

# **CORPORATE INCOME TAX AUDITS EVALUATION**

**May 2021**

**Joint paper between RRA and TARAC**

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**RWANDA REVENUE AUTHORITY**  
TAXES FOR GROWTH AND DEVELOPMENT

## Corporate Income Tax Audits Evaluation

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### Summary

Tax audits are a critical component of the compliance activities of Revenue Authorities and they have a specific deterrent effect enhancing voluntary compliance by ensuring audited taxpayers comply with the provision of the current tax laws and regulations. Additionally, tax audits contribute to taxpayers' education on the application of tax laws and also identify improvements in procedures needed for an efficient and fair tax system.

Following the cooperation agreement between the Rwanda Revenue Authority (RRA) and the Tax Administration Research Centre (TARC), RRA and TARC embarked on a collaborative project to

1. Evaluate the impact (and significance) of RRA Corporate Income Tax (CIT) audits on revenues and compliance, and
2. Assess the effectiveness of different types of audit approaches.

This project was viewed by RRA Management of significant importance and the assessment reached would feed into recommendations on the allocation of audit staff across different activities in RRA but also provide guidance and input into RRA's Future Operating Model which will lay out the institutional organization RRA, including the tax audit function.

The study's findings are:

- CIT audits contribute to compliance: On average CIT audited enterprises tend to report 20.7% more CIT income the year after the start of the audit process, relative to comparable taxpayers who have not been audited.
- CIT audits contribute to 12.3% more payable CIT tax declared by audited enterprises the year after the audit process that corresponds to approximately 2.8% of total CIT payable declared by all CIT enterprises that year.
- CIT compliance, following the tax audit, diminishes as time passes.
- The impact on CIT compliance is driven by audited enterprises who have been found non-compliant. For the enterprises who have been found compliant the evidence is

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inconclusive.

- The evidence suggests the type of CIT audit matters:
  - Comprehensive Audits have a significant aggregate **positive** compliance effect (one year after the audit) whereas
  - Desk and Issue audits have a significant aggregate **negative** compliance effect the second/third year after the start of the audit process.

## Recommendations

1. The positive impact of comprehensive audits on compliance is short-lived (one year). There is evidence that carefully designed ‘nudging’ (which reduces ‘noise’) may have positive impact on compliance. An **information campaign** (for example sms/letter/email notification, and advisory visits where necessary), targeting audited enterprises before, during, but also after the audit process might extend the compliance impact of those audits. The impact of this policy should be **carefully evaluated** as behavioral responses might be unpredictable and revenue reducing.
2. The analysis has been unable to identify whether the positive impact of audits is the same across the audited enterprise population or whether it varies across types of enterprises. **Additional analysis of this is required.**
3. Desk and Issue audits are important types of audit representing together on average around 58% of audits across the 4 audit waves (2013-2016), but their negative impact is worrying, especially given the increase reliance, following COVID-19, on such audits. It is likely that the negative impact means that taxpayers realize that it pays to increase underreporting following the audit. To mitigate this, an **information campaign** should be considered together with other options such as, for example, specific **follow-up campaigns** targeting audited enterprises after the completion of the audit process.
4. The analysis has been unable to identify whether this negative impact is the same across the audited business population or whether it varies across types of enterprise and size of enterprise. **Additional analysis of this is required.**
5. **Accurate and complete reporting** depends on accurate documentation kept by enterprises. We have been unable to determine, due to lack of information, the extent of wilful underreporting and underreporting caused by inadvertent error due to ignorance or confusion about the tax law. Better information on audits is required (see also point 7 below).
6. Compliance and the impact on compliance of audits depend on the **quality of tax audits**. The Research Team had no access to data on this and therefore the have not been able to

evaluate it. **This requires further investigation.**

7. **Audit data collected must be enriched** to include, for example, more descriptive and detailed information on the type/source of non-compliance identified (e.g. overinflated losses, undeclared income) and other characteristics related to the process followed, such as information on audit intensity (such as, auditors' characteristics, time spent on the audit process). This will also help to further investigate and understand the reasons of the different behavioral impact of the different types of audit. In addition, we have also been unable to look in detail at the sectors most likely to underreport. It would have been desirable to have more information on sectors (2-3-4 digits) for more targeted check on businesses.
8. VAT has not been excluded as tax base but it has not been the main focus. It is recommended that present analysis is complemented with a **report on VAT audits**.
9. Key to audits is risk criteria designed by operational knowledge and its statistical updating. **Evaluating the appropriateness of the current risk-based audit selection process** and its capability in identifying the taxpayers more likely to be noncompliant **would be desirable** to enhance the performance and the efficiency of the whole audit process.
10. There is evidence that interdependence matters in tax evasion decisions. Network effects typically arise because individuals exchange their experience with other peers, so they tend to influence and be influenced by the tax evasion behavior of other taxpayers. Audits play a crucial role in this process and it would be desirable to further investigate this issue by **estimating the indirect network effect of audits** on deterring future noncompliance of taxpayers who did not experienced an audit but belong to the network of taxpayers who have.
11. Finally, it would be desirable to expand the scope of this project by analyzing the **role** that **Electronic Billing Machines** has been playing **in shaping compliance** since their introduction.

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## **Acronyms**

ATT	Average Treatment Effect on the Treated
CEM	Coarsened Exact Matching
CIT	Corporate Income Tax
MHD	Mahalanobis Distance Metric Matching
IPTW	Inverse Probability of Treatment Weighting
RRA	Rwanda Revenue Authority
TARC	Tax Administration Research Centre
VAT	Value Added Tax

## 1. Introduction<sup>4</sup>

The mission of the Rwanda Revenue Authority (RRA) is to mobilise revenue for economic development through efficient and equitable services that promote economic growth. Revenue mobilisation is necessary for the provision of much needed basic public goods/services but also to reduce the fiscal deficit as well reduce reliance on foreign aid. In fulfilling this mandate, RRA's key objectives are aimed at improving compliance and optimizing revenue collection. Taxpayers have the obligation to report and pay taxes, and thus contribute to the economic growth and development of Rwanda.<sup>5</sup>

Following the cooperation agreement between the Rwanda Revenue Authority and the Tax Administration Research Centre (TARC), RRA and TARC embarked on a project with aim to

1. Evaluate the impact (and significance) of audit on revenue and compliance and
2. Assess the effectiveness of different types of audit approaches.

Rwanda is country that embraces reforms. Over the years RRA have taken important steps to improve service delivery and enhance tax compliance. These include, among others, intensification of tax education and information programs, monitoring of non-filers and non-payers, enhancement of EBM V.2, enhancement of e-tax system and local government tax management system, integration of e-tax system with the local government tax management system and further progress towards enhancement of the Electronic Single Window System. RRA however faces challenges which might hinder its performance and service delivery. The main ones include COVID-19 outbreak and associated mitigation measures that had a large impact on economic activity and a significant bearing on high domestic tax arrears, low tax compliance culture by some taxpayers and insufficient allocated budget to clear all VAT refund backlog.

Tax audits can affect taxpayer's behaviour in three ways. First, there is a direct effect represented by the adjustments on the audited return. This is the direct outcome of the audit process uncovering underreporting and applying fines. Second, there is a direct (specific) deterrence effect on the future behaviour of taxpayers who have been audited, and finally there is an indirect (general) deterrence effect, that is, the impact of auditing on those who have not experienced an audit but belong to the network of audited taxpayers (spillover effect). This report focuses on the estimation of the direct (specific) deterrence effect on the future reporting behaviour of audited taxpayers.

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<sup>4</sup> Without implicating, discussions with Kieran Byrne, Brian Erard, Julian Jamison, participants at the 8<sup>th</sup> TARC Annual Conference and the TARC Workshop on Tax Audits Evaluation is grateful acknowledged. TARC is a Research Centre funded by ESRC (Economic and Social Research Council) whose support is gratefully acknowledged. TARC's mission is to deliver outstanding interdisciplinary research in tax administration and policy that addresses the major challenges and strategic priorities confronting policymakers and tax authorities. The replication codes supporting this research have been submitted to the Rwanda Revenue Authority. Regarding errors and omissions the standard caveat for scientific research applies.

<sup>5</sup> Tax Compliance Improvement Plan (2019-2020), Rwanda Revenue Authority.

To answer the questions posed at the outset the Research Team combined several sources of data constituting a unique administrative dataset which included the universe of Corporate Income Taxes (CIT), Value Added Tax (VAT) for the period 2011-2018 and the universe of risk-based audit data for the period 2013-2016 including information on the risk rules and criteria with the corresponding risk weighting scheme employed by the RRA to risk-score CIT filers for audit selection. The CIT and VAT tax bases constitute just under 50% of tax revenues collected in Rwanda.

The results suggests the presence of a pro-deterrent effect of RRA audits on future noncompliance of the CIT tax base. In particular, audited taxpayers tend to report on average about 20.7% more taxable income the year after the start of the audit process, relative to similar matched taxpayers who have not been audited, and about 12.3% more CIT payable that corresponds to roughly 2.8% of total CIT payable declared by tax filers that year. The effect is lower in magnitude after 2 and 3 years but not statistically significant. As in previous contributions in the literature, the research team have also analysed the differential effect that audits have had based on the audit outcome. The findings suggest that the aggregate impact of audits is completely driven by the change in behaviour of audited taxpayers identified to be non-compliant while the analysis is not conclusive for taxpayers identified as compliant.

RRA relies on different type of audit to enforce tax compliance. In general, the main characteristic that distinguish audits is whether they are implemented by correspondence (desk-based) or in-person (comprehensive). Desk based and comprehensive face-to-face audits are substantially different types of examinations: The former being in general more narrowly focused on single aspects of the tax return, more impersonal and certainly administratively for RRA (and the taxpayer) less costly to undertake. Instead, comprehensive audits are in-depth in-person examinations that may examine several tax bases. The analysis shows that the type of audit matters: Comprehensive audits drive the aggregate pro-deterrence result while Desk and Issue audits tend to have opposite effect on the second year from the start of the audit process. The analysis establishes the aggregate impact of audits and has been unable to establish (due to data limitations) what drives the size of the impact of audits (that is, whether for example, it is driven by the size of enterprise, micro/small/medium/large or other characteristics specific to enterprises). This requires more analysis.

The structure of this report is as follows. Section 2 provides some institutional details and a discussion on the data and Section 3 discusses corporate income tax audits. Section 4 provides a brief overview of the related literature. Section 5 presents the methodology while section 6 presents the results of the analysis. Section 7 provides some concluding remarks.

## **2. Institutional details and data**

Any person/enterprise subject to any type of tax administered by RRA has to be registered in RRA and obtain a fiscal number before engaging in any economic activity of taxation relevance. CIT is

a tax on income generated by incorporated businesses. CIT income has to be declared annually before April of the following tax period. CIT constitutes, together with VAT, a significant part of the tax revenues collected. As shown in Table 1, Rwanda collects around 50% of its tax revenues from CIT (average across 2013-2018, 17.24%) and VAT (average across 2013-2018, 33.06%).

**Table 1: Distribution of revenues, selective years (as % of total revenues)**

<b>Tax revenues: structure</b>	<b>CIT</b>	<b>VAT</b>	<b>PIT</b>	<b>Excise</b>	<b>Custom duties</b>	<b>Other</b>
<b>2013/2014</b>	16	33.9	23.4	14.5	7.6	3.7
<b>2014/2015</b>	17.5	33.3	23.9	14	7.4	3.8
<b>2015/2016</b>	16.1	32.8	23.3	14	8.5	5.3
<b>2016/2017</b>	17.5	32.4	23.07	12.3	8.4	5.6
<b>2017/2018</b>	19.1	32.9	22.8	12	7.9	5.3

Note: The source of data is RRA (2019).

RRA classifies enterprises in Article 2 of the Ministerial Order N° 002/13/10/TC as follows: *Micro*-enterprises are defined as declaring a turnover of less than 12 million Rwf (USD \$ 13,380 as of February 2019 exchange rate) in a tax period; *Small*-enterprises have a turnover between Rwf 12 million and Rwf 50 million (USD \$ 55,750) in a tax period; and *Medium*-enterprises have a turnover higher than Rwf 50 million in a tax period. The law also specifies an enterprise in order to be classified as *Large*-enterprises it needs to be notified by the RRA so it is registered as a large taxpayer. The analysis that follows employs the classification of enterprises by their size provided to the Research Team by RRA in the official records of tax declarations.

Table 2 shows that the number of CIT taxpayers who submitted a tax return (called ‘filers’) has been increasing since 2011, with almost doubling in 2014 from 13,778 to 24,405 and steadily increase thereafter by almost 10% year on year.

**Table 2: Number of CIT filers by fiscal year (2011-2018)**

<b>Tax period</b>	<b>Total of CIT filers</b>
<b>2011</b>	10,260
<b>2012</b>	11,372
<b>2013</b>	13,778
<b>2014</b>	24,405
<b>2015</b>	29,174
<b>2016</b>	32,572
<b>2017</b>	36,793
<b>2018</b>	40,490

Note: Calculations based on data provided by RRA.

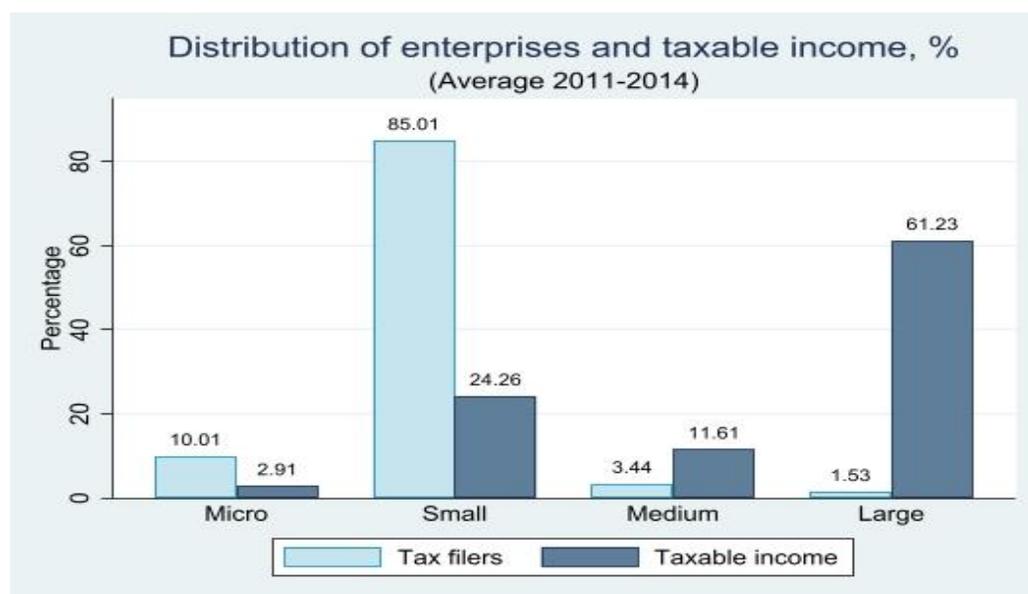
This increase in the number of CIT filers is attributed to a number of factors. First, with Law N°28/2012 (which modified and complemented Law N°16/2005 on direct taxes on income) RRA introduced the possibility for small enterprises to opt for a simplified revenue-based linear tax regime which requires paying a lump sum tax at the rate of 3% of their turnover. There is also a simplified flat revenue-based tax regime where micro-enterprise companies pay flat tax amounts between Rwf 60,000 and Rwf 300,000, as classified by their turnover. Enterprises that have opted for the simplified linear revenue-based tax regime and those eligible for the flat tax regime have to submit limited information to the RRA, namely their business income and tax payable. The linear tax regime entails a standard CIT rate of 30% on profit with some reductions available for specific groups. In addition to this in 2012 there was a revision of the responsibilities of Registration and Block Management division, where some responsibilities of the division were assigned to other divisions allowing the Registration and Block Management division to focus on following up on unregistered potential taxpayers. In 2014, there was also the establishment of Corporate Risk Management and Modernization department and through this the introduction of a more targeted approach on audits, which served as deterrence for noncompliance. 2016 saw the establishment of Compliance Monitoring division in Domestic Taxes Department with priority given to the follow-up on non-fillers and non-payers on regular basis.<sup>6</sup>

Graph 1 presents the average distribution of enterprises reporting CIT by size across the period 2011-2014 together with the corresponding share of revenues collected by size of the enterprises. Graph 2 presents the same figures for the period 2015-2018. Looking at the period 2011-2014, the large majority of enterprises filing a CIT declaration in Rwanda are identified as either Micro-enterprises (10.01%) or Small-enterprises (85.01%), with Medium-enterprises and Large-enterprises consisting together of roughly 5% of the total. The main share of tax revenues is collected from large/medium enterprises, which account together for 72.84% of total CIT revenues collected (61.23% Large, and 11.61% Medium).

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<sup>6</sup> Most enterprises make use of electronic billing machines, whose provision is described in Law n° 37/2012 of 09/11/2012 on the Code of Value Added Tax and the Ministerial Order no 002/13/10/TC of 31/07/2013. Article 18 specifies the three exempt categories from electronic billing machine registration. In particular, all non-VAT registered businesses are automatically qualified for exemption from the electronic billing machine. Exempt category II includes all VAT registered businesses where the scope of VAT sales is small compared to the company's total sales. Sales that sum up to 75% of the company's income derived from exempted services, are considered to belong with exempt category II. They must apply for an exemption. Exempt category III (three) includes all VAT registered businesses whose sales are only conducted during a limited portion of the year. However, any such taxpayer may not be exempted if sales are summed to at least 30 invoices during a calendar year. Such businesses need to apply for exemption.

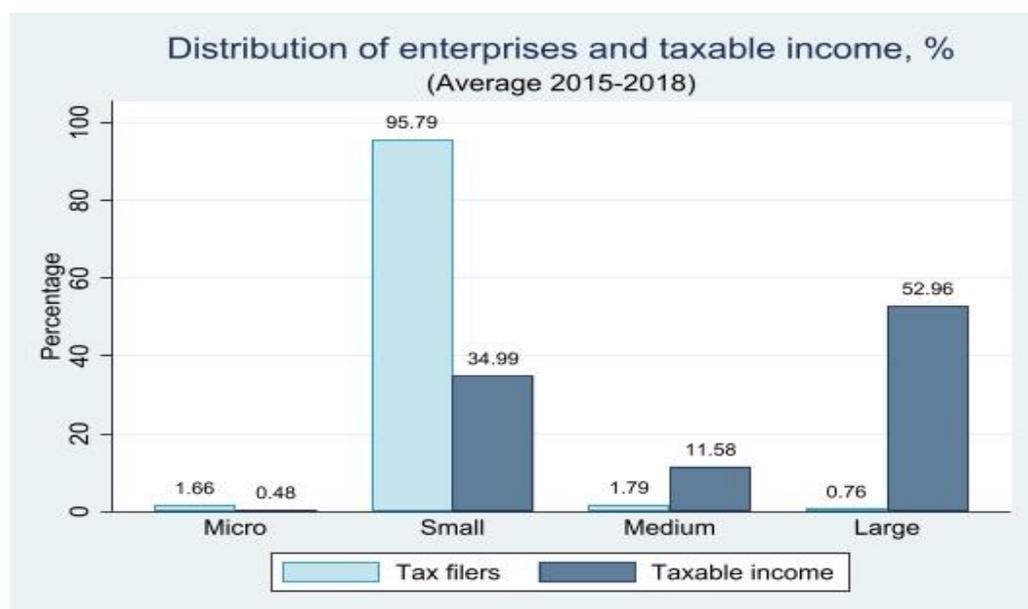
**Graph 1: Distribution of enterprises and taxable income declared (2011-2014)**



Note: Calculations are based on data provided by RRA.

The picture has changed marginally during the period 2015-2018, where the number of Micro-enterprises, Medium-enterprises and Large-enterprises declined. Medium-enterprises and Large-enterprises comprise of 2.55% of the population, Micro-enterprises 1.66% of the total whereas Small-enterprises 95.79% of the total. Still Large and Medium-enterprises account of 64.54% of total taxable income, which corresponds to 8.3% less taxable income declared in the period 2015-2018 relative to the period 2011-2014.

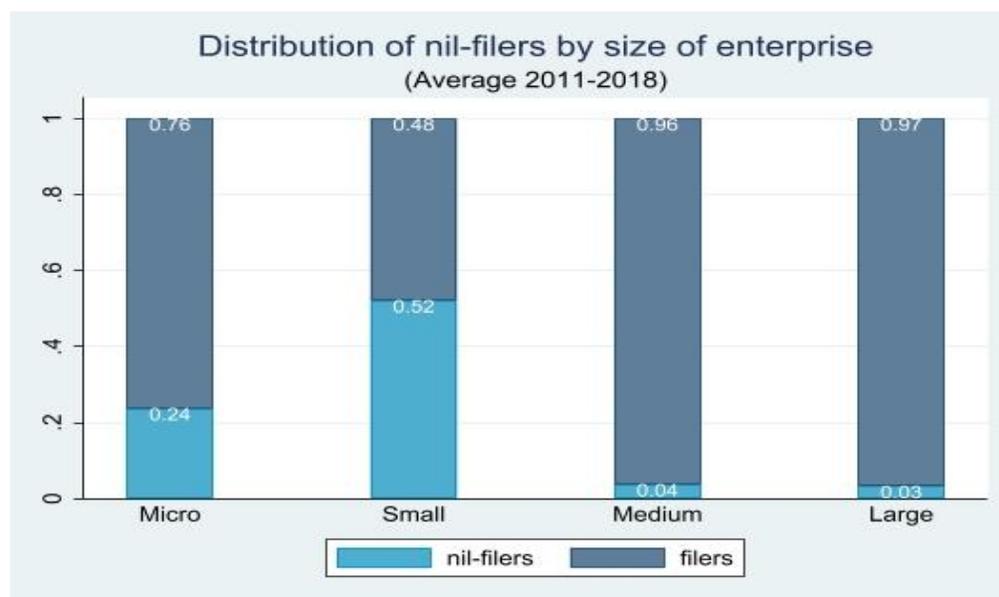
**Graph 2: Distribution of enterprises and taxable income declared (2015-2018)**



Note: Calculations are based on data provided by RRA.

A significant share of CIT filers are nil-filers. A nil-filer is a taxpayer who filed nil sales, input, output and other declaration element claiming not having operated any business activity during a given tax period. Graph 3 presents the average share of nil-filers and filers (those submitted a tax return and declared positive taxable income) by size of enterprise across the period 2011-2018. The majority of nil-filers belong to the categories of small and micro-enterprises. In particular, 24% of micro-enterprises are nil-filers while 52% of small-enterprises correspond to this category. The percentage of nil-filers is smaller for medium (3%) and large-enterprises (4%).

**Graph 3: Nil-filers and filers by size (2011-2018)**

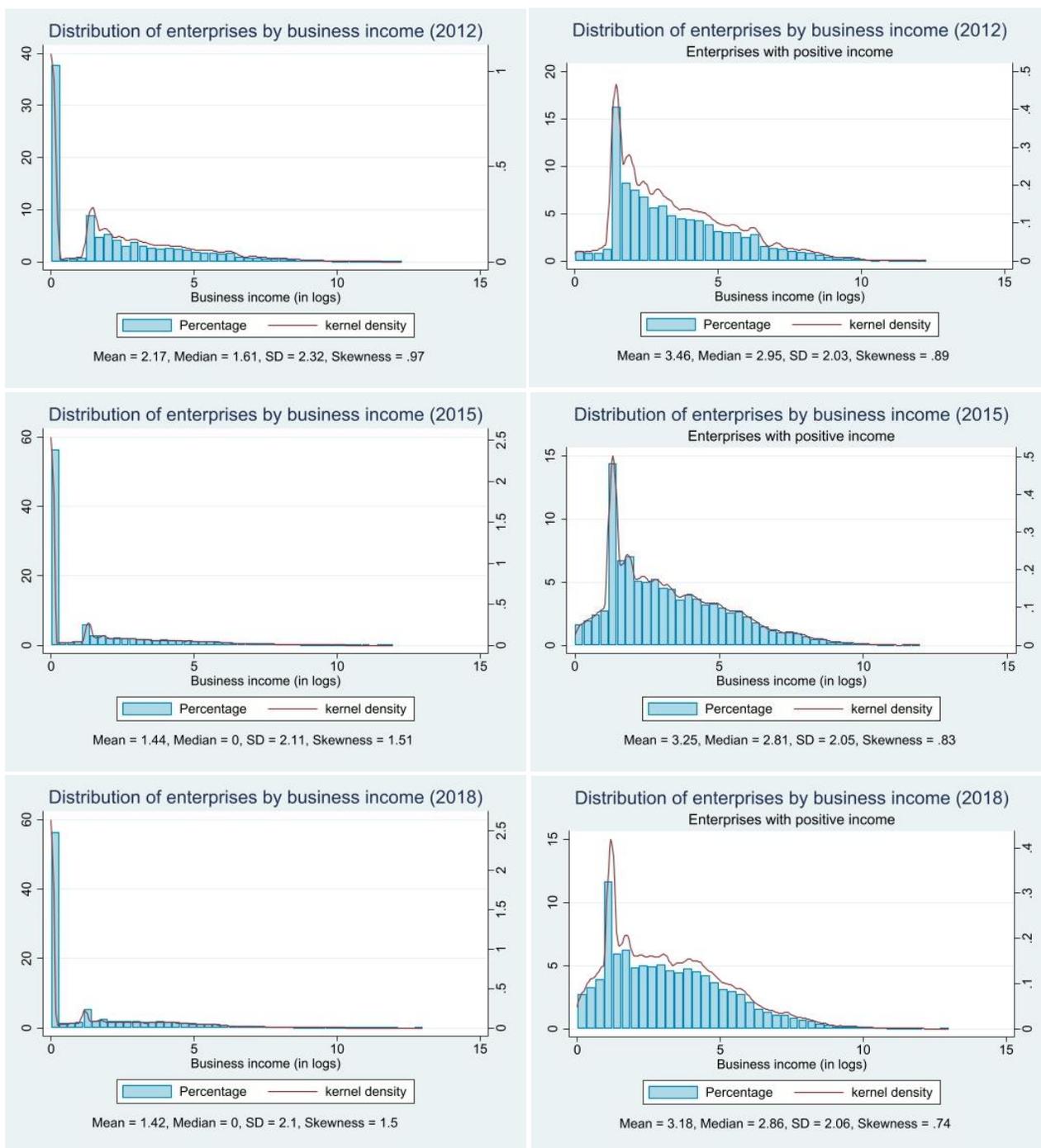


Note: Calculations are based on data provided by RRA.

Graph 4 presents the distribution of enterprises based on their reported income (expressed in natural logarithms) for selective tax periods. Given the magnitude of the nil-filers, both the complete distribution and the distribution of firms reporting a positive income is reported. The distributions are predominantly moderately right-skewed and so the median reported income is less than the mean across all years reported.

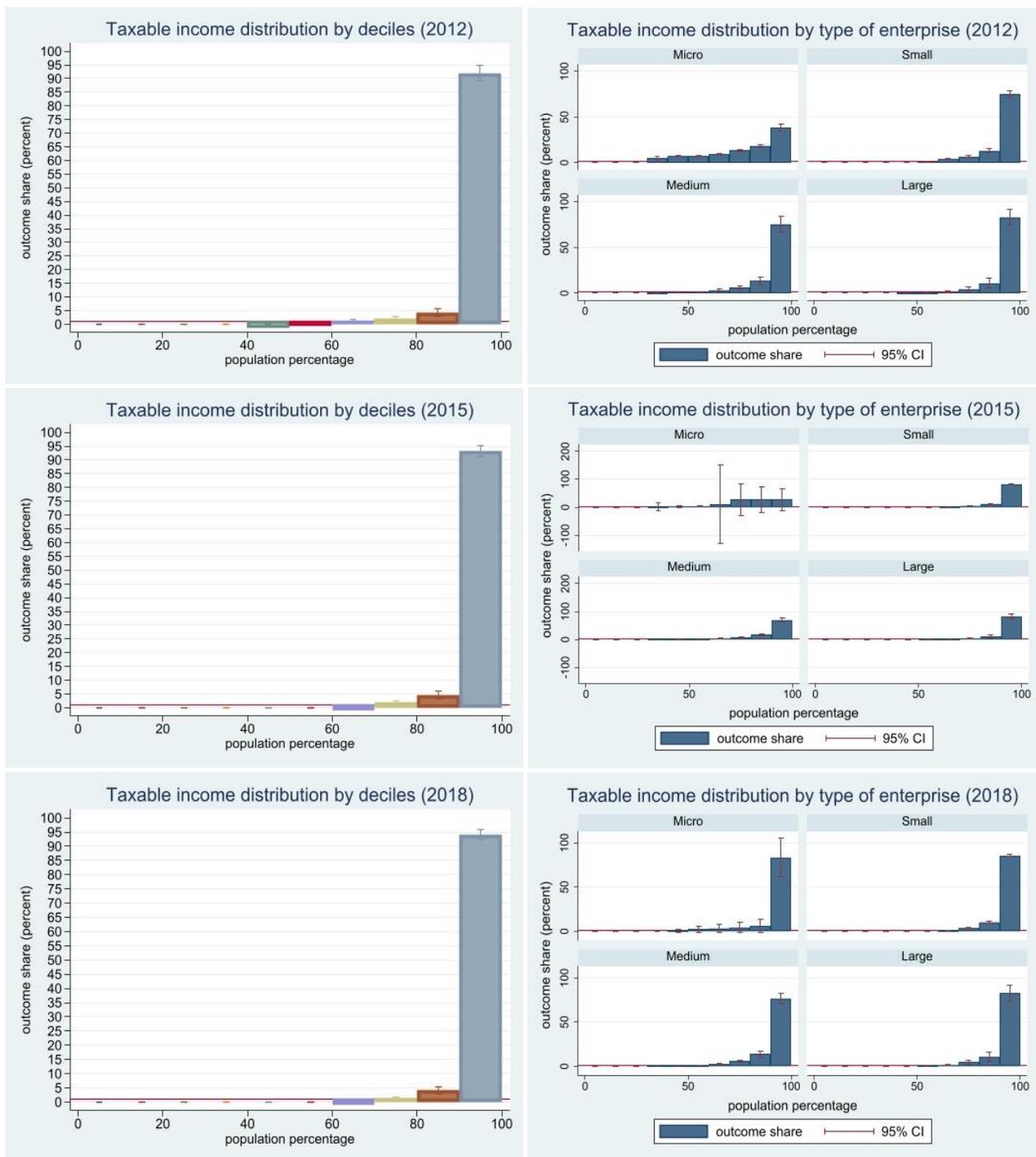
Graph 5 reports the distribution of taxable income by deciles of population for the universe of CIT filers and by size of enterprises for the same selected years as in Graph 4. Note that in terms of taxable income reported, enterprises in the tenth decile declare more than 90 percent of taxable income across all periods in the available data (left-hand-side panel graphs). The right-hand-side panels also show that the majority of reported income, across enterprise types, is reported by the top deciles of their corresponding distribution.

**Graph 4: Distribution of enterprises by business income (for years 2012, 2015, and 2018)**



Note: Calculations are based on data provided by RRA.

**Graph 5: Distribution of taxable income (for years 2012, 2015, and 2018)**



Note: Calculations are based on data provided by RRA.

### 3. Corporate Income Tax Audits

To assess the impact of tax audits on CIT filers’ reporting behaviour the analysis relies on different datasets provided by RRA. The data comprises the world of (anonymised) CIT declarations for the tax periods from 2011 to 2018, as well as detailed records of audits undertaken by both the Large Taxpayers Office and the Small and Medium Taxpayers Office during the years 2013 through 2016.<sup>7</sup> The analysis also utilises detailed confidential information on the criteria for audit selection, including the risk rules employed to assign risk scores to all tax declarations for all taxpayers in the data set. The risk criteria utilise significant information that spans across all tax bases, and in particular VAT which is an important tax base businesses report on. The administrative data is retrieved from RRA systems which collect and store tax data required by law to be submitted by Rwandan taxpayers. The integrity of the data has been assured by the RRA.

Table 3 shows the number of audits involving CIT and VAT and the relative probabilities of being audited by audit wave and by tax regime (linear and flat).<sup>8</sup>

**Table 3: Number of audited firms**

<b>Audit</b>	<b>Tax</b>	<b>Number of audited</b>	<b>Probability of being audited</b>
<b>2013</b>	<b>Total</b>	257	1.87
	<b>Linear</b>	255	2.40
	<b>Flat</b>	2	0.06
<b>2014</b>	<b>Total</b>	218	0.89
	<b>Linear</b>	214	0.99
	<b>Flat</b>	4	0.14
<b>2015</b>	<b>Total</b>	435	1.49
	<b>Linear</b>	432	1.60
	<b>Flat</b>	3	0.14
<b>2016</b>	<b>Total</b>	337	1.03
	<b>Linear</b>	322	1.04
	<b>Flat</b>	15	0.88

Note: Calculations based on data provided by RRA.

Tax audits in Rwanda are guided by Law No 25/2005 on tax procedures which describe the tax audit process as well as the statute of limitations and the type of tax enforcement examinations

<sup>7</sup> Tax collection in Rwanda is managed by 30 tax centres appointed at the district level plus one ad-hoc tax centre for large companies based in Kigali (Kigali Large Taxpayer Department – LTD). The tax centres of the three districts which constitute the city of Kigali (Gasabo, Kicukiro and Nyarugenge) plus the Kigali LTD manage around 71% of CIT tax declarations.

<sup>8</sup> The taxpayer who is not satisfied with the contents of the tax assessment notice may appeal to the Commissioner General within thirty (30) days after receipt of the assessment notice. The appeal does not suspend the obligation to pay tax, interest and penalties. Upon written request by the taxpayer, the Commissioner General may suspend payment of the disputed amount of tax for the duration of the appeal. The tax audits considered are completed (and considered closed by RRA) and there is no outstanding appeal against them.

undertaken by the RRA. Concerning the statute of limitations, RRA can audit a taxpayer for a period going back five years, although this can be extended to ten years in case of detected fraud. However, the RRA *tends to audit two tax periods*. Taxpayers are required to keep their records for a period of ten years. Tax enforcement examinations involve three types of audits: Desk audits, Issue audits and Comprehensive audits. Desk audits are conducted by RRA staff using information already submitted to RRA. Issue audits are usually focused on a single tax type, single aspect or single tax period (for example, refund audits are a type of issue audit which focuses on tax declarations claiming refunds, VAT or income tax, from RRA). Issue audits may be desk-based or involve visits to the taxpayer's business premises. Comprehensive audits are more in-depth and time-intensive. RRA staff usually conduct these audits whilst visiting the taxpayer's business premises and reviewing all relevant documents across tax bases.

Regarding notification, in the case of desk audits, taxpayers may not be informed about the audit unless a specific problem is identified. Taxpayers will always be invited to offer explanations before being issued with assessment notices. In the case of issue audits, taxpayers will be notified at least three days beforehand. The postponement of an issue-oriented audit cannot exceed seven working days. In the case of comprehensive audits, taxpayers will be notified at least seven days beforehand. If the taxpayer is not ready, they may write to RRA requesting an extension, up to a maximum of thirty days. The law also describe the process to address the settlement of disputes of audit assessments.<sup>9</sup>

Table 4 presents summary statistics for the main outcome variables associated with the audit process. Note in particular that the outcome of the audit process, aggregating uncovered underreporting and all the fines, represents, on average, 51.52% of the potential revenues. Appendix 1 (Tables A1-A3) reports the same type of statistics disaggregated by audit type, by size of enterprise and by size of enterprise within each audit type.

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<sup>9</sup> This is described in particular in Chapter VII of the Law n° 25/2005 of 04/12/2005 on tax procedures. Following the completion of the audit, the RRA is required to issue a taxpayer with a draft notice of assessment called rectification note. The taxpayer is granted 30 days within which to respond. In case the taxpayer has not responded by that time, a final notice of assessment is issued. The taxpayer is allowed 30 days within which to appeal. Once an appeal is submitted to the Commissioner General, the RRA has 30 days within which to respond to the objection. This can be extended by another 30 days but not beyond this period. At this stage, the appeal is handled by the appeal committee, and the taxpayer and the taxpayer's agent are invited for a meeting to provide explanations. Once the final assessment is issued, the tax due is payable. However, the Commissioner General has powers to suspend the payment pending the determination of the appeal. There is a provision for resolving the dispute through an amicable settlement process. Taxpayers can opt for this approach while at the same time exploring the next stage of the appeal process. A taxpayer that disagrees with the response on the final assessment can appeal to the high court within 30 days.

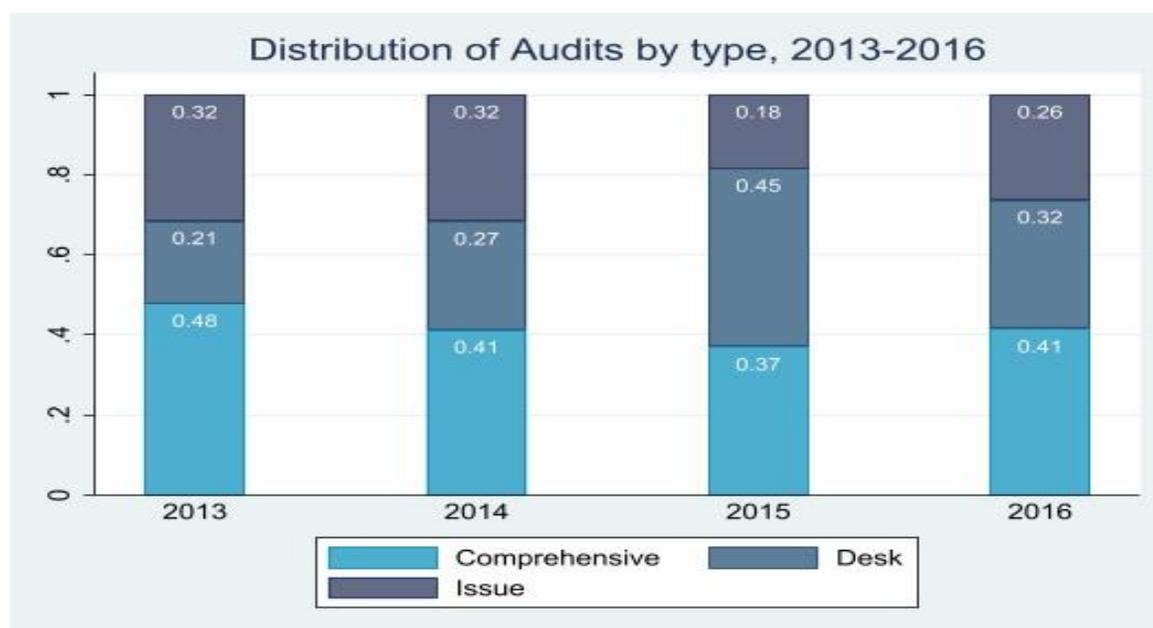
**Table 4: Audits descriptive statistics, 2013-2016**

Variable	Obs.	Measurement Unit	Mean	Standard Deviation	Min	Max
Audit outcome	1247	In 1000 US \$	64.929	605.704	0	19369.84
Total fines	1247	In 1000 US \$	35.971	375.237	0	11621.9
Total audit outcome	1247	In 1000 US \$	100.9	976.502	0	30991.74
Total audit outcome (%)	1247	% revenues	51.517	45.037	0	100

Note: Calculations based on data provided by RRA.

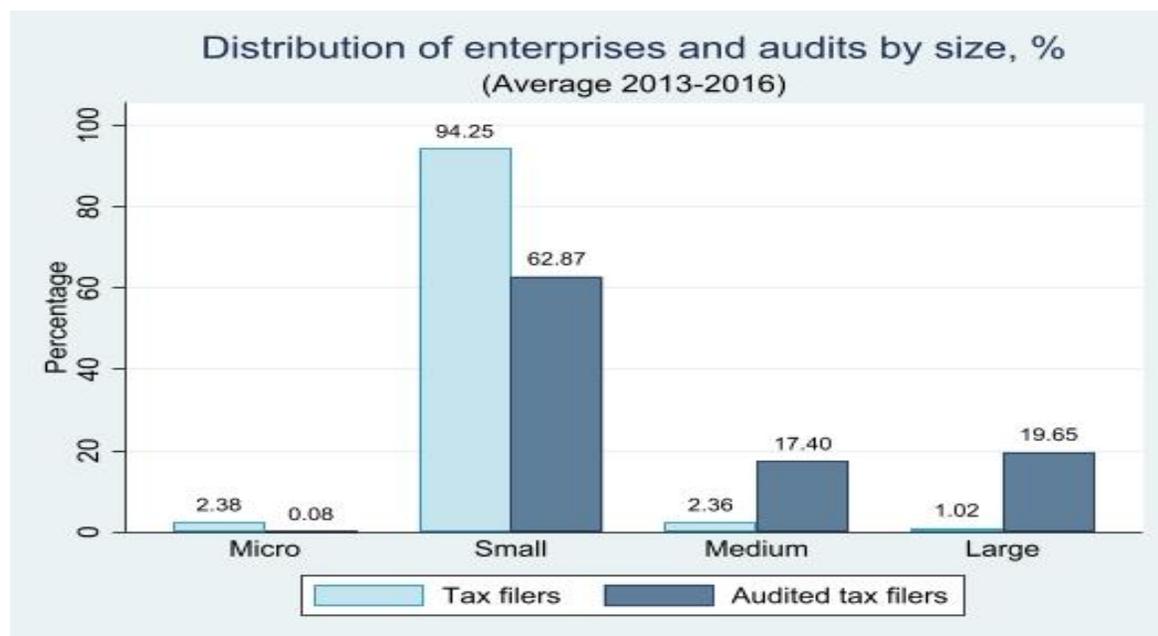
Graph 6 presents the distribution of audits by type of examination and by audit wave. Across audit waves there is some variability in terms of audit types. In 2015, for example, the relative majority of audits were desk audits, whereas in 2016 the majority is comprehensive. However, there is more stability in the relative shares of comprehensive versus narrow-scope audits (desk and issue). Indeed, both in 2014 and 2016 narrow-scope audits represent 59% of total audits vs. 41% of comprehensive and in 2015 narrow-scope audits are 63% of the total versus 37% of comprehensive. The 2013 wave is a bit more of an outlier with a 52% of narrow-scope audits and a 48% of comprehensive audits. Graph 7 reports the distribution of audits by size of enterprises together with the distribution of enterprises by size across the four waves of audits. As shown in Graph 7, most audits during 2013-2016 are performed, on average, on small-enterprises (62.87% of the total) following with audits on large-enterprises (19.65%).

**Graph 6: Distribution of audits by type and audit wave (2013-2016)**



Note: Calculations based on data provided by RRA.

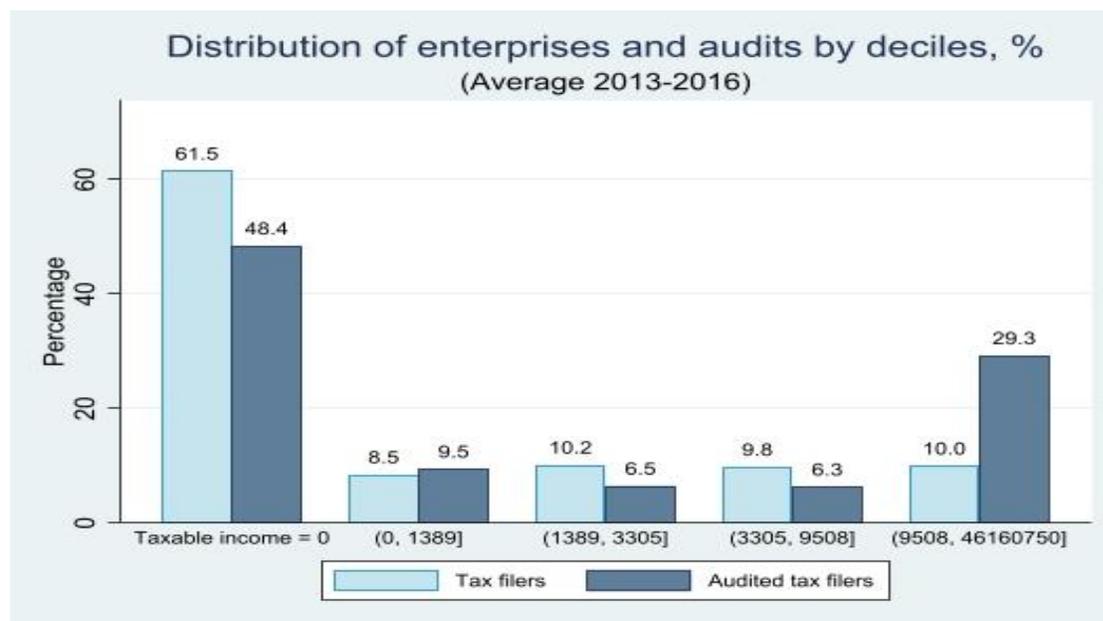
**Graph 7: Distribution of enterprises and audits by size, %**



Note: Calculations based on data provided by RRA.

Graph 8 shows the distribution of enterprises and audits by deciles across the four audit waves (with first six deciles having been grouped together since they include taxpayer who report nil taxable income).

**Graph 8: Distribution of enterprises and audits by taxable income deciles, %**



Note: Calculations based on data provided by RRA. Taxable income reported in brackets is expressed in Thousands of US \$.

#### **4. Existing knowledge (brief literature review)**

The recent literature on audit assessment has focused on the estimation of the direct deterrence effect that is, the impact of audits on subsequent tax payments by the audited individuals. What drives compliance behaviour (putting aside elements related to social norms and stigma) is how taxpayers perceive the likelihood of them being audited. From the contributions to the literature it emerges that the impact of an audit on future compliance behaviour is ambiguous. Experiencing an audit could lead taxpayers to update their (perceived) likelihood of being audited upwards thereby responding with an increase in their reported income (see Dubin et al., 1990). But the opposite effect is also possible: following an audit, it is conceivable that taxpayers may start reporting less income expecting that, having been audited already, the revenue authority is unlikely to audit them again in the next auditing period. Though both possibilities seem to be theoretically plausible, the latter effect (which has been termed ‘bomb-crater’) is predominantly associated with laboratory experiments (see, for example, Maciejovsky et al., 2007; Kastlunger et al., 2009).

The recent empirical contributions, employing administrative data from high-income countries, find a significant average positive impact of specific deterrence on the future behaviour of audited taxpayers at least in the short run (see Kleven et al., 2011; Gemmell and Ratto, 2012; DeBacker et al., 2018a,b; Beer et al., 2020; Advani et al., 2019; Løyland and Øvrum, 2017; Løyland et al., 2019; Li et al., 2019).<sup>10</sup> The literature on developing countries is scant: One of the reasons that empirical work in this area has remained limited is the relative paucity of reliable data. There are tax challenges in developing economics and understanding the role of tax audits is particularly important given the large informal sectors which are difficult to tax (Keen and Simone, 2004, Besley and Persson 2009, 2010).

Unsurprisingly, the focus of the existing literature has been on high-income countries. This focus is not only driven by data availability but also, and perhaps more importantly, by the (fairly recent) willingness of tax administrations to embrace scientific research rooted in the quest for more efficient organisations and demand for more accountability.

#### **5. Methodology**

The main objective of the study is to quantify the Average Treatment effect of audits on the reporting behaviour of Treated (i.e. audited) taxpayers (*ATT*). In these types of analyses there is selection bias since enterprises/taxpayers have been selected through an application of risk scores which synthetize an individual taxpayer’s likelihood and impact of non-compliance. This is also

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<sup>10</sup> There is a sizeable literature analysing tax compliance issues in the developing world from different angles (see for example, Fishlow, A., and Friedman, 1994, who are looking at the relationship between tax evasion and the economic cycle in developing countries; Hoseini and Briand, 2020, who study the impact of replacing sales tax by VAT on production efficiency and informality in India; Weigel et al. 2021, who focus on the determinants of state capacity in the D.R. of Congo; Weigel and Kabue, 2019, who emphasise the role of government legitimacy in increasing the intrinsic motivation to pay taxes; and Balán et al. 2020, who investigate the role of local elites in tax collection and compliance).

the case with RRA where based on individual risk scores, operational risk-based audits target specific clusters in the CIT filers' population suspected of being more likely to underreport income. The implication of this is that the cluster of audited taxpayers is not, in a statistical sense, identical to the one of unaudited taxpayers.

To address this issue the Research Team employs a matched-Difference-in-Difference (matched-DID) approach that consists matching treated/audited taxpayers with similar (unaudited) taxpayers in the control group and apply a DID approach with that matched control group. The basic idea behind matching is to pair each taxpayer of the treatment group with a set of observationally equivalent control group taxpayers. By holding the confounding factors constant, the difference between the outcome variable of treated taxpayers and matched taxpayers (in the control group) is a direct estimate of the treatment effect (audit). Matching is based on several pre-treatment taxpayers' characteristics including, and importantly, the likelihood of being selected for an audit. The study utilises a synthetic risk index of the available risk criteria as one of the variables to match the two groups of taxpayers.<sup>11</sup> It suffices here to say that the estimation strategy includes Coarsened Exact Matching (CEM), Propensity Score Matching (PSM) as well as Mahalanobis distance metric matching (MHD) estimators as robustness (see Iacus et al, 2011, 2012; Guo and Fraser, 2015). We also use Inverse Probability of Treatment Weighting (IPTW) for the estimation of audit-type specific *ATT* (see Cattaneo (2010) and Stuart (2010)).

The discussion now turns to the results.

## 6. Results

This section presents the results of the analyses performed to estimate both the aggregate and the audit-type-specific *ATT* for the audit wave in 2015: the choice of audit wave is driven by data availability and completeness. Focusing on the 2015 audit wave means that there are enough tax periods to evaluate the impact of the audit up to 3 years after the audit process and also enough observations in pre-treatment periods (in the sense that there are enough enterprises that file timely their CIT declaration) which ensures a good matched sample size on pre-treatment variables. Moreover in 2015 the number of audits performed is higher than in other waves, which contributes to ensuring a better size in the matched sample and more precise estimated effect.

### 6.1. Aggregate *ATT*

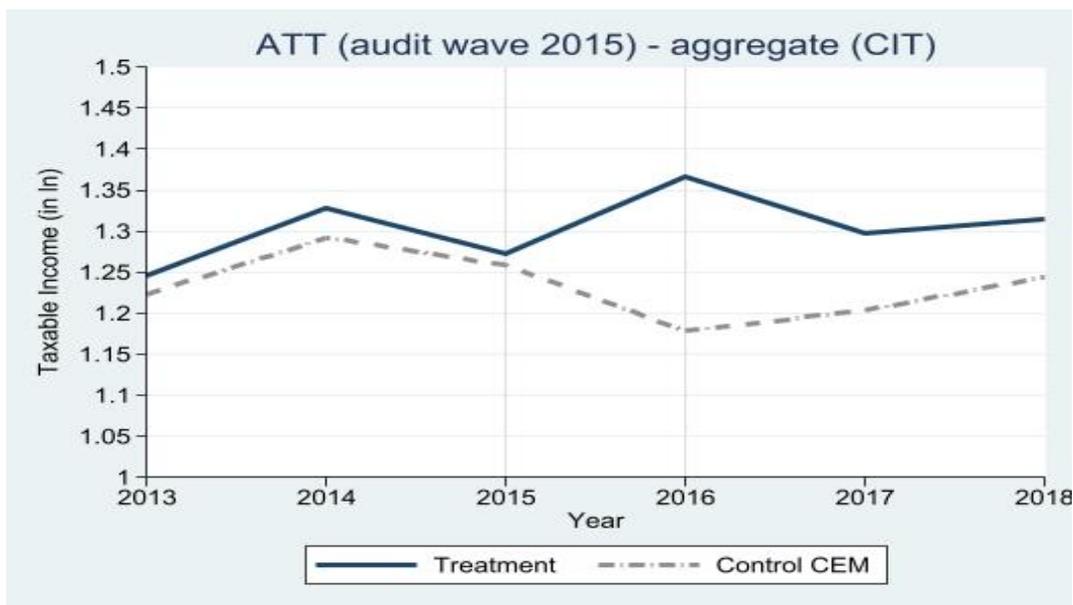
A crucial assumption for any DID analysis is the existence of a common trend before treatment (Meyer, 1995). Under this assumption, one should observe a similar pattern in the evolution of the reporting behaviour of audited and non-audited taxpayers before treatment. Graph 9 presents the estimated *ATT* obtained using CEM. It shows the evolution of the reported taxable income expressed in natural logarithm across treatment cohorts. Noticeably as a result of the CEM process,

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<sup>11</sup> The formalities of this (and more details on the analytics) are developed and explained in Kotsogiannis et al. (2021).

the ln-converted taxable income presents not only a very similar trend in the periods before treatment but it is also comparable in levels across treatment cohorts. After the treatment, the estimates clearly indicate a positive effect of audits on subsequent tax reporting behaviour of audited taxpayers. A similar result is obtained for CIT payable expressed in ln (Graph 10).

**Graph 9: ATT of Audits on audited taxpayers (CEM): Taxable income**



**Graph 10: ATT of Audits on audited taxpayers (CEM): CIT payable**

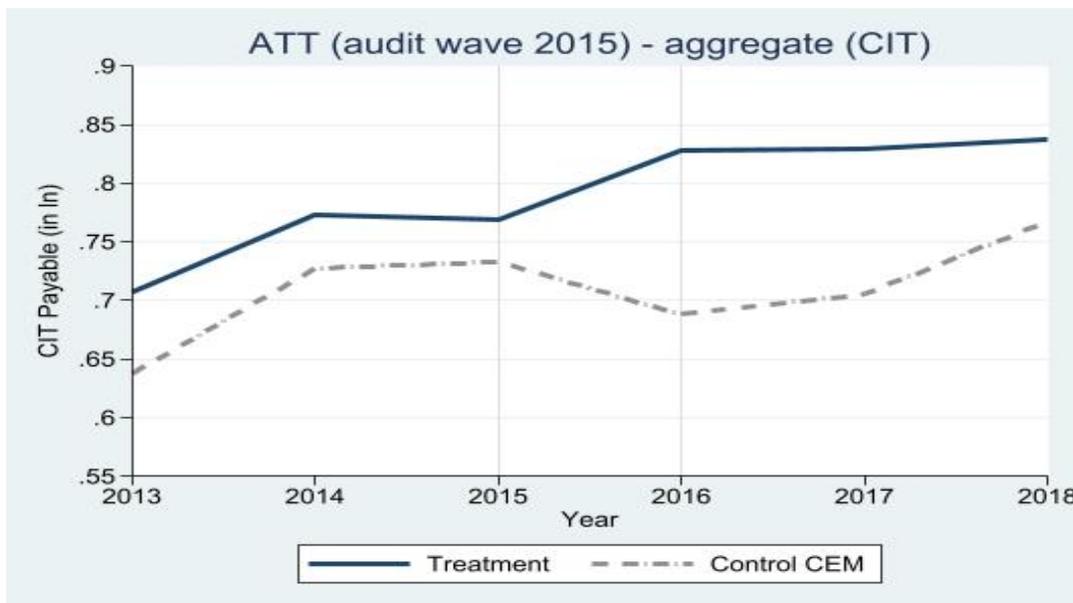


Table 5 reports the aggregate estimation of the *ATT* for the audit wave of 2015. Given that the dependent variables are expressed in ln, the results can be interpreted as semi-elasticities. Columns (1) and (4) report the estimated *ATT* obtained with our four alternative matching approaches respectively on reported taxable income and CIT one year after the audit process. Our preferred estimation strategy (CEM) indicate that audited taxpayers tend to report about 17.5% more taxable income the year after the start of the audit process, relative to similar matched taxpayers who have not been audited. This translates into about 10.3% more tax payable reported compared to the control group. By employing the alternative matching techniques as robustness checks we obtain results that are qualitatively and quantitatively very similar leading to relatively low model uncertainty. Indeed, regarding taxable income (CIT payable) the largest estimated impact obtained one year after treatment using nearest-neighbour MHD matching is about 29.7% (14.7%) while the lowest obtained using kernel PSM is about 14.8% (10.3% using CEM) and the ratio between these two estimates is 1.69 (1.44). We also report the average *ATT* across matching techniques. On average, treated taxpayers tend to report about 20.7% (12.3%) more income (CIT) one year after the audit process when compared to the control group. All these results are robust in providing evidence of significant and sizable pro-deterrence effect of audits on CIT reporting behaviour one year after audit process has started. We also report the estimates two and three years after the audit process (Columns 2-3 and 5-6). The effect is lower in magnitude when time passes but not significant.<sup>12</sup>

**Table 5: Main Results – Aggregate ATT**

Dependent Variable Years after the audit	Taxable Income			CIT payable		
	I	II	III	I	II	III
Matching estimator	(1)	(2)	(3)	(4)	(5)	(6)
<b>CEM</b>	0.175** (0.078)	0.080 (0.125)	0.056 (0.132)	0.103** (0.051)	0.087 (0.086)	0.033 (0.093)
<b>Kernel - MHD</b>	0.208*** (0.069)	0.003 (0.114)	0.025 (0.096)	0.124*** (0.047)	0.030 (0.077)	0.012 (0.071)
<b>Kernel - PSM</b>	0.148* (0.084)	-0.074 (0.107)	-0.145 (0.126)	0.119** (0.053)	0.023 (0.074)	-0.059 (0.094)
<b>Nearest Neighbour</b>	0.297*** (0.099)	0.125 (0.120)	0.195 (0.143)	0.147** (0.072)	0.079 (0.084)	0.097 (0.096)
<b>Average ATT</b>	0.207** (0.105)	0.034 (0.171)	0.033 (0.190)	0.123* (0.071)	0.055 (0.128)	0.021 (0.135)

Note: Bootstrapped standard errors are reported in parentheses, heteroskedasticity-consistent standard errors are

<sup>12</sup> To investigate the robustness of the findings, we have replicated the analysis by focusing on broad categories of enterprises belonging to three progressively less inclusive subsamples of sectoral activities. The results of these analyses tend to validate our main findings (see Appendix 2). Unfortunately, we are unable to estimate the *ATT* at a finer sectoral level due to the reduced sample size.

reported for Nearest Neighbour estimator (Abadie and Imbens, 2008); \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## **6.2. Impact conditional on audit outcome**

As already debated in Section 4, the literature has evidenced that the impact of the audit process might be different depending on the outcome of the tax inspection. In order to verify whether this is also the case for the framework under analysis, we replicate the analysis by differentiating the sample based on the outcome of the audit process. Table 6 presents the result of this analysis. The results suggest that the main effect is driven by audited enterprises determined noncompliant while it is not conclusive for the audited taxpayers determined compliant.<sup>13</sup> Indeed, while for the cluster of enterprises determined noncompliant the results are significant and comparable, both in sign and size with the aggregate *ATT*, we cannot establish a conclusive direction in the impact of compliance for the very residual sub-sample of enterprises determined compliant.

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<sup>13</sup> Probably, this is in part due to the residual dimension of this cluster that represents just the 10% of the treatment group.

**Table 6: ATT by audit outcome: Determined Noncompliant vs. Determined Compliant**

Dependent Variable Years after the audit Matching estimator	Determined Noncompliant						Determined Compliant					
	Taxable Income			CIT payable			Taxable Income			CIT payable		
	I (1)	II (2)	III (3)	I (4)	II (5)	III (6)	I (1)	II (2)	III (3)	I (4)	II (5)	III (6)
<b>CEM</b>	0.166** (0.084)	0.086 (0.099)	0.049 (0.114)	0.097* (0.056)	0.105 (0.069)	0.036 (0.079)	0.248 (0.151)	0.039 (0.217)	0.123 (0.247)	0.152* (0.087)	-0.051 (0.128)	0.006 (0.133)
<b>Kernel - MHD</b>	0.212** (0.094)	0.022 (0.101)	0.033 (0.095)	0.128* (0.067)	0.058 (0.074)	0.023 (0.061)	0.089 (0.171)	-0.043 (0.243)	-0.072 (0.221)	-0.008 (0.098)	-0.089 (0.154)	-0.015 (0.109)
<b>Kernel - PSM</b>	0.152* (0.082)	-0.067 (0.104)	-0.084 (0.122)	0.124** (0.054)	0.038 (0.075)	-0.013 (0.084)	0.058 (0.116)	-0.351 (0.225)	-0.372 (0.284)	0.029 (0.083)	-0.260* (0.140)	-0.248 (0.201)
<b>Nearest Neighbour</b>	0.320** (0.143)	0.182 (0.146)	0.206 (0.188)	0.184* (0.102)	0.141 (0.118)	0.087 (0.140)	0.351* (0.207)	-0.009 (0.309)	0.140 (0.315)	0.151 (0.141)	-0.083 (0.186)	0.054 (0.196)

Note: Bootstrapped standard errors are reported in parentheses, heteroskedasticity-consistent standard errors are reported for Nearest Neighbour estimator (Abadie and Imbens, 2008); \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

### 6.3. Audit-type specific *ATT*

As already discussed in previous sections, desk-based and issue-oriented audits on the one hand and comprehensive audits on the other are considerably different types of tax enforcement examinations implemented. They tend to involve different degree of intensity in the examination of declared tax items and thus, they are likely to have potentially a different impact in deterring future noncompliance. Table 7 presents the results of the estimation of the *ATT* by audit type conducted via IPTW.

According to this analysis, comprehensive audits seem to drive the aggregate results presented in Table 5, being the only type of audit to present a pro-deterrence effect after one year from the start of the audit process and a trend similar to the aggregate *ATT* in subsequent years. Interestingly Desk and Issue audits present a non-significant impact after one year but **have a counter-deterrence effect** starting from the second year.

More specifically, comprehensive audits lead to an average increase of about 28.5% (24.6%) in income (CIT) reported by audited taxpayers after receiving this type of audit when compared to the control group. Less intense type of audit tends to have a non-significant effect the first year after the audit and start to have a counter-deterrent effect from the second year after the audit leading to a reduction of 23.5% (9.5%) in income (CIT) reported by taxpayers that experienced these kind of audit.<sup>14</sup>

Why do desk and issue audits have a counter-deterrent effect? A possible explanation for this is that taxpayers have underreported more than these narrow-scope audits have successfully identified, signalling to the taxpayer that the RRA's compliance strategy is not targeting correctly.<sup>15</sup>

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<sup>14</sup> As for the estimation of the aggregate *ATT*, we investigate the robustness of these findings by replicating the analysis focusing on broad categories of enterprises belonging to three progressively less inclusive subsamples of sectoral activities. The results remain qualitatively unchanged and quantitatively coherent with the ones presented in the main text (see Appendix 2). Unfortunately, we are unable to estimate the *ATT* by type of audit at a finer sectoral level due to the reduced sample size.

<sup>15</sup> Our results on audit type conceptually relate to a study framed in the US suggesting that correspondence audits are not a perfect substitute for face-to-face examinations being the former generally associated with a counter-deterrent effect while the latter with a pro-deterrence effect, Erard et al. (2020).

**Table 7: Main Results – ATT by audit type**

Dependent Variable	Taxable Income			CIT payable		
	I	II	III	I	II	III
Years after the audit	(1)	(2)	(3)	(4)	(5)	(6)
Comprehensive	0.285*	0.130	-0.040	0.246*	0.136	0.030
	(0.162)	(0.187)	(0.185)	(0.125)	(0.150)	(0.125)
Desk & Issue	0.020	-	-0.170*	0.006	-0.095*	-0.078
	(0.069)	(0.091)	(0.091)	(0.040)	(0.057)	(0.051)

Note: Bootstrapped standard errors are reported in parentheses; \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

## 7. Concluding remarks

This report provides results on the impact of risk-based CIT audits on future compliance behaviour in Rwanda. By using available data on CIT, VAT and the corresponding audit strategies performed during the 2015 wave, we find evidence of a pro-deterrence effect on reported taxable income of audited businesses. The findings suggest that:

- Audited enterprises tend to report, on average, about **20.7% more income the year after the audit process**, relative to similar taxpayers who have not been audited.
- This translates into about 12.3% more tax payable reported compared to the control group and corresponds to roughly 2.8% of total CIT payable declared by tax filers in 2016.
- The effect is **lower in magnitude when time passes but not statistically significant**.
- The impact is driven by taxpayers who have been found **noncompliant during the audit**; for the compliant taxpayers the evidence is inconclusive.
- The evidence suggests that the type of audit matters:
  - **Comprehensive audits** drive the aggregate pro-deterrence results,
  - While **Desk and Issue audits tend to have the opposite aggregate effect on the second/third year after the audit process**.

The report proposes a number of recommendations. These are:

1. The positive impact of comprehensive audits on compliance is short-lived (one year). There is evidence that carefully designed ‘nudging’ (which reduces ‘noise’) may have positive impact on compliance. An **information campaign** (for example sms/letter/email notification, and advisory visits where necessary), targeting audited enterprises before, during, but also after the audit process might extend the compliance impact of those audits. The impact of this policy should be **carefully evaluated** as behavioural responses might

be unpredictable and revenue reducing.

2. The analysis has been unable to identify whether the positive impact of audits is the same across the audited enterprise population or whether it varies across types of enterprises. **Additional analysis of this is required.**
3. Desk and Issue audits are important types of audit representing together on average around 58% of audits across the 4 audit waves (2013-2016), but their negative impact is worrying, especially given the increase reliance, following COVID-19, on such audits. It is likely that the negative impact means that taxpayers realise that it pays to increase underreporting following the audit. To mitigate this, an **information campaign** should be considered together with other options such as, for example, specific **follow-up campaigns** targeting audited enterprises after the completion of the audit process.
4. The analysis has been unable to identify whether this negative impact is the same across the audited business population or whether it varies across types of enterprise and size of enterprise. **Additional analysis of this is required.**
5. **Accurate and complete reporting** depends on accurate documentation kept by enterprises. We have been unable to determine, due to lack of information, the extent of wilful underreporting and underreporting caused by inadvertent error due to ignorance or confusion about the tax law. Better information on audits is required (see also point 7 below).
6. Compliance and the impact on compliance of audits depend on the **quality of tax audits**. The Research Team had no access to data on this and therefore they have not been able to evaluate it. **This requires further investigation.**
7. **Audit data collected must be enriched** to include, for example, more descriptive and detailed information on the type/source of non-compliance identified (e.g. overinflated losses, undeclared income) and other characteristics related to the process followed, such as information on audit intensity (such as, auditors' characteristics, time spent on the audit process). This will also help to further investigate and understand the reasons of the different behavioural impact of the different types of audit. In addition, we have also been unable to look in detail at the sectors most likely to underreport. It would have been desirable to have more information on sectors (2-3-4 digits) for more targeted check on businesses.
8. VAT has not been excluded as tax base but it has not been the main focus. It is

recommended that present analysis is complemented with a **report on VAT audits**.

9. Key to audits is risk criteria designed by operational knowledge and its statistical updating. **Evaluating the appropriateness of the current risk-based audit selection process** and its capability in identifying the taxpayers more likely to be noncompliant **would be desirable** to enhance the performance and the efficiency of the whole audit process.
10. There is evidence that interdependence matters in tax evasion decisions. Network effects typically arise because individuals exchange their experience with other peers, so they tend to influence and be influenced by the tax evasion behaviour of other taxpayers. Audits play a crucial role in this process and it would be desirable to further investigate this issue by **estimating the indirect network effect of audits** on deterring future noncompliance of taxpayers who did not experienced an audit but belong to the network of taxpayers who have.
11. Finally, it would be desirable to expand the scope of this project by analysing the **role that Electronic Billing Machines** has been playing **in shaping compliance** since their introduction.

## Appendices

### Appendix 1: Additional tables

**Table A 1: Audits descriptive statistics by audit type**

	N	Mean	Standard Deviation	Min	Max
<b>Comprehensive</b>					
Audit outcome	584	127.794	880.162	0	19369.84
Total fines	584	71.9	545.722	0	11621.9
Total audit outcome	584	199.694	1419.449	0	30991.74
Total audit outcome (%)	584	48.865	45.428	0	100
<b>Desk</b>					
Audit outcome	376	7.796	28.38	0	373.608
Total fines	376	2.528	18.98	0	282.285
Total audit outcome	376	10.324	45.12	0	602.239
Total audit outcome (%)	376	54.221	44.511	0	100
<b>Issue</b>					
Audit outcome	287	11.859	54.25	0	854.036
Total fines	287	6.674	30.145	0	462.796
Total audit outcome	287	18.534	83.328	0	1316.832
Total audit outcome (%)	287	53.368	44.774	0	100

**Table A 2: Audits descriptive statistics by size of enterprise**

	N	Mean	Standard Deviation	Min	Max
<b>Large</b>					
Audit outcome	245	254.514	1343.156	0	19369.84
Total fines	245	147.527	833.913	0	11621.9
Total audit outcome	245	402.041	2167.624	0	30991.74
Total audit outcome (%)	245	55.623	45.229	0	100
<b>Medium</b>					
Audit outcome	217	35.448	98.339	0	813.746
Total fines	217	14.998	46.548	0	372.005
Total audit outcome	217	50.446	136.17	0	992.013
Total audit outcome (%)	217	50.694	44.878	0	100
<b>Missing</b>					
Audit outcome	15	0	0	0	0
Total fines	15	0	0	0	0
Total audit outcome	15	0	0	0	0
Total audit outcome (%)	15	0	0	0	0
<b>Small</b>					
Audit outcome	770	14.18	70.36	0	1100.586
Total fines	770	7.087	43.957	0	681.85
Total audit outcome	770	21.267	113.247	0	1782.436
Total audit outcome (%)	770	51.445	44.881	0	100

**Table A 3: Audits descriptive statistics by size of enterprise and type of audits**

**Panel A: Comprehensive audits**

	N	Mean	Standard Deviation	Min	Max
<b>Large</b>					
Audit outcome	215	283.773	1430.488	0	19369.84
Total fines	215	164.391	888.42	0	11621.9
Total audit outcome	215	448.164	2308.847	0	30991.74
Total audit outcome (%)	215	57.27	44.399	0	100
<b>Medium</b>					
Audit outcome	119	54.105	124.593	0	813.746
Total fines	119	22.247	57.416	0	372.005
Total audit outcome	119	76.352	169.938	0	992.013
Total audit outcome (%)	119	55.072	42.584	0	100
<b>Small</b>					
Audit outcome	235	30.562	123.324	0	1100.586
Total fines	235	17.014	77.617	0	681.85
Total audit outcome	235	47.576	199.751	0	1782.436
Total audit outcome (%)	235	41.152	46.121	0	100
<b>Missing</b>					
Audit outcome	15	0	0	0	0
Total fines	15	0	0	0	0
Total audit outcome	15	0	0	0	0
Total audit outcome (%)	15	0	0	0	0

**Panel B: Desk audits**

	N	Mean	Standard Deviation	Min	Max
<b>Large</b>					
Underreporting detected	13	22.367	78.106	0	282.285
Total fines	13	24.422	77.689	0	282.285
Total audit outcome	13	47.419	155.499	0	564.571
Total audit outcome (%)	10	70.013	48.283	0	100
<b>Medium</b>					
Audit outcome	55	14.083	51.125	0	373.608
Total fines	55	6.328	30.803	0	228.632
Total audit outcome	55	20.411	81.103	0	602.239
Total audit outcome (%)	55	48.285	47.923	0	100
<b>Small</b>					
Audit outcome	309	6.051	16.3	0	203.97
Total fines	309	.923	3.423	0	32.274
Total audit outcome	309	6.973	17.201	0	203.97
Total audit outcome (%)	309	55.441	43.632	0	100

**Panel C: Issue audits**

	N	Mean	Standard Deviation	Min	Max
<b>Large</b>					
Audit outcome	18	58.76	202.96	0	854.036
Total fines	18	26.809	108.834	0	462.796
Total audit outcome	18	85.569	310.504	0	1316.832
Total audit outcome (%)	18	39.699	49.581	0	100
<b>Medium</b>					
Audit outcome	43	11.142	23.913	0	94.54
Total fines	43	6.026	18.209	0	94.54
Total audit outcome	43	17.168	39.376	0	189.081
Total audit outcome (%)	43	41.66	46.531	0	100

**Small**

Audit outcome	226	8.261	18.241	0	185.012
Total fines	226	5.194	12.789	0	110.887
Total audit outcome	226	13.455	29.432	0	295.899
Total audit outcome (%)	226	56.684	43.659	0	100

**Table A 4: Summary statistics of the main pre-treatment covariates**

Variable	N	Measurement Unit	Mean	Standard Deviation	Min	Max
Aggregate Risk Score 2013	11221	Index	0.09	0.09	0	0.51
Aggregate Risk Score 2014	11221	Index	0.08	0.09	0	0.51
Aggregate Risk Score 2015	11221	Index	0.13	0.11	0	0.55
Taxable income 2013	11221	Thousands of US \$	9.02	69.81	0	3138.56
Taxable income 2014	11221	Thousands of US \$	10.49	88.84	0	5404.28
Taxable income 2015	11221	Thousands of US \$	12.24	123.88	0	8936.49

**Table A 5: Overall imbalance pre and post CEM matching**

**Multivariate imbalance reduction**

<b>L1 statistic pre CEM:</b>	0.61
<b>L1 statistic post CEM:</b>	0.28

Note: the table depicts  $L_1$  statistics for multivariate imbalance as defined in Iacus *et al.* (2011).

**Table A 6: Univariate imbalance pre and post CEM matching**

	<b>L1 pre CEM</b>	<b>L1 post CEM</b>
<b>Aggregate Risk Score</b>	0.479	0.118
<b>Taxable income 2013</b>	0.140	0.079
<b>Taxable income 2014</b>	0.191	0.071
<b>Taxable income 2015</b>	0.176	0.059

Note: the table depicts  $L_1$  statistics for univariate imbalance as defined in Iacus *et al.* (2011).

## Appendix 2: Sensitivity Analyses

**Table A 7: Aggregate ATT – subsample I**

Dependent Variable Years after the audit	Taxable Income			CIT payable		
	I	II	III	I	II	III
Matching estimator	(1)	(2)	(3)	(4)	(5)	(6)
<b>CEM</b>	0.287** (0.119)	0.187 (0.147)	0.177 (0.162)	0.167** (0.083)	0.174 (0.110)	0.127 (0.110)
<b>Kernel - MHD</b>	0.229** (0.094)	-0.010 (0.113)	0.015 (0.105)	0.133** (0.060)	0.017 (0.080)	0.000 (0.078)
<b>Kernel - PSM</b>	0.155* (0.090)	-0.082 (0.111)	-0.093 (0.111)	0.119* (0.063)	0.017 (0.082)	-0.016 (0.080)
<b>Nearest Neighbour</b>	0.255*** (0.098)	0.166 (0.154)	0.064 (0.145)	0.120* (0.064)	0.081 (0.101)	-0.008 (0.104)

Note: Bootstrapped standard errors are reported in parentheses, heteroskedasticity-consistent standard errors are reported for Nearest Neighbour estimator (Abadie and Imbens, 2008); \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The results are obtained by excluding from the matched sample enterprises operating in agriculture, forestry and fishing, mining and quarrying and manufacturing sectors. As a result, the sample includes enterprises operating in sectors belonging to sections D to U of the International Standard Industrial Classification (ISIC) of all economic activities (see UN, 2008).

**Table A 8: ATT by audit type – subsample I**

Dependent Variable Years after the audit	Taxable Income			CIT payable		
	I	II	III	I	II	III
Type of Audit	(1)	(2)	(3)	(4)	(5)	(6)
<b>Comprehensive</b>	0.364* (0.197)	0.190 (0.235)	0.083 (0.274)	0.305* (0.164)	0.165 (0.186)	0.100 (0.195)
<b>Desk &amp; Issue</b>	0.023 (0.081)	- (0.078)	-0.173* (0.097)	-0.006 (0.049)	-0.113** (0.052)	-0.100* (0.058)

Note: Bootstrapped standard errors are reported in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The results are obtained by excluding from the matched sample enterprises operating in agriculture, forestry and fishing, mining and quarrying and manufacturing sectors. As a result, the sample includes enterprises operating in sectors belonging to sections D to U of the ISIC of all economic activities (see UN, 2008).

**Table A 9: Aggregate ATT – subsample II**

Dependent Variable Years after the audit	Taxable Income			CIT payable		
	I	II	III	I	II	III
Matching estimator	(1)	(2)	(3)	(4)	(5)	(6)
<b>CEM</b>	0.286** (0.124)	0.207 (0.141)	0.197 (0.126)	0.166* (0.087)	0.184* (0.100)	0.139 (0.092)
<b>Kernel - MHD</b>	0.202** (0.084)	-0.011 (0.094)	-0.016 (0.115)	0.115* (0.059)	0.019 (0.064)	-0.020 (0.075)
<b>Kernel - PSM</b>	0.135* (0.080)	-0.077 (0.097)	-0.078 (0.122)	0.107* (0.057)	0.025 (0.065)	0.003 (0.076)
<b>Nearest Neighbour</b>	0.195** (0.095)	0.195 (0.174)	0.181 (0.141)	0.077 (0.062)	0.105 (0.129)	0.088 (0.095)

Note: Bootstrapped standard errors are reported in parentheses, heteroskedasticity-consistent standard errors are reported for Nearest Neighbour estimator (Abadie and Imbens, 2008); \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01. The results are obtained by excluding from the matched sample enterprises operating in agriculture, forestry and fishing, mining and quarrying and manufacturing sectors as well as those operating in the supply of electricity, gas, water, steam & air conditioning. Thus, the sample includes enterprises operating in sectors belonging to sections F to U of the ISIC of all economic activities (see UN, 2008).

**Table A 10: ATT by audit type – subsample II**

Dependent Variable Years after the audit Type of Audit	Taxable Income			CIT payable		
	I	II	III	I	II	III
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Comprehensive</b>	0.358 (0.243)	0.184 (0.231)	0.077 (0.269)	0.304 (0.190)	0.173 (0.194)	0.108 (0.206)
<b>Desk &amp; Issue</b>	-0.001 (0.095)	-0.225** (0.096)	-0.194* (0.106)	-0.021 (0.048)	-0.100* (0.058)	-0.112** (0.057)

Note: Bootstrapped standard errors are reported in parentheses; \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01. The results are obtained by excluding from the matched sample enterprises operating in agriculture, forestry and fishing, mining and quarrying and manufacturing sectors as well as those operating in the supply of electricity, gas, water, steam & air conditioning. Thus, the sample includes enterprises operating in sectors belonging to sections F to U of the ISIC of all economic activities (see UN, 2008).

**Table A 11: Aggregate ATT – subsample III**

Dependent Variable Years after the audit	Taxable Income			CIT payable		
	I	II	III	I	II	III
Matching estimator	(1)	(2)	(3)	(4)	(5)	(6)
<b>CEM</b>	0.242* (0.127)	0.242 (0.180)	0.222 (0.203)	0.122 (0.091)	0.202 (0.128)	0.148 (0.147)
<b>Kernel - MHD</b>	0.137 (0.094)	-0.011 (0.110)	-0.011 (0.121)	0.065 (0.061)	0.015 (0.075)	-0.019 (0.082)
<b>Kernel - PSM</b>	0.124 (0.096)	-0.028 (0.123)	-0.102 (0.112)	0.089 (0.065)	0.059 (0.088)	-0.029 (0.074)
<b>Nearest Neighbor</b>	0.228** (0.092)	0.192 (0.141)	0.236** (0.139)	0.083 (0.060)	0.085 (0.096)	0.102 (0.097)

Note: Bootstrapped standard errors are reported in parentheses, heteroskedasticity-consistent standard errors are reported for Nearest Neighbour estimator (Abadie and Imbens, 2008); \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The results are obtained by further reducing the matched sample with respect to subsample II by including only the enterprises operating in sectors belonging to sections F to M and S of the ISIC of all economic activities where audits are more frequent. Namely, these are: construction; wholesale and retail trade, repair of motor vehicles and motorcycles; transportation and storage; accommodation and food service activities; information and communication; financial and insurance activities; real estate activities; professional, scientific and technical activities; other service activities (see UN, 2008).

**Table A 12: ATT by audit type – subsample III**

Dependent Variable Years after the audit	Taxable Income			CIT payable		
	I	II	III	I	II	III
Type of Audit	(1)	(2)	(3)	(4)	(5)	(6)
<b>Comprehensive</b>	0.382 (0.244)	0.232 (0.227)	0.143 (0.263)	0.312 (0.195)	0.210 (0.186)	0.135 (0.202)
<b>Desk &amp; Issue</b>	0.017 (0.071)	-0.210** (0.095)	-0.151 (0.099)	-0.018 (0.036)	-0.102* (0.057)	-0.093* (0.055)

Note: Bootstrapped standard errors are reported in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The results are obtained by further reducing the matched sample with respect to subsample II by including only the enterprises operating in sectors belonging to sections F to M and S of the ISIC of all economic activities where audits are more frequent. Namely, these are: construction; wholesale and retail trade, repair of motor vehicles and motorcycles; transportation and storage; accommodation and food service activities; information and communication; financial and insurance activities; real estate activities; professional, scientific and technical activities; other service activities (see UN, 2008).

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