic Tax division of the URA in October 2014. This information can be used to determine which auditors should be assigned to which cases, in order to improve the efficiency of the audit system. The auditors that were interviewed work in 12 different audit offices across the country (Figure 4.1): 6 regional offices (Arua, Jinja, Fort Portal, Mbale, Gulu, Mbarara), 4 Kampala offices, all larger than the regional offices, and the Medium Taxpayers' Office (MTO) and Large Taxpayers' Office (LTO), located in Kampala and which deal with these categories of taxpayers.[29]

Number of Auditors Per Office
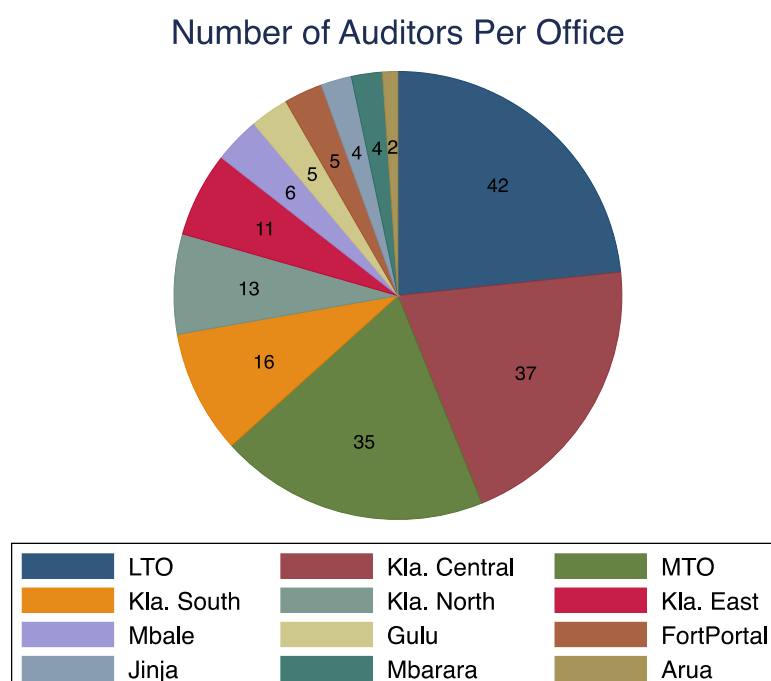
Figure 4.1 Number of Auditors per Office

4.1. Socio-economic characteristics of the auditors

4.1.1. Age, gender and family characteristics

There are more men (61.67%) than women among the auditors, and they are between 24 and 54 years old. Their mean age is 37, half of them

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[28] Approximate figure.

[29] Small Taxpayers are entities with a turnover greater than 50 million UGX (280,173 taxpayers in 2011), Medium Taxpayers are entities with a turnover above 2 bn UGX (1,709 taxpayers in 2011), and Large Taxpayers or entities with a turnover greater or equal to 15 bn UGX and/or belonging to specific sectors such as oil and mining, banking, insurance, government departments (779 taxpayers in 2011). Taxpayers that do not fall into any of these categories are considered Micro Taxpayers.
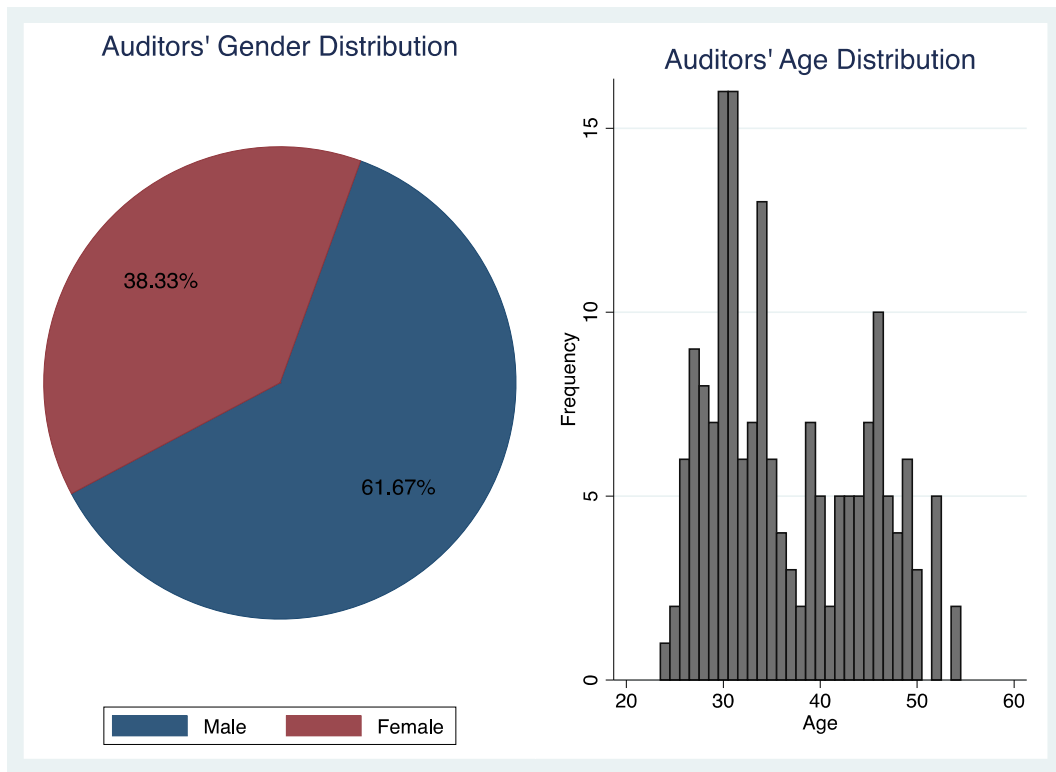
Figure 4.2 Auditors' gender (left panel) and age (right panel) distribution
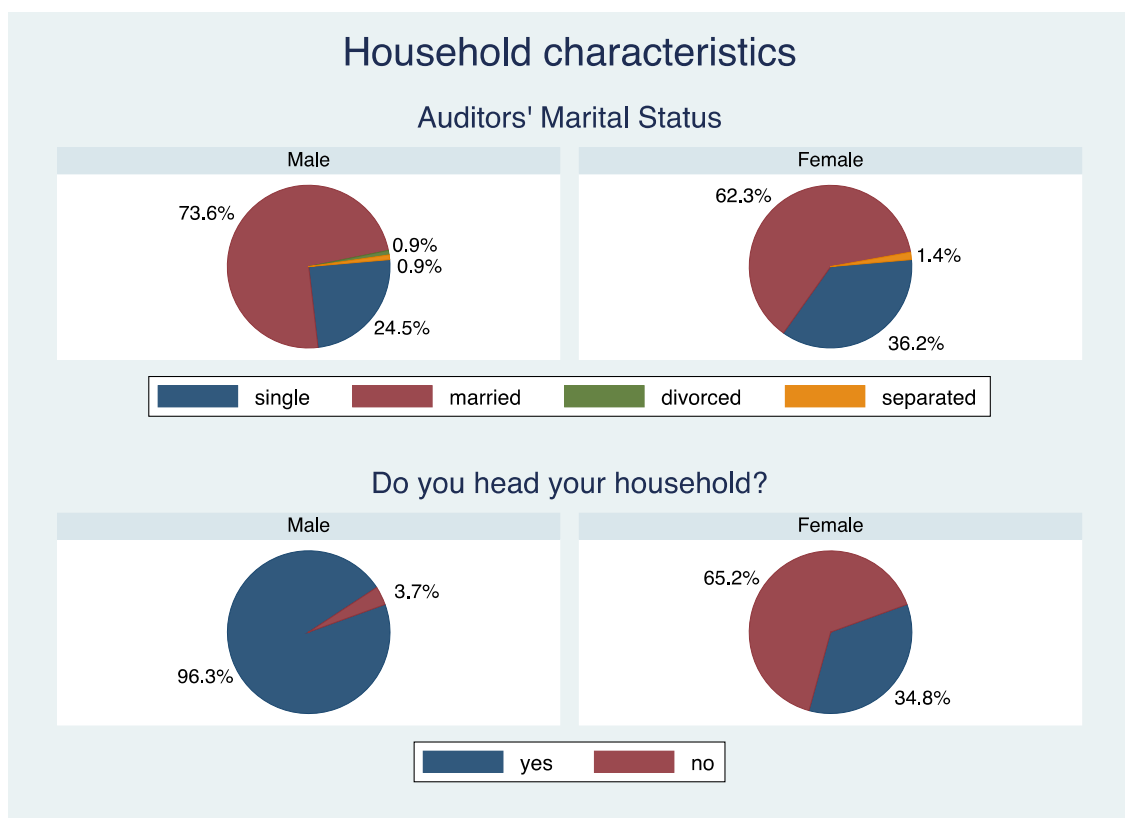
Figure 4.3 Auditors' household characteristics

being 34 or younger (Figure 4.2). Figures 4.3 and 4.4 display household composition characteristics. A large majority of the auditors are married (73.6% of men, 62.3% of women). 76% of the auditors have children, the average number of children being 2.19. This is significantly below the national fertility rate (5.97 children per woman).[30] On average, respondents live with 5.6 other persons in their household, among which 3.5 are their dependents.

One of the questions aimed at identifying the social categories by which auditors describe themselves (Figure 4.5). Class/occupation was frequently cited, more by men (47.7%), among which it was the most selected option, than by women (34.9%). Among women, the most widely cited was religion (39.4%). It was the second largest category among men. Overall, the prevalence of the class/occupation answer seems to show that auditors identify strongly with their profession or at least with the social status associated.

4.1.2. Financial situation

The questionnaire included a section on the auditors' financial situation. In addition to auditors' earnings, other household members' mean monthly income is 2.6 million UGX (with a median 1.5 million UGX). This figure is higher for women (3.3 million UGX), more frequently earning less than their partner, than for men (2.2 million UGX). Auditors' monthly expenditures amount to 1.5 million UGX (including food, transport, rent, tuition fees, entertainment, and medication, in that order of average contribution to total expenditures). They save on average 400 000 UGX each month, yet 10% of them don't save anything. 55% have a current account, 75% a savings account, and 57% shares or business investments. Figure 4.6 displays the percentage of auditors possessing different kinds of assets.

4.1.3. Personality: results from the Big Five Personality Traits test

Recent research in psychology and organizational behaviour tends to identify four domains of personal variability: personality traits, abilities, values and motives, and narratives.[31] A sub-section of the questionnaire was dedicated to each of the first three of these dimensions (see section 4.2 for abilities, and section 4.3.3 for values and motives). Regarding the assessment of personality traits, we resorted to the Big Five Inventory, a method developed and validated by psychologists in the 1990's.[32] In developed countries, these personality traits are often measured in psychometric tests conducted by human resource

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[30] CIA World Factbook 2014.
[31] Roberts (2006) *Research in Organizational Behavior*, Volume 24, Chapter 1, pp. 1–41. Elsevier. Cited in Dal Bò et al (2013) "Strengthening State Capabilities: The Role of Financial Incentives in the Call to Public Service" *Quarterly Journal of Economics* 128 (3): 1169-1218.
[32] John (1990) "The "Big Five" factor taxonomy: Dimensions of personality in the natural language and in questionnaires." In L. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 66-100). New York: Guilford Press. For validation of the BFI see for example John et al. (2008) *Paradigm Shift to the Integrative Big-Five Trait Taxonomy: History, Measurement, and Conceptual Issues.* New York, NY: Guilford Press.

Figure 4.4 Auditors' household characteristics (cont'd)
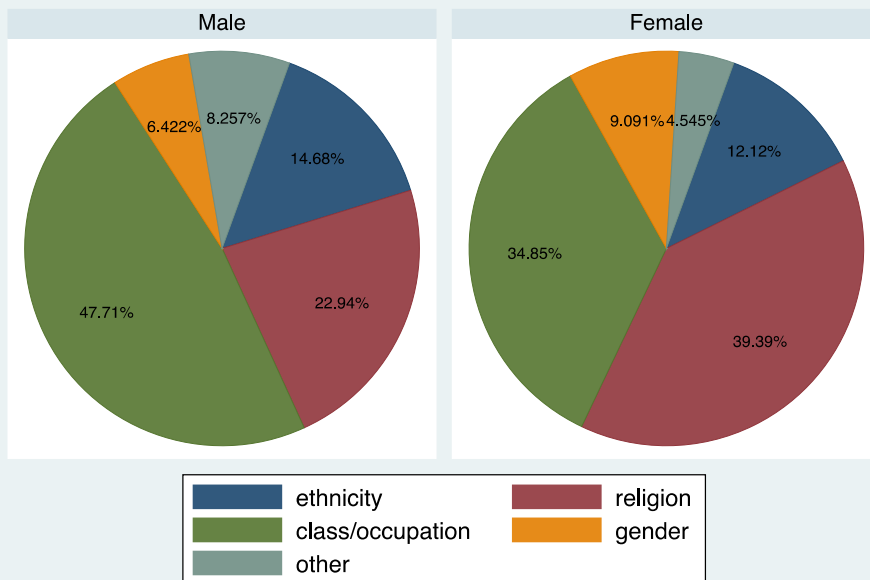
Figure 4.5 Auditors' self-declared social identity
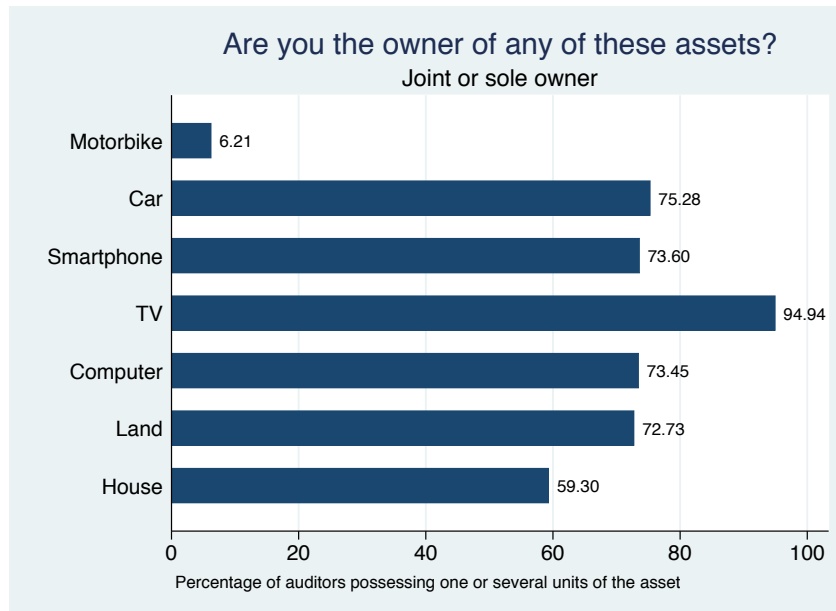
Figure 4.6 Assets owned by the auditors

Table 4.1 Big Five Personality traits benchmarks

Big Five Personality Traits: benchmarks

	URA Auditors	Mexican public service candidates(a)	USA internet users(b)
	Mean scores (standard deviation)		
Extraversion	-0,11 (0,27)	0,67 (0,55)	0,18 (0,9)
Agreeableness	0,22 (0,27)	1,11 (0,43)	0,66 (0,70)
Conscientiousness	0,05 (0,30)	1,28 (0,47)	0,55 (0,70)
Neuroticism	-0,14 (0,26)	-1,19 (0,53)	0,04 (0,8)
Openness	-0,06 (0,29)	0,93 (0,49)	0,98 (0,66)
Observations	N=178	N=2,254	N=132,515

(a) From Dal Bo et al (2013) "Strengthening State Capabilities: The Role of Financial Incentives in the Call to Public Service", *Quaterly Journal of Economics,* forthcoming. Candidates to Community Development Agent positions in Mexico took recruitment exams designed to measure their abilities, including a Big Five Inventory.

(b) From Gosling et al (2003) "Development of Personality in Early and Middle Adulthood: Set Like Plaster of Persistent Change?", *Journal of Personality and Social Psychology* Vol. 84, No. 5, 1041-1053. BFI tests were made publicly available on the internet. The results displayed are for US (90,8% of the sample) and Canada residents aged 21-60.

departments, both in the public and the private sector. The results are then used among other selection tools in the hiring process, as well as for the assignment of employees to different tasks. The Big Five Inventory is a taxonomy of personality characteristics, derived from a series of empirical studies that achieved to classify elements people used to describe themselves and others into five main personality traits: extraversion, agreeableness, conscientiousness, emotional stability and openness. Since the 1990's, numerous studies have shown that these personality traits were correlated with job performance - see Barrick and Mount (1991) and Hurtz and Donvan (2000) for meta-analyses covering different occupational groups.[33] The importance of the different dimensions may vary across occupations, for instance, while conscientiousness comes out as a positive characteristic in all types of jobs across the different studies, extraversion has been shown to be specifically important for professions involving social interactions.[34] *Extraversion* corresponds to "the orientation of one's interests and energies toward the outer world of people and things rather than the inner world of subjective experience and is characterized by positive affect and sociability". *Agreeableness* is the "tendency to act in a cooperative, unselfish manner". Someone who is *conscientious* is "organized, responsible, and hardworking". *Emotional stability* is the opposite of *neuroticism*, the latter characterizing people who are prone to psychological distress and rapid mood change. Neuroticism has been shown detrimental to job performance. Finally, *openness* refers to a person's openness to new experiences, new cultures, and new encounters.

Respondents had to answer a series of 44 questions on how they perceived themselves,[35] each question contributing to one of the five traits. By averaging scores for questions linked to the same personality trait, we obtain a score on a [-1.5/1.5] scale for each of the five dimensions. However, these scores are not very meaningful in absolute terms, rather, they are designed to allow comparisons across different groups.[36] Furthermore, what constitutes a valuable personality trait strongly depends on the kind of job we are considering. Therefore, we display in Table 4.1 results from the Big Five Inventory in two other studies: the first one was carried out in Mexico, applicants to Community Development Agent positions had to take the test as a part of the recruitment process (Dal Bò et al 2013). It is interesting to compare their results with the ones from the auditors' survey, since in both cases respondents are public service agents. We can thus imagine that there are similarities in the personality traits required to perform the job successfully.[37] The second study uses data

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[33] Barrick and Mount (1991) "The Big Five Personality Dimensions and Job Performance: A Meta-Analysis" *Personnel Psychology*; Spring 1991; 44, 1.
Hurtz and Donovan (2000) "Personality and Job Performance: The Big Five Revisited" *Journal of Applied Psychology* Vol. 85 No. 6, 869-879
[34] Barrick and Mount (1991)
[35] For example: "I see myself as someone who is talkative", to which the respondent can answer "I strongly agree", "I agree", "I neither agree nor disagree", "I disagree" or "I strongly disagree".
[36] Srivastava (2012) "Norms for the Big Five Inventory and other Personality Measures" Blog Post.
[37] One major difference however is that in the Mexican case respondents are completing the BFI in the context of a recruitment process, where they could have incentives to be dishonest to maximize their chances of being hired. However, according to the authors of the study, such behaviours are limited because i) respondents sign an honour code; ii) they must give the contact

from BFI that American and Canadian Internet users took voluntarily, for personal motives. How do the auditors compare to individuals in these two samples? Their scores appear lower than in the other two samples in four dimensions out of five (extraversion, agreeableness, conscientiousness, openness), which are usually considered as positively associated with job performance especially in the public sector positions involving social interaction. The only dimension in which they have a better score than respondents from the Mexican sample is neuroticism: they appear less prone to emotional instability than the candidates to Mexican public service positions.

4.1.4. Education

Nearly half of the respondents have completed postgraduate education, and this proportion is slightly higher for women (50.75% against 44.04% for men). Less than 2% did not complete undergraduate education (Figure 4.7). Figure 4.8 displays the subjects studied in undergraduate education (out of these 175 respondents, 94 pursued their education to postgraduate level). Overall, 139 have a Bachelor of Arts, 32 a Bachelor of Science, and 4 a Diploma. A large majority of respondents have a Bachelor of Arts in Accounting, Commerce, Financing or Business Administration. Across types of undergraduate programs, subjects studied are very much concentrated in the fields of Accounting, Business, Economics, and Finance.
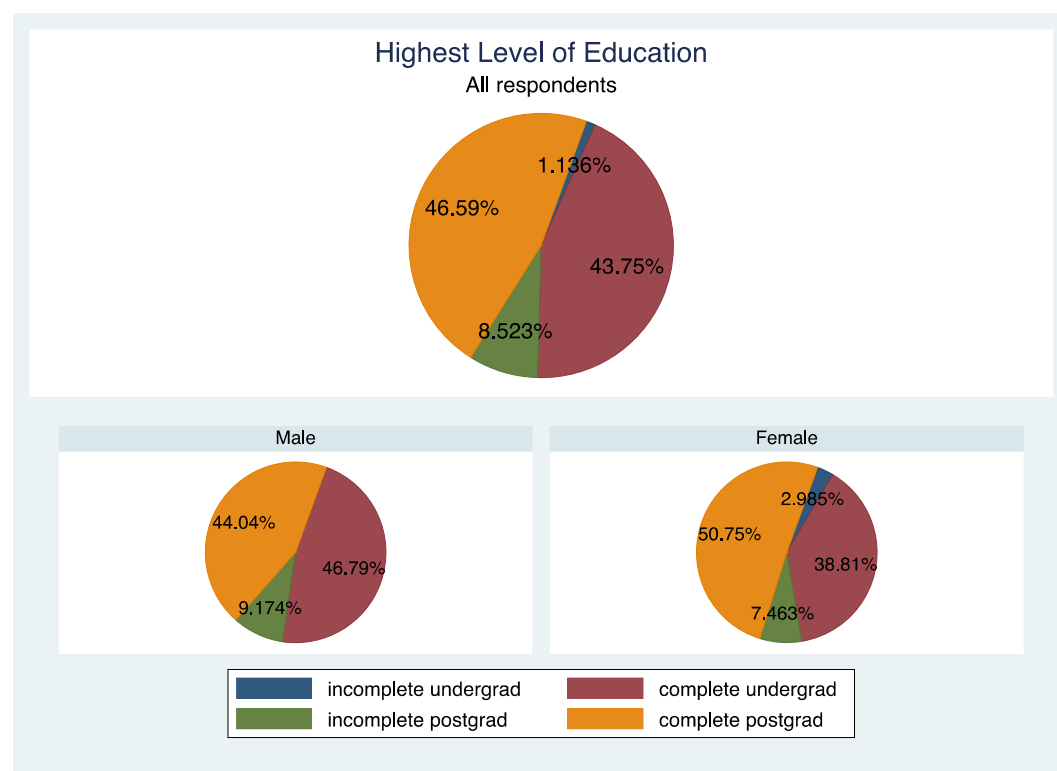
Figure 4.7 Highest level of education, all auditors (top panel) and by gender (bottom panel)

information of their past employers, which provides a threat of verification; iii) correlations with observed variables for the dimensions for which it was possible don't seem to suggest misreporting.

Undergraduate Education
Subjects studied

Subject	Frequency
BA. Accounting/Commerce/Finance	62
BA. Business Administration	47
BSC. Accounting, Finance	18
BA. Economics, Statistics	16
BA. Social Sciences	13
BSC. Economics, Statistics	10
Other BSC.	4
Diploma	4
Other BA.	1

frequency

N=175
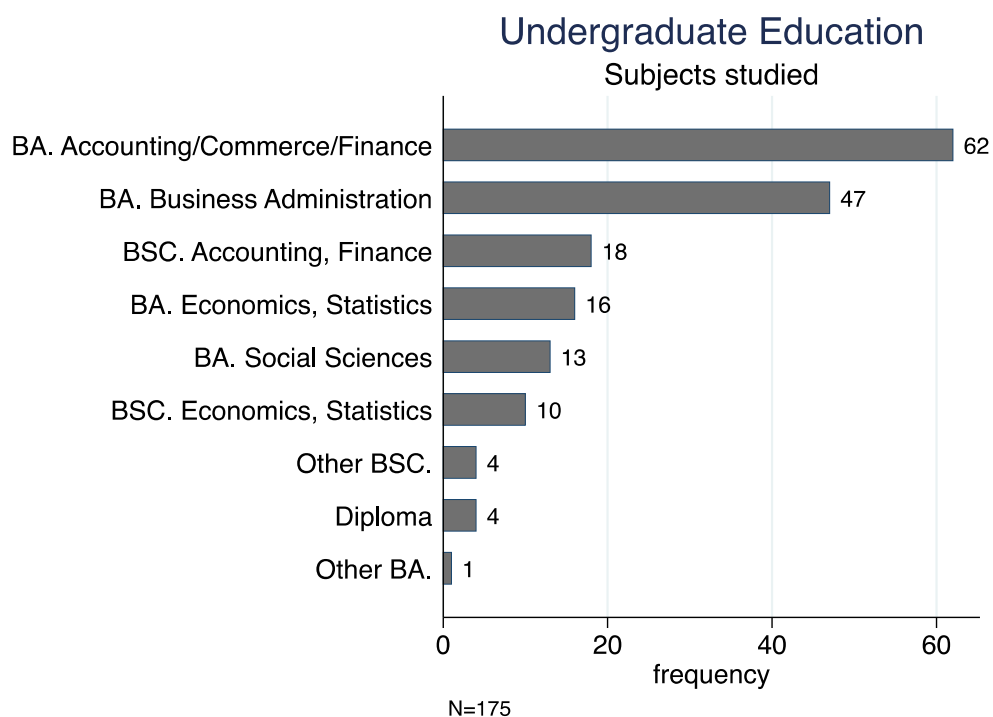
Figure 4.8 Subjects studied in undergraduate education

Postgraduate Education
Subjects studied

Subject	Frequency
Business Administration/Management	21
Taxation	20
Accounting	20
Finance/Financial Management	16
Economics	9
Other	8

frequency

N=94
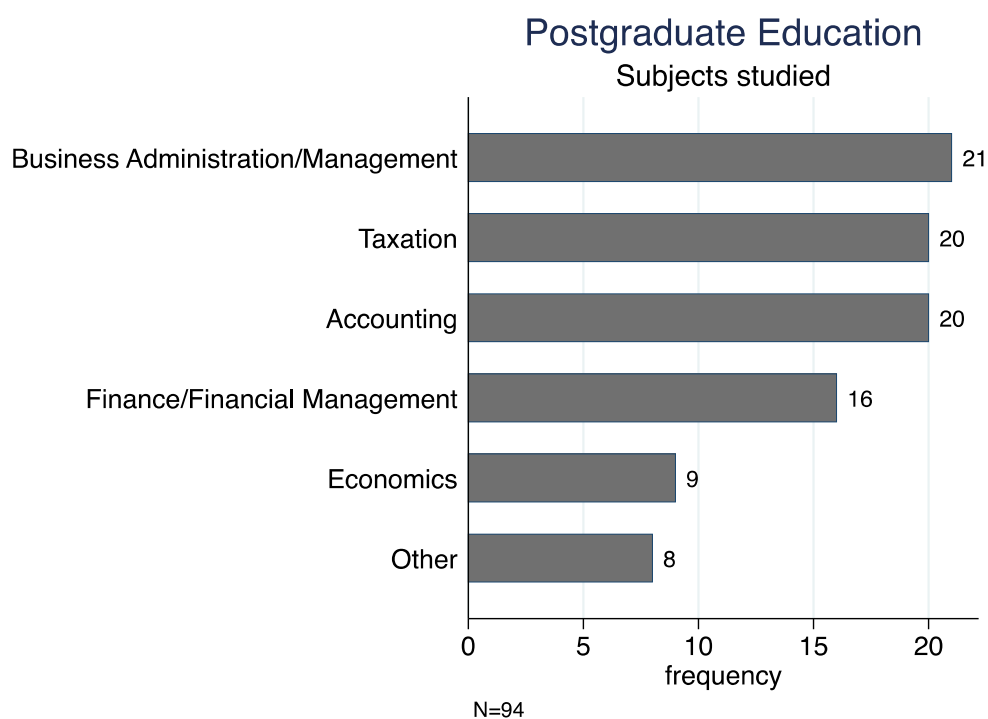
Figure 4.9 Subjects studied in postgraduate education

Figure 4.9 displays the subjects studied in postgraduate education for the 94 concerned auditors. Business administration (21), taxation (20) and accounting (20) appear as the major fields of studies. Finally, 44% of the auditors did a professional course, most of them in addition to postgraduate education (only 3 of the 76 with an additional course did not complete postgraduate education). Figure 4.10 shows how many auditors took an ACCA (Association of Chartered Certified Accountants) or CPA (Certified Public Accountants) course, the two most directly related to URA audit activities. 43 out of 180 auditors got either one of these two certificates. Furthermore, in theory, all auditors should benefit from a two-year Postgraduate Diploma in Taxation and Revenue Administration (PODITRA) training when joining the URA, whether or not they completed an ACCA or CPA training. The URA introduced this training in 1998. However, because of resource constraints – the cost of the training incurred by the URA being 10 million UGX per year and per person - the training had been suspended in 2006/07 until recently. As a result, only 37 auditors out of 180 mention PODITRA either as their postgraduate degree or as their additional training (Figure 4.11).[38]
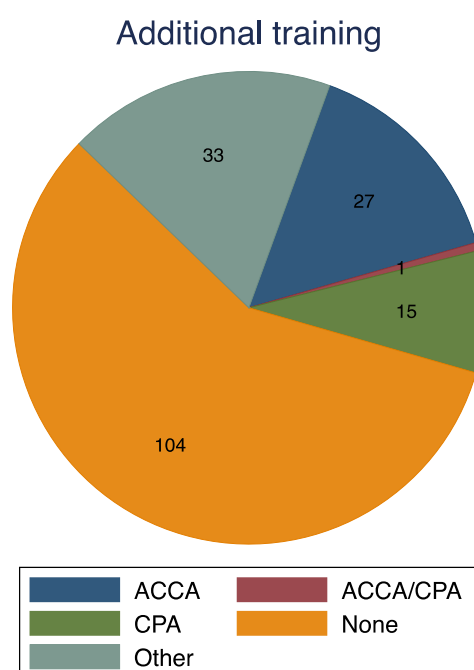
Figure 4.10 Number of auditors having completed a professional course

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[38] Among those who received the PODITRA training, 15 completed undergraduate education only before joining it, while 9 also report another type postgraduate education. Those with PODITRA training are on average older (42.9 against 35.1 years old) and at the URA since longer (tenure of 13.9 years against 7.8 years, same position since 6.7 years on average against 4.7 years).
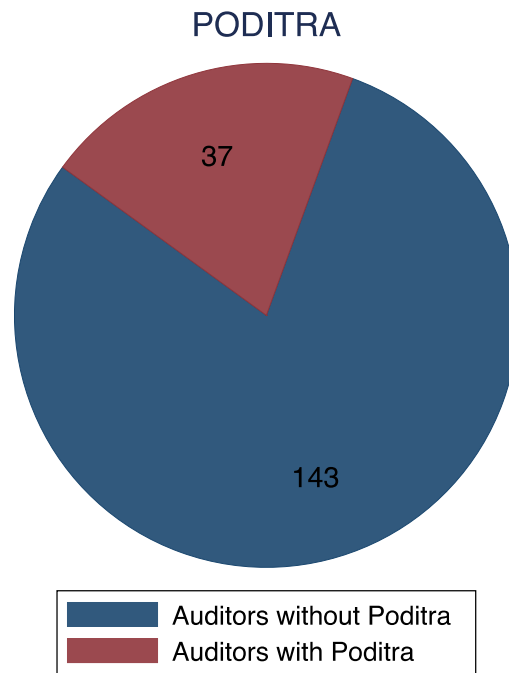
Figure 4.11 Number of Auditors having done the Post Graduate Diploma in Taxation and Revenue Authority delivered by the URA

4.2. Knowledge and ability tests

Knowledge and abilities of the auditors were assessed by two different methods. Respondents first had to answer a short questionnaire measuring their accounting skills and knowledge of tax legislation. Furthermore, the Raven's Progressive Matrices test was used to measure general intelligence and problem-solving ability independent of acquired knowledge.

4.2.1. Questionnaire on accounting skills

The questionnaire comprised eight questions on general accounting definitions and methods, algebra and tax legislation (see Table 4.2). Respondents had 30 minutes to answer. Respondents could score between 0 and 10. The distribution of scores is displayed in the top panel of Figure 4.12. The mean score is 5.5, and the median 5.8. It is interesting to look at the results by question (bottom panel of Figure 4.12). Questions that appeared as the biggest challenges were the computation of the depreciated value of an asset (Question 3), an accounting definition (Question 5) and a tax legislation question (Question 7). Questions that were rather well answered were all accounting definition questions (Questions 2, 6, 8). Less than half of respondents gave a correct answer to Question 1, which consisted in an algebra calculation.

Table 4.2 Questionnaire on accounting skills and knowledge of tax law

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Questionnaire

Accounting Skills

1) Briar Co. signed a government construction contract providing for a formula price of actual cost plus 10 percent. In addition, Briar was to receive one-half of any savings resulting from the formula price being less than the target price of $2,200,000. Briar's actual costs incurred were $1,920,000. How much should Briar receive from the contract?
   a) $2,060,000
   b) $2,112,000
   c) $2,156,000
   d) $2,200,000

2) Explain the difference between cash based and accrual based accounting

3) If an asset is valued at 1,000,000 UGX at year one and will be fully depreciated to its salvage value of 100,000 UGX in 10 years, calculate its depreciated value in year five using each straight-line depreciation, and 20% per year accelerated depreciation

4) Name five "red-flags" you would look for when auditing or trying to decide whether to audit a company.

Knowledge of Tax Law and practice

5) Please answer the following questions about income splitting: what is it, how is it determined, and what is the Law's position on it?
   a) What is income splitting?
   b) How is income splitting determined?
   c) What is the legal position on income splitting?

6) Of the following, which is not a valid income deduction
   a) The cost of repairs to a building used in the production of income
   b) All income donated to charity
   c) All expenses related to starting up a business
   d) For a farmer, all expenses involved in building a green house

7) Christopher is a Namibian citizen who has been living in Kampala for three years. His Ugandan employer is sending him to a two week training program In Kampala. Tuition for this program is 300,000 UGX. How much of this expense can the employer deduct on the employer's taxes?

8) For the purpose of assessing VAT, what is the point of supply (i.e. where does supply actually take place) for the following products?
   a) Physical Goods
   b) Water, electricity, or other energy
   c) Services?

Table 4.3 displays the questionnaire scores by education level, by experience at the URA and by age. The overall score is slightly correlated with education level, the average score being 5.52 (median 5.57) among respondents who studied up to the undergraduate level, and 5.7 (median 6) among those who completed postgraduate studies.[39] Results are slightly negatively correlated with tenure and number of years at the same position. This could be either purely driven by age, affecting cognitive abilities, memory etc. Indeed we see a slight negative correlation with age. It could also be because with years, auditors get used to the procedures they must carry out and the knowledge acquired during training is not maintained nor reactivated. Finally, it could be that curriculums improved over the recent years and that auditors who arrived more recently at the URA benefited from a better education and/or training than those working at the URA since a long time. Even if these correlations are weak, they could hint to the relevance of offering trainings and skill-enhancement activities to the auditors all along their career.

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[39] Spearman's rho is equal to 0.11, but not significant at the 5% level
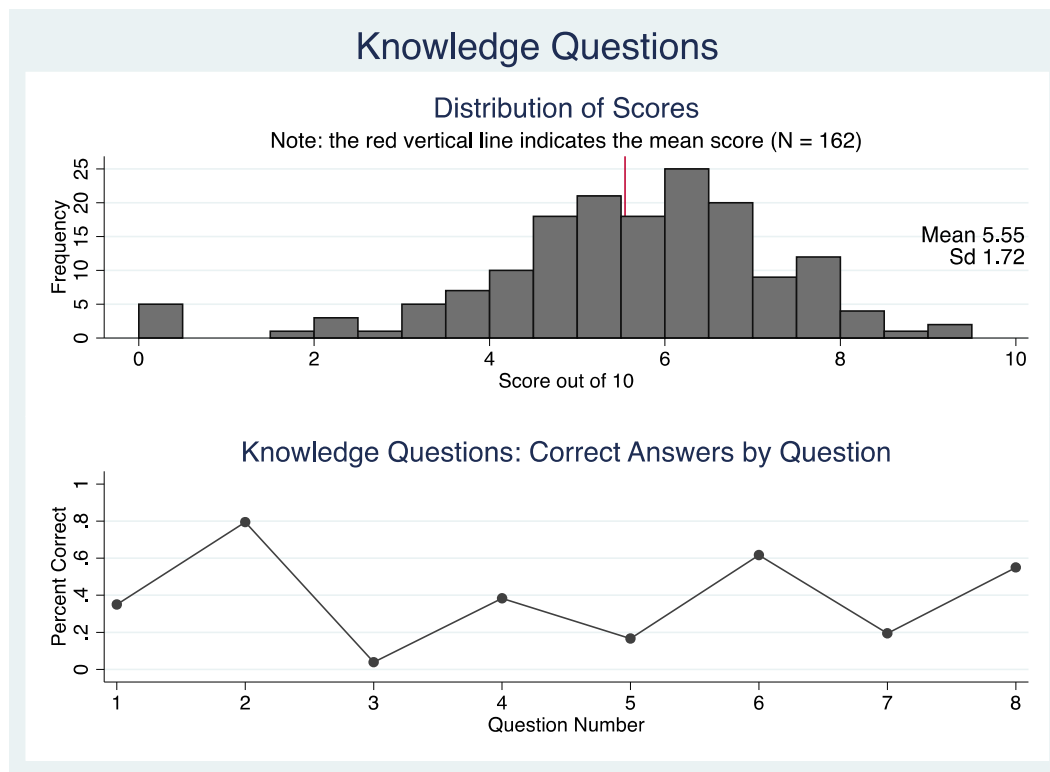
Figure 4.12 Knowledge questionnaire: distribution of scores (top) and percentage of correct answers for each question (bottom)

4.2.2. Raven's matrices test

Raven's Progressive Matrices Set is a general intelligence test, developed by psychologist John Raven in the 1930's. It is nowadays widely used to measure problem-solving ability and capacity of thinking logically, irrespective of context or acquired knowledge. Respondents are shown a series of figures, and have to select the design that could fit in to complete the pattern. The original test comprises 60 figures, however in order for the survey to remain of reasonable duration, we had to restrict the test to the first set of 12 matrices. Respondents had 15 minutes to complete it, and the distribution of scores (out of 12) is displayed in Figure 4.13 (the average score is 4.97/12).

Table 4.3 displays the results by education level, by years spent at the URA and by age. There does not seem to be a correlation between the Raven's Matrices score and education level. This is coherent with the idea that the test measures cognitive abilities *independently of acquired knowledge.* However, we see a strong negative correlation with the number of years spent at the URA and number of years spent in the same position, probably driven by the negative correlation with age.[40] The average score is 5.68 among the 24-31 years old, against 4.20 among the 41-54 years old. This is consistent with previous studies showing a decline with age in the Raven's Matrices score.[41]

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[40] Spearman's rho = -0.19, -0.20 and -0.19 respectively, all significant at the 5% level.
[41] See for example Persaud (1987) "Sex and age differences on the Raven's matrices" *Perceptual and motor skills* 65(1) :45-6.
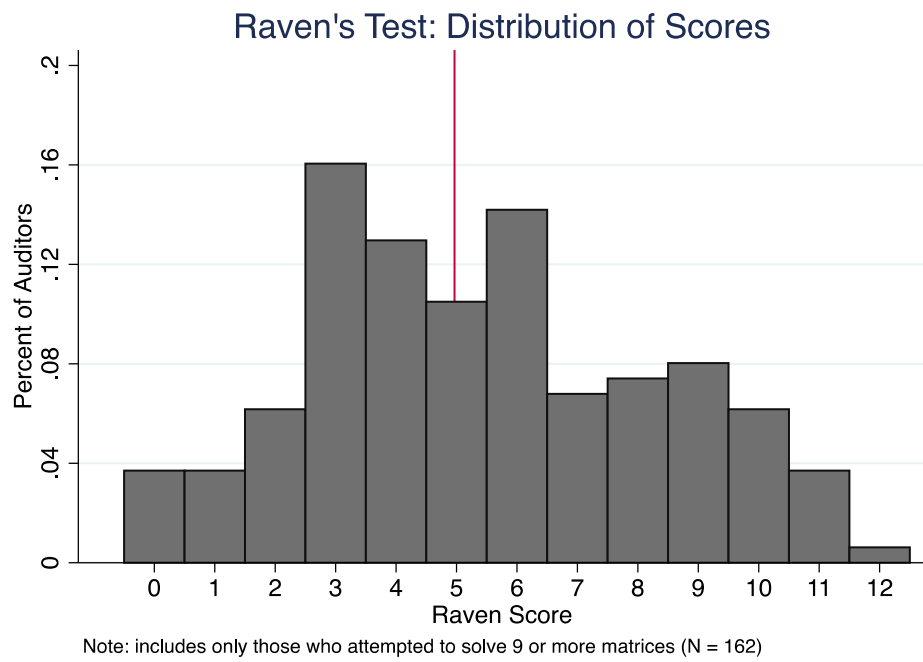
Figure 4.13 Results from the Raven's matrices test

Results from the knowledge questionnaire and the Raven's matrices test by education level, experience and age

	Knowledge Questionnaire score out of 10	Raven's Matrices score out of 12
	Mean (standard deviation)	
All	5.55 (1,72)	4.97 (3,10)
By education level	rho = 0,11 (a)	rho = -0,08
Incomplete undergraduate (b)	4.6 (0,04)	7 (0)
Undergraduate	5.52 (1,75)	5.01 (3,05)
Incomplete Postgraduate	5.1 (1,50)	6.73 (2,46)
Postgraduate	5.7 (1,78)	4.57 (3,24)
By years of URA experience (c)	rho = -0,02	rho = -0,19***
< 5 years	5.57 (1,52)	5.82 (2,88)
5-12 years	5.82 (1,75)	4.84 (3,15)
> 12 years	5.26 (1,89)	4,26 (3,13)
By years at the same position (c)	rho = -0,06	rho = -0,20***
< 3 years	5.52 (1,64)	5,74 (2,94)
3-6 years	5.72 (1,59)	4,55 (3,07)
> 6 years	5.45 (1,92)	4,35 (3,15)
By age (c)	rho = -0,05	rho = -0,19***
24-31	5,57 (1,63)	5,68 (2,94)
32-40	5,79 (1,89)	4,87 (3,31)
41-54	5,4 (1,54)	4,20 (2,83)
By questionnaire score (d)		rho = 0,25***
Low score	-	4,52 (2,97)
Lower middle score	-	4,77 (2,84)
Upper middle score	-	4,96 (3,16)
High score	-	6,18 (3,09)
By Raven's Matrices score (e)	rho = 0,25***	
Low score	4,99 (1,82)	-
Lower middle score	5,25 (1,52)	-
Upper middle score	5,89 (1,73)	-
High score	6,32 (1,43)	-

(a) Spearman's rank correlation coefficients. *** Indicates that the correlation is significant at the 5% level.

(b) Caution this category concerns only 1,14% of the sample.

(c) The thresholds are the tertiles of the distribution.

(d) Observations divided in four groups, using quartiles of the distribution as thresholds. Low is below 4,73. Lower middle is between 4,73 and 5,80. Upper middle is between 5,80 and 6,66. High is above 6,66.

(e) Observations divided in four groups, using quartiles of the distribution as thresholds. Low is 3 or below. Lower middle is 4-5. Upper middle is 6-7. High is above 7.

4.3. Auditors' experience with the URA

4.3.1. Time spent at the URA and motivation for joining

Auditors experience at the URA as well as their relation to their institution and their mission could have some substantial effects on their everyday work. Figure 4.14 shows how long auditors have been working at the URA and at their current position. It appears that many have less than 5 years of experience at their current position (50% of the respondents had 5 years or less), only 5% have 10 years of experience or more. Half of the auditors joined the institution 6 years ago or less. 10% have been at the URA since 20 years or more. Respondents were also asked their motivation for joining the URA (see Figure 4.15). This can be an indicator of how they perceive or value their job. Most cited reasons are the salary offered, the fact that working at the URA is a good opportunity, and job benefits. Many also mention the prestige associated with working at the URA. Very few answer that they joined the URA because they had no other option. Therefore overall it seems that auditors have a positive opinion of their professional status and associated benefits.
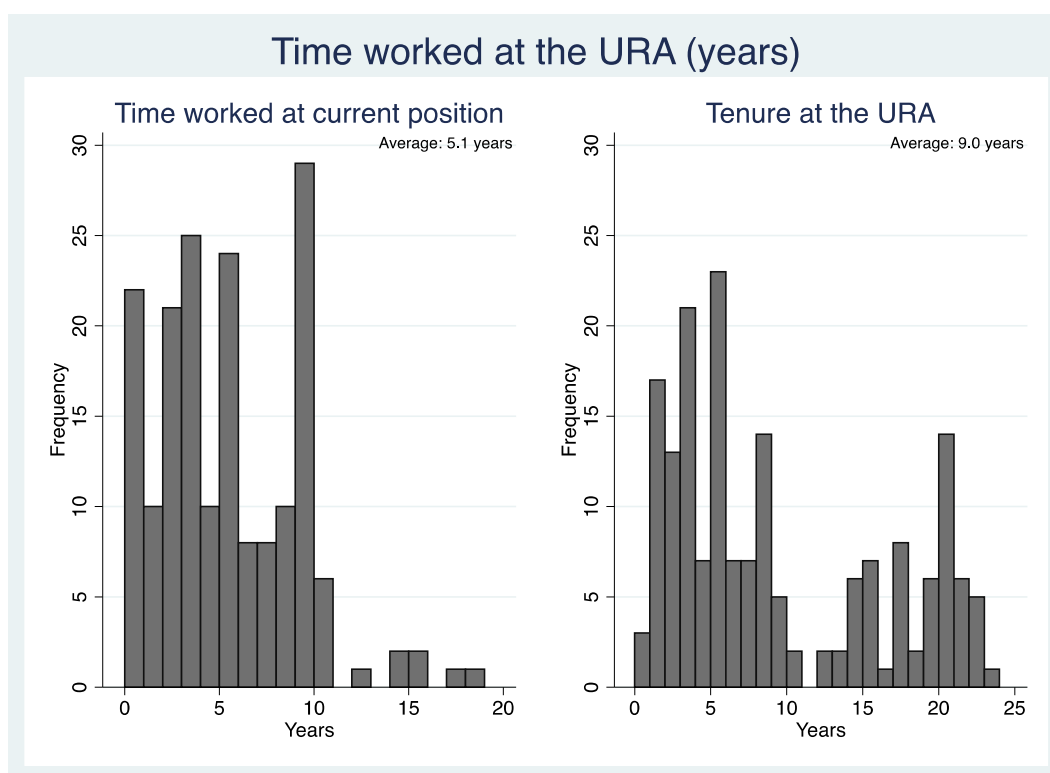
Figure 4.14 Auditors' experience at their current position (left), at the URA (right)

I chose to work at the URA because...

of job benefits
1	2.8
2	14.7
3	5.6
4	58.2
5	18.6

of the salary
1	2.3
2	22.0
3	12.4
4	57.1
5	6.2

of the prestige associated
1	3.4
2	28.1
3	10.1
4	39.9
5	18.5

of quality of peers
1	5.7
2	36.2
3	26.4
4	27.6
5	4.0

it's a good opportunity
1	3.4
2	6.2
3	7.3
4	41.6
5	41.6

opportunity after graduating
1	12.9
2	39.3
3	9.0
4	23.6
5	15.2

no other option
1	23.0
2	53.9
3	9.6
4	9.6
5	3.9

Legend
1 - Strongly Disagree
2 - Disagree
3 - Neither agree nor disagree
4 - Agree
5 - Strongly Agree
Percentage of respondents reported in red.
Respondents could give multiple answers.

Figure 4.15 Auditors' motivation for joining the URA

4.3.2. Auditors' perception of public service

Figure 4.15 gives an idea of the wide array of reasons a job seeker could have for wanting a specific job. Studies have shown that public sector employees usually have different professional motivations than private sector ones, with a stronger motivation to serve the public interest. Similarly, they have values that lead them to be more likely to volunteer and to display "pro-social" behaviour in general.[42] Furthermore, it has been shown that these public service motivations and values have a positive impact on job performance in the public sector.[43] For these reasons, the survey included a section aiming to assess the auditors' motivation to serve the public interest, as it could be a determinant of their dedication and efficiency at their workplace.

We resorted to a public service motivation evaluation method developed by Public Affairs Professor James Perry in 1996. There are 40 questions, each being a statement (for instance "I consider public service as my civic duty") to which respondents answer "I strongly agree", "I agree", I neither agree nor disagree", "I disagree" or "I strongly disagree", coded from 5 to 1. Figure 4.16 displays the full list of statements with the average score and the standard deviation for each question. Perry's Public Service Motivation scale was also used in the paper by Dal Bó et al. (2013) on public service agents in Mexico, which offers an interesting comparison with the auditors' results.

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[42] Rotolo and Wilson (2006) "Employment sector and volunteering: The contribution of non-profit and public sector workers to the volunteer labor force" *Sociological Quarterly* 47(1), 21–40.

[43] Perry and Wise (1990) "The Motivational bases of Public Service" *Public Administration Review* 50(3) 367-373. Petrovsky (2009) "Does public service motivation predict higher public service performance? A research synthesis." *Unpublished.*

The questions are grouped into six modules. The first five questions relate to the respondent's *attraction to policy making*. The auditors' average score is 3.26 out of 5, the lowest of all modules, but higher than the one observed in the Mexican data (2.86). Questions 6. to 12. are meant to measure *commitment to the public interest*. Here again, the average score is higher than what is observed for the Mexican candidates (3.67 against 3.35). The five following questions (13. to 17.) capture the respondent's consideration for *social justice*. The auditors' answers yield an average score of 3.72, similar to the one in the Mexican study. Questions 18. to 24. measure the sense of *civic duty*. It is the only module where the auditors' score is lower than the score in Dal Bó et al. (2013) (3.68 against 3.94). The following questions relate to *compassion* (questions 25. to 32.), for which auditors score 3.39 against 3.05 in the Mexican study. The last eight questions measure the respondents' inclination for *self-sacrifice*. The auditors' score is the same as the one of the Mexican public agent candidates (3.72).

Overall, the auditors seem characterised by a strong public service motivation. Notably, inclination for self-sacrifice and consideration for social justice come out as dominant values. Conversely, the auditors show a relatively lower attraction for policy making, and a weaker tendency for compassion. Their overall public service motivation score is higher than the one observed among the Mexican candidates to public agent positions (3.57 against 3.44).[44]

4.3.3. Auditors' view on how to make the URA a better workplace

Respondents were also asked how they thought the working environment at the URA could be improved. The four propositions – improving job benefits, increasing salaries, adopting more rigorous selection procedures, improving work experience and training - were selected in equal proportions (Figure 4.17). Other suggestions included (number of occurrences in brackets): improving the IT system and automated services (8), promoting equal opportunities and employee welfare (17), increase transparency (4), tax sensitizing (2).

4.3.4. Auditors' view on the URA's strategy

Finally, auditors were asked about their vision of the priority areas that should be in the URA's auditing strategy. When asked which sectors audits should focus on, wholesale and retail (37%) and the informal business sector (23%) were the most widely cited, then came agriculture and fishing (9.5%) and manufacturing (8.43%). When asked about the firm size the URA should target the most, 45% of respondents thought the URA should focus on catching small firms (Figure 4.18).

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[44] Computed as a non-weighted average of the module averages.

Perception of Public Service
1. Politics is a dirty business*
2. I respect government officials who can turn a good idea into a law
3. Ethical behavior of government officials is as important as their abilities
4. The "give-and-take" role of public policy does not appeal to me*
5. I do not care much about politicians*
6. People can talk about the public interest but are truly concerned about their own interest*
7. It is difficult for me to take interest in what is happening in my community*
8. I contribute selflessly to my community
9. A meaningful public service is important to me
10. I want the government to do what is best for the whole community, even if it hurts my interests
11. Civil servants' duties come before loyalty to superiors
12. I consider public service as my civic duty
13. I believe that there are many public causes worth defending
14. I don't think that the government can do much to make society fairer*
15. If one group does not share the wealth of the society, all lose out
16. I am willing to use every ounce of my energy to make the world a fairer place
17. I am not afraid to fight for the rights of others, even if ridiculed
18. Government officials who are sworn in office when action is needed undertake responsibilities that would not be expected from other citizens
19. I am ready to go very far to fulfill my obligations towards my country
20. Public service is one of the highest forms of citizenship
21. I believe that we all have a moral obligation towards civic affairs, however busy we may be
22. It is my duty to take care for the less privileged
23. The sentence "duty, honor and country" stirs up deep emotions in me
24. It is my responsibility to help solve issues arising from interdependence between people
25. I am rarely affected by the distress of the less privileged*
26. The majority of social programs are too crucial to be interrupted
27. It is hard for me to contain my emotions when I see people in distress
28. To me, patriotism includes caring for the well-being of others
29. I hardly ever think about the well-being of people that I do not know personally*
30. I am frequently reminded how dependent we are upon each other
31. I have little compassion for people in need not willing to help themselves*
32. There are few public programs that I wholeheartedly support*
33. Making a difference in society means more to me than individual accomplishments
34. I believe in putting duty before oneself
35. Being well-off is way more important for me than doing good deeds*
36. A lot of what I do contributes to something larger than myself
37. Serving the citizens makes me feel good, even if no one pays me for it
38. People should give back to society more than what society gives them
39. I am one of those rare people who would risk incurring personal losses in order to help someone else
40. I am ready to make huge sacrifices for the benefit of society

Note: Respondents could answer "I strongly agree", "I agree", "I neither agree nor disagree", "I disagree" or "I strongly disagree" to each of the questions, scored in that order from 5 to 1. Scores for questions marked by * are reversed when calculating the module means. N=180 .
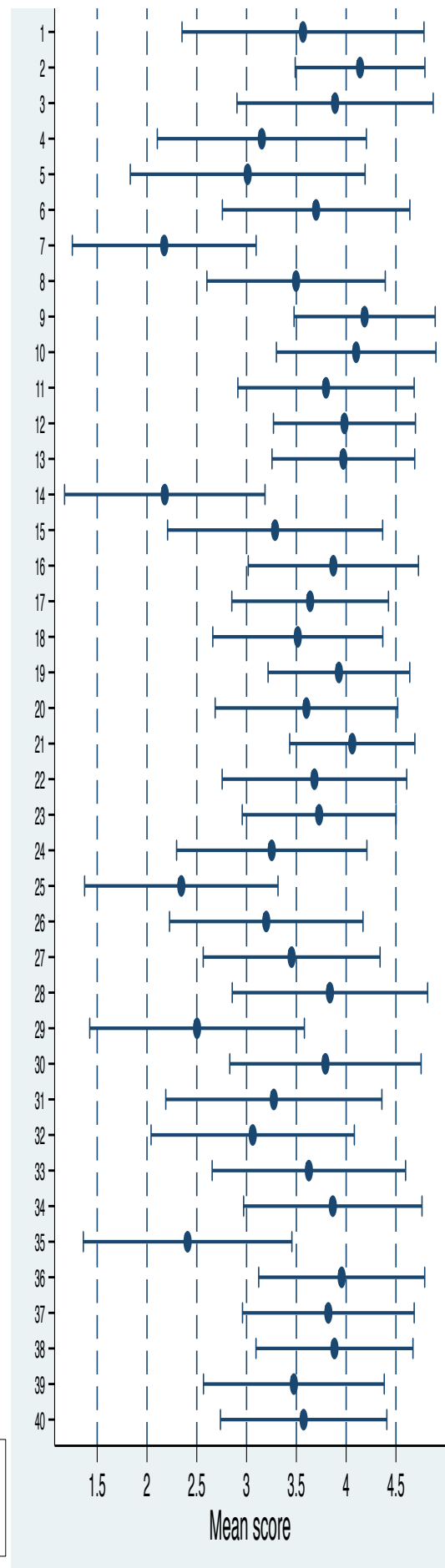
Figure 4.16 Auditors' perception of the public service

What changes could the URA make to be a better workplace?

■ Improve Job Benefits	■ Increase Salaries
■ More Rigorous Hiring Procedures	■ Improve Work Experience & Training
■ Other	
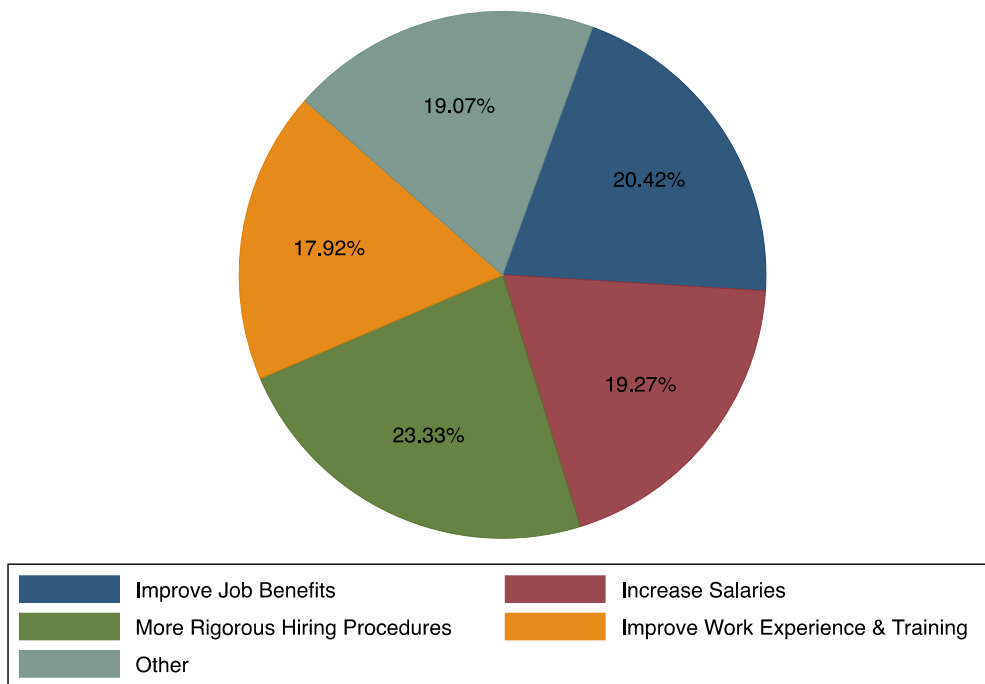
Figure 4.17 Auditors' opinion on how to make the URA a better workplace

What Sector should URA focus on catching?

What Firm Size should the URA focus on catching?

■ small	■ medium
■ large	■ dont know
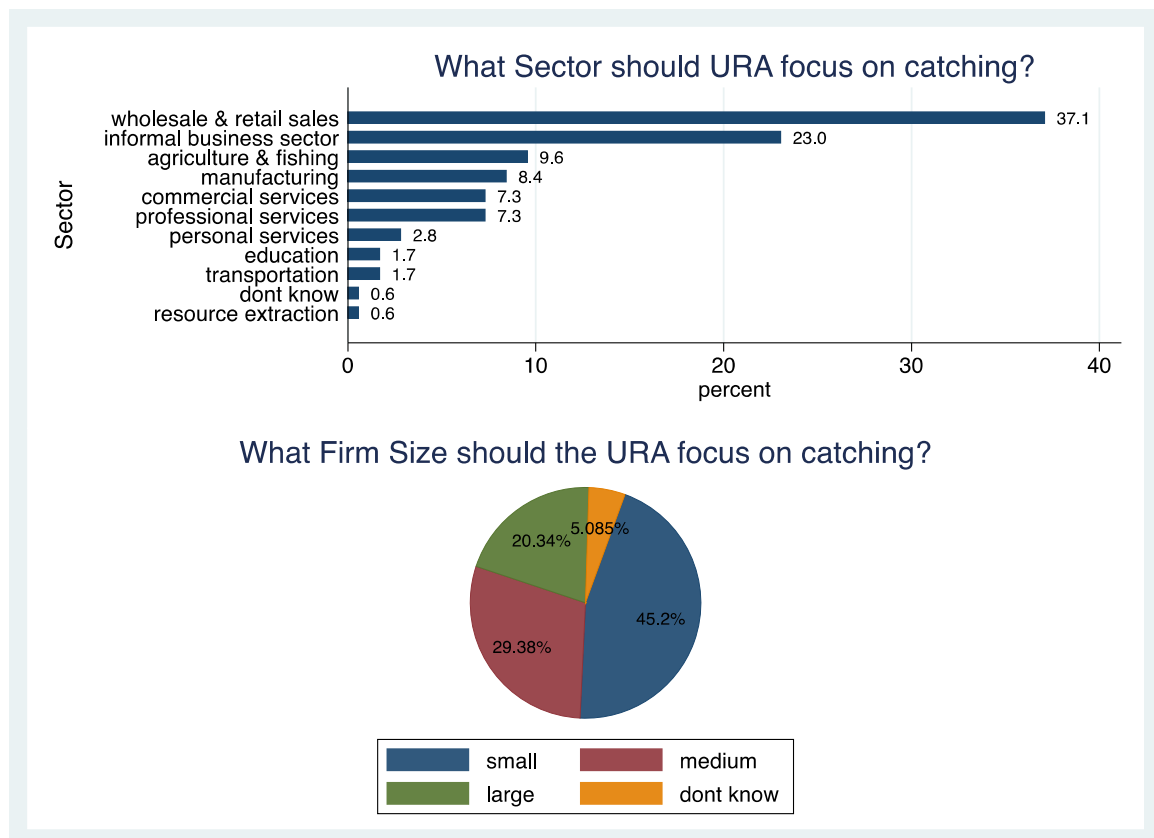
Figure 4.18 Auditors' view on the audit strategy the URA should adopt

5. Towards an improvement of the audit system: correlations of audit yield with auditors' and audited firms' characteristics

In this section, we show how the available data enabled us to look for correlations of auditor and taxpayer characteristics with audit yield. We first present taxpayer characteristics, showing differences between the audited and the unaudited firms. We then investigate the relations between auditor and taxpayer characteristics and audit yield. In our original proposal, we planned to include interactions between auditor and taxpayer characteristics in these analyses. Due to the small sample size for which we have complete information on the audit, the auditors and the taxpayers, those regressions would not yield any robust results. Therefore, we do not present the results in this report.

5.1. Which taxpayers are selected for audit?

Table 5.1 displays descriptive statistics for both audited and non-audited taxpayers, allowing comparison between the two.[45] Audited firms are larger than non-audited ones in many aspects: their average annual sales amount to 8 billion UGX against 931 million UGX for the non-audited ones.[46] Audited firms employ 57 persons on average, against 18 for the non-audited. A third of the audited firms are in the wholesale and retail sector (34%), consistent with the auditors' survey answers to the question "On which sector should the URA focus?" (Figure 4.18). The "transport, storage and communication" sector is overrepresented in the audited sample compared to the non-audited sample (13% against 5%), so is manufacturing (10% against 5%) and, to a lesser extent, real estate and business services (12% against 9%). Construction accounts for 12% of the audited firms, and 17% of the non-audited. The profit ratio and administrative expenses are two of the variables used in the risk score to flag taxpayers that should be audited. Consistently, we see that administrative expenses amount to 10% of total sales on average in audited firms against 6% of total sales in non-audited ones. However average profits before tax are -2% of total sales for audited firms, and -1% for non-audited ones.

Tables 5.2 and 5.3 show descriptive statistics for the sample used in the econometric analyses. Auditor characteristics (Table 5.2) are from the auditors' survey described in Section 4. Audit yield information (Table 5.3) comes from the database on audit cases, and taxpayer variables come from the audit cases and tax databases (see Section 2). We use three different measures of audit outcome: (1) total amount paid as a result of the audit, or recovery, (variable *paid*); (2) total amount assessed as due by the auditor, which may or may not have been actually collected (variable *tot_assessed*); (3) the ratio of (1)/(2), i.e. the proportion paid (variable *proportion_paid*). Auditors are usually not held

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[45] Figures A.5.1 to A.5.5 in Appendix II show Kernel density estimates of sales, number of employees, administrative expenses and profits for audited and unaudited firms.

[46] Although the Kernel density estimation of total sales has thicker tails for the audited firms, showing that they belong to a wider range of firm sizes than the unaudited ones, more concentrated around the mean.

Table 5.1 Descriptive statistics audited vs. non-audited firms

Variables	Audited firms Mean (sd)	Non-audited firms Mean (sd)
Totalsales (in millions of shillings)	8,060.98	931.41
	(48,354.78)	(9,384.79)
ln(1+totalsales)	5.60	3.00
	(2.94)	(2.83)
employees	57.14	17.72
	(219.26)	(66.30)
ln(1+employees)	2.64	2.04
	(1.39)	(1.10)
totaladminexpense (In millions of shillings)	536.03	46.26
	(4,188.18)	(701.89)
admin_expense (as a ratio to total sales)	0.10	0.06
	(0.15)	(0.13)
profitlossbeforetax (in millions of shillings)	327.68	12.08
	(6,425.23)	(1,132.32)
profit_before_tax (as a ratio to total sales)	-0.02	-0.01
	(0.19)	(0.19)
Construction	0.13	0.18
	(0.33)	(0.38)
Manufacturing	0.10	0.05
	(0.30)	(0.21)
Other sectors	0.19	0.30
	(0.39)	(0.46)
Real estate and Business services	0.12	0.09
	(0.32)	(0.28)
Transport, storage and Communication	0.13	0.05
	(0.33)	(0.22)
Wholesale and Retail trade	0.34	0.34
	(0.47)	(0.47)

Table 5.2 Descriptive statistics for econometric analysis: auditors

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
age	63	41.60	6.84	27.00	54.00
age_squared	63	1,776.84	556.95	729.00	2,916.00
male	65	0.68	0.47	0.00	1.00
female	65	0.32	0.47	0.00	1.00
single	65	0.17	0.38	0.00	1.00
married	65	0.82	0.39	0.00	1.00
tenure	64	13.18	6.86	0.00	24.00
complete_ug	62	0.31	0.46	0.00	1.00
incomplete_pg	62	0.03	0.18	0.00	1.00
complete_pg	62	0.66	0.48	0.00	1.00
training (ACCA/CPA)	38	0.39	0.50	0.00	1.00
poditra	65	0.22		0.00	1.00
raven_score	65	4.91	3.51	0.00	11.00
job_skills	55	5.67	1.92	0.00	9.06
extraversion	63	-0.16	0.27	-0.75	0.62
agreeableness	63	0.22	0.32	-0.78	1.00
conscientiousness	63	0.09	0.29	-0.50	1.00
neuroticism	63	-0.19	0.26	-1.00	0.50
openness	63	-0.06	0.31	-0.90	1.00

Notes: Tenure is the number of years spent at the URA. Complete_ug (respectively complete_pg) means highest level of education is complete undergraduate (respectively postgraduate). Incomplete_pg means the auditor completed undergraduate and started postgraduate without completing it. Training (ACCA/CPA) indicates that an auditor completed either an Association of Chartered Certified Accountants or a Certified Public Accountant training. Poditra indicates that an auditor did the Postgraduate Diploma in Taxation and Revenue Administration (PODITRA) training. Raven_score is the score obtained at the Raven's matrices test, out of 12. Job_skills is the scored obtained at the knowledge questionnaire, out of 10. Extraversion, agreeableness conscientiousness, neuroticism and openness are the Big Five personality traits scores (between -1.5 and 1.5).

Table 5.3 Descriptive characteristics for econometric analysis: audit cases and audited taxpayers

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	Min	max
Audit Yield					
paid_total_mill (in millions of shillings)	6,140	17.97	245.08	0.00	13,537.64
ln_paid (ln(1+paid))	6,140	3.55	5.82	0.00	23.33
paid_ihs (IHS)	6,140	3.86	6.05	0.00	24.02
tot_assessed_mill (in millions of shillings)	6,140	78.12	1,141.84	0.00	68,739.27
ln_total_assessed (ln(1+tot_assessed))	6,140	7.49	6.53	0.00	24.95
tot_assessed_ihs (IHS)	6,140	8.10	6.60	0.00	25.65
proportion_paid	6,023	0.34	0.42	0.00	1.00
Taxpayer Characteristics					
totalsales	4,268	8,251.47	49,439.58	0.00	859,552.00
lntotalsales (ln(1+totalsales))	4,268	5.58	2.95	0.00	13.66
average_employees	3,163	58.66	226.72	0.00	5,987.66
ln_employees (ln(1+employees))	3,163	2.65	1.40	0.00	8.70
Construction	4,269	0.13	0.33	0.00	1.00
Manufacturing	4,269	0.10	0.30	0.00	1.00
Real estate and Business services	4,269	0.12	0.32	0.00	1.00
Transport, storage and Communication	4,269	0.13	0.33	0.00	1.00
Wholesale and Retail trade	4,269	0.33	0.47	0.00	1.00
Other sectors	4,269	0.19	0.39	0.00	1.00
totaladminexpense (in Millions of Shillings)	4,268	522.26	4,080.82	0.00	75,937.79
admin_expense (as ratio to total sales)	4,268	0.10	0.15	0.00	0.98
profitlossbeforetax (in Millions of shillings)	4,268	317.24	6,315.29	-184,749.89	214,071.99
profit_before_tax (as ratio to total sales)	4,268	-0.02	0.19	-1.00	1.00
Audit Characteristics					
Comprehensive	6,116	0.20	0.40	0.00	1.00
Issue	6,116	0.59	0.49	0.00	1.00
Desk	6,116	0.21	0.41	0.00	1.00

Notes: IHS refers to the inverse hyperbolic sine transformation. Proportion_paid refers to the ratio between total paid and total assessed. Other sectors refers to all other sectors namely, Accommodation and Food services, Activities of extraterritorial organization, Activities of households as employers, Administrative and support service activities, Agriculture, forestry and fishing, Extra Territorial Organizations, Financial and insurance services, Information and communication, Mining and Quarrying, Professional, scientific and technical, Public Administration, Education, Health and social work, Recreation and Personal services and Utilities.

responsible for the actual revenue collections subsequent to their assessment of the taxpayer's liabilities. However, the Domestic Taxes division has informed us that this was something it was progressively attempting to change. On average, auditors assessed that the taxpayer owed 78.12 million UGX, against 17.97 million UGX actually paid. The average proportion paid is 34%. A majority of the audit cases (59%) are issue audits, i.e. audits that concentrate on a specific tax type or period. Because of their focus on key risk areas, these audits consume fewer resources than comprehensive audits, the latter being in-depth examinations of all of a taxpayer's liabilities, for all tax types. Comprehensive audits account for 20% of our sample. Finally, 21% are desk audits, which are also issue audits, but conducted from the office using internal resources, without necessarily contacting the taxpayer.

5.2. Correlation of audit yield with auditor and taxpayer characteristics

To assess how auditor and taxpayer characteristics are related to audit yield, we estimate the following ordinary least squares (OLS) model:

$$Y_i = ß_0 + ß_1 A_i + ß_2 T_i + ß_3 D_i + \mu_t + \varepsilon_i \quad (1)$$

where Y_i is the outcome of audit case i carried out in year t. A is a vector of auditor characteristics including sex, age, education and training (indicator for ACCA or CPA training), tenure at the URA, scores of the knowledge questionnaire (job skills), score of the Raven's Matrices test, and BFI personality traits. T is a vector of taxpayer characteristics including sector of activity, total sales, number of employees, administrative expenses and profit as ratios of total sales. D is an indicator for the type of audit (comprehensive, field issue or desk issue). μ_t is a year fixed effect. Results are displayed in Table 5.4. Results for versions of the model with either only auditor characteristics or only taxpayer characteristics are shown in Tables A.5.1 and A.5.2 of Appendix II. Y_i is alternatively the log of $1 + paid$ (column 1), the IHS (inverse hyperbolic function) [47] of $paid$ (column 2), the log of $1 + tot\_assessed$ (column 3), the IHS of $tot\_assessed$ (column 4) and $proportion\_paid$ (column 5). It is important to keep in mind that because the selection of audited taxpayers and the assignment of the auditors to the different audit cases are not random, but on the contrary linked to the expected outcomes of the audits, our analyses do not show causal relations but only correlations (see Box 5.1).

Among auditor characteristics, completion of postgraduate studies is associated with 55-to-57% higher assessed liabilities. Each additional year of tenure at the URA is associated with 10% lower assessed liabilities. On average,

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[47] Log-transforming the explained variables allows to normalize skewed distributions, and to run regressions in which the correlations with other variables are expressed in percent changes rather than nominal changes. However, the logarithm function is not defined for zero nor for negative values, and there are some $y_i = 0$ in our data. That is the reason why we define the function $\ln(1+y_i)$. But adding an arbitrary constant (here equal to 1) in the logarithm is not perfectly rigorous, since results are sensitive to the choice of the constant. Therefore, we also use the inverse hyperbolic sine transformation defined by $\ln(y_i + (y_i+1)^{1/2})$. The ihs is defined for $y_i = 0$, and except for small values of y_i, it approximates $\ln(y_i) + \ln(2)$ and thus the interpretation of the coefficients is the same as for the logarithm function when it is used as a dependent variable.

assessed liabilities are 90% lower in audit cases led by male auditors. Finally, the personality variables from the BFI questionnaire yield the following results: a one standard deviation increase in the extraversion score is linked to 60% lower assessed liabilities, and a one standard deviation increase in the openness score to 35% lower liabilities. However, the features listed above are not necessarily associated with audit outcome overall, since in some cases we see no significant correlation with the actual amounts paid nor with the proportion paid. This hints to a possible discrepancy between the auditor's ability to assess liabilities and the URA's capacity to enforce that decision. Regarding the BFI traits, openness is associated with higher paid-to-assessed ratios (+6 percentage points for a one standard deviation increase). Conscientiousness is associated with higher amounts paid (+38% for a standard deviation increase in the conscientiousness score). Finally, a one standard deviation increase in the job skills score is associated with a 5.8 percentage point decrease in proportion paid (this not being a causal relation, it could be that auditors with higher job skills are assigned to more difficult cases). Neither the variable indicating additional training nor the variable indicating the completion of the Poditra course have a significant relationship with audit outcomes in this specification.[48]

Looking at taxpayer characteristics, we observe that firm size is positively correlated with audit outcome: a 1% increase in total sales is linked to 0.11% higher assessed liabilities, a 1% increase in the workforce to 0.34% higher assessed liabilities and 0.41% higher collected revenue. Audits carried out in real estate and business services sector and in the construction sector appear as particularly successful: in the former assessed liabilities are 42% higher and amounts paid 54 to 59% higher than in other sectors,[49] and in the latter assessed liabilities are 51% higher (though this last coefficient is only significant at the 10% level).[50] Finally, higher administrative costs seem associated to lower assessed liabilities, a one percentage point increase in the administrative expenses-to-sales ratio being associated with a 0.60% decrease in assessed liabilities, but higher profit ratios are associated with higher liabilities (a 1 percentage point increase in the profit ratio is linked to a 0.70% increase in assessed liabilities) and higher amounts paid (0.90% increase in paid amounts for a 1% increase in profit ratio).

Furthermore, looking at audit type, we observe that in comprehensive audits, both assessed liabilities and collected revenues are more than two times higher than in desk audits. In issue audits, assessed liabilities are around 50%

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[48] However, we do see a positive relation between Poditra and audit yield in the model with auditor characteristics only, when we don't control for taxpayer characteristics (Table A.5.1 in Appendix II).

[49] As compared to the following: Accommodation and Food services, Activities of extraterritorial organization, Activities of households as employers, Administrative and support service activities, Agriculture, forestry and fishing, Extra Territorial Organizations, Financial and insurance services, Information and communication, Mining and Quarrying, Professional, scientific and technical, Public Administration, Education, Health and social work, Recreation and Personal services and Utilities.

[50] Statistical significance is a concept used to assess the reliability of estimated coefficients. If a coefficient is "significant at the 5% level" (i.e. p-value smaller than 0.05), that means that the probability that the coefficient takes the estimated value in the regression although it is actually nil (i.e. although there is actually no relationship between that coefficient and the explained variable) is of only 5%.

higher than in desk audits. To see whether the effect of the different taxpayer and auditor characteristics mentioned above vary with the type of audit that is carried out, we also ran the following regression:

$$Y_i = \text{\ss}_0 + \text{\ss}_1 A_i + \text{\ss}_2 T_i + \text{\ss}_3 D_i + \text{\ss}_4 (D_i * A_i) + \text{\ss}_5 (D_i * T_i) + \mu_t + \varepsilon_i \quad (2)$$

where the indicator variable for comprehensive audits is interacted with taxpayer and auditor characteristics. Results are shown in Table A.5.3 of the Appendix II. Regarding auditor characteristics, it appears that in the context of a comprehensive audit, the negative correlation of the BFI trait of openness with assessed liabilities is even stronger than in issue audits. Furthermore, in comprehensive audits, a higher agreeableness score is associated with lower amounts paid in absolute terms and as a proportion of assessed liabilities: an increase by one standard deviation in the agreeableness score is linked to a decrease in the proportion paid by 17 percentage points. Regarding taxpayer characteristics, the relationship between total sales and audit yield is stronger in a comprehensive audit. Higher sales are associated with larger assessed liabilities in all audit cases, but they are linked to a higher proportion paid only in the case of a comprehensive audit.[51] Finally, audits in the wholesale and retail sector are not associated with higher audit yields unless they are comprehensive, in that case the proportion paid is on average 20 percentage points higher than in other sectors.

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[51] Although the coefficient is quite small.

Box 5.1. Econometrics: correlation versus causation

Econometrics is the application of statistical methods to economic data, with the aim of identifying how different variables are linked to each other (correlation) and ideally how they influence each other (causation). Consider a basic linear regression - or ordinary least squares model - with a unique explanatory variable:

$$Y_i = \alpha_0 + \alpha_1 X_i + \varepsilon_i$$

The OLS model fits a line relating the values of Y and the values of X in a way that minimizes the distance of each observation to the line. α_1 is the slope of the line, α_0 is the intercept, and ε_i is the error term, i.e. for each observation i the difference between what the model predicts ($\alpha_0 + \alpha_1 X_i$) and the actual observation (Y_i). The sign of α_1 shows whether Y and X are positively or negatively related, and its magnitude shows how strongly one varies with the other in the data. For example, if Y_i is audit yield, and X_i the number of years of experience of an auditor, $\alpha_1 > 0$ would mean that on average, cases carried out by more experienced auditors have higher yields.

What can we learn with correlations?
But maybe experienced auditors are more often than not entrusted with comprehensive audit cases. Since comprehensive audits investigate all taxes and periods, unlike issue audits, it is straightforward that they should lead to higher revenue collections. Therefore, to know if cases led by more experienced auditors yield more revenues regardless of audit type, we add an explanatory variable C_i in our model, indicating if the audit was a comprehensive one.

$$Y_i = \alpha_0 + \alpha_1 X_i + \alpha_2 C_i + \varepsilon_i$$

The coefficient α_2 captures how yields differ between issue and comprehensive audits. α_1 is now the relation between auditor's experience and audit yield *controlling for* audit type. If α_1 is still positive, it means that on average, the longer the auditor's experience the higher the yields, whether we consider issue or comprehensive audit cases. We can add multiple explanatory variables, as we did in the models of this report.

Why can't we directly measure the causal impact of X on Y?
Yet, it could be that auditors with longer tenure have more successful audits *for other reasons* than their years of experience. For instance, maybe those who continue this job after many years are the most passionate about it and thus more efficient, which would not imply than any auditor staying an additional year would see his or her audit yields increase (unobserved heterogeneity). We could also imagine that station heads assign easier cases – with higher expected yields - to more experienced auditors, which would not imply that they perform better on all kinds of audits (selection bias). Some of these possible channels can't be measured and are thus absent of the model. The data offers no perfect counterfactual: even if we control for numerous variables, we do not have information on what the outcome of an audit case i would have been keeping everything – both observed and unobserved characteristics – unchanged but the auditor's number of years of experience.

What solutions exist?
Some statistical methods allow to estimate the causal relation between two variables – for instance difference-in-differences, regression discontinuity designs, instrumental variables, matching –yet they require real-life settings obeying to very specific conditions, and high data quality. Another option, very popular in economic research since the early 2000's, is the implementation of randomized controlled trials: inspired from medical research, these policy intervention designs randomly select individuals benefiting from a intervention among a pool of eligible, enabling comparisons between recipients and a true counterfactual group.

5.3. Conclusions and possible improvements of the analyses

Our results show that auditors' personality as measured by the BFI comes into play. Audits carried out in the real estate and business services sector as well as those in the construction sector are those associated with the highest yields. Audits of larger firms and of firms with larger profit ratios lead to higher assessed liabilities and revenue collections on average. Unsurprisingly, comprehensive audits – and issue audits, but to a lesser extent - have higher yields than desk audits.

Our results also confirm the relevance for the auditors' work of completing postgraduate studies (whether a professional course is completed after graduating or not). It could thus be a strategy for the URA to i. target candidates with postgraduate education in its auditor hiring process; ii. (partly) support the completion of postgraduate education of auditors already working at the URA. Half of the auditors surveyed were at their position since five years or more. This allows time for the investment the URA would make in auditors' skills to be recouped. As an illustration, a two-years Master Degree in Accounting/Finance at Makerere University costs around 5.6 million UGX. [52] This does not mean however that support to PODITRA or ACCA/CPA trainings should be suspended, since knowledge acquired through university and job skills developed in professional courses are complementary.

Unfortunately, we cannot draw any conclusions on the causal impact of these different factors on audit success. Additional data and a precise knowledge of the rules determining how audit cases are selected and how auditors are assigned to audit cases could potentially allow applying more relevant statistical methods, hopefully bringing us closer to causal interpretations. Another development could be the implementation of a randomized controlled trial, to assess the impact of one or two specific characteristics.

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[52] http://mak.ac.ug/sites/default/files/downloads/Graduate-Programmes-Fees-Structure.pdf

Table 5.4 Regression of audit yield on taxpayer and auditor characteristics (equation 1)

VARIABLES	(1) Dependent variable: ln(1+paid)	(2) Dependent variable: paid (IHS)	(3) Dependent variable: ln(1+total_assessed)	(4) Dependent variable: tot_assessed (IHS)	(5) Dependent variable: proportion_paid
	OLS	OLS	OLS	OLS	OLS
age	0.017	0.018	0.059**	0.060**	-0.003
	(0.028)	(0.032)	(0.025)	(0.026)	(0.006)
male	0.021	0.080	-2.234***	-2.343***	0.143
	(0.508)	(0.579)	(0.531)	(0.556)	(0.121)
tenure	-0.036	-0.034	-0.104***	-0.107***	0.005
	(0.036)	(0.040)	(0.034)	(0.036)	(0.007)
complete_pg	0.516	0.543	0.550*	0.577*	0.021
	(0.343)	(0.388)	(0.306)	(0.320)	(0.072)
training	-0.065	-0.038	-0.298	-0.307	0.052
	(0.407)	(0.459)	(0.383)	(0.409)	(0.080)
poditra	-0.136	-0.152	0.031	0.034	0.038
	(0.280)	(0.316)	(0.236)	(0.250)	(0.054)
raven_score	0.014	0.025	-0.057	-0.058	0.014
	(0.055)	(0.062)	(0.049)	(0.052)	(0.011)
job_skills	-0.083	-0.100	0.083	0.085	-0.032**
	(0.066)	(0.075)	(0.059)	(0.063)	(0.014)
BFI scores:					
extraversion	-0.240	-0.150	-3.562***	-3.719***	0.248
	(0.842)	(0.952)	(0.784)	(0.824)	(0.178)
agreeableness	-0.802	-0.881	-0.417	-0.464	-0.034
	(0.490)	(0.550)	(0.390)	(0.409)	(0.090)
conscientiousness	1.124**	1.156*	0.687	0.637	-0.022
	(0.522)	(0.590)	(0.474)	(0.500)	(0.104)
neuroticism	0.876	1.051	0.746	0.778	0.045
	(0.851)	(0.969)	(0.773)	(0.812)	(0.183)
openness	-0.104	-0.036	-1.406***	-1.427***	0.220**
	(0.390)	(0.446)	(0.360)	(0.380)	(0.094)
lntotalsales	0.049	0.054	0.111***	0.116***	-0.001
	(0.030)	(0.035)	(0.034)	(0.036)	(0.007)
ln_employees	0.410***	0.441***	0.343***	0.350***	0.053***
	(0.077)	(0.086)	(0.064)	(0.067)	(0.014)
Sector (Ref: Others):					
Manufacturing	-0.148	-0.162	-0.121	-0.125	0.021
	(0.249)	(0.283)	(0.218)	(0.233)	(0.052)
Construction	-0.084	-0.121	0.504**	0.551**	-0.050
	(0.271)	(0.306)	(0.223)	(0.237)	(0.053)
Real est. and bus. serv.	0.532**	0.587**	0.420**	0.438*	0.073
	(0.243)	(0.277)	(0.212)	(0.227)	(0.052)
Transport, stor., comm.	0.207	0.221	0.206	0.193	0.061

	(0.223)	(0.255)	(0.223)	(0.239)	(0.054)
Wholesale & retail trade	0.025	0.007	-0.026	-0.023	0.037
	(0.219)	(0.248)	(0.195)	(0.207)	(0.045)
admin_expense	0.390	0.498	-0.664*	-0.654	0.077
	(0.474)	(0.538)	(0.399)	(0.423)	(0.106)
profit_before_tax	0.928***	1.009**	0.654**	0.722**	0.098
	(0.357)	(0.403)	(0.308)	(0.329)	(0.080)
Audit type (Ref: Desk):					
Comprehensive	1.100***	1.235***	1.351***	1.451***	0.018
	(0.227)	(0.259)	(0.208)	(0.220)	(0.051)
Issue	0.225	0.251	0.474***	0.521***	-0.005
	(0.171)	(0.198)	(0.178)	(0.188)	(0.045)
Constant	1.394	1.704	1.458	1.943	0.575*
	(1.653)	(1.870)	(1.573)	(1.665)	(0.339)
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	884	884	884	884	864
R-squared	0.206	0.194	0.314	0.304	0.106

Notes: Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. OLS regressions with auditor and taxpayer characteristics. The dependent variable paid (IHS) in column 2 is the inverse hyperbolic transformation of the total paid, and in column 4, the dependent variable is the inverse hyperbolic transformation of total assessed. In column 5, the dependent variable is proportion paid, where proportion paid = total paid/total assessed. Complete_pg indicates having completed postgraduate education, versus incomplete postgraduate or complete undergraduate. Training is an indicator for completing ACCA or CPA courses. Job_skills is the score obtained in the knowledge questionnaire. Sectors are Manufacturing; Construction; Real estate and business services; Transport, storage and communication; Wholesale and retail trade. The omitted category is "Other sectors". The audit risk parameters admin_expense and profit_before_tax are expressed as a ratio to total sales. The omitted category of audit type is Desk.

6. Towards an improvement of the audit system: using firm transaction data to reveal the reporting gap in the VAT system

In this section, we adopt a different approach to show how transaction data extracted from VAT monthly reports can be used to identify inconsistencies in firm reporting. Such a methodology could help the URA detect risky taxpayers. Furthermore, firm-to-firm transaction data can also allow mapping production networks. A better knowledge of the latter potentially enables to anticipate the intensity with which auditing a specific firm will impact its trading partners.

6.1. Presentation of the transaction data

The data comes from the VAT monthly reports ("Monthly Value Added Tax Return" DT-2031 form) submitted by VAT-registered firms (see paragraph 2.1). More precisely, we use data from the second half of these forms, where firms must report all the transactions they had over the period covered by the tax:

- Schedule 1 "Output tax schedule": sales made to VAT-registered customers and to final customers, on which the firm reporting must pay VAT;
- Schedule 2 "Input tax schedule for local purchases": purchases from VAT-registered suppliers, for which the firm reporting can claim tax credit;
- Schedule 3 "Input tax schedule for imports": purchases from foreign suppliers, for which the firm reporting can claim tax credit;
- Schedule 4 "Administrative expenses": details of administrative expenses on which VAT was incurred, and for which the firm reporting can claim tax credit.[53]

We focus on the period from June 1st, 2012 to May 31st, 2013. In practice, we have data until November 2013, but we observed that transactions are not always reported in the month of invoicing (although they normally should from our understanding of URA legislation). Focusing on transactions that took place until May 31st 2013, this leaves a significant amount of time (six months) for firms to report past transactions that had not been reported before that date.

6.2. Using the transaction data to identify misreporting: purpose of the empirical exercise

The main idea of the exercise is to use the transaction data as third-party reporting, comparing sales a firm self-declares and on which the VAT it owes is calculated to what other firms declare having bought from that firm. Consider a buyer Y reporting a domestic purchase from a seller X in Schedule 2 (or in

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[53] The VAT rate on administrative expenses is the standard VAT rate (18%). These expenses are reported separately only for accounting reasons, to allow analysts to distinguish them from other inputs.

Schedule 4). Seller X should report the same transaction in its Schedule 1, as a sale. Seller X will be taxed on the amount of this transaction, whereas on the contrary buyer Y will be able to deduct the VAT charged at the time of transaction from its tax liabilities. Therefore, if the amount reported by buyer Y is superior to the one reported by seller X, there is a potential revenue loss for the URA, because of misreporting and/or intentional tax evasion. This could be because seller X under-declares its sales to reduce its tax liabilities, or because buyer Y over-declares its purchases to increase its input tax credits. The latter is probably more rare because more risky and more complex, since buyer Y would need to provide information such as invoice number and nature of goods on fictive transactions. Therefore, for simplicity, we refer to these inconsistencies as "under-reporting" (of sales) in the rest of this section, although theoretically they can also include over-reporting of purchases.

To see whether we observe such patterns in the data, we aggregate all transactions occurring within the 12-month period by pair of firms (seller-buyer) and by direction (from X to Y and from Y to X separately). We aggregate transactions over the whole period for a simple reason. If we chose to look at individual transactions, inconsistencies could arise from differences in the dates of transaction reported by buyer and seller, which may be simple mistakes with no consequences for overall revenue collections. This would lead to an overestimation of inconsistencies. As a complement to our main empirical analysis, we illustrate these inconsistencies in transaction reporting dates in paragraph 6.4.1. Furthermore, we choose to carry out our analyses at the firm-pair level, instead of aggregating transactions of a firm X with all trading partners, because the latter could also yield misleading results. For example if seller X under-reports sales to firm Y, but reports sales to firm Z without Z reporting these purchases (if Z does not wish to claim tax credit for them, for example), we could find no inconsistency at the aggregate level (sales to all firms self-declared by X equal to or larger than the aggregate level of purchases from X declared by all firms) although there are some at the pair level (in pair X-Y). In support of our methodological choice of providing analyses at the pair level, we display results from the same analyses carried out with aggregation of trade information from all partners of a given firm in paragraph 6.4.2. This reveals the underestimation of inconsistencies this second method would lead to.

We start the analysis from the universe of sellers declaring domestic sales in Schedule 1. We then relate what they declare (number of transactions and amounts) to what their trading partners declare having bought from them in Schedule 2 or Schedule 4. Our empirical strategy aims to reveal systematic discrepancies between self-reported sales and purchases reported by others.

6.3. Results: extent of the the VAT reporting gap

The comparisons we make are based on three variables:

i.   Aggregate amount of firm-to-firm transactions carried out within the 12-month period
ii.   Number of firm-to-firm transactions carried out within the 12-month period

iii. Aggregate amount of firm-to-firm transactions conditional on the fact that the number of transactions reported by sellers and buyers are the same

How are the firm pairs constituted using the information comprised in the VAT return forms? We display results for two matching methods, each defining a different sample of transactions:

i. *Baseline matching method:* keeping all transactions with trading partners for which a valid TIN is reported. If firm X declares having sold something to firm Y (entered with a valid TIN), the X-Y pair is included, even if firm Y does not declare having bought something from firm X. If X declares having sold something to firm Z, but that Z's TIN is not reported correctly, the X-Z pair is not included. 11,112 unique sellers are in this sample, and they report 2,048,740 transactions. Firms buying from these sellers declare 2,523,902 transactions.

ii. *Reciprocal matching method:* keeping only transactions between firms that reciprocally report trading with each other (seller is mentioned in buyer's Schedule 2 or Schedule 4, buyer is mentioned in seller's Schedule 1). In the example above, the X-Y pair would not be included since Y does not report having bought from X. 5,276 unique sellers are in this sample, they declare 1,531,930 transactions, and buyers declare 1,312,587.

Combining these different modalities yields five different instances for the analysis.[54] Results are shown in Figures 6.1 (variable *Aggregate amount*), 6.2. (variable *Number of transactions*), 6.3. (Variable *Aggregate amount conditional on the same number of transactions*), and in Tables 6.1 and 6.2. In each Figure, the left panel displays results for the baseline sample and the right panel for the reciprocal sample. In the graphs, each dot corresponds to a pair of firms. The x-axis is the amount/number (in log) reported by the buyer in its Schedule 2 or Schedule 4, the y-axis is the amount/number (in log) reported by the seller in its Schedule 1. In theory, if reporting was perfect, all dots should be on the 45-degrees line, since in each pair buyer and seller would report the same amounts/number of transactions. A dot above the bisector means that the seller is reporting more than the buyer. This is not necessarily an inconsistency: maybe the buyer does not report its purchase because it does not need the tax credit. Furthermore, this situation does not lead to a loss of tax revenues for the URA. However, a dot under the bisector means the buyer is reporting more than the seller. This is likely an inconsistency, potentially hinting to firm misreporting. We define the reporting ratio as the ratio of sales self-reported by a seller to purchases from that seller reported by a buyer, in other words the ratio of the y-axis values of the graph to the x-axis values (except that to compute the reporting ratio we take both variables in level and not in log as for the graphs). Table 6.1 displays the percentage of pairs for which the reporting ratio is equal to zero, between zero and one, equal to one, between one and two and above

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[54] For variable (iii) *Aggregate amount conditional on the same number of transactions* the baseline matching method and the reciprocal matching method define the same sample.

two. The fraction of cases for which the ratio is equal to 1 shows the proportion of pairs with consistent reporting i.e. for which amounts declared by sellers and buyers are the same. The fraction below 1 (columns 1+2) indicates the proportion of cases for which there is under-reporting. For observations with a reporting ratio inferior to one, Table 6.2 indicates the extent of under-reporting, displaying the number and share of sellers under-reporting (column 1) and for which reported amounts or number of transactions are more than 1%/10% lower (columns 2 and 3, respectively) than what the buyer declares.

Figures 6.1, 6.2 and 6.3 reveal that although the points are concentrated around the bisector, the number of cases for which sellers report less than buyers (dots under the bisector) is substantial. Figure 6.1 and the first two lines of Table 6.1 show that in 78% (resp. 42%) of cases, amounts declared by the seller are lower than amounts declared by the buyer.[55] In the baseline sample (resp. reciprocal sample), 9,631 out of 11,112 (resp. 3,923 out of 5,276) unique sellers are involved in transactions with under-reporting, and for 9,457 (resp. 3,527) of them, self-declared sales are more than 10% smaller than those declared by the buyer (first two lines of Table 6.2). Many of these inconsistencies seem to come from discrepancies in the number of transactions declared by each party: in the sample with all valid TINs, there is under-reporting of the number of transactions in 75% of the cases, this figure is 34% in the sample with reciprocal trading partners only (Figure 6.2 and lines 3 and 4 of Tables 6.1). This shows that most of the misreporting/tax evasion comes from firms not reporting at all some of their transactions rather than systematically decreasing the amount of sales. Under-reporting of the number of transactions concerns 9,515 sellers (3,641 in the reciprocal sample), and for 9,474 (resp. 3,542) of them, its magnitude exceeds 10%. When keeping only pairs where the number of transactions declared by the seller and the buyer are consistent, under-reporting is less substantial, yet it remains in 23% of the cases, corresponding to 1,551 unique sellers, and for 836 of them it is larger than 10% (Figure 6.3 and fifth line of Tables 6.1 and 6.2).

The non-reported sales amount to 4,148 billion UGX in the baseline sample, and 606 billion UGX in the reciprocal sample (unconditional on matching number of transactions). Applying a standard VAT rate of 18% to these amounts leads to an estimation of lost revenues of 747 billion UGX, 109 billion UGX with the reciprocal sample. As an illustration, these values amount respectively to 58% and 8.5% of total VAT collections in 2012/13 (1,279 billion UGX).[56] The size of this reporting gap shows the large potential impact of using this information to demand amended tax returns and to improve compliance. However, these estimates are not definite, and could be refined if we had access to the complete VAT data for the considered period. For instance we are missing the variable indicating firms' total sales, and we could imagine that some firms failed to report individual transactions in the different Schedules, but still included these amounts in their aggregate sales value.

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[55] Shares computed exclusive of cases where the amount reported by the buyer is zero i.e. where the denominator in the reporting ratio is nil.

[56] URA 2014 data. Same source as Table 1.1. Note that VAT collections are calculated on the July, 1st 2012 – June, 30st 2013 period whereas our estimations are computed on the June, 1st 2012 – May, 31st 2013 period.

6.4. Complementary empirical results

6.4.1. Inconsistencies in transaction and reporting dates

The illustration of the delays in firms' reporting of past transactions is of interest for the URA as such, but also comforts us in our choice of carrying out the under-reporting analysis by aggregating transactions over the whole 12-month period. Indeed, it shows the additional inconsistencies which would arise using monthly data, and which are irrelevant to our primary concern here. Table 6.3 displays, for each Schedule, the share of transactions by monthly brackets of reporting date, from within one month (here defined as a 30-day period rather than based on calendar months) to more than 6 months after the transaction occurred. Only 55.57% of sales (Schedule 1) are reported within a month, as they theoretically should. 34.90% are reported within a 1-to-2 months period, and 4.23% are reported more than 6 months after they occurred. The transactions with the smallest share reported on time are the administrative expenses (only 40.21% within one month). This figure is 51.20% for local purchases and 46.33% for imports. However, overall we note that for all Schedules the bulk of the transactions are reported within two months (from 83.63% for administrative expenses to 90.47% for sales).

6.4.2. Under-reporting analysis at the aggregate level instead of the firm-pair level

Table 6.4 displays the same figures as Table 6.2, except that a seller's sales and number of transactions are aggregated over all buyers. The baseline sample still includes 11,112 unique sellers, but the reciprocal sample now includes 2,872 unique sellers against 5,276 in the analysis at the firm-pair level, and the sample where we keep cases for which sellers and buyers declare the same number of transactions comprises 1,022 unique sellers. As expected, the extent of the inconsistencies is lower in this setting than when looking at firm pairs: there is under-reporting for 7,306 sellers (66%) in the baseline sample, against 9,631 (87%) in the first analysis, and for 1,545 sellers, corresponding to 54% (against 3,923 (74%)) in the reciprocal sample. 7,385 sellers of the baseline sample are identified as under-reporting when considering the number of transactions, 1,387 in the reciprocal sample. Finally, misreporting of total amounts conditional on the number of transactions involves 287 sellers (28%) against 1,551 (47%) in the analysis at the firm-pair level. Overall, the shares of firms found misreporting for the aggregate-level analysis are 20-to-40% lower than those identified with the firm-pair level analysis. This shows that carrying out the analyses at the pair level is preferred since it prevents from underestimating the extent of misreporting.

6.4.3. Size, sector and location of misreporting firms

To identify the characteristics of misreporting firms (sector and size), we need to match the data from the VAT Schedules with data from the Corporate Income Tax returns and the PAYE returns. Figure 6.4 shows the share of

misreporting firms in each firm-size group (firm-size here refers to the number of employees), and for each sectorial group. Figure 6.5 shows the share of misreporting firm in each location. The proportion of firms identified as misreporting is larger among smaller firms (highest in the group of firms with 10 to 50 employees). The sector with the largest share of misreporting firms is wholesale, retail and repair. This proportion is the lowest in construction and services. These findings are consistent with the auditors' answers to the question "What firm size and sector should the URA focus on catching?" (see Figure 4.18 in Section 4). Indeed, in the auditors' answers, wholesale and retail was the most cited sector, and small firms were identified as the most risky. The districts of Kitgum, Koboko, Masaka and Pallisa display the highest shares of misreporting firms. The share is particularly low in the districts of Bushenyi, Nebbi, Rukungiri.

6.5. Implications for URA strategy and suggestions for future work

Discrepancies in firm-to-firm transaction data could be used to identify non-compliant taxpayers, i.e. firms who are not reporting all of their sales (or also possibly firms who are reporting non-existent purchases). In fact, the methodology presented here could be automatized and included in the risk management process of the audit case selection. We would be glad to know whether this is relevant and useful for the URA, and whether URA staff has views on other types of indicators for non-compliance that could be computed using these transaction data.

Furthermore, it would be interesting to assess the extent to which the identification of these inconsistencies can increase revenue collections and deter from tax evasion. This does not necessarily imply carrying out the actual audits, in fact some quicker and cheaper methods have been tested in other contexts to evaluate the usefulness of third party reporting. In Ecuador, in 2011-2012, the fiscal administration notified 8,000 firms that inconsistencies had been detected between the income they reported and what could be computed from third party information.[57] In this setting, the fiscal administration sought to verify the revenues and costs declared by the firms for the calculation of the yearly corporate income tax (CIT hereafter). Self-reported revenues and costs were given by each firm's CIT return form. Third party information on revenues came from: i. what other firms declared having bought from a given firm in their VAT monthly returns (similarly to what we use here); ii. credit card sales reported by credit card companies; iii. exports reported by the Ecuadorian customs; iv. returns to financial investments recorded by financial institutions. Third party (incomplete) information on costs came from: i. imports reported by Ecuadorian customs; and ii. sales to a given firm reported by other firms in their monthly VAT returns. Two treatments were implemented: in some cases, firms were simply informed that discrepancies had been found and were asked to submit an amended CIT return form. Another group of firms was informed of the exact third party revenues and costs that had been estimated for them, and were also asked to amend their CIT return. The intervention potentially had a very large

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[57] Carrillo, Pomeranz, and Singhal (2014) "Dodging the Taxman: Firm Misreporting and Limits to Tax Enforcement" Harvard Business School Working Paper No. 15-026.

scope: if all notified firms had adjusted their revenues to match those estimated using third party information, this would have led to 400 million USD additional revenue collections. However, the impact was much smaller because of weaknesses in other aspects of the enforcement environment: only 11-to-19% of the notified firms amended their CIT returns, since the fiscal administration did not have the means to implement a coercive version of the amendment requirement,[58] the firms who had not been informed of the third party estimates of their revenues systematically made smaller adjustments; and finally, firms tended to offset the increase in declared revenues by an increase in declared costs.

Similarly, a study in the US tried to measure the impact of the introduction of a mandatory reporting of electronic receipts (Form 1099-K) on tax compliance.[59] The authors find that the introduction of the new form led 40% of the concerned taxpayers to start filing their annual profits and losses, and led to a 24% increase in reported receipts for the firms who were already filing. However, as in the Ecuadorian study, firms partially offset this increase by increasing their reported expenses, which are not subject to third party reporting.[60]

These studies allow to measure the actual impact of third party reporting by analysing examples of policy interventions that use such information to increase compliance. They both show that third party reporting is a powerful tool for influencing taxpayers' behaviour, but at the same time they shed light on the limits of its effectiveness when other aspects of the enforcement environment are too weak. Further research in this area can hint to solutions to these flaws, in order to find methods to use third party information in the most efficient way.

How could something similar be tested in the Ugandan context using firm-to-firm transaction data?
- The major threat to the efficiency of third party reporting mentioned in the Ecuadorian and US studies (offsetting revenues by costs or similarly tax liabilities by tax credits) would be less influential in the context of the URA, since with the data we use here, firms would have to indicate their trading partners for each transaction and would not be able to offset tax liabilities by additional input tax credits very easily.
- Furthermore, the URA could add the threat of an audit to the amendment requirement, which was not the case in the Ecuadorian intervention. The URA could also inform firms that, going forward, discrepancies in firm-to-firm transaction data would serve as a flag for audit decisions. In practice, different treatments could be tested to see how firms' reactions differ according to the information/threats they receive.

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[58] Firms can only be prosecuted for failure to submit an amended return if a written notification has been delivered to them in person by a member of the fiscal administration staff, which is very expensive. The email option has been chosen because of resource constraints.

[59] Slemrod et al. (2015) "Does Credit-card information reporting improve small-business tax compliance?" NBER Working Paper No. 21412.

[60] Furthermore, much non-compliance of small businesses stems from cash use, which the new form does not address.

- An intervention like the one carried out in the Ecuadorian context is relatively cheap and easy (emails sent to targeted firms), but if it is done in a rigorous way (notably by selecting randomly the firms to be notified among those suspected of misreporting in order to have a treatment and a control group) many lessons can be learnt on the usefulness of the VAT transaction data for improving tax compliance.

6.6. Using VAT data to map production networks and to analyse peer effects in firm tax compliance

The rich dataset of firm-to-firm transactions from the VAT returns could also allow mapping production networks in the economy, i.e. patterns in economic activity between firms. According to a firm's position in the network, an audit of that firm (or another intervention) may have different impacts on its partners. Better knowledge of these mechanisms could allow targeting audits in a way that maximises deterrence from tax evasion. This is in line with the ongoing work at the Compliance Division of the Domestic Taxes Department, which seeks to shift audit evaluation tools from revenue-based indicators to more behaviour-based indicators.

For instance, an economy can be subject to different arrangements, with different implications for the impact of interventions or shocks to one firm on the whole economy.[61] In a *horizontal economy* firms don't trade among themselves, they each use primary inputs and sell directly to final consumers. In a *vertical economy*, trade is unidirectional: a unique firm uses primary inputs, it sells its output to another firm which uses it as its input and then sells its own output to a third one, etc. The last firm of the chain is the only one selling to final consumers. In a *star economy*, one firm acts as a hub in the network: its output is used as inputs by all other firms. The intensity with which a productivity shock – or any other kind of shock - on a given firm will affect the economic network as a whole strongly depends on the type of economy, and on the position of the firm in that economy. In a *horizontal economy* the shock does not propagate to other firms. The impact of a shock on the economy as a whole is the strongest in a *star economy*, if the firm affected by the shock is the "star" one.

We could imagine that similar mechanisms are at work in the context of a tax-compliance enhancing intervention. For instance, an audit of the "star" firm in a *star economy* is likely to have the biggest impact on other firms, since they all interact with the audited one. However, a limitation is that the VAT data can only serve to map *formal* economic networks. Yet, it could still be very enlightening to carry out an experiment to try and assess the differential impact of an audit according to the targeted firm's position in the network.

- Such an evaluation could be a complement to the one mentioned in 6.5: an intervention based on third party information (notification to firms and/or threat of an audit) could be tested on firms at different positions in the network and/or in different kinds of networks, in order to compare the impact of the intervention across groups.

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[61] Carvalho (2014) "From Micro to Macro via Production Networks" *Journal of Economic Perspectives* 28(4): 23-48.

- Or an evaluation of this kind could be done for actual audits, selecting audited firms according to their position in the network to analyse what difference it makes for trading partners' reaction.
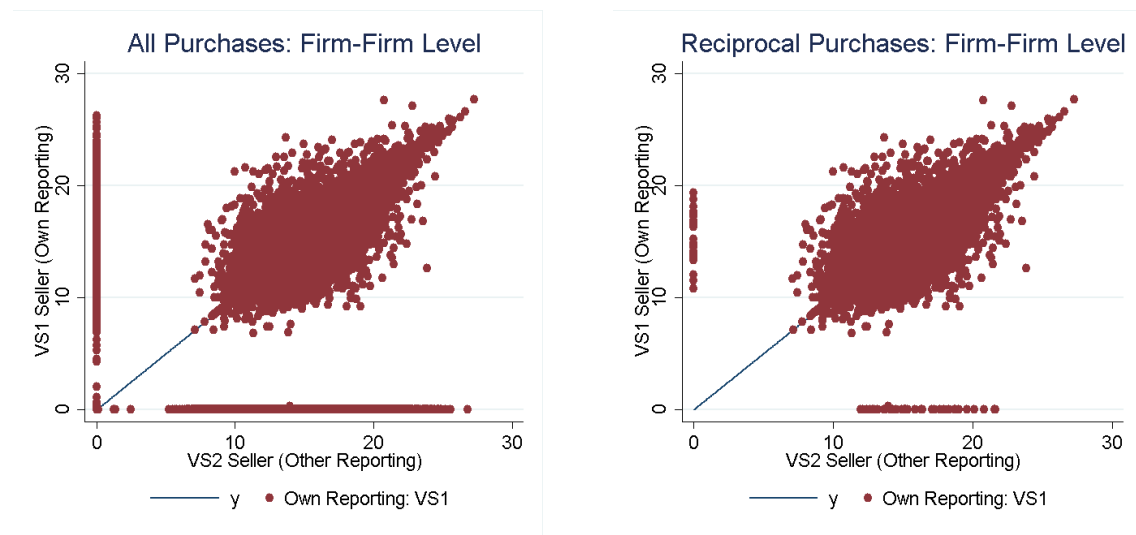
Figure 6.1 Aggregate amount of firm-to-firm transactions (log of value in UGX), baseline and reciprocal samples.
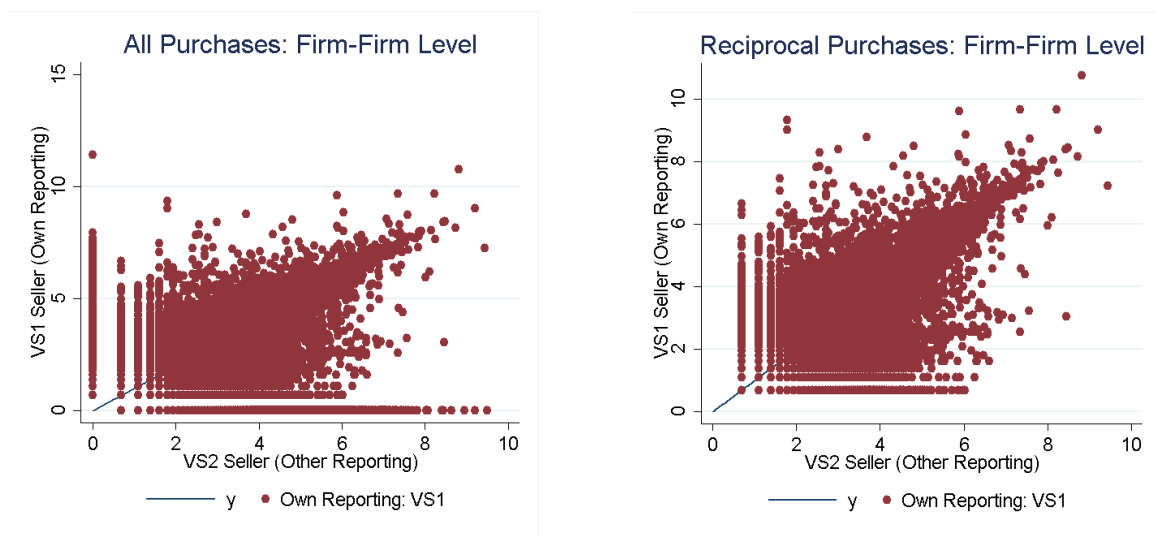

Figure 6.2 Number of firm-to-firm transactions (in log), baseline and reciprocal samples.
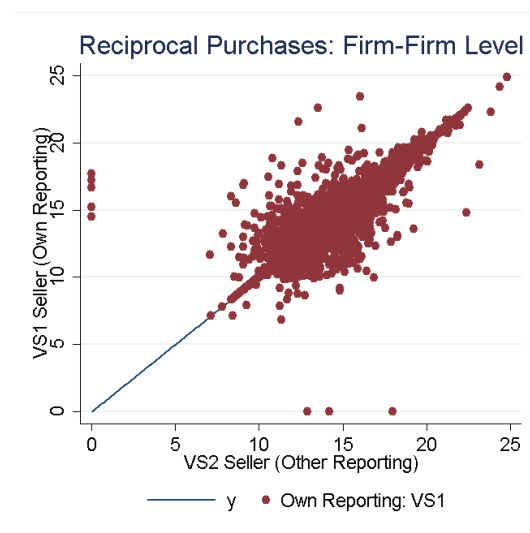

Figure 6.3 Aggregate amount of firm-to-firm transactions conditional on number of transactions (log of value in UGX), baseline and reciprocal samples are identical.

Table 6.1 Under-reporting analysis at the firm pair level: distribution of the reporting ratio (sales to a buyer self-declared by seller/purchases from that seller declared by the buyer). Proportion of transactions observed at each value of the ratio, excluding cases where buyer declares zero.

Instance	Ratio = 0	0< Ratio < 1	Ratio = 1	1< Ratio < 2	Ratio > 2
Amount – Baseline Sample *11,112 unique sellers* *2,523,902 transactions* *declared by the buyers*	62%	16%	7%	11%	4%
Amount – Reciprocal Sample *5,276 unique sellers* *1,312,587 transactions* *declared by the buyers*	0%	42%	18%	28%	12%
Number of transactions – Baseline Sample *11,112 unique sellers* *2,523,902 transactions* *declared by the buyers*	62%	13%	12%	8%	5%
Number of transactions – Reciprocal Sample *5,276 unique sellers* *1,312,587 transactions* *declared by the buyers*	0%	34%	31%	20%	15%
Amount conditional on same number of transactions *3,335 unique sellers* *20,593 transactions*	0%	23%	56%	19%	2%

Table 6.2 Under-reporting analysis at the firm pair level: intensity of under-reporting. Number (share in brackets) of unique sellers observed at each level of under-reporting.

Instance	Under-reporting > 0	Under-reporting > 1%	Under-reporting > 10%
Amount – Baseline Sample	9,631 *(87%)*	9,562 *(86%)*	9,457 *(85%)*
Amount – Reciprocal Sample	3,923 *(74%)*	3,776 *(72%)*	3,527 *(67%)*
Number of transactions – Baseline Sample	9,515 *(86%)*	9,515 *(86%)*	9,474 *(85%)*
Number of transactions – Reciprocal Sample	3,641 *(69%)*	3,640 *(69%)*	3,542 *(67%)*
Amount conditional on same number of transactions	1,551 *(47%)*	1,141 *(34%)*	836 *(25%)*

Table 6.3 Inconsistency in transaction and reporting dates

Schedule 1 - Sales

	% Share of Transactions
Within 1 month	55.57%
Between 1-2 months	34.90%
Between 2-3 months	1.91%
Between 3-4 months	1.50%
Between 4-5 months	1.03%
Between 5-6 months	0.72%
Greater than 6 months	4.23%
Misreporting (filing date before transaction date)	0.15%

Schedule 2 – Local Purchases

	% Share of Transactions
Within 1 month	51.20%
Between 1-2 months	38.60%
Between 2-3 months	3.72%
Between 3-4 months	1.68%
Between 4-5 months	1.06%
Between 5-6 months	0.87%
Greater than 6 months	2.85%
Misreporting (filing date before transaction date)	0.01%

Schedule 3 - Imports

	% Share of Transactions
Within 1 month	46.33%
Between 1-2 months	39.20%
Between 2-3 months	4.80%
Between 3-4 months	2.80%
Between 4-5 months	2.13%
Between 5-6 months	1.28%
Greater than 6 months	3.45%
Misreporting (filing date before transaction date)	0.00%

Schedule 4 – Administrative expenses

	% Share of Transactions
Within 1 month	40.21%
Between 1-2 months	43.42%
Between 2-3 months	6.21%
Between 3-4 months	3.11%
Between 4-5 months	1.95%
Between 5-6 months	1.19%
Greater than 6 months	3.90%
Misreporting (filing date before transaction date)	0.01%

Table 6.4 Under-reporting analysis at the aggregate level: intensity of under-reporting. Number (share in brackets) of sellers observed at each level of under-reporting.

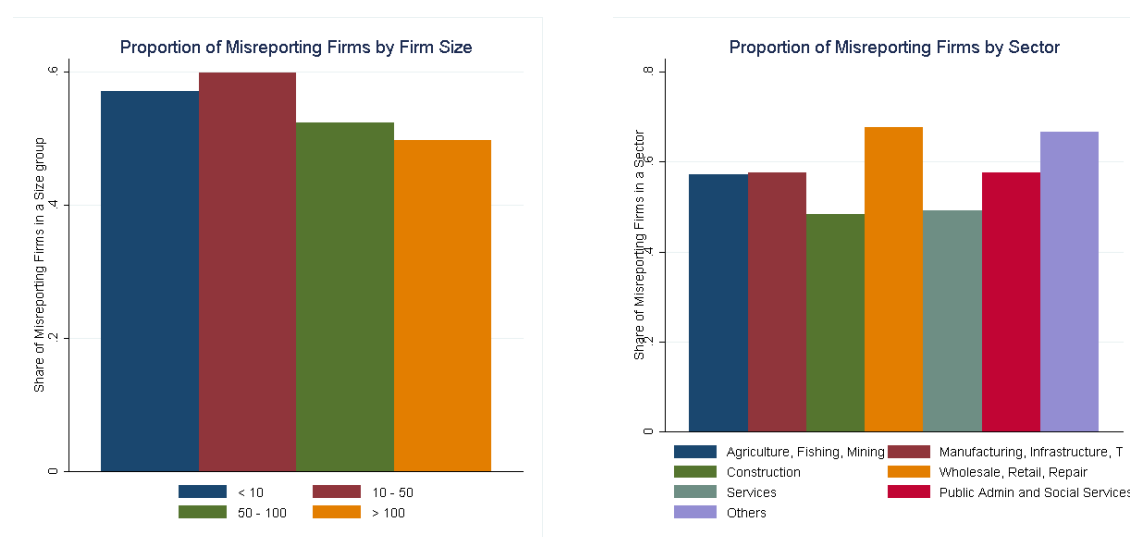| Instance	Under-reporting > 0	Under-reporting > 1%	Under-reporting > 10%
Amount – Baseline Sample	7,306 *(66%)*	7,210 *(65%)*	6,744 *(61%)*
Amount – Reciprocal Sample	1,545 *(54%)*	1,453 *(51%)*	1,118 *(39%)*
Number of transactions – Baseline Sample	7,385 *(66%)*	7,373 *(66%)*	7,063 *(64%)*
Number of transactions – Reciprocal Sample	1,387 *(48%)*	1,372 *(47%)*	1,141 *(40%)*
Amount | num# transactions	287 *(28%)*	176 *(17%)*	74 *(7.2%)*

Figure 6.4 Proportion of misreporting firms by firm size (number of employees) and by firm sector
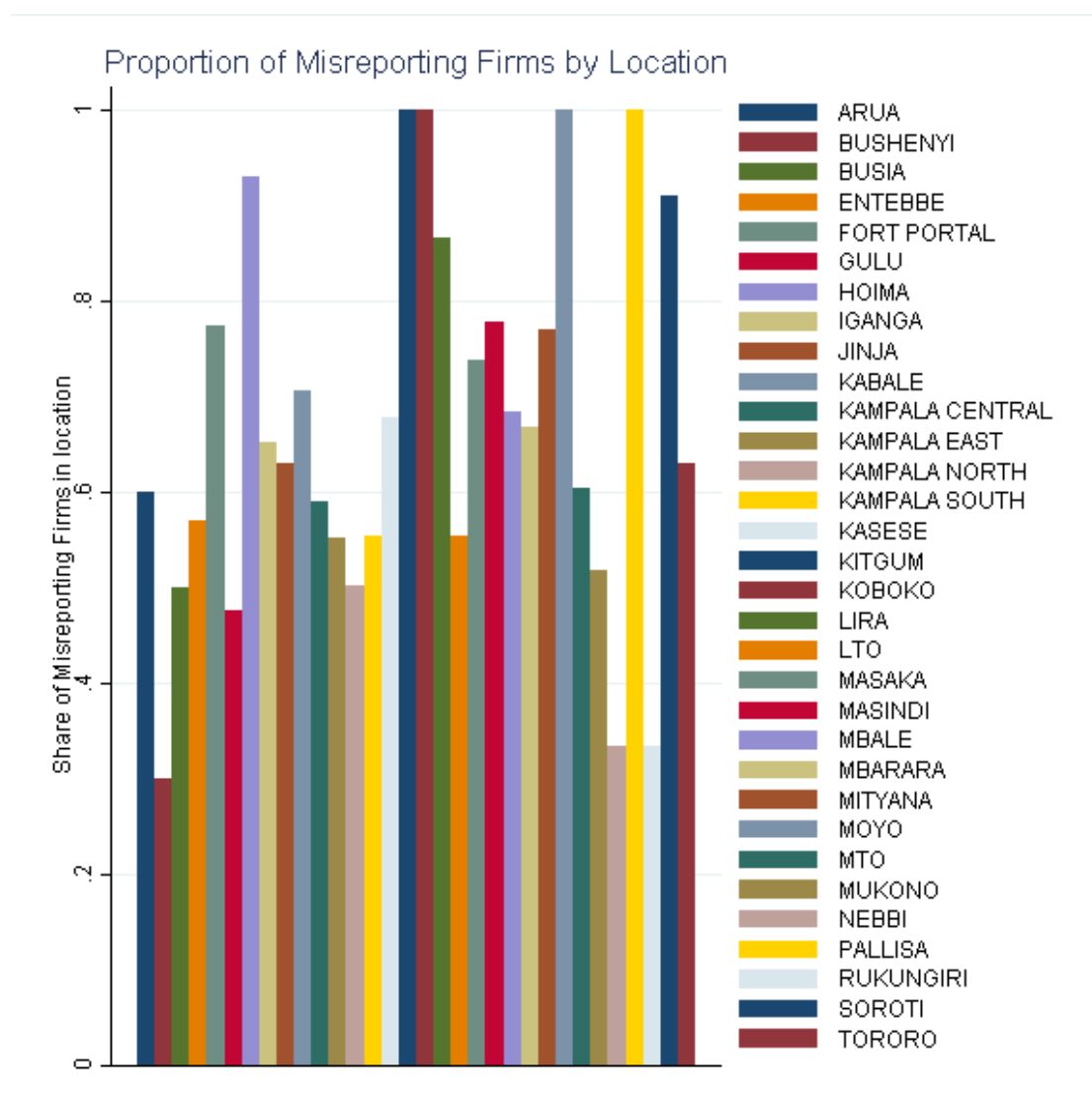
Figure 6.5 Proportion of misreporting firms by firm location

Conclusions and suggestions for future research

Building on the findings of this preliminary report, we believe there is scope for further research and cooperation with the URA in the following areas:

- *Improving analyses on the correlations between auditor/taxpayer characteristics and audit yield:* identifying causal relations would require i. a fully correct understanding of the audit case selection process; ii. comprehensive data on audited and non-audited taxpayers' risk scores, on taxpayers' other characteristics and on audit cases (in our current data, some key variables are missing for some of the years) ; iii. ideally, an experimental setting (*randomized controlled trial*) where audited taxpayers would be selected randomly among a pool of eligible taxpayers.

- *Assessing the effect of the introduction of third-party reporting on tax evasion:* the methodology presented in Section 6 could help the URA detect risky taxpayers. Questions of interest could be: by how much does this allow to increase revenue? How do taxpayers react to the information that the URA is potentially using third party reporting? Here again, an experimental setting would be the best-suited approach for investigating these issues.

- *Analysing spillovers in deterrence from tax evasion:* firm-to-firm transaction data enables to map production networks in the economy. This information could be used to see how a firm reacts when one of its trading partners is audited or subject to any other kind of URA intervention. Eventually, this knowledge could be used by the URA to target taxpayers in a way that maximizes spillovers.

Our proposal for the next stage of the research includes an experimental intervention designed to address questions raised in the last two points. The intervention would use information from the VAT schedules as shown in Section 6, and our study would allow to precisely measure its impact. We hope to implement this evaluation in collaboration with the URA in the coming months.

Appendix I (Section 3)

Yearly computation of risk scores for audit case selection $2010 - 2014$

Note: *formulas marked by a # need confirmation or further explanation*

Final risk score
$$= \frac{Total\ score * 100}{Highest\ weight\ of\ parameter * Total\ number\ of\ applicabe\ parameters}$$

1. *Fiscal years* $2010 - 2011$ *and* $2011 - 2012$

1.1. 24 variables used in the score

$$Score = z_{adm} + z_{gross\_profit} + z_{imports1} + z_{imports2} + z_{input} + z_{late1} + z_{late2} + z_{late3} + z_{late4}$$
$$+ z_{net\_profit} + z_{nil1} + z_{nil2} + z_{nil3} + z_{nil4} + z_{nonfiler1} + z_{nonfiler2} + z_{nonfiler3}$$
$$+ z_{nonfiler4} + z_{nonfiler5} + z_{nonfiler6} + z_{offset1} + z_{offset2} + z_{operating\_exp}$$
$$+ z_{operating\_profit}$$

For each variable x, z_x *is* $x's$ *contribution to the risk score*
z_x *depends on the value of* x *and ranges from* 0 *to* 5
 # In theory $0 \leq score \leq 120$

1.2. Definitions, thresholds and weights used to calculate the contribution of each variable to the overall score

- $\forall x \in \{adm, gross\_profit,\ imports1,\ imports2,\ net\_profit,\ operating\_exp,\ operating\_profit \}$

$$z_x = 1 * I_{[1,10]}(x) +\ 2 * I_{[11,20]}(x) +\ 3 * I_{[21,30]}(x) +\ 4 * I_{[31,40]}(x) +\ 5 * I_{[41,50]}(x)$$

$$adm = \frac{administrative\ expenses}{turnover}$$

$$gross\_profit = Gross\ profit\ margin$$

$$\#\ imports1 = \frac{imports\ per\ IT\ return}{imports\ per\ Asycuda + +}$$

$$\#\ imports2 = \frac{imports\ per\ VAT\ return}{imports\ per\ Asycuda++}$$

$$net\_profit = Net\ profit\ margin$$

$$operating\_exp = \%\ increase\ in\ \frac{operating\ expenses}{turnover}$$

$$operating\_profit = Operating\ profit\ margin$$

- $z_{input} =\ 1 * I_{[1,5]}(input) +\ 2 * I_{[6,10]}(input) +\ 3 * I_{[11,15]}(input) +\ 4 * I_{[16,20]}(input) +\ 5 * I_{[21,50]}(input)$

$$input = \%\ increase\ in\ \frac{input\ tax}{total\ purchases}$$

- $\forall x \in \{late1 \dots late4,\ nil1 \dots nil4,\ nonfiler1 \dots nonfiler6,\ offset2\}$

$$z_x = 3 * I_{[1,2]}(x) + \ 4 * I_{[3,4]}(x) + \ 5 * I_{[5,12]}(x)$$

$$late1 = occurrences\ of\ late\ filing\ for\ GPBT\ (gaming\ and\ pool\ betting\ tax)$$

$$late2 = occurrences\ of\ late\ filing\ for\ LED\ (local\ excise\ duty)$$

$$late3 = occurrences\ of\ late\ filing\ for\ PAYE$$

$$late4 = occurrences\ of\ late\ filing\ for\ VAT$$

$$nil1 = occurrences\ of\ nil\ filing\ for\ GPBT\ (gaming\ and\ pool\ betting\ tax)$$

$$nil2 = occurrences\ of\ nil\ filing\ for\ LED\ (local\ excise\ duty)$$

$$nil3 = occurrences\ of\ nil\ filing\ for\ PAYE$$

$$nil4 = occurrences\ of\ nil\ filing\ for\ VAT$$

$$nonfiler1 = occurrences\ of\ non-filing\ for\ excise$$

$$nonfiler2 = occurrences\ of\ non-filing\ for\ GPBT\ (gaming\ and\ pool\ betting\ tax)$$

$$nonfiler3 = occurrences\ of\ non-filing\ for\ IT$$

$$nonfiler4 = occurrences\ of\ non-filing\ for\ PAYE$$

$$nonfiler5 = occurrences\ of\ non-filing\ for\ VAT$$

$$nonfiler6 = occurrences\ of\ non-filing\ for\ withholding\ tax$$

$$offset2 = frequency\ of\ VAT\ offsets\ and/or\ refunds$$

- $z_{offset1} = 1 * I_{[5,9]}(offset1) + \ 2 * I_{]9,14]}(offset1) + 3 * I_{]14,19]}(offset1) + \ 4 * I_{]19,20]}(offset1) + \ 5 * I_{]20,10000]}(offset1)$

$$note\text{: }all\ values\ are\ in\ millions\ of\ UGX$$

$$offset1 = amount\ of\ VAT\ offsets\ and/or\ refunds$$

2. *Fiscal years* $2012-2013$ *to* $2014-2015$

→ Variables related to late filing of certain taxes were deleted ($z_{late1} \dots z_{late4}$)

→ The variable related to net profit margin was deleted (z_{net_profit})

→ Thresholds were changed for variables related to administrative expenses, gross profits, non-filing of PAYE, non-filing of VAT, amounts of VAT offset/refund.

→ We only display computations for the variables for which these changes occurred

2.1. *19 variables used in the score*

$$Score = z_{adm} + z_{gross\_profit} + z_{imports1} + z_{imports2} + z_{input} + z_{nil1} + z_{nil2} + z_{nil3} + z_{nil4}$$
$$+ z_{nonfiler1} + z_{nonfiler2} + z_{nonfiler3} + z_{nonfiler4} + z_{nonfiler5} + z_{nonfiler6}$$
$$+ z_{offset1} + z_{offset2} + z_{operating\_exp} + z_{operating\_profit}$$

2.2.   *Thresholds and weights used to calculate the contribution of each variable to the overall score if changed compared to FY2011-2012*

- $\forall x \in \{adm, gross\_profit\}$

$$z_x = 1 * I_{[1,5]}(x) + 2 * I_{[6,10]}(x) + 3 * I_{[11,15]}(x) + 4 * I_{[16,20]}(x) + 5 * I_{[21,50]}(x)$$

- $\forall x \in \{nonfiler4, nonfiler5\}$

$$z_x = 3 * I_{[0,2]}(x) + 4 * I_{[3,4]}(x) + 5 * I_{[5,12]}(x)$$

→ The only difference with previous years is that a firm gets $z_x = 3$ even if there are zero occurrences of non-filing of VAT / non-filing of PAYE.

- $z_{offset1} = 1 * I_{[5,10]}(offset1) + 2 * I_{]10,15]}(offset1) + 3 * I_{]15,20]}(offset1) + 4 * I_{]20,25]}(offset1) + 5 * I_{]25,30]}(offset1)$

note: *all values are in millions of UGX*

Appendix II (Section 5)

Figure A.5.1 Kernel density estimation for total sales of audited and non-audited firms

Figure A.5.2 Kernel density estimation for number of employees of audited and non-audited firms

Figure A.5.3 Kernel density estimation for administrative expenses of audited and non-audited firms

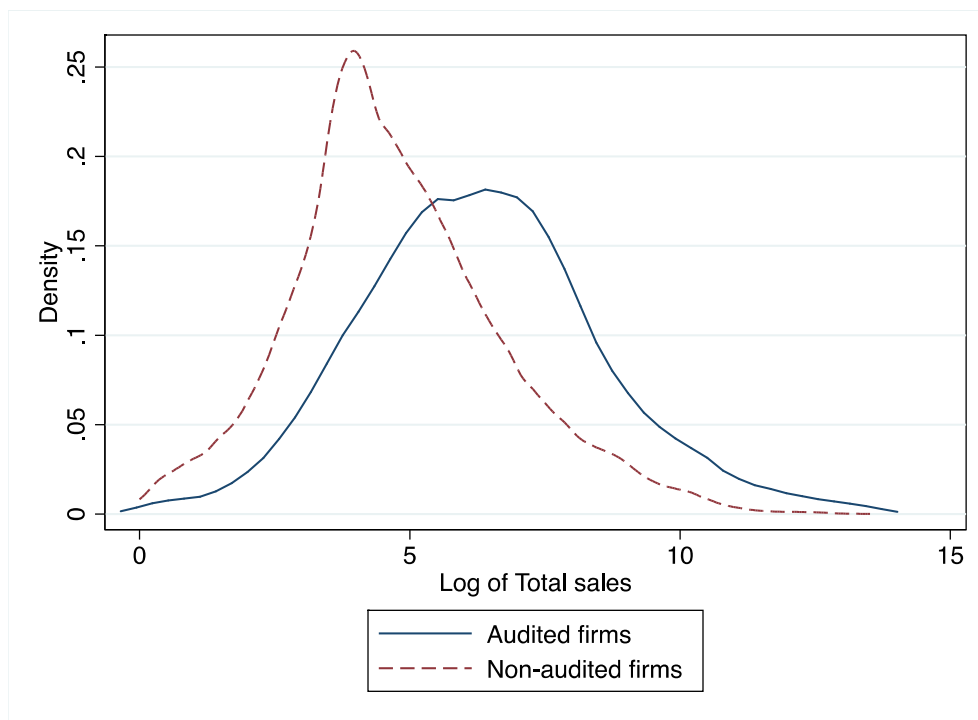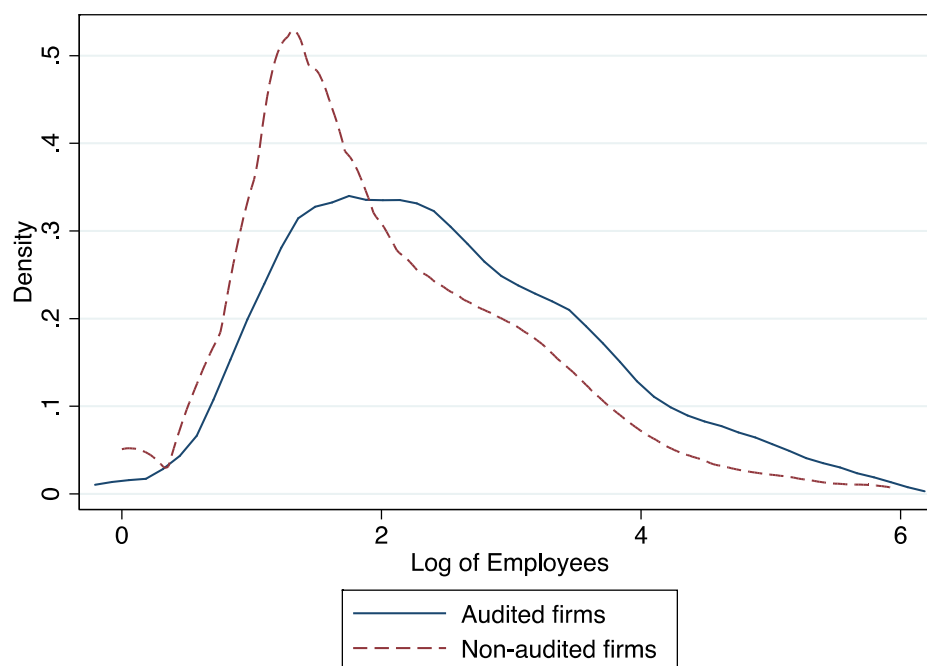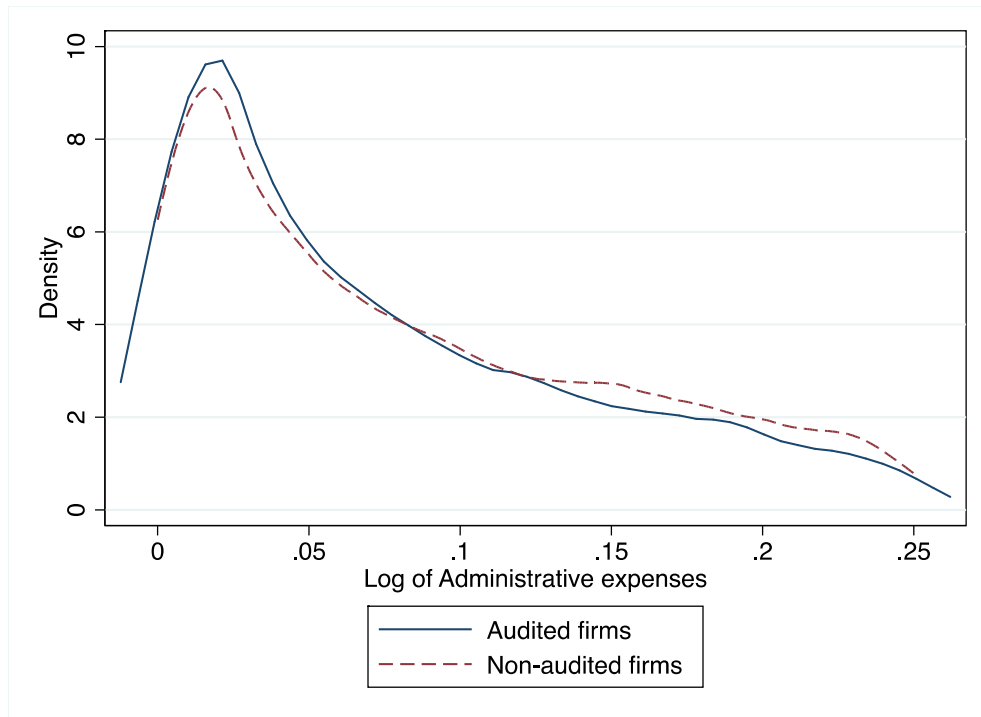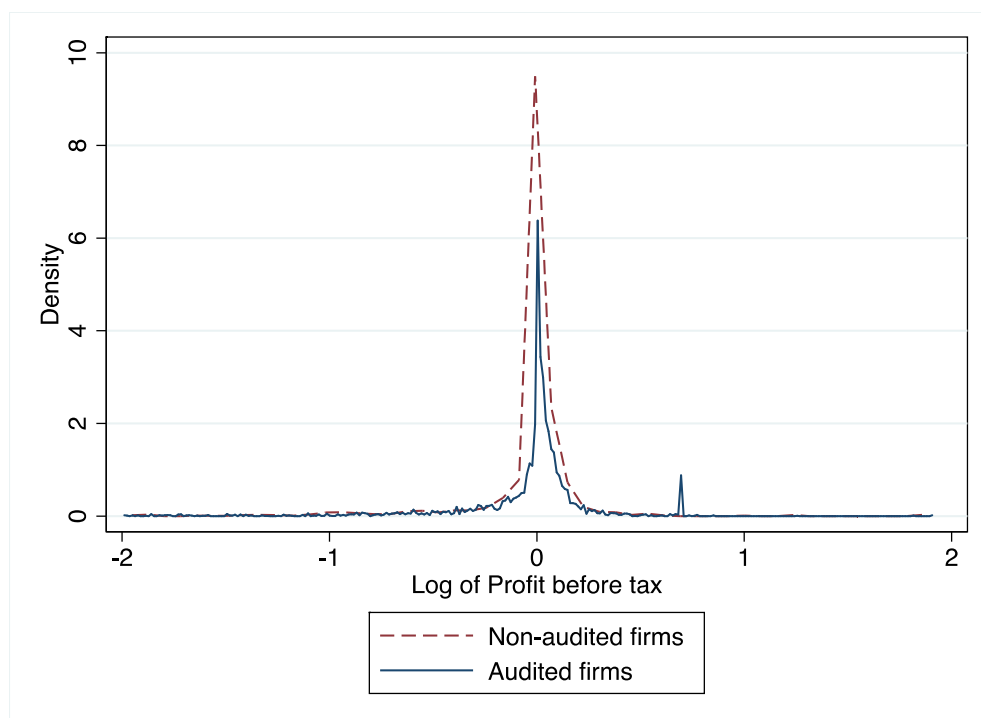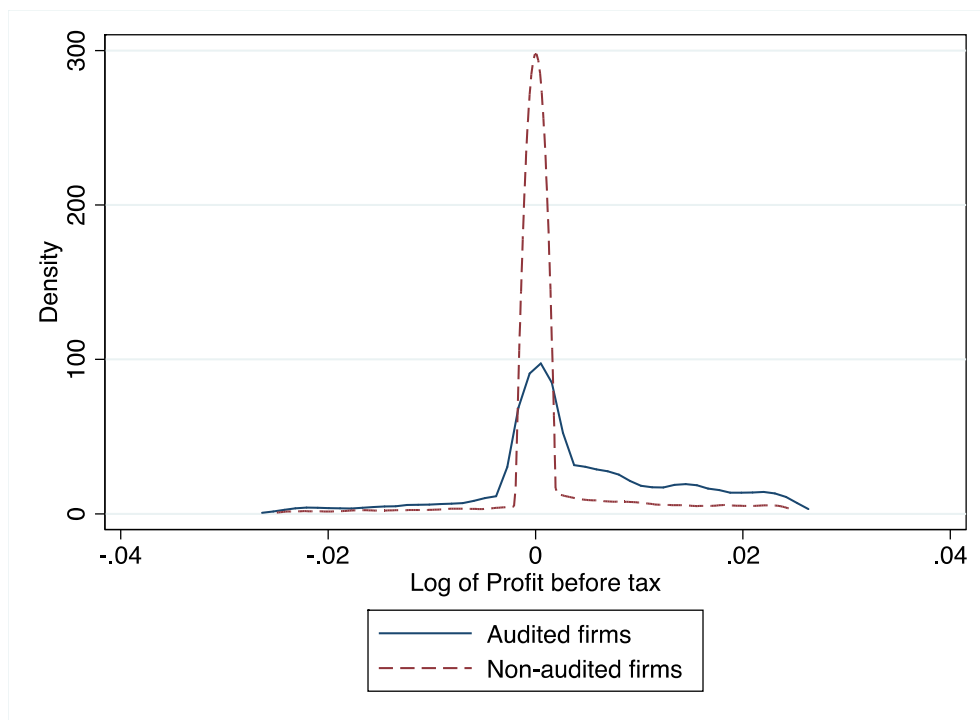**Figure A.5.4 Kernel density estimation for profits of audited and non-audited firms**

Figure A.5.5 Kernel density estimation for profits of audited and non-audited firms – log(profit) rescaled from -0.025 to 0.025

Table A.5.1 Regression of audit yield on auditor characteristics only

VARIABLES	(1) Dependent variable: ln(1+paid)	(2) Dependent variable: paid (IHS)	(3) Dependent variable: ln(1+total_assessed)	(4) Dependent variable: tot_assessed (IHS)	(5) Dependent variable: proportion_paid
	OLS	OLS	OLS	OLS	OLS
age	0.062***	0.068***	0.062***	0.064***	0.005
	(0.017)	(0.019)	(0.016)	(0.017)	(0.003)
male	-1.191***	-1.305***	-2.162***	-2.275***	-0.113*
	(0.327)	(0.366)	(0.408)	(0.424)	(0.066)
tenure	-0.118***	-0.124***	-0.131***	-0.133***	-0.007
	(0.028)	(0.031)	(0.027)	(0.029)	(0.005)
complete_pg	1.041***	1.114***	1.259***	1.309***	0.060
	(0.238)	(0.265)	(0.284)	(0.295)	(0.046)
training	0.003	0.031	0.093	0.093	0.042
	(0.248)	(0.279)	(0.287)	(0.304)	(0.048)
poditra	0.315*	0.363*	0.147	0.158	0.107***
	(0.182)	(0.205)	(0.181)	(0.190)	(0.033)
raven_score	-0.067*	-0.065*	-0.086**	-0.086**	0.006
	(0.035)	(0.039)	(0.037)	(0.040)	(0.006)
job_skills	0.034	0.027	0.190***	0.195***	-0.017**
	(0.042)	(0.047)	(0.042)	(0.045)	(0.008)
BFI scores:					
extraversion	-2.039***	-2.203***	-3.330***	-3.478***	-0.172
	(0.585)	(0.653)	(0.519)	(0.545)	(0.106)
agreeableness	-0.237	-0.250	0.009	-0.041	-0.006
	(0.375)	(0.418)	(0.368)	(0.383)	(0.066)
conscientiousness	1.512***	1.559***	1.544***	1.497***	0.000
	(0.414)	(0.463)	(0.491)	(0.513)	(0.078)
neuroticism	-0.185	-0.147	0.632	0.745	-0.078
	(0.539)	(0.607)	(0.535)	(0.565)	(0.110)
openness	-0.413	-0.393	-1.704***	-1.739***	0.114*
	(0.275)	(0.313)	(0.287)	(0.303)	(0.062)
Audit type (Ref: Desk):					
Comprehensive	1.500***	1.699***	1.908***	2.058***	0.081**
	(0.148)	(0.168)	(0.139)	(0.148)	(0.032)
Issue	0.539***	0.609***	0.911***	0.996***	0.038
	(0.092)	(0.107)	(0.111)	(0.120)	(0.025)
Constant	0.722	0.935	1.196	1.642	0.475**
	(1.129)	(1.262)	(1.254)	(1.314)	(0.216)
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	1,921	1,921	1,921	1,921	1,884
R-squared	0.160	0.156	0.222	0.215	0.086

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS regressions with auditor characteristics only. The dependent variable paid (IHS) in column 2 is the inverse hyperbolic transformation of the total paid, and In column 4, the dependent variable is the inverse hyperbolic transformation of total assessed. In column 5, the dependent variable is proportion paid, where proportion paid = total paid/total assessed. Tenure is the number of years spent working at the URA. Complete_pg indicates having completed postgraduate education, versus incomplete postgraduate or complete undergraduate. Training is an indicator for completing ACCA or CPA courses. Job_skills is the score obtained in the knowledge questionnaire. The omitted category of audit type is Desk

VARIABLES	(1) Dependent variable: ln(1+paid) OLS	(2) Dependent variable: paid (IHS) OLS	(3) Dependent variable: ln(1+total_assessed) OLS	(4) Dependent variable: tot_assessed (IHS) OLS	(5) Dependent variable: proportion_paid OLS
lntotalsales	0.010	0.008	0.180***	0.186***	-0.009**
	(0.048)	(0.050)	(0.036)	(0.037)	(0.004)
ln_employees	0.399***	0.411***	0.466***	0.473***	0.020**
	(0.096)	(0.101)	(0.074)	(0.075)	(0.008)
Sector (Ref: Others):					
Manufacturing	0.198	0.186	0.017	0.013	0.025
	(0.418)	(0.435)	(0.312)	(0.317)	(0.032)
Construction	0.675	0.694	0.154	0.172	-0.010
	(0.438)	(0.457)	(0.312)	(0.316)	(0.031)
Real est. and bus. serv.	-0.003	-0.011	0.304	0.309	-0.017
	(0.398)	(0.416)	(0.302)	(0.307)	(0.030)
Transport, stor., comm.	-0.221	-0.245	0.196	0.191	-0.047
	(0.377)	(0.394)	(0.288)	(0.293)	(0.030)
Wholesale & retail trade	-0.046	-0.055	0.108	0.117	0.008
	(0.350)	(0.365)	(0.265)	(0.268)	(0.025)
admin_expense	0.602	0.687	-1.184**	-1.183**	0.035
	(0.737)	(0.769)	(0.561)	(0.570)	(0.058)
profit_before_tax	0.671	0.726	0.101	0.141	0.046
	(0.615)	(0.640)	(0.461)	(0.468)	(0.046)
Audit type (Ref: Desk):					
Comprehensive	3.812***	4.022***	1.779***	1.839***	0.128***
	(0.360)	(0.375)	(0.267)	(0.270)	(0.026)
Issue	1.260***	1.317***	0.459**	0.472**	0.053**
	(0.275)	(0.288)	(0.210)	(0.214)	(0.023)
Constant	-0.121	0.275	0.569	1.062**	0.632***
	(0.515)	(0.541)	(0.416)	(0.428)	(0.052)
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	2,639	2,639	2,639	2,639	2,576
R-squared	0.179	0.171	0.582	0.579	0.071

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS regressions with taxpayer characteristics only. The dependent variable paid (IHS) in column 2 is the inverse hyperbolic transformation of the total paid, and In column 4, the dependent variable is the inverse hyperbolic transformation of total assessed. In column 5, the dependent variable is proportion paid, where proportion paid = total paid/total assessed. Sectors are Manufacturing; Construction; Real estate and business services; Transport, storage and communication; Wholesale and retail trade. The omitted category is "Other sectors". The audit risk parameters admin_expense and profit_before_tax are expressed as a ratio to total sales. ". The omitted category of audit type is Desk.

Table A.5.3 Results from regression where audit type variable *comprehensive* is interacted with auditor and taxpayer characteristics (equation 2)

VARIABLES	(1) Dependent variable: ln(1+paid) OLS	(2) Dependent variable: paid (IHS) OLS	(3) Dependent variable: ln(1+total_assessed) OLS	(4) Dependent variable: tot_assessed (IHS) OLS	(5) Dependent variable: proportion_paid OLS
age	0.023	0.025	0.069**	0.072**	-0.001
	(0.030)	(0.034)	(0.030)	(0.032)	(0.007)
male	-0.387	-0.360	-2.507***	-2.621***	0.064
	(0.504)	(0.582)	(0.593)	(0.617)	(0.129)
tenure	-0.058	-0.057	-0.114***	-0.116***	0.001
	(0.040)	(0.046)	(0.040)	(0.041)	(0.008)
complete_pg	0.453	0.483	0.479	0.524	0.071
	(0.365)	(0.417)	(0.368)	(0.386)	(0.088)
training	-0.131	-0.095	-0.323	-0.307	0.092
	(0.451)	(0.517)	(0.460)	(0.492)	(0.099)
poditra	-0.106	-0.113	-0.062	-0.069	0.082
	(0.296)	(0.338)	(0.270)	(0.288)	(0.062)
raven_score	-0.011	-0.001	-0.055	-0.055	0.012
	(0.060)	(0.069)	(0.056)	(0.060)	(0.012)
job_skills	-0.060	-0.072	0.067	0.073	-0.028*
	(0.072)	(0.083)	(0.069)	(0.074)	(0.016)
BFI scores:					
extraversion	-0.968	-0.962	-3.918***	-4.102***	0.111
	(0.845)	(0.966)	(0.898)	(0.939)	(0.199)
agreeableness	-0.146	-0.154	-0.644	-0.708	0.092
	(0.535)	(0.602)	(0.460)	(0.483)	(0.104)
conscientiousness	1.086*	1.118*	0.686	0.656	-0.000
	(0.576)	(0.654)	(0.552)	(0.585)	(0.125)
neuroticism	0.718	0.926	0.717	0.748	0.126
	(0.897)	(1.026)	(0.879)	(0.928)	(0.207)
openness	-0.034	0.057	-1.026**	-1.048**	0.253**
	(0.404)	(0.470)	(0.414)	(0.440)	(0.116)
lntotalsales	0.032	0.034	0.122***	0.126***	-0.007
	(0.032)	(0.037)	(0.038)	(0.040)	(0.008)
ln_employees	0.348***	0.374***	0.295***	0.301***	0.047***
	(0.086)	(0.096)	(0.073)	(0.077)	(0.016)
Sector (Ref: Others):					
Manufacturing	-0.188	-0.190	-0.292	-0.295	0.034
	(0.259)	(0.298)	(0.259)	(0.277)	(0.061)
Construction	-0.143	-0.188	0.618**	0.686***	-0.071

	(0.288)	(0.330)	(0.245)	(0.263)	(0.061)
Real est. And bus.serv.	0.447	0.494	0.452*	0.476*	0.063
	(0.273)	(0.314)	(0.255)	(0.276)	(0.063)
Transport, stor., comm.	0.100	0.105	0.130	0.119	0.048
	(0.240)	(0.277)	(0.250)	(0.269)	(0.061)
Wholesale &retail trade	-0.208	-0.266	0.033	0.043	-0.023
	(0.229)	(0.262)	(0.224)	(0.239)	(0.052)
admin_expense	0.385	0.503	-0.775*	-0.762	0.120
	(0.505)	(0.574)	(0.458)	(0.488)	(0.120)
profit_before_tax	1.045**	1.143**	0.940**	1.030**	0.077
	(0.415)	(0.467)	(0.378)	(0.407)	(0.095)
Audit type (Ref: Desk):					
Comprehensive	-0.387	-0.131	1.342	1.806	-0.249
	(3.928)	(4.392)	(3.127)	(3.249)	(0.628)
Issue	0.255	0.279	0.512***	0.562***	0.003
	(0.175)	(0.202)	(0.189)	(0.200)	(0.046)
Comprehensive*lntotalsales	0.087	0.097	-0.066	-0.061	0.030*
	(0.089)	(0.100)	(0.090)	(0.097)	(0.016)
Comprehensive*employees	0.181	0.188	0.170	0.171	0.021
	(0.230)	(0.256)	(0.152)	(0.160)	(0.036)
Comprehensive*adminexpense	-0.137	-0.169	1.120	1.142	-0.355
	(1.283)	(1.435)	(0.924)	(0.967)	(0.231)
Sector (Ref: Others):					
Comprehensive*Manufacturing	0.355	0.338	0.664	0.674	0.015
	(0.704)	(0.789)	(0.445)	(0.464)	(0.120)
Comprehensive*Construction	0.196	0.232	-0.763	-0.852	0.144
	(0.784)	(0.874)	(0.592)	(0.621)	(0.131)
Comprehensive*Real est. and bus. serv.	0.522	0.581	-0.212	-0.231	0.126
	(0.635)	(0.717)	(0.454)	(0.477)	(0.118)
Comprehensive*Transport, stor., comm.	0.682	0.739	0.297	0.296	0.147
	(0.669)	(0.747)	(0.542)	(0.572)	(0.119)
Comprehensive*Wholesale & retail trade	0.803	0.946	-0.185	-0.210	0.221**
	(0.657)	(0.730)	(0.449)	(0.470)	(0.111)
Comprehensive*lnprofitbefore_tax	-0.152	-0.204	-0.755	-0.827	0.114
	(0.837)	(0.946)	(0.606)	(0.637)	(0.170)
Comprehensive*age	-0.045	-0.053	-0.029	-0.032	-0.008
	(0.076)	(0.086)	(0.055)	(0.058)	(0.013)
Comprehensive*male	1.824	1.997	1.320	1.310	0.330
	(1.522)	(1.697)	(1.437)	(1.537)	(0.260)
Comprehensive*tenure	0.081	0.088	-0.017	-0.019	0.020
	(0.082)	(0.092)	(0.071)	(0.076)	(0.014)
Comprehensive*complete_pg	0.481	0.528	0.360	0.275	-0.082
	(0.896)	(0.997)	(0.689)	(0.723)	(0.150)
Comprehensive*training	-0.024	-0.052	-0.437	-0.499	-0.098
	(0.923)	(1.032)	(0.809)	(0.851)	(0.153)

Comprehensive*poditra	-0.414	-0.492	0.079	0.130	-0.184
	(0.778)	(0.869)	(0.598)	(0.622)	(0.120)
Comprehensive*raven_score	0.101	0.107	-0.098	-0.103	0.025
	(0.140)	(0.158)	(0.112)	(0.117)	(0.020)
Comprehensive*job_skills	-0.097	-0.115	0.123	0.112	-0.015
	(0.178)	(0.201)	(0.142)	(0.148)	(0.028)
BFI scores:					
Comprehensive*extraversion	3.311	3.747	1.697	1.778	0.534
	(2.496)	(2.768)	(1.886)	(1.990)	(0.379)
Comprehensive*agreeableness	-2.625**	-2.883**	1.021	1.077	-0.542***
	(1.281)	(1.434)	(0.824)	(0.852)	(0.187)
Comprehensive*conscientiousness	1.014	1.133	0.583	0.498	0.096
	(1.401)	(1.567)	(1.091)	(1.167)	(0.232)
Comprehensive*neuroticism	-0.432	-0.663	-1.170	-1.080	-0.332
	(2.670)	(2.999)	(2.127)	(2.258)	(0.420)
Comprehensive*openness	-0.556	-0.666	-1.830**	-1.821*	-0.099
	(1.100)	(1.228)	(0.905)	(0.940)	(0.186)
Constant	1.856	2.137	1.582	1.950	0.548
	(1.843)	(2.108)	(1.923)	(2.051)	(0.398)
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	884	884	884	884	864
R-squared	0.232	0.220	0.341	0.329	0.143

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS regressions with auditor and taxpayer characteristics, and the interaction of the audit type variable "Comprehensive" with auditor and taxpayer characteristics. The dependent variable paid (IHS) in column 2 is the inverse hyperbolic transformation of the total paid, and In column 4, the dependent variable is the inverse hyperbolic transformation of total assessed. In column 5, the dependent variable is proportion paid, where proportion paid = total paid/total assessed. Complete_pg indicates having completed postgraduate education, versus incomplete postgraduate or complete undergraduate. Training is an indicator for completing ACCA or CPA courses. Job_skills is the score obtained in the knowledge questionnaire. Sectors are Manufacturing; Construction; Real estate and business services; Transport, storage and communication; Wholesale and retail trade. The omitted category is "Other sectors". The audit risk parameters admin_expense and profit_before_tax are expressed as a ratio to total sales. The omitted category of audit type is Desk.

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