An Introduction to Digital Tax Payment Systems in Low-and Middle-Income Countries

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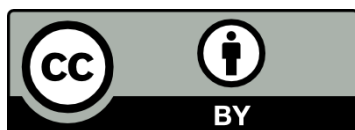
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Summary

National tax administrations are increasingly investing in the digital facilities needed to make it possible for taxpayers to go online both to file their routine tax returns (e-filing) and remit the tax payments due (e-payment). These facilities potentially benefit both taxpayers and tax administrations. This paper first maps the landscape, explaining which filing and payment technologies are used for tax collection in Africa. We then examine why these technologies are not used to their full potential. Some constraints are on the demand side. These include taxpayers' preferences for cash and in-person relations and low familiarity with and trust in digital technology. Other constraints lie in infrastructure deficits and broader political, regulatory, and institutional factors. Unlocking the full potential of e-filing and e-payment systems thus seems to depend on meeting several pre-conditions, including solid political will, sound regulatory frameworks, reliable payment infrastructure and adequate investment in human capital. However, there is relatively little reliable evidence of the actual effectiveness of e-services in tax collection. We conclude by outlining some research priorities.

Keywords: tax compliance, digitalisation, digital financial services.

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Acknowledgements

Acronyms

B2G	Business to government
DFS	Digital financial services
DRM	Domestic revenue mobilisation
FIRS	Federal Inland Revenue Service, Nigeria
G2B	Government to business
G2G	Government to government
G2P	Government to person
KRA	Kenya Revenue Authority
LMICs	Low- and middle-income countries
P2G	Person to government
RRA	Rwanda Revenue Authority

Introduction

Digital financial services (DFS) and digital ID systems are becoming ever more prevalent in low- and middle-income countries (LMICs). They have become critical components of broader tax reform and domestic revenue mobilisation (DRM) efforts. They often include e-filing and payments platforms (including mobile money), various forms of functional and foundational digital identification systems, and several other technology tools that facilitate secure registration and payment for government services, including taxes.

On paper, these technologies offer many benefits to taxpayers, including:
- Reducing tax compliance costs by improving record-keeping for tax purposes, and limiting travel time and the need to visit physical tax offices.
- Improving front-end taxpayer services (including tax filing and payment).
- Increasing the overall transparency and predictability of the overall taxpayer experience.

For tax administrators, these technologies promise to:
- Improve access to, and usage of, taxpayers' data – including data from third parties and transactions data – while also strengthening audit selection and management.
- Limit the scope for corruption and collusion by introducing more transparent and auditable records.
- Reduce administrative costs and enhance the efficiency of back-end data management systems and processes.
- Improve overall revenue generation.

However, there are many gaps in our understanding of the precise impacts of these technologies on tax systems, and even less is known about how revenue authorities in LMICs use them to improve administrative outcomes. This report will be the first in a series that seeks to present the state of existing evidence about tax administrations' investments in DFS and digital ID systems. While we leave the discussion of digital ID systems to a future report, this paper will assess the observable effects of digital payment technologies on tax systems in LMICs, with a specific focus on a) web-based e-filing and e-payments platforms, and b) mobile money systems which revenue authorities have directly invested or enabled in. The context of our analysis is one of limited state and fiscal capacity, wherein tax administrations face several challenges in their efforts to digitise their systems. These challenges range from poor infrastructure to widespread informality, and from limited funding to often inconsistent political will (Okunogbe and Santoro 2022).

The special attention given to e-filing, e-payments, and mobile money is justified because, as this report will show, they have each become common features of digital transformation and IT reform projects in LMICs, including across sub-Saharan Africa. Unlike broader, economy-wide digitisation efforts, these technologies often fall within the full remit of revenue authorities, which gives us the opportunity to analyse their narrow effects on tax administrative outcomes. This report will not deeply examine the effects of some adjacent technologies, including electronic fiscal devices, rebate payment structures, e-invoicing, and other systems for accounting, risk, fraud, or audit management. Though these systems may complement core tax payment functions, they each require a depth of analysis that is beyond the scope of this report. For a recent review of these broader technologies, please refer to Okunogbe and Santoro (2022) and Arewa and Davenport (2022).

This report will emphasise the effects of both mobile money and web-based e-filing and e-payments technologies on tax compliance, collection, trust, accountability, and the broad provision of taxpayer services. It will begin in section 1 by introducing the characteristics and

broad promises of tax payment systems in LMICs, and then proceed to examine specific evidence on the performance of e-filing, e-payments, and mobile money technologies. Following this, section 2 will expand on what we know about the limitations and barriers to successful adoption of these digital payment systems and section 3 will conclude with a discussion on the pre-conditions for their effective use in tax administrations in low-capacity contexts. This report's final contribution will be an exploration of future areas of research on digital payments and tax systems.

1 A primer on tax payment systems in low- and middle-income countries

1.1 What challenges do revenue authorities face in relation to payment systems?

To understand the landscape of tax payment systems in LMICs, we first need to grasp the challenges tax administrations face, and the conditions that necessitate significant investments in digital payment technologies. Tax systems in LMICs, including those in sub-Saharan Africa, are often characterised by a few interrelated dynamics, including a) heavy reliance on face-to-face interactions, b) cash-dependence and manual administrative processes, c) high tax compliance costs, and d) inefficient data governance and corruption. Although these dynamics are not unique to LMICs, they may circumscribe to a great degree the technological options available to decision-makers seeking to improve the efficiency of tax administration.

Payment systems in LMICs are also marked by broader factors that may lie outside the mandate of tax policy and administration. These include low levels of digital literacy in the general population, various gaps in country-wide technology infrastructure, and myriad exogenous institutional and political dynamics that inform technology investments (Gnangnon and Brun 2018; World Bank 2021; Awasthi, Lee, Poulin, Choi, Kim, Lee, Sung, and Chang 2019; Adelmann, Elliott, Ergen, Gaidosch, Jenkinson, Khiaonarong, Morozova, Schwarz and Wilson 2020; World Bank 2016; Kangave, Nakato, Waiswa and Zzimbe 2016; Ligomeka 2019; Moore 2020).[1] Each of these dynamics will reappear across the report as central themes to anchor our understanding of how digital payment technologies function within tax administrations.

1.2 What are digital tax payments and how do they differ from non-digital forms of payment?

Cash has historically been the predominant instrument with which people and businesses paid taxes, fees, and other liabilities owed to government. This began to change in the late twentieth century with the advent of modern payment instruments facilitated primarily by commercial banks. The digital and electronic government (and tax) payments ecosystem is now incredibly vast globally and across LMICs. It covers various systems and technologies, including e-filing and e-payment platforms, point-of-sale machines and mobile money, and electronic credit and debit transfers.

The payment (cash and digital) landscape typically encompasses several types of government payments:

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[1] Gaps in technology infrastructure could include unstable electricity access, inadequate data centres, mobile and internet connectivity, or limited cyber security and data protection systems.

- Government to government (G2G) payments refer to intra-governmental payments, often from one government ministry, department, and agency (MDA) to another.
- Government to person (G2P) and government to business (G2B) payments include payments such as conditional cash transfers or subsidies, income tax rebates, VAT refunds, or any other payments made by a government entity to individuals or businesses.
- Finally, person to government (P2G) or business to government (B2G) payments refer to taxes, pension and social security contributions, licence fees, fines, and any other payments individuals and businesses make to governments at the municipal, state, or national levels (World Bank 2012; Fichers and Naji 2020).[2]

This report will focus specifically on P2G and B2G digital payments for tax purposes.

1.3 The broad promise of digital payment systems

The potential effects of digitising government payment systems seem promising on paper. Some estimates find that developing countries stand to save between $220 billion to $320 billion annually, which was more than ODA inflows to emerging economies in 2015 (Lund, White and Lamb 2017). Digitising payments can also reduce leakages from P2G and B2G payments. Unlike cash, electronic payments could be less prone to corruption, embezzlement, and other leakages. By creating a digital trail of transactions, electronic payments could also limit the scope for tax evasion and tax fraud, while reducing incentives for officials to extort or solicit bribes from taxpayers.

These digital trails could vastly improve revenue authorities' audit and enforcement capabilities by providing the foundational data with which officials can analyse payment patterns and detect evasion (Lund *et al.* 2017). Many countries have increasingly sought to avail themselves of these benefits, and P2G payments are now estimated to be worth $8 trillion globally, though only $375 million of this accrues in LMICs (Wasunna, Mburu, Hassan and Plaitakis 2019).

Moreover, LMICs are rapidly becoming more digitally connected, signalling an opportune moment for revenue authorities to invest in digital payment systems. For example, sub-Saharan Africa averages 106 new internet users every second, with internet penetration increasing ten-fold since the turn of the millennium. Mobile phones and technologies have become increasingly ubiquitous, so much so that more people access the internet with their mobile phones than with a fixed line broadband (IMF 2020).

Though the quality of connectivity lags in other regions and these technologies remain unaffordable for millions of people, sub-Saharan Africa has made great strides in digital depth, particularly in the mobile financial sector.[3] Mobile money transactions in the region amount to 25 per cent of GDP, compared to only 5 per cent in the rest of the world. The region has also produced several indigenous financial technology (fintech) services and applications, and hosts over 600 active tech hubs to support digital innovation (IMF 2020). Subject to country-specific realities, these developments could address critical limitations to tax administration in LMICs.

The rest of this report will more deeply examine how revenue authorities have invested in P2G and B2G digital payment systems by focusing on a) e-filing and e-payment platforms and b) mobile money platforms. It will specifically present evidence of their effectiveness (or

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[2]   G2B and G2P payments have the highest rate of use of electronic payments, while P2G has the lowest (World Bank 2012).

[3]   For example, the average mobile download speed in SSA is 7.4 Mbps, which is about three times slower than the global average (IMF 2020).

lack thereof) in addressing core tax administrative challenges, and detail the factors hindering or enabling these investments to deliver sufficient returns.
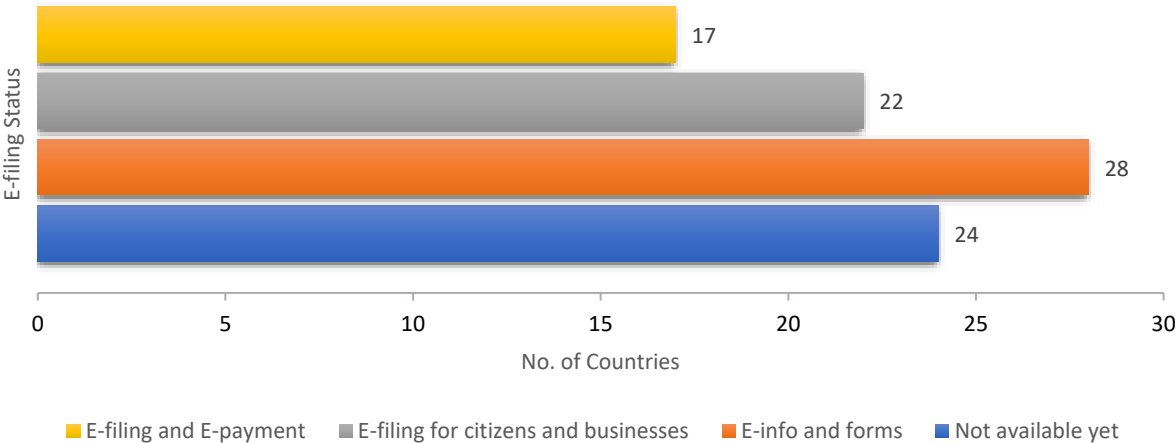
1.4 E-filing and e-payments

Tax authorities in LMICs significantly enable digital P2G payments through e-filing and e-payments platforms. In some places, e.g., Cameroon and Eswatini, mostly as a response to the Covid-19 pandemic, digital P2G payments have become mandatory and the only available option for taxpayers. These platforms allow taxpayers to file their tax returns and settle their liabilities digitally (through web-based systems) and are often embedded as modules within broader tax management information systems. These web-based payment services are often directly integrated with the relevant commercial banks, and allow payments through various digital channels, including bank transfers and debit and credit cards. In Kenya, for example, the Kenya Revenue Authority (KRA) implemented its iTax system in 2013. iTax provides a secure, fully automated and web-based application for taxpayers to file tax returns and make payments online (Ndung'u 2017; Ndung'u 2019).

Nigeria's Federal Inland Revenue Service (FIRS) similarly introduced e-filing and e-payments in 2013 through its Integrated Tax Administration System (ITAS) (Mas'ud 2019). Today, FIRS provides taxpayers with complementary commercial payments systems to settle their tax liabilities. These include local payment solutions like Remita, Interswitch and e-tranzact, as well as the multi-stakeholder Nigeria Inter-Bank Settlement System (NIBSS).

Several other countries – including Uganda, Rwanda, South Africa, Guatemala, among others – have implemented e-filing and e-payment systems to varying degrees of success (Ndung'u 2017; Ndung'u 2019; Mas'ud 2019; IMF 2020; Crawford 2013; Awasthi *et al.* 2019; Bukia 2019; Arewa and Davenport 2022; Okunogbe and Pouliquen 2022). In fact, a significant number of LMICs now have at least some form of e-tax services, including e-filing and e-payments, with a larger group of LMICs providing online info and forms (see Figure 1). However, sub-Saharan Africa lags slightly behind other regions (IMF 2020).

Figure 1 Diffusion of e-filing and e-payment services in lower- and lower-middle-income countries 2017

Sources: Arewa and Davenport 2022, from World Bank Public Financial Management Systems and eServices Global Dataset, https://datacatalog.worldbank.org/dataset/public-financial-management-systems-and-eservices-global-dataset (last updated 2017).

On balance, and based on limited evidence, e-filing and e-payments systems have provided modest but critical benefits to revenue administrations across LMICs. Since KRA launched

its e-filing and e-payments system (via iTax), tax collection increased from US$6.82 billion in 2013 to US$10 billion in 2015 – albeit a clear causal link cannot be established (Ndung'u 2019). Some studies have also concluded that, across sub-Saharan Africa, countries that provide e-filing and e-payment services tend to have better VAT collection efficiency, with most countries in the region recording significant improvements in overall tax collection efficiency after implementing e-filing and e-payments (IMF 2020). Focusing on a single country, Eswatini, Santoro, Amine and Magongo (forthcoming) show how mandating e-filing and e-payment through the e-Tax system as a response to Covid-19 significantly improved compliance. E-Tax registered taxpayers were less likely to file nil (by 60 per cent), likely to declare more turnover and taxable income and 70 per cent more likely to pay conditionally on filing.

In addition to potentially increasing revenue generated, e-filing and e-payment systems also reduce the costs of revenue collection, particularly by automating otherwise manual and time-consuming processes. This in turn reduces the administrative burden on tax officials and the tax compliance costs for taxpayers (Ndung'u 2017; Ndayisenga and Shukla 2016; Obert, Rodgers, Tendai and Desderio 2018). One study (Kochanova, Hasnain and Larson 2016) found that the average time to file and pay taxes reduced by up to 16 per cent within three years of introducing e-filing and e-payments, while the average number of tax payments reduced by 39 per cent within the same period, suggesting broad efficiency gains. The same study also found e-filing systems that provided e-payment functionality reduced the probability of tax inspections by up to 9 per cent and the probability of paying bribes to tax officials by 5 per cent (Kochanova *et al.* 2016; World Bank 2016). Similarly, as shown by Okunogbe and Pouliquen (2022) in Tajikistan, e-filing uptake led to a large reduction in bribes (18 percentage points) among taxpayers less likely to have been evading. More broadly, e-filing resulted in a large reduction in compliance costs across taxpayers with five hours saved each month (about 40 per cent of the time spent on fulfilling tax obligations).

In Belarus, Costa Rica and Kenya, the introduction of e-filing and e-payment systems reduced the time it took businesses to prepare and pay taxes by 804, 239, and 230 hours respectively (World Bank 2016). In Uganda, small business owners' attitudes about tax compliance changed positively after the Uganda Revenue Authority (URA) enabled e-filing and e-payment of taxes in 2012. And in South Africa, in part due to electronic filing and payments, up to 95 per cent of personal income tax assessments are made within three seconds. Back in 2006, these assessments would have taken 180 days (IMF 2020).

Rwanda's experience with electronic filing and payments technologies reflects similar results. The Rwanda Revenue Authority (RRA) introduced e-filing and e-payments in 2012, covering various tax types including VAT, PAYE, excise duties, and withholding taxes. Since then, these digital systems have curtailed the need for face-to-face interactions between taxpayers and tax officials, while reducing the time it takes to settle tax liabilities (Ndayisenga and Shukla 2016). The use of e-filing and e-payments reduced the time it took businesses to prepare, file, and pay taxes from 119 hours in 2015 to 109 hours in 2016 (Fichers and Naji 2020).

E-filing and e-payments systems have also been shown to incrementally improve access to real-time data and facilitate information sharing, reflecting nascent improvements in data quality (Mas'ud 2019; Brun, Chambas, Tapsoba and Wandaogo 2020). Despite these positive pieces of evidence, a lot more research is needed to reach firmer conclusions about the precise impacts of e-filing and e-payment systems on tax administration outcomes.

1.5 Mobile money

Mobile money P2G systems constitute a critical and ever more pervasive component of digital payments systems, especially in sub-Saharan Africa. These systems are distinct from, and in many cases more popular amongst taxpayers than, web-based e-filing and e-payment services. Mobile money operators (MMOs) have effectively become ubiquitous in many countries, including Kenya, Rwanda, Uganda, and Tanzania. Illustratively, across sub-Saharan Africa, the number of mobile money agent outlets was on average more than 38,000 in 2018, compared to basically zero in 2008 (IMF 2020).

In many African countries, mobile money accounts even surpass traditional bank deposit accounts, with 21 per cent of adults continent-wide having a mobile money account. Such is the prevalence of mobile money in Africa that transactions tripled from 8 per cent to 25 per cent of all transactions on average between 2014 and 2018, compared to an increase from 3 per cent to 5 per cent in the rest of the world (IMF 2020). Mobile money distribution networks are also seven and 20 times more widespread than automated teller machines (ATMs) and bank branches, respectively (Fichers and Naji 2020). Other estimates demonstrate that mobile e-government portals doubled from 25 countries in 2012 to over 48 countries just two years later (World Bank 2016). It was the consensus that the early adopters of mobile money (Kenya, Uganda, and Tanzania) drove this prevalence, but the volume of transactions in so-called 'frontier countries' – including Burkina Faso, Cote d'Ivoire, and Ghana – has essentially caught up (IMF 2020). Given the apparent significance of mobile money in Africa, this report will devote an independent section to discussing its benefits and drawbacks for tax administration, as well as what differentiates it from web-based e-filing and e-payment P2G platforms.

The primary driver of mobile money's ubiquity in Africa is the growing depth of mobile penetration in the continent. More Africans are connected through their mobile phones than through the internet. In some countries, like Senegal, Cote d'Ivoire, and Burkina Faso, over 70 per cent of adults own a mobile phone, and over 30 per cent have mobile money accounts. Likewise, 50 per cent of adults in the Democratic Republic of Congo (DRC) and 74 per cent of adults in Cameroon have mobile phones, though only about 16 per cent have mobile money accounts (Wasunna *et al.* 2019).

Elsewhere, in Rwanda, 99 per cent of the country is covered in 4G mobile services, and 49 per cent of its population had access to mobile services at the end of 2019. Between 2014 and 2017, mobile money accounts in Rwanda also rose from 18.1 per cent to 31.1 per cent (Fichers and Naji 2020). A survey of 12 African countries found that over 60 per cent of individuals used their mobile phones to interact with government, compared to only 5 per cent who used the internet via computer (World Bank 2016).

Mobile money's prevalence has several implications for financial inclusion, poverty reduction, taxation, and broader economic development objectives. These implications are multiplied in part because of the pressures of Covid-19, which further emphasised the necessity of providing digital payment alternatives as a substitute for physical, cash-based transactions.

Though there are several demonstrable case studies of B2G and P2G mobile money payments for other public services (utilities and civil registration, among others), this report will focus primarily on how such systems operate within revenue authorities to facilitate tax collection. Tax payments are often made less frequently than other government payments (probably with the exception of VAT and PAYE), and also require more documentation (filing, self-assessments), adding more complexity to the process. Across LMICs, one study found that over 46 countries have enabled B2G and P2G mobile money payments for at least one type of government service, but often for several. The same study discovered that only 29

countries surveyed enabled mobile money payments for taxes, with 20 of those countries located in sub-Saharan Africa (Fichers and Naji 2020).[4]

Box 1 – How do mobile money P2G and B2G services work?

Mobile money refers to myriad financial services offered through mobile phones. This includes person-to-person payments, credit, savings, and cross-border transfers and remittances. Mobile money platforms in Africa facilitate payments directly between parties using unstructured supplementary service data (USSD) codes, or alternatively via a network of agents that facilitate cash-in, cash-out (CICO) transactions. Mobile money services are often deployed through two models: bank-led and mobile network operator (MNO)-led. Bank-led models involve operators who are directly tied to traditional banks, which means the usually strict know-your-customer (KYC) requirements that apply to banks will be applied to the bank's mobile money service. Providers like MTN and Safaricom directly offer MNO-led mobile money services. MNO-led models are more prevalent across Africa (by volume of transactions), and often require less strict KYC requirements, to some degree because of different measured risks for MNO mobile money customers (Cooper, Munoz Perez, Esser, Allen, Hlophe and Ferreira 2019; Mondato 2018). P2G and B2G mobile money payment systems are developed primarily through four models (Fichers and Naji 2020; Wasunna and Frydrych 2017):

1. Direct integration: direct integration between the mobile money provider and the tax authority or government agency. Here, integration is fast and simple, with reconciliation and settlements often occurring in real-time if application programming interfaces (APIs) are used. Direct integration can be costly, however, because it requires tax authorities to set up individual arrangements with each mobile money provider. This may be too burdensome even in monopolistic markets and could have implications for the uptake and inclusivity of the payments system.
2. Third-party integration: involves the use of a third-party payments aggregator that connects various mobile money providers to the tax authority or other government agencies. Though the upfront costs are greater for third-party integration, and the aggregators are often profit-driven, third-party integration could potentially cover more taxpayers than direct integration, especially in non-monopolistic markets.
3. Centralised platforms: mobile money P/B2G services can also be provided through centralised government platforms that host various government services and integrate several payment options. Centralised platforms take a long time to develop, and require intensive cross-governmental coordination, which might be politically or institutionally infeasible in some contexts. Kenya's eCitizen platform and Rwanda's IremboGov platform are notable examples of centralised platforms that offer mobile money payment services.
4. Physical service centres: P2G and B2G mobile money services can also be provided through government-run physical service centres, many of which accept several payment methods, including cash.

Though more evidence is needed to conclusively assess the impact these mobile money platforms have on tax administrative outcomes, existing research suggests they may provide demonstrable benefits to revenue authorities and taxpayers.

As with e-filing and e-payment (web-based) systems, mobile money platforms can help expand the tax base, lower tax compliance costs, limit administrative burdens and increase

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[4] The 20 countries include Botswana, Burkina Faso, Burundi, Cameroon, Congo, DRC, Cote d'Ivoire, Ghana, Guinea, Kenya, Lesotho, Liberia, Rwanda, Sierra Leone, Somalia, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

revenue collection because of their convenience to taxpayers and tax authorities. In Kenya, mobile money has been particularly popular because of its ease, convenience, and speed. Today, over 90 per cent of digital payments on Kenya's eCitizen platform (which also facilitates some tax payments to the Kenya Revenue Authority) are made using mobile money (Wasunna and Frydrych 2017; Fichers and Naji 2020). Some estimates suggest mobile money platforms can even lower transaction costs by up to 75 per cent (Fichers and Naji 2020).

In Tanzania, 15 per cent of eligible taxpayers used mobile money to settle their tax liabilities just one year after the Tanzania Revenue Authority (TRA) introduced mobile money payments for property taxes, presumptive taxes, and personal income taxes. Likewise, after Mauritius introduced mobile payments for income tax, the Mauritius Revenue Authority (MRA) recorded more than 123,000 online and mobile tax returns, a year-over-year increase of 12 per cent (GSMA 2014). Elsewhere, in Guinea, revenue from vehicle taxes increased from GNF10 billion (US$1.2 million) in 2016 to GNF34 billion (US$4 million) in 2017 after the country enabled mobile money payments. The number of vehicle licences similarly increased from 124,000 to 360,000 in the same period (Fichers and Naji 2020).

Other evidence points to the capacity for mobile money P2G platforms to improve the quality of taxpayer registration and authentication processes. These platforms can be operated alongside functional or foundational ID systems to make it simpler and more efficient to register taxpayers (Pazarbasioglu, Mora, Uttamchandani, Natarajan, Feyen and Saal 2020). Tax authorities need robust authentication and verification systems to make taxpayer registration more effective and tax registries less error prone. Mobile money networks may be well-placed to augment registration efforts, especially for hard-to-reach populations. For example, the Liberia Revenue Authority (LRA) developed, with some success, a mobile data collection toolbox called Kobo to facilitate its efforts to register and collect information from small and informal businesses. In 2018, the LRA also launched its first mobile money tax payment platform for all taxes, including the goods and services tax, business income tax and personal income tax (Fichers and Naji 2020).

Though there is limited evidence of mobile money platforms directly increasing tax revenue, there is some evidence of the technology's effects on broader government revenue generation. For example, the Kenyan National Transportation Safety Authority (NTSA) recorded revenue increases from US$1.1 million to US$2 million between 2015 and 2016 after it migrated its citizen-facing services to the centralised eCitizen platform (with mobile money payments enabled) (Fichers and Naji 2020).

At least on paper, mobile money systems – and e-payments, generally – could feasibly reduce the scope for collusion, tax evasion and fraud because of the improved traceability of funds. These systems also often have inbuilt financial control, management, and audit tools that enhance accountability and transparency, and curtail revenue leakages (Ndung'u 2019; Ndung'u 2017; Ndayisenga and Shukla 2016). After Guinea enabled mobile payments for vehicle taxes, it was also able to use the system to produce daily reports on payments received and develop a digital platform to track tax payments in real time – with significant positive implications for financial planning and monitoring (Fichers and Naji 2020). In Rwanda, the M-declaration tool – a mobile money based option to pay taxes for presumptive taxpayers – yielded positive impacts among those taxpayers who adopted it. The tool appears to have reduced compliance costs for adopters, who because of the tool can pay anytime across the country. As with broader e-filing and e-payment systems, technical constraints still limit the potential of the M-declaration platform, and more can be done to improve the service to benefit taxpayers (Santoro, Lees, Carreras and Mukamana forthcoming).

2 Limitations and barriers of digital tax payment systems

Despite the promise of digital payment systems for revenue mobilisation, many LMICs continue to face several barriers limiting the effectiveness of these systems. Widespread user adoption also remains low. Illustratively, in sub-Saharan Africa, only about 30 per cent of countries provide e-filing or e-payment services, and many more lack basic, accessible websites that provide information about public finances (IMF 2020). The barriers and limitations of digital tax payment systems vary considerably depending on country-specific realities. The rest of this section will be devoted to addressing some of these common barriers.

2.1 Demand-side and socio-economic barriers

2.1.1 Low rates of user acceptance

Even when the e-filing and e-payment services are provided, uptake can be slow. An experiment on e-filing in Tajikistan concluded slow uptake was due to lack of awareness and lack of trust in the system, lack of access to computers and the internet, and interfaces that were not user-friendly (Okunogbe and Pouliquen 2022).

Other studies have found generally low levels of user acceptance of digital payment solutions, often due to lack of awareness and the high upfront costs needed to adopt new digital systems in the short run (Wasunna and Frydrych 2017; Soutter, Ferguson and Neubert 2019). Large businesses located in urban areas might be the exception here, especially those that operate in capital-intensive sectors and pay multiple taxes (Yilmaz and Coolidge 2013). Notably, even in those contexts where e-services are the only choice for taxpayers, uptake is far from being universal. In Eswatini, for instance, even after the September 2020 mandate to use e-filing and a zero-cash handling policy, only 41 per cent of taxpayers took up the service eight months after the revenue authority imposed the mandate. The majority either missed their filing obligations or continued with paper-based practices which were then processed digitally by a tax official or a tax accountant (Santoro *et al.* forthcoming b). Similarly in Rwanda, where e-filing and e-payment have been mandatory for taxpayers since 2015, many taxpayers are either unaware (33 per cent) or not using the tools (57 per cent for e-tax and 73 per cent for M-declaration).

Importantly, a severe digital divide can arise when considering digital services. Always in Rwanda, Santoro *et al.* (forthcoming a) show a first clear divide in awareness, as female, less educated taxpayers, with less sophisticated businesses, are significantly less aware of e-services. Furthermore, a second divide arises when considering actual adoption. Again, female taxpayers and the less knowledgeable and sophisticated taxpayers have lower rates of adoption. The authors also find that, one year into the Covid-19 pandemic, the same digital divide appears for new users (Santoro *et al.* forthcoming a).

2.1.2 Low trust in digital solutions

Trust in digital payment systems is vital to their widespread adoption. Yet across many LMICs, trust is not a foregone conclusion. Where trust is low, taxpayers are unlikely to alter their compliance habits unless use of the digital system is made mandatory and non-digital systems are not widely available (Yilmaz and Coolidge 2013). Low trust environments enable high transaction costs, curtail innovation, and keep penetration rates at low levels (World Bank 2016). In Tajikistan, taxpayers had low trust in the e-filing and e-payment system and

tax officials were also reluctant to relinquish extortionary relationships with taxpayers. Consequently, tax inspections increased after the implementation of the system, and collusive networks remained intact despite the e-filing and e-payment system being functional (Okunogbe and Pouliquen 2022). In Rwanda as well, a sense of mistrust towards the IT infrastructure of the revenue authority generates negative perceptions among users, not only of e-filing and e-payment services (Santoro *et al.* forthcoming a), but also of other more established technologies, like electronic billing machines (Mascagni, Dom and Santoro 2021).

More evidence is needed to demonstrate the relationship between trust in digital payment systems and their widespread acceptance among taxpayers. However, some indications suggest that trust can be positively influenced by responsible data governance, privacy, and cybersecurity mechanisms to limit the abuse of taxpayers' data (Pazarbasioglu *et al.* 2020; Thakur and Srivastava 2014). However, many LMICs do not perform very well here. Although 107 countries globally have enacted privacy laws, only 51 of them are developing countries. In those countries with existing privacy laws, enforcement and implementation remain relatively weak (World Bank 2016).

2.1.3 Transaction limits on digital payment platforms

Digital payment adoption can also be limited in contexts where taxpayers' tax liabilities exceed inbuilt transaction limits on digital payment platforms, especially mobile money. In Burkina Faso, Senegal and Cote d'Ivoire, for example, the maximum limit for mobile money accounts is only US$4,430. In DRC, the limit is only US$500. These thresholds are especially limiting for medium to large enterprises which, because of these limits, are often unable to use mobile money platforms to settle their tax liabilities and are left to rely on other, less limiting digital or non-digital payment methods (Wasunna and Frydrych 2017; Wasunna *et al.* 2019). It is also true that, as in Rwanda, mobile money-based options are often tailored for smaller taxpayers owning smaller tax liabilities, as with the M-declaration system (Santoro *et al.* forthcoming a).

2.1.4 High costs of adoption and unequal access to digital payment solutions

Digital payment solutions often come with new or enhanced costs for taxpayers. These costs can sometimes be too burdensome for taxpayers, who may find the time and effort too great to learn how to use the digital systems. The costs can be even higher for both tax officials and taxpayers who are not IT-savvy (Azmi and Kamarulzaman 2010; Hung, Chang and Yu 2006; Mas'ud 2019). Similar dynamics are at play for businesses (especially small and informal businesses) for whom the costs of digitising financial, accounting, and payment systems can be prohibitive (Kochanova *et al.* 2016; Ndayisenga and Shukla 2016; Obert *et al.* 2018). To counter this, in Rwanda the revenue authority has sought to lower adoption costs by investing in practical training, subsidies to enable taxpayers to procure the right tools or software, and both virtual and in-person customer service (Santoro *et al.* forthcoming a).

The effects of digital payment systems can also depend on the type of tax, with taxes collected at source (e.g., PIT and CIT) being somewhat more amenable to digital payment systems than consumption taxes or trade taxes (Wawire 2020; Brun *et al.* 2020). Moreover, not all digital payment systems are the same, or deliver the same features. Illustratively, some evidence demonstrates that e-filing systems that are developed without complementary payments functions do not significantly reduce tax compliance costs in the short- or medium-run (Kochanova *et al.* 2016).

Although digital payment systems are often considered to be invaluable tools for financial inclusion, by some measures this is not the case for P2G digital payments. In Taiwan, for

example, adopters of e-filing and e-payment systems were predominantly male, university educated, young, and married (Hung *et al.* 2006). Similarly, in Kenya, mobile money uptake was highest among urban, educated, and male individuals (Wasunna and Frydrych 2017). A very similar pattern has been discussed for Rwanda as well, again questioning the big original promises of financial inclusion (Santoro *et al.* forthcoming a). Though more evidence is needed to draw firm conclusions about how inclusive digital P2G payment systems are, the little evidence that exists suggests that more work is needed to ensure its benefits accrue to a wider variety of people.

2.1.5 Low digital capabilities and preference for in-person interactions

Tax systems in LMICs often require face-to-face interactions between taxpayers and tax authorities, with taxpayers frequently having to travel to their nearest tax offices to access various taxpayer services and pay taxes. Physical interactions are necessary in part because many tax authorities in LMICs are unable to access sufficient data (especially electronic and third-party data) to otherwise verify taxpayers' information (Okunogbe and Pouliquen 2022).

Tax payments are inherently complex, and require not just user-friendly taxpayer portals, but also simple underlying codes and procedures. The complexity of filing individual taxes is such that it requires more information than other types of P2G payments (e.g., utilities, bills) (Wasunna *et al.* 2019). As a result, even when, say, mobile money payment services are available, taxpayers may still require or prefer significant in-person support, which in turn curtails their use of the mobile payment option (Wasunna and Frydrych 2017). In Kenya, for example, the registration process for tax identification numbers (TIN) still occurs in person in many rural areas (Ndung'u 2019). Though this is necessary to ensure those in hard-to-reach areas have access to taxpayer services, it reflects some core challenges inherent in the deployment of digital solutions in low-capacity contexts. Notably, digital services are only as effective as taxpayers are digitally literate and connected. In places where many people are neither digitally literate nor connected, revenue authorities must continue providing in-person services or risk excluding the most vulnerable or disconnected.

However, the need to provide in-person services may sometimes limit adoption of digital payment solutions and blunt their effect on revenue mobilisation (Yilmaz and Coolidge 2013). In Tajikistan, for example, e-filing and e-payment was not made mandatory for taxpayers and, as a result, uptake was low, and many businesses continued submitting paper returns (Okunogbe and Pouliquen 2022). In Uganda, electronic filing and payment forms were even more complicated than the manual ones, and taxpayers had to file both paper and digital forms. Tax compliance costs correspondingly increased for taxpayers (World Bank 2016).

Moreover, in recent times the Covid-19 pandemic and physical distancing requirements have necessitated remote, online interactions between taxpayers and tax officials (Okunogbe and Santoro 2022). In some cases, like in Cameroon, Rwanda and Eswatini, government mandates have made digital payment of taxes compulsory. While initial evidence indicates some positive effect on compliance (Santoro *et al.* forthcoming b), other studies hint to parallel manual practices persisting among taxpayers, who often trust and value physical contact with tax officials (Santoro *et al.* forthcoming a).

2.1.6 Cash dependency

Taxpayers' preference for in-person support demonstrates the dominance of cash in many LMICs, despite the growing availability of digital and automated alternatives. Illustratively, in Nigeria and Indonesia, only about 10 to 15 per cent of tax receipts in 2015 were made through digital payment systems. Though these digital payments amounted to 34 per cent of overall tax revenue in Nigeria, and 61 per cent of overall tax revenue in Indonesia, many taxpayers continued to settle their tax liabilities using non-digital methods (Lund *et al.* 2017).

In many contexts, the persistence of manual practices reflects immense resistance to change among incumbent staff (Okunogbe and Santoro 2022). This can be because of inadequate change management and sensitisation but can also be due to tax officials' desire to maintain collusive networks or information monopolies through existing systems and administrative structures.

Taxpayers often still prefer to pay with cash even when the digital alternatives cost less than travelling to a tax office and interacting with tax officials (Wasunna and Frydrych 2017). In Senegal, the government had to go as far as enacting regulations to counteract taxpayers' reluctance to use digital payment systems, though the results of this approach are still to be determined (Wasunna *et al.* 2019).

Several other countries have advertently or inadvertently attempted to restrict the use of cash in favour of digital and electronic alternatives, often with limited or fleeting success. India's experience with its 2016 demonetisation policy is an illustrative example. In 2016, the government of India declared up to 86 per cent of its existing currency in circulation to be illegitimate, requiring citizens to replace obsolete currency notes with new notes. However, the government was unable to print the new currency notes to meet the exploding demand in the early phases of implementation. This resulted in a dramatic shortage of cash and an almost inevitable reliance on electronic forms of payment. New research on the effects of the demonetisation policy in West Bengal not only observed sizeable short-term increases in firms' use of electronic payment instruments (primarily electronic point-of-sale machines), but also concomitant increases in both sales and tax liabilities reported (Das, Gadenne, Nandi, and Warwick 2022).

Other evidence on the effects of disincentivising cash are somewhat less promising. In Uruguay, efforts to promote financial inclusion had no effects on tax compliance and tax payments. Brockmeyer and Saenz-Somarriba (2022) show that, although consumers are very responsive to VAT rebates for credit and debit card transactions, these rebates had a less notable effect on retail firms' use of point-of-sale machines and thus a negligible effect on VAT liability reported. Uruguay's experience could be unique because of overall high levels of reporting for cash sales, which means there is less room for digital incentives to improve tax compliance. Similarly, in Mexico, a tax on cash bank deposits was ineffective in increasing the adoption of digital payment technologies (Bachas, Higgins and Jensen 2020). Though none of these case studies involve the direct provision of digital (web-based or mobile) tax payment portals and services, they emphasise the dominance of cash and the complex relationship between digital adoption and taxation.

The reliance on face-to-face interactions, cash, and manual systems ultimately contributes to administrative inefficiencies and high compliance costs for taxpayers, while incentivising corruption, extortion, and fraud. Taken together, these factors compound the difficulties many LMICs face raising sufficient tax revenue in ways that are equitable, fair, and accountable (Okunogbe and Pouliquen 2022; World Bank 2016). In Tanzania, for example, tax officials seeking to measure and curb corruption required collectors to record payments in a ledger and report back before receiving new ledgers. By the end of the year, this simple process revealed that up to 30 per cent of the books, amounting to 35 percent of expected revenue, went missing. In India, the story is not much different. In 2016 alone, India's tax revenue shortfall was $117 billion – 6 per cent of its GDP – in part due to widespread tax evasion and a heavily manual enforcement system (Lund *et al.* 2017).

2.2 Infrastructural constraints

2.2.1 Interoperability and insufficient technical compatibility

Digital payment systems in LMICs are limited by inadequate technical compatibility and system integration, especially between different payment providers or different models of delivery. In some cases, rigid legal, industry or regulatory doctrines are the culprit. For example, regulations on corporate practices that limit cooperation between mobile money providers and commercial banks are likely to hamper innovation and uptake of mobile technologies for P2G payments (Geva 2020; Soutter *et al.* 2019).

Lack of integration also limits the interoperability of payment systems, both between payment providers and between government agencies and departments. Interoperability here refers to the ability of the underlying payments infrastructure to support many payment instruments or payment providers. In addition to non-existent or undefined regulatory doctrines, weak interoperability is also in part due to inadequate technical standards and business environments that incentivise proprietary systems and competition, rather than collaboration and innovation (World Bank 2012; Pazarbasioglu *et al.* 2020).

Lack of harmonisation between various models of P2G systems – i.e., direct integration, third-party integration, central government platforms, and physical centres – can hinder taxpayer uptake (Wasunna and Frydrych 2017). Moreover, multiple integration models for e-payment platforms can confuse taxpayers and further entrench barriers to widespread uptake of P2G digital payment systems (Wasunna *et al.* 2019).

Compatibility between e-filing platforms and e-payment channels is also relevant, and a key challenge in many countries. In Eswatini, for instance, the e-Tax platform does not include an e-payment module and taxpayers must settle their liabilities by other means. Despite this, the platform is otherwise adequately integrated since it shows taxpayers their filing and payment history and outstanding balances. This detail is thought to have had positive impacts on payment behaviour (Santoro *et al.* forthcoming b). Rwanda's e-services also suffer from a lack of compatibility, although the revenue authority is working towards embedding payment channels directly into the e-filing portal (Santoro *et al.* forthcoming a).

2.2.2 Weak underlying ICT infrastructure

Digital payment systems also face several barriers due to weak underlying ICT infrastructure. Having technically and administratively sound payment systems is vital, but so too are the broader ICT fundamentals in the economy. These include the quality of cellular, broadband, and wi-fi internet, affordability of smart phones and personal computers, and consistency of electricity supply (Ndung'u 2019; Wasunna and Frydrych 2017; Soutter *et al.* 2019).

Weak ICT fundamentals have more than an abstract effect on the effectiveness of P2G digital tax payment systems. They can lead to frequent system failures, slow systems, and interrupted services. Such delays and interruptions – especially when they occur during tax filing periods or between payment confirmation and reconciliation – can have deleterious effects on taxpayers' faith in the fairness of the system (Azmi and Kamarulzaman 2010; Wasunna and Frydrych 2017; Thakur and Srivastava 2014). Evidently, Santoro *et al.* (forthcoming a) show that, although e-filing and e-payment tools improve bookkeeping and access to information, they also come with significant technical challenges that frustrate taxpayers and effectively offset any benefits. These challenges include complex site navigation, repeated failures during peak times, lack of online assistance, and the corresponding disorientation among taxpayers (Santoro *et al.* forthcoming a).

2.3 Political, regulatory and institutional constraints

Digital tax payments depend on – and can be limited by – a host of political and institutional constraints. To be effective, P2G digital payment systems often demand wider government coordination, with political buy-in and champions driving implementation through financial, political, and bureaucratic roadblocks. However, in many LMICs, P2G digital payment systems often lack such whole-of-government coordination, resulting in fragmented citizen-facing platforms and services (Fichers and Naji 2020).

Having a digitisation strategy that is championed across various government agencies, including the tax agency, enables a more concerted, and possibly more effective, P2G ecosystem. Rwanda and Kenya stand as positive signals in this regard. Both countries developed centralised government-wide digital services platforms (in Rwanda, IremboGov; in Kenya, eCitizen) to provide a variety of services to citizens while consolidating various payment options under one digital location (Wasunna *et al.* 2019).

Other political and institutional barriers could stem from inflexible electoral cycles, lack of political will, limited or unreliable technical assistance from development partners, budget shortfalls, and taxpayers' high perception of government corruption (Wawire 2020).

Though these barriers may appear severely limiting in many LMIC contexts, existing research indicates that revenue authorities – and governments at large – can take incremental steps to improve the effectiveness of digital payment systems.

3 Pre-conditions for effective use of digital tax payment systems

Though the digitisation of government and tax payment services has become more prevalent across LMICs, there are still major gaps in our understanding of what makes these digital investments successful. At a cursory glance, some existing literature suggests digital payment systems require various institutional, financial, and technological conditions to be effective, and that these conditions are not always under the control of the mandated government agency or revenue authority. This section will introduce some of the prevailing positions on the factors that enable effective digital payment systems.

3.1 Institutional commitment and political will

To be effective P2G digital payment systems often demand significant allocation of resources, cross-governmental coordination, and institutional commitment. Such commitment is necessary to build broader national digital payment strategies from which revenue authorities may benefit, secure the relevant technologies and IT expertise, or overcome resistance from potential entrenched interests. Strong institutional commitment can also ensure effective integration and interoperability between different systems and the integrity of payment systems (Azmi and Kamarulzaman 2010; Geva 2020; Wasunna and Frydrych 2017).

Institutional and political commitment ensure that critical stakeholders, including financial institutions, payment service providers, and tax practitioners, are all involved in decision-making processes. Such commitment, especially from the top, could prevent P2G payment solutions from being isolated from broader institutional and political priorities. Countries that can secure a strong level of stakeholder coordination often produce better performing and

more widely accepted payment systems than those that do not (World Bank 2012; Crawford 2013).

Similarly, strong institutional commitment provides the environment for unifying champions and policies to emerge. This in turn makes it more straightforward to integrate tax admin P2G payment systems within national payment strategies and systems, ideally connected to the country's treasury single account (if developed) or centralised payments or citizen-services portals.

Kenya's experience with the eCitizen platform and Rwanda's experience with IremboGov offer useful case studies about the importance of coordinated development and sustained political and institutional commitment. Following a presidential directive to digitise all government payments, Kenya convened a multi-stakeholder, multi-agency Government Digital Payments (GDP) task force in 2014. The GDP task force was mandated with driving the implementation of the centralised, government-wide eCitizen portal. Today, the eCitizen portal enables citizens to access, apply for and pay for over 300 government services, including taxes. Over 90 per cent of payments on the platform are now processed using mobile money (Wasunna *et al.* 2019). Kenya's success here is also in part because of a clearly defined national ICT policy framework and the mobilisation of dedicated financial resources, none of which would have been possible without adequate support from the institutional and political leadership (Wasunna and Frydrych 2017).

Similarly, Rwanda's IremboGov provides registration, access, and payment functions for close to 90 government services (Wasunna *et al.* 2019). Though IremboGov does not offer tax filing or payment services, the potential and scale of the platform demonstrates the possibilities of whole-of-government coordination and national strategic alignment. Finally, coordinated approaches can be critical for standardising data standards, integrating interfaces, and data sharing, with positive implications for providing user-friendly digital platforms.

3.2 Legal and regulatory frameworks

Effective digital P2G payment systems are inevitably dependent on appropriate legal and regulatory frameworks. These frameworks are often necessary to permit administrative reforms, including the simplification of tax procedures to enable digital payments. Adequate and context-specific laws and regulations clarify the rules, standards, and procedures governing the various technical or institutional functions of the payment systems. These functions could include the use of digital signatures and data encryption, as well as consumer protection and data privacy. They could also include laws or regulations clarifying the roles of various stakeholders, including the tax administration itself, payment service providers and vendors, ministries of finance, and the central bank, among others.

P2G payment systems not only collect sensitive taxpayer data, but also manage sensitive financial flows that can be especially vulnerable to various legal, operational and security risks. Such risks multiply when the governing frameworks are non-existent, inadequate, or ill-defined. Inadequate frameworks may result in procedural or technological duplication and redundancies, weak standardisation of payment portals or methods, or limited transparency and accountability. Inadequate frameworks may also expose public servants and IT specialists to legal liability, especially if they unwittingly implement payment programmes that contravene existing laws and regulations (World Bank 2016; Crawford 2013; Geva 2020; Azmi and Kamarulzaman 2010; Pazarbasioglu *et al.* 2020; Thakur and Srivastava 2014; Soutter *et al.* 2019).

However, the relevant laws and regulations should ideally not be too restrictive. They should be able to provide balanced oversight and supervision and they should be developed

collaboratively to ensure that the governing mandates fit the context-specific operational realities of implementing the filing and payment systems. Too restrictive laws and regulations could, for example, limit the types of payment instruments that can be used, or impose arbitrary transaction limits or fees.[5] Restrictive regimes could also result in laws that prohibit payment service intermediaries, which in some contexts limit the integration of different providers with the tax agency (Geva 2020; World Bank 2012).

3.3 Payment system infrastructure

The benefits of digital payment systems depend on the provision of multiple payment instruments and proper systems for processing, clearing, or recording payments. However, the effective provision of these systems depends in turn on the existence of critical underlying infrastructures (Yilmaz and Coolidge 2013; Kochanova *et al.* 2016; Ndayisenga and Shukla 2016; Obert *et al.* 2018). Many LMICs, especially those in Africa, have made improvements in meeting these infrastructure needs, but not yet enough to enable coordinated and reliable structures to support P2G payment systems (Arewa and Davenport 2022).

Payment system infrastructure also involves the technical dimensions of providing transactions, clearing, and settlement functions. This encompasses the systems for taxpayer identification and authentication, payment validation and verification, data storage and management, and reporting, among others. Getting these fundamentals right commonly requires harmonisation of payment options, as well as the financial and digital capacity to enable interoperability between relevant data systems (Wasunna and Frydrych 2017; Pazarbasioglu *et al.* 2020; Ndung'u 2019).

Revenue authorities would ideally develop payment systems capable of processing both large and small payments and handling large volumes of data, especially during tax filing periods (Azmi and Kamarulzaman 2010). Payment confirmation and reconciliation is therefore especially important. Errors during this process can be costly to tax officials and hamper taxpayers' confidence and trust in the system, particularly in contexts where there are sharp delays between confirmation and reconciliation (Wasunna *et al.* 2019).

Finally, tax authorities must invest in building easy-to-understand and user-friendly payment portals to ensure accessibility and increase uptake. Well-designed and simple interfaces with suitable information system flows are indispensable to effective payment systems (Thakur and Srivastava 2014; Soutter *et al.* 2019; Hung *et al.* 2006; Yilmaz and Coolidge 2013; Wasunna *et al.* 2019). One study from Nigeria found that taxpayers were more likely to adopt e-filing and e-payment systems if they believed the software would be easy to use and understand. Other studies have found that the reliability and speed of the system were consistent predictors of taxpayers' willingness to use digital payment systems (Mas'ud 2019; Thakur and Srivastava 2014; Hung *et al.* 2006).

3.4 Investments in human capital

Investments in human capital are vital to the success of P2G digital payment systems. Such investments often take two forms: investments to sensitise taxpayers and investments to train tax officials and IT staff. Many studies have found that individuals with some foundational IT skills are more likely to use e-filing and e-payment systems (Kochanova *et al.* 2016; Ndayisenga and Shukla 2016; Obert *et al.* 2018).

Revenue authorities must often provide strong incentives to replace cash and change behaviours and assumptions about digital solutions. Taxpayer sensitisation is critical to

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[5] See Nigeria's restrictions on mobile money for more: https://techpoint.africa/2021/07/20/nigeria-mobile-money/

changing entrenched attitudes or biases about digital solutions. Sensitisation strategies could include marketing and education materials across various digital and non-digital media, providing intermediaries to assist taxpayers in overcoming the digital learning curve, or even disclosing the depth of privacy and security mechanisms in the system to further engender trust. Recent evidence indicates strong demand for such assistance in the taxpayer population (Santoro *et al.* forthcoming a).

Revenue authorities may also need to provide in-person and online workshops or seminars on using payment systems, especially in the early stages of adoption (Bhuasiri, Zo, Lee and Ciganek 2016; Mas'ud 2019; Ndayisenga and Shukla 2016; Hung *et al.* 2006; Yilmaz and Coolidge 2013; Obert *et al.* 2018; Crawford 2013). This would ideally include publishing user manuals, providing 24/7 helpdesks during tax season, and informing taxpayers of proper digital habits to ensure they are informed about how to protect their data (Bhuasiri *et al.* 2016). In addition to providing the necessary tools to guide taxpayers using the digital systems, revenue authorities must also invest in training and change management for tax officials, especially those lacking the appropriate IT skills – as is happening, for instance, in Rwanda and Eswatini (Santoro *et al.* forthcoming a, b).

4 Conclusion and areas for further research

Although revenue authorities in low-income contexts are increasingly seeking to benefit from digital payment solutions, this report has sought to show that much more evidence is needed to understand the conditions under which these solutions become effective. Focusing specifically on web-based e-filing/payment systems and mobile money services, it argues that these technology investments, like all technology investments, are limited or enabled as much by core technical functions as they are by human capacity, political, institutional, and infrastructural factors and dynamics. These conclusions suggest that the nexus of digital payment technologies and taxation is fertile ground for future research, given their broad potential to transform tax administration. This section will proceed by considering specific research questions and themes that would close the evidence gap and improve our understanding of the promise and implications of digital tax payment systems.

1. **Examining the exclusivity of digital payment systems:** how do patterns of digital access differ across various taxpayer demographics – including gender, age, income, location, and education – and how, if at all, do these variations affect technology adoption and tax compliance? How should the design and development of digital payment systems respond to these demographic factors?
2. **Understanding system limitations:** how do various system limitations – e.g., reconciliation and confirmation delays, power outages, and unstable internet – impact taxpayers' confidence and trust in digital tax payment solutions?
3. **Assessing the role of third-party actors:** how do the many categories of third-party actors impact rates of e-filing and e-payment use? Third-party actors here could refer to sanctioned payment aggregators or commercial payment service providers (e.g., Remita (Nigeria), Maxcom). It could also refer to both sanctioned and unsanctioned tax agents, including tax accountants or even, for example, cybercafé workers who provide unofficial e-filing/e-payment support to taxpayers.
4. **Understanding the relationship between digital tax payment systems and broader public financial management:** here, what is critical is understanding how or if digital tax payment systems affect (or are affected by) the characteristics of the country's public financial management. For example, are digital tax payment systems more effective in countries with centralised or decentralised public financial management (PFM) structures? What effect, if any at all, might the existence of a centralised financial management software (e.g., IFMIS) or a treasury single account

(TSA) have on the performance of digital tax payment systems (e.g., outcomes on transparency, accountability, or data quality)?

5. **Mapping levels of usage of digital P2G payments across contexts:** some evidence suggests that although 94 per cent of the world's population are now covered by a mobile broadband network, about 43 per cent are still not using mobile internet. A disproportionate number of those without access are in LMICs and are often vulnerable members of society (Bahia and Suardi 2021). Much more research is needed to understand how this digital divide influences patterns of usage of digital payments broadly, and P2G digital payments specifically.

6. **Exploring the technical, institutional, and political underpinnings of successful implementation:** are digital payment solutions better delivered directly by the revenue authority (e.g., e-Tax, Uganda) or by a central government authority (e.g., eCitizen, Kenya)? Are they better delivered by commercial payment service providers (e.g., Remita, Nigeria), or directly by the government? How entrenched are challenges to intra-governmental/horizontal collaboration and to what extent do these challenges impede the effectiveness of digital payment solutions? What are the legal and regulatory conditions for effective implementation and uptake? The answers to these questions will necessarily vary depending on the country context, but a research agenda that maps out the conditions under which decision-makers should go with one option over another will be highly useful.

7. **Mapping out design and usability must-haves:** existing research already suggests hard-to-use digital payment systems disincentivise uptake, especially when layered over already opaque tax systems. What are the ideal design and user experience/interface fundamentals that revenue authorities should consider in the design and implementation of web-based payment systems? How should these systems and tools be designed to be accessible to users and taxpayers, especially in contexts of low digital literacy?

8. **Examining tax system outcomes:** in line with a few studies already cited in this report, there is much room to further study the effect of digital tax payment solutions on specific tax administration functions and outcomes. For example, how does digitising tax payments augment audit selection or the implementation of risk-based audits? How does it affect tax compliance across various tax types and taxpayer segments? What are its effects on fraud and tax evasion? How or to what extent do digital payment solutions create efficiency gains (e.g., time, money, resource allocation)?

References

Adelmann, F., Elliott, J.A., Ergen, I., Gaidosch, T., Jenkinson, N., Khiaonarong, T., Morozova, A., Schwarz, N. and Wilson, C. (2020) *Cyber Risk and Financial Stability: It's a Small World After All*, Staff Discussion Note No. 2000/007, Washington, DC: International Monetary Fund

Arewa, M. and Davenport, S. (2022) 'The Tax and Technology Challenge', in R. Dom, A. Custers, S.R. Davenport and W. Prichard *Innovations in Tax Compliance: Building Trust, Navigating Politics, and Tailoring Reform*, Washington DC: World Bank

Awasthi, R., Lee, H.C., Poulin, P., Choi, J.G., Kim, W.C., Lee, O.J, Sung, M.J. and Chang, S.Y. (2019) *The Benefits of Electronic Tax Administration in Developing Economies: A Korean Case Study and Discussion of Key Challenges*, Research Paper, Washington DC: World Bank and Sejong City, Republic of Korea: KDI School of Public Policy and Management

Azmi, A.A.C. and Kamarulzaman, Y. (2010) 'Adoption of Tax e-filing: A Conceptual Paper', *African Journal of Business Management* 4.5: 599–603

Bachas, P., Higgins, S. and Jensen, A. (2020) *Towards a Cashless Economy? Evidence from the Elasticity of Cash Deposits of Mexican Firms*, Working Paper, Washington, DC: World Bank

Bahia, K. and Suardi, S. (2021) *The State of Mobile Internet Connectivity 2021*, GSMA

Bhuasiri, W., Zo, H., Lee, H. and Ciganek, A. (2016) 'User Acceptance of E-Government Services: Examining an e-Tax Filing and Payment System in Thailand', *Information Technology for Development* 22.4: 675–95

Brockmeyer, A. and Saenz Somarriba, M.V. (2022) *Electronic Payment Technology and Tax Compliance: Evidence from Uruguay's Financial Inclusion Reform*, Policy Research Working Paper 9947, World Bank

Brun, J.F., Chambas, G., Tapsoba, J. and Wandaogo, A.A. (2020) *Are ICT's Boosting Tax Revenues? Evidence from Developing Countries*, Études et Documents, n9, CERDI

Bukia, I. (2019) 'Supporting Tax Policy for Small Business in Georgia', *Economics and Business* XI.1: 122–26

Cooper, B., Munoz Perez, L., Esser, A., Allen, M., Hlophe, N. and Ferreira, M. (2019) 'An Analysis of ID Proxy Initiatives across the Globe', 29 November, Cenfri

Crawford, D. (2013) 'Chapter 7: Filing and Payment', in *Detailed Guidelines for Improved Tax Administration in Latin America and the Caribbean*, USAID

Das, S., Gadenne, L., Nandi, T. and Warwick, R. (2022) *Does Going Cashless Make You Tax-Rich? Evidence from India's Demonetization Experiment*, Warwick Economics Research Paper Series 1393, University of Warwick, Department of Economics

Fichers, N. and Naji, L. (2020) *Digitalising Person-to-government Payments: Leveraging Mobile to Improve Government Revenue and Access to Public Services*, London: GSMA

Geva, B. (2020) *Electronic Payments: Guide on Legal and Regulatory Reforms and Best Practices for Developing Countries*, Geneva, Switzerland: International Trade Centre

Gnangnon, S.K. and Brun, J. (2018) 'Impact of Bridging the Internet Gap on Public Revenue Mobilization', *Information Economics and Policy* 43.C: 23–33

GSMA (GSM Association) (2014) 'Paying Taxes through Mobile Money: Initial Insights into P2G and B2G Payments', *Mobile for Development* blog, 4 December, https://www.gsma.com/mobilefordevelopment/programme/mobile-money/paying-taxes-through-mobile-money-initial-insights-into-p2g-and-b2g-payments/

Hung, S.Y., Chang, C.M. and Yu, T.J. (2006) 'Determinants of User Acceptance of the e-Government Services: The Case of Online Tax Filing and Payment System', *Government Information Quarterly*, 23.1: 97–122

IMF (2020) 'Digitalization in Sub-Saharan Africa', in *Regional Economic Outlook: Sub-Saharan Africa, April 2020. COVID-19: An Unprecedented Threat to Development,* Washington DC: IMF

Kangave, J., Nakato, S., Waiswa, R. and Zzimbe, P.L. (2016) *Boosting Revenue Collection through Taxing High Net Worth Individuals: The Case of Uganda*, ICTD Working Paper 45, Brighton, UK: Institute of Development Studies

Kochanova, A., Hasnain, Z. and Larson, B. (2016) *Does E-Government Improve Government Capacity? Evidence from Tax Administration and Public Procurement*, Policy Research Working Paper 7657, Washington DC: World Bank

Ligomeka, W. (2019) *Assessing the Performance of African Tax Administrations: A Malawian Puzzle*, African Tax Administration Paper 14, Brighton, UK: Institute of Development Studies

Lund, S., White, O. and Lamb, J. (2017) 'The Value of Digitalizing Government Payments in Developing Economies' in S. Gupta, M. Keen, A. Shah and G. Verdier (eds), *Digital Revolutions in Public Finance*, Washington DC: IMF

Mas'ud, A. (2019) *Acceptability of e-Filing of Taxes by Micro-Entrepreneurs in Northwestern Nigeria*, ICTD Working Paper 96, Brighton: Institute of Development Studies

Mascagni, G., Dom, R. and Santoro, F. (2021) *The VAT in Practice: Equity, Enforcement and Complexity*, ICTD Working Paper 117, Brighton: Institute of Development Studies

Mondato Insight (2018) 'Do Bank-Led Models Stall Progress?', 6 February, https://blog.mondato.com/do-bank-led-models-stall-progress/

Moore, M. (2020) *What Is Wrong with African Tax Administration?* ICTD Working Paper 111, Brighton: Institute of Development Studies

Ndayisenga, E. and Shukla, J. (2016) 'Effect of Electronic Tax Management System of Tax Collection in Rwanda: Case Study of Rwanda Revenue Authority (RRA)', *International Journal of Business and Management*, 4.5: 38–49

Ndung'u, N. (2019) *Digital Technology and State Capacity in Kenya*, Policy Paper 154, Washington DC: Center for Global Development

Ndung'u, N. (2017) 'Digitalization in Kenya' in S. Gupta, M. Keen, A. Shah and G. Verdier (eds), *Digital Revolutions in Public Finance*, Washington DC: IMF

Obert, S., Rodgers, K., Tendai, M.J. and Desderio, C. (2018) 'Effect of E-tax Filing on Tax Compliance: A Case of Clients in Harare, Zimbabwe', *African Journal of Business Management* 12.11: 338–342

Okunogbe, O. and Pouliquen, V. (2022) 'Technology, Taxation, and Corruption: Evidence from the Introduction of Electronic Tax Filing', *American Economic Journal: Economic Policy* 14.1: 341–72

Okunogbe, O. and Santoro, F. (2022) *The Promise and Limitations of Information Technology for Tax Mobilisation*, ICTD Working Paper 135, Brighton: Institute of Development Studies

Pazarbasioglu, C., Mora, A.G., Uttamchandani, M., Natarajan, H., Feyen, E. and Saal, M. (2020) *Digital Financial Services*, World Bank Group

Santoro, F., Lees, A., Carreras, M. and Mukamana, T. (Forthcoming a) 'E-Tax Services in Rwanda: Uptake and Impacts', ICTD Working Paper Series, Brighton: Institute of Development Studies

Santoro, F., Amine, R. and Magongo, T. (Forthcoming b) 'Mandating E-filing and E-payment and Tax Compliance: Evidence from Eswatini', ICTD Working Paper Series, Brighton: Institute of Development Studies

Soutter, L., Ferguson, K. and Neubert, M. (2019) 'Digital Payments: Impact Factors and Mass Adoption in Sub-Saharan Africa', *Technology Innovation Management Review* 9.7

Thakur, R. and Srivastava, M. (2014) 'Adoption Readiness, Personal Innovativeness, Perceived Risk and Usage Intention Across Customer Groups for Mobile Payment Services in India', *Internet Research* 24.3

Wasunna, N. and Frydrych, J. (2017) *Person-to-Government (P2G) Payment Digitalization: Lessons from Kenya*, London: GSMA

Wasunna, N., Mburu, S., Hassan, M. and Plaitakis, A. (2019) *Championing a Unified Digital Person-to-Government (P2G) Payments Strategy: Lessons from Orange P2G Operations in Africa*, London: GSMA

Wawire, N. (2020) *Constraints to Enhanced Revenue Mobilization and Spending Quality in Kenya*, CGD Policy Paper 163, Washington DC: Center for Global Development

World Bank (2021) *World Development Report 2021: Data for Better Lives*, Washington, DC: World Bank

World Bank (2016) *World Development Report 2016: Digital Dividends*. Washington, DC: World Bank

World Bank (2012) *General Guidelines for the Development of Government Payment Programs*, Working Paper, Washington, DC: World Bank

Yilmaz, F. and Coolidge, J. (2013) *Can E-Filing Reduce Tax Compliance Costs in Developing Countries?* Policy Research Working Paper 6647, Washington, DC: World Bank