

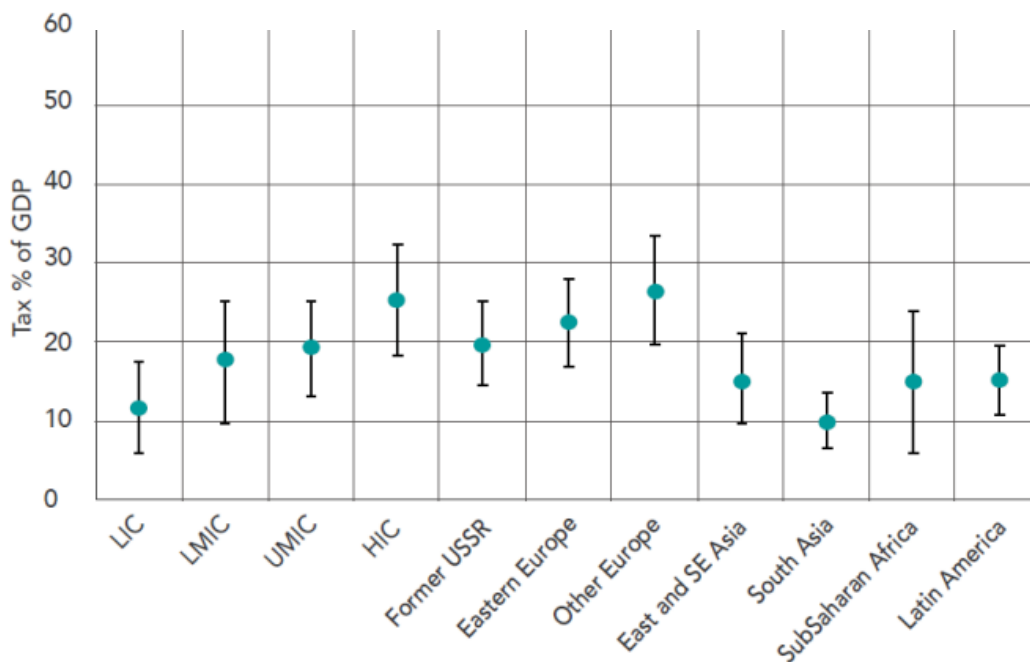
THEMATIC INSIGHT

September 2020

Modernizing tax collection¹

Developing, maintaining, and using tax records to boost revenue

Tax revenue as % of GDP



Source: Glenday et al. (2018)

Introduction

Tax revenue funds the provision of public goods, but poor countries struggle to raise taxes. In fact, as shown in the figure above, low income countries (LICs) raise only half as much tax revenue, as a share of GDP, as high-income countries (HIC). In turn, low tax revenue in developing countries leads to lower public good provision and insufficient anti-poverty programs, also in turn hindering economic growth and citizen welfare.

For policymakers in financially constrained countries, it is key to find ways to boost tax compliance by more strategically and efficiently using *existing* resources. This involves keeping better records to know who governments should be taxing and how much, processing and updating data, and testing different tax collection and audit procedures.

Key Questions:

- What are effective strategies to decrease tax avoidance?
- Can bureaucrats increase tax compliance by more effectively managing their tax data?
- What are the benefits and drawbacks of tax officials having discretion in assessment of tax liability, versus more rule-based processes or algorithmic decision-making?

¹ This Research Recap was prepared in February 2020 by Anya Marchenko and Leah Bridle at the Center for Effective Global Action (CEGA) as part of the Economic Development and Institutions (EDI) Programme funded by UK Aid.

In this brief, we discuss the taxation challenges of two countries - Senegal and India. We discuss the modern solutions that EDI-funded researchers are developing and testing in partnership with local tax authorities to help these countries raise more property, VAT, and corporate income tax.



SENEGAL

Researchers are introducing a modern tax records and management system to increase the amount of property tax collected by the Senegalese tax authority

Researchers: Denis Cogneau, Marc Gurgand, Justine Knebelmann, Victor Pouliquen, Bassirou Sarr

CONTEXT: In Dakar, where this study takes place, baseline survey results estimate that only 13% of taxpayers paid the property tax in 2018, and **only 20% of potential revenue was collected**. Senegal's current tax to GDP ratio is 15%, with an objective to reach 20% by 2023 (per the Senegalese National Development Plan). However, given limited tax compliance rates, property taxes only amount to .4% of GDP, far below what they could be.

The national tax administration, Direction Générale des Impôts et Domaines (henceforth DGID), is in charge of keeping track of property values and collecting property tax. There are multiple stages of inefficiency in the property taxation process.

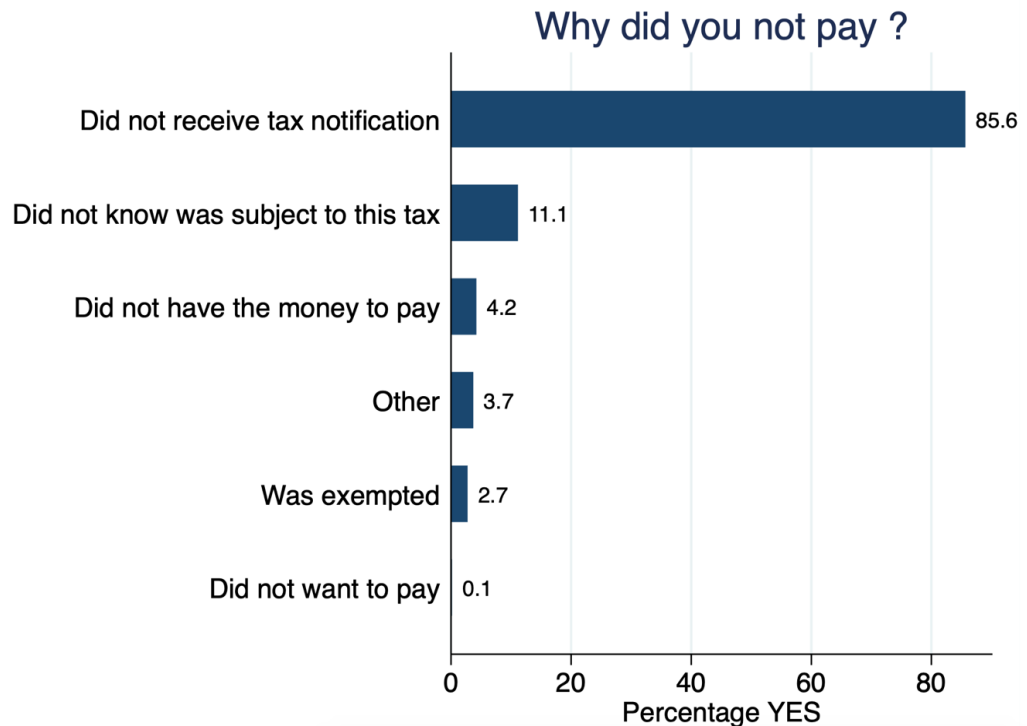
Step 1: Valuing the property

In principle, property owners are required to annually update DGID on the value of their property by coming to a DGID office. Since this is costly and there is little threat of punishment for taxpayers who do not comply, many taxpayers fail to do so (for example, even among owners already known to the tax administration, only 19% had paid their property tax in 2018).

In practice, DGID does not update most property values in its official records. Given property values in the Dakar metro area have been steadily rising, most properties are under-valued, which gives citizens little incentive to update DGID's valuations and thereby increase their tax burden.

Step 2: Sending reminders to pay taxes

Reminders to pay taxes are notification letters that must be physically delivered to each individual taxpayer's property by an official. However, **fewer than half of the tax notifications are actually distributed** because DGID does not have up-to-date or detailed enough addresses for these properties. It is not surprising, then, that among citizens who did not pay property taxes, 85% say that it is because they never received a notification.



*Survey results of taxpayers in Dakar collected by the research team indicate that most property owners who do not pay say they were not notified by the government to do so.
(photo courtesy of Justine Knebelmann)*

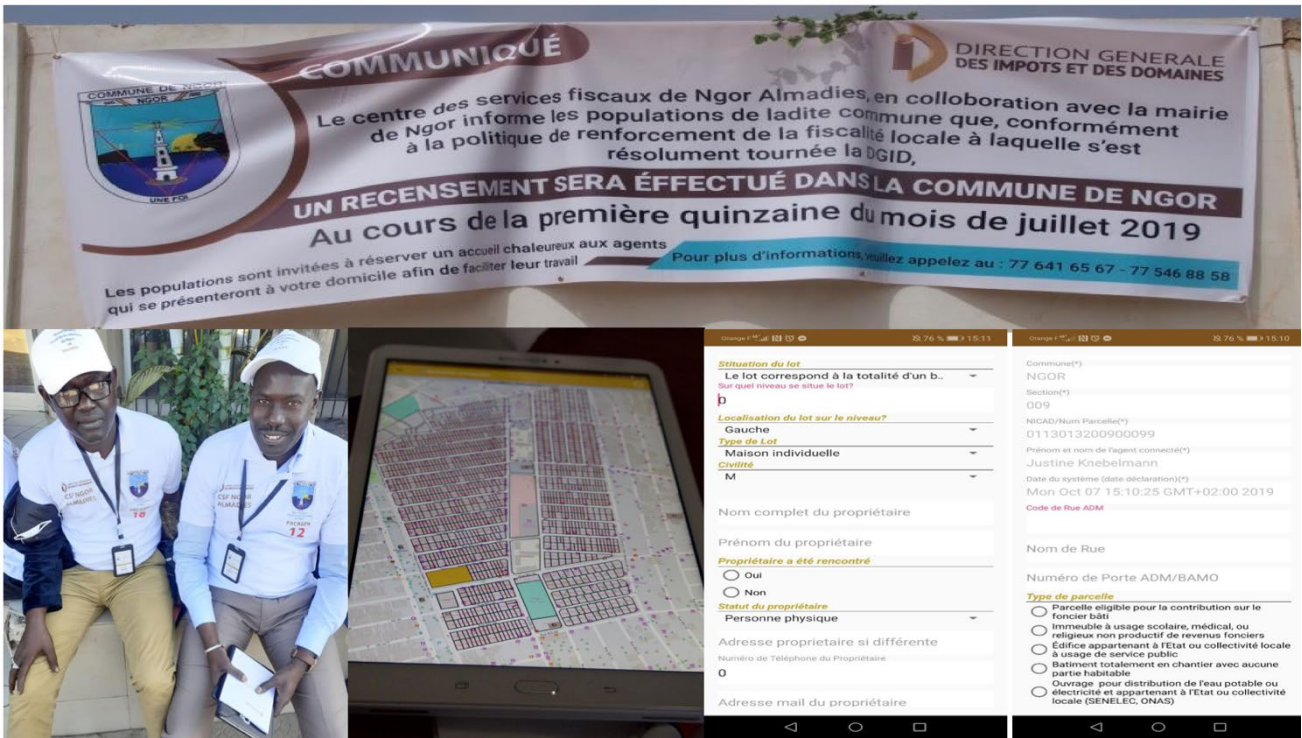
Step 3: Paying taxes

If the taxpayer does receive the notification, they are required to physically come to a Senegalese Treasury office to pay, which is costly. The lack of understanding of these requirements, or perceived lack of repercussions for evading property taxes, is evident in baseline survey results: 40% of owners said they did not pay property taxes either in the current or past year.

INTERVENTION: For two years, the researchers worked with DGID and a local IT firm to develop an application that would help DGID keep track of properties, property values, locations, and predict what a property's predicted valuation *should* be. The project team, the tax administration, and the developers designed the application collaboratively.

The project has three interrelated goals:

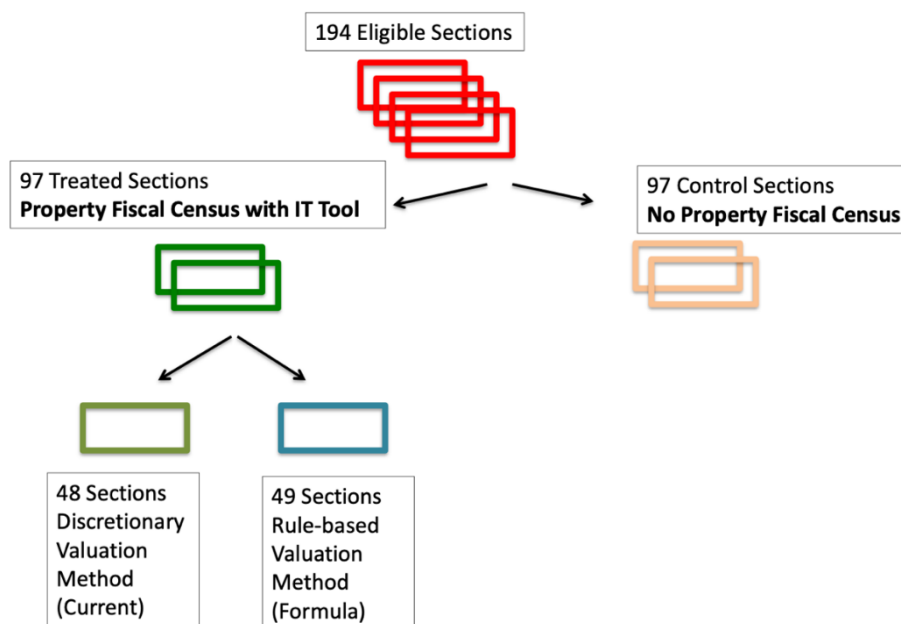
1. Conduct a comprehensive, digital census of the properties in Dakar.
2. Give tax officials a new data collection and management web application that they can use to access the updated property census information.
3. Finally, in half of the treated cadastral sections (a cadastre is a map of the bounds of properties in an area), the application also provides property valuation *estimates* based on the data already uploaded. This includes the type of floor and walls, whether the property has a terrace, etc.



Photos courtesy of Justin Knebelmann

Officials, bottom left, conducting a property census in treated sections in Dakar carry around a tablet with cadastral maps (bottom middle) to verify and update the property data (bottom right). A sign informs citizens of the ongoing property census (top).

As part of developing this new property tax management system, the researchers selected 97 cadastral sections in Dakar's metro area to map where properties are located and upload this data into the modernized record system. This allows them to compare the value of tax collected in these "treated" regions as compared to 97 similar regions with business-as-usual tax collection. The experimental design includes cadastres that will and will not be censused, as well as sections for which the property values will be predicted via algorithm versus by human judgment (see Figure below).



PRELIMINARY RESULTS: The roll out of the administrative tool remains ongoing, with full results available mid-2021. The project will evaluate whether this new data management system helps increase property tax collection.

Thus far, the research team has completed a survey among a sample of property tax owners in Dakar, to understand owners' identity and ownership status, properties and their values, and respondents' experiences with the property tax and perception of the government.

Takeaways from the survey of property owners:

Only about half of the time could the owner of a given property be found to complete the survey. Among those who paid property tax in 2018, the average amount they owed was 40% higher than what they paid.

61% of respondents (owners) reported a lower property value than what was reported by third party experts who visited the property, implying that over half of properties surveyed may be undervalued and therefore under-taxed.

Another EDI-funded study—reviewed next—is working with DGID to increase the success of DGID's audits of firms. Specifically, they are working to increase the probability of finding the firms that are avoiding taxes and getting more money from fining those firms (termed audit yield).

Designing and testing an algorithm to select which firms to audit

Researchers: Anne Brockmeyer, Denis Cogneau, Pierre Bachas, Bassirou Sarr

CONTEXT: Tax administrations in low-income countries often rely on inspectors' discretion over which firms to audit. In principle, this may work well if tax auditors choose to act fairly based on specific and privately held (and likely poorly documented) knowledge about firms when deciding which to audit. However, this reliance on discretion also increases the risk of unfair practices or corruption. It is unclear whether the benefits (in terms of tax revenue) of tax auditors being able to make decisions based on private information outweighs the (potential) cost of increased corruption. An illustrative statistic suggests that the current discretion-based method is not very effective: Senegal loses \$420 million annually to corporate tax evasion, or just under 3% of its GDP (this rate is on par with other countries in the region, such as Sierra Leone and the Gambia, but more than Senegal's neighbours such as Mauritania and Guinea-Bissau) (Cobham 2017).

Most audits target firms rather than individual taxpayers, given firms pay the vast majority of tax revenue (OECD 2017), and third-party information is available. Around 1,600 of such firm audits are conducted each year in Senegal, of which 200 are comprehensive audits at the firms' offices and 1,400 are desk audits at the tax authority's offices.

INTERVENTION: The researchers work with the universe of (162) tax inspectors in the offices responsible for conducting audits, and the entire population of (approximately 10,000) registered firms in the corporate and VAT tax regimes in Senegal.

The team designed an algorithm that selects firms for auditing. The algorithm predicts the likelihood that each firm is evading taxes, based on data from corporate income tax, value-added taxes, and other data. Each firm has an equal likelihood of being assigned to one of the following three audit mechanisms: discretionary selection by the tax authority, algorithmic selection, or random selection (a comparison group to benchmark the other two approaches). **The team can then compare the tax collection outcomes across these three groups. Which approach more effectively detects non-compliant firms, and increases the financial returns to auditing?**

RESULTS: Results will be available in the summer of 2020. The team developed the algorithm in 2017 and have now tested this audit selection method in 2018 and 2019, updating with new data each year. The team is currently rolling out the taxpayer survey, starting the 2020 audit program, and holding preparatory meetings with new regional tax centres that will use this audit selection method for the first time in 2020.

While both studies are still underway, they have the potential to significantly impact how much revenue Senegal collects from taxes.



INDIA

Algorithms that harness tax data can effectively detect 'bogus' firms that enable VAT tax evasion

Researchers: Aprajit Mahajan and Shekhar Mittal

The value-added-tax (VAT) is attractive to governments because, in theory, it induces high compliance from firms. Since *both* firms involved in a transaction report the finances of that transaction separately, VAT taxation leaves an extensive paper trail, which the tax authority can use to verify transactions. However, the complexity of documentation² and the costs to process this paper trail makes it difficult to deter tax fraud and punish evaders. Taxpayers may simply respond by evading using more complex techniques.

One VAT tax evasion technique is “bogus” firms. A bogus firm is set up for the purposes of fraud — they generate false paper trails and sell fake receipts to real firms, so that those “costs” can be subtracted out of what the firms owe the tax authority in VAT taxes.

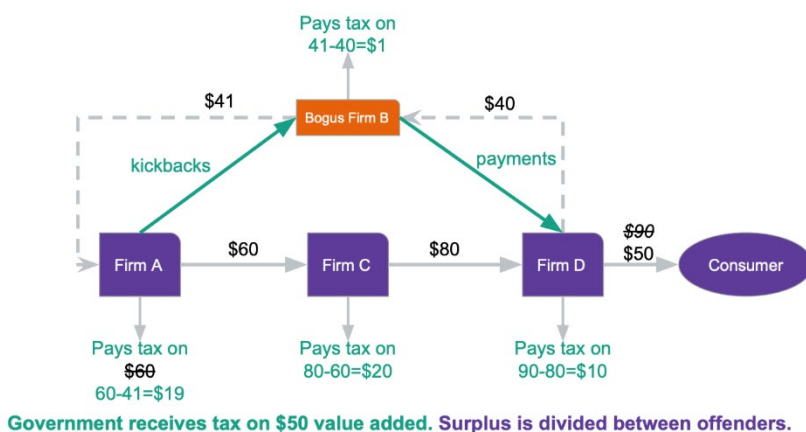
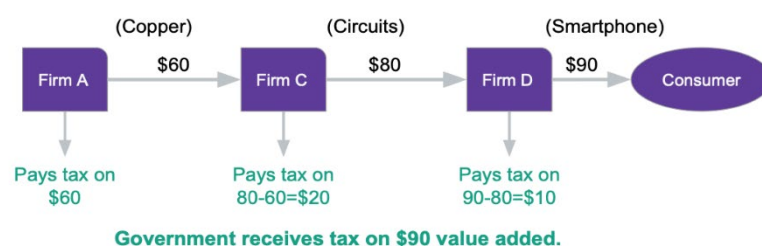
CONTEXT: The Delhi tax authority usually identifies ‘bogus’ firms by visiting the physical site to see if the firm

is conducting legitimate business. However, the tax authority cannot physically visit all of the firms that they

A primer on VAT taxation

(example and figures compliments of Shekhar Mittal)

VAT is an indirect tax charged at multiple stages of production in which firms do not have to pay VAT on the *input* goods to production. Consider the production of a smartphone, whose manufacturing chain involves many firms. If a firm in this manufacturing chain sells \$80 worth of circuits to another firm, with \$60 of copper that they used as an input, they pay VAT only on \$20 (see diagram below). In this way, VAT only taxes the *value* the firms *adds* to production.



² Many governments across East Africa mandate that businesses use electronic fiscal devices (EFDs) to increase VAT tax compliance and documentation. These EFDs electronically record the sales that a firm makes and are designed to send the resulting receipts to a state revenue office’s centralized database. In a separate EDI-funded pilot, Fredrick Manang and Pierre Bachas sought to test whether EFDs and tax compliance notifications could increase VAT compliance in Tanzania. Preliminary takeaways confirm that maintaining this centralized database of VAT receipts will be essential, and should not be assumed, before designing and testing tax evasion deterrence interventions.

have flagged as potentially fraudulent, thus many bogus firms continue to write fake receipts to real firms. Ideally, tax auditors could efficiently use tax records to predict which firms are highly likely to be bogus, visit the firm location in person to confirm whether a firm is just a shell for the sole purpose of VAT evasion (i.e., bogus), fine the firm, and shut them down.

While how much revenue the government is losing from bogus firms is unknown, officials in Delhi suggest that it might be as high as \$300 million (a common number named in conversations between the researchers and Delhi officials). Note that in 2017-18, Delhi's total VAT tax revenue was [\\$1.5 billion](#).

INTERVENTION & RESULTS: The authors have designed, and are currently implementing, a machine learning tool to help identify “bogus” firms in Delhi. The tool works as follows.

The authors have data, over the previous several years before the study, on which firms the Delhi tax officials audited and whether they actually turned out to be bogus. The authors then test whether the algorithm would have performed better given the same tax data that Delhi officials had – i.e., whether the algorithm would have identified more fraudulent firms correctly than the ones Delhi tax officials had actually picked for inspection.

The results are impressive. **The researchers estimate that if the tax administration had used the algorithm to predict which firms to audit in the past, rather than relying on physical inspections, they could have prevented enough VAT tax evasion to increase revenue by US\$15 - 45 million (Mittal 2018).**

Clearly this project has the potential to have large policy impact. Currently, Mahajan and co-authors are working with other states in India, including Punjab, to discuss rolling out the algorithm to increase VAT tax collection.

Conclusion

These experiments test promising reforms that facilitate the design and maintenance of tax record systems, the interpretation of resulting data, and its use to target audits.³ But one concern with modernizing tax systems is resistance from within. For example, the RA2 Bangladesh institutional diagnostic illustrated that reforms to digitize tax collection have been successfully blocked by taxpayers and tax collectors and inspectors (Ahmed 2020).

As researchers work with authorities in Senegal and India collect more tax revenue, this raises an important conceptual question: What happens when governments start collecting more taxes?

One potential consideration is the incidence of tax. In the case of property taxes in Dakar, Gurgand et al. are looking at the effects of the property tax census on the housing market. If the intervention induces property owners to pay more of the taxes they owe, will that translate into tenants having to pay higher rents? Most evidence has explored this question through difference-in-difference approaches, rather than through randomization. This project brings novel experimental evidence to bear on this question.

With the municipal elections in December 2019 in Dakar, there could also be **political ramifications** to increasing tax compliance. This raises a key secondary question, of whether increased taxation will translate into citizens demanding more services and accountability from their local representatives. RA2 work from the Tanzania Institutional Diagnostic illuminates another consideration of how politics can interact with taxation. Likwelile and Assey (2018) posit that one reason why the tax system in Tanzania is complex and inefficient is because it benefits certain bureaucrats, politicians, and powerful taxpayers. These agents may resist improvements to the system in order to protect their influence and control.⁴

³ The personnel management of tax officials could also play an important role in tax revenue collected. For example, the General Tax Directorate of Benin engaged through EDI's RA2 is pursuing a results-based management system with a record that is thus far mixed (Caldeira and Graziosi, 2019).

⁴ In the case of Tanzania, Fjeldstad (2001) maintains that “such an environment offers informal incomes for civil servants and their social network members and provides a visible arena for local councillors to play out their political aspirations *vis-à-vis* their constituents.”

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