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Technology Evolution and Tax Compliance: Evidence from Rwanda

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Summary of African Tax Administration Paper 30

Narrowing the 'information problem' through technology

Data on economic transactions is crucial for tax administrations to be able to enforce tax compliance. One way of obtaining more information is through technology. In the last decade, African tax administrations have increasingly adopted technological advances such as integrated systems, electronic filings, and electronic billing machines (EBMs). EBMs allow taxpayers to digitise their transactions and transfer billing information automatically to the revenue authority. They also hold high potential for taxpayers, as they can allow firms to lower administrative and compliance costs, streamline transactions, improve their record-keeping, strengthen their capacity, and in the case of small businesses, attract clients and engage in trade thanks to the improved accuracy.

Rwanda is one of the fastest growing and most technology-oriented countries in Africa, whose tax authority, despite a steadily rising tax-to-GDP ratio, still faces challenges such as limited resources and high levels of informality. In 2013, the Rwandan Revenue Authority (RRA) introduced EBMs through a machine called EBM1. The machine used a SIM card, through which VAT-registered taxpayers transmitted sale transaction data to the RRA in real-time. Like any technology, it came with several issues, such as high costs, storage limitations and lack of support. As a result, an improved free software version called EBM2 was rolled out in 2017, which could digitize and store receipts and capture core business information like inventory and item types.

This paper evaluates the impact of the implementation of EBM2 on VAT and income tax fillings. Thanks to a collaboration with the RRA, we looked at a subset of around 60,000 EBM users' monthly/quarterly VAT and annual income tax returns from 2013 to 2020. We focus specifically on two groups, those who had previously used EBM1 and shifted to EBM2 (shifters) and those who only adopted EBM2 (new users). Taking advantage of the fact that the adoption of both technologies happened over time, we conduct a difference-difference strategy that allows us to estimate the impact of EBM2 by comparing the changes in key outcomes for VAT, such as non-taxable sales, VAT input, VAT on sales, refund requests, the accuracy of reports and the likelihood of nil reporting, and income reporting outcomes.

How effective are EBMs in improving tax compliance?

Regarding VAT reporting of new users, we find that adopting EBM2 caused a significant increase in all key VAT return items. And the probability of nil-filing – filing a tax return with no taxable income – is curbed by 33 percentage points. These results show that EBM2 is quite effective for new users, who likely benefit from adopting the technology for the first time.

The impact of EBM2 on those who shifted from EBM1 is more muted, as we find a weak negative effect of VAT on output and final VAT due. We believe a weaker impact for shifters is likely because of their familiarity with EBM1.

Regarding income tax, the probability of filling on time, turnover, and final tax payable income, are reduced. Thus, the adoption of EBM2 has had negative spillover effects on income tax compliance. In addition, we see that expenses rise for new users and they also struggle to file on time. For shifters, expenses fall, which we believe might result from EBM2 improving data sharing with RRA and thus making tax avoidance through expense over-reporting harder. Finally, the paper also estimates the impact of EBM2 on reporting accuracy. We find that EBM2 increases the discrepancies between VAT and income tax returns. This happens in two ways; first, the probability of filing both returns is lower, and second, the probability of reporting the same turnover across returns is also reduced. The fact that new users report VAT income more accurately and income less could be explained by the misperception that the RRA monitors VAT more closely than income tax, thanks to EBM2.

How do different taxpayers react to new IT solutions such as EBM2?

Because different taxpayers can respond differently to IT solutions, we compare taxpayers by sector, location, and size. When it comes to firm sectors, manufacturing firms increase turnover after adopting EBM2, as do firms in trade and construction. Not surprisingly, when it comes to firm location, there is more impact in Rwanda's capital, Kigali, with users there significantly increasing their turnover and final VAT due compared to those in the provinces.

When analysing firms by size, there is a backfiring effect from medium and large taxpayers, especially on VAT paid on inputs and final VAT liability. When it comes to new users, small taxpayers report higher turnover and final VAT due. The results suggest that the RRA's attention should be focused on two groups: **larger taxpayers**, who are more tax-savvy and can probably be more creative when it comes to tax avoidance, and **rural taxpayers**, who due to a lack of knowledge, might not be reaping all the benefits from EBM2.

Conclusions and Policy recommendations

Overall, we find that sophisticated IT solutions, like EBM2, can effectively increase tax revenue and compliance. However, since these increases are not equal for all taxpayers and can also result in negative results for income tax, more attention is needed to reap the benefits of technology properly. Implementing EBMs holds big promises and lessons for both the RRA's tax administration and tax administrations in the region.

There are two main policy takeaways. First, the fact that the effect of EBM2 for new technology users is higher and that these users are mainly small firms indicates that this technology has high potential in increasing voluntary compliance for a group where investing in strong audit strategies might not be so fruitful, given that they generate a low share of VAT. However, this should be complemented by policies such as strengthening e-invoicing.

Second, since we find that shifters from EBM1 to EBM2, although largely unresponsive, report less VAT on sales and final VAT due, the tax administration should keep a closer eye on this group. These are mainly more equipped taxpayers who could have learned how to respond to increased enforcement measures over time. Thus, the learning effect must be considered for further policy.

> **"Even if a more sophisticated IT solution for taxpayers, such as EBM2, is effective in increasing tax revenue and compliance, this is not the case for all taxpayers and, in some cases, technology is ineffective."**

Further reading

Hakizimana, N. and Santoro, F. (2023) 'Technology Evolution and Tax Compliance: Evidence from Rwanda', ICTD, African Tax Administration Paper 30, Brighton: Institute of Development Studies, DOI: 10.19088/ICTD.2023.033

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Credits

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