



Digital Identification & Finance Initiative Africa: An Overview of Research Opportunities

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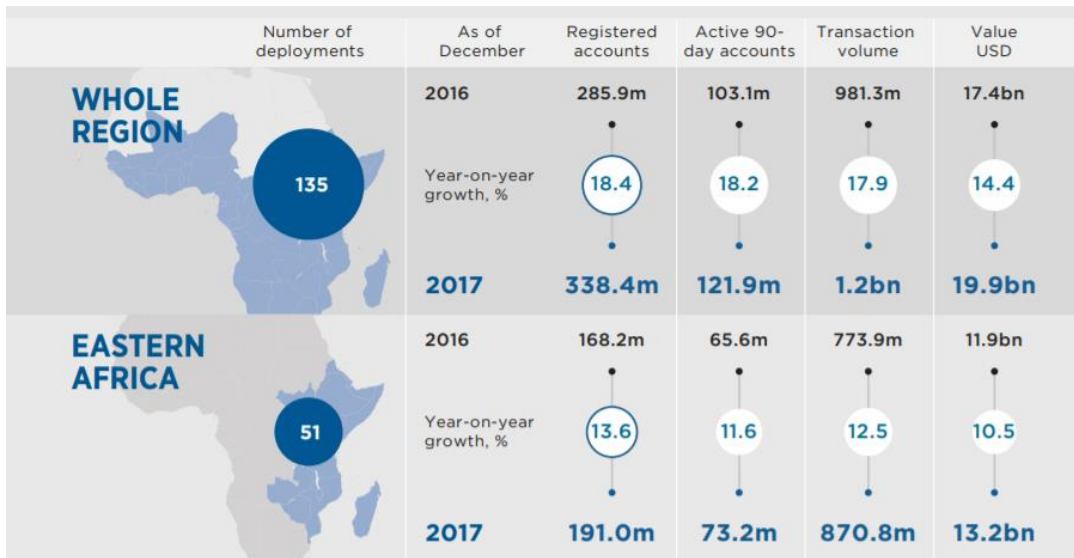
1 Introduction

1.1 Context: digital payments and IDs across Africa

Digital payments have been expanding quickly across sub-Saharan Africa, both via mobile money as well as via bank accounts (more recently, even digital bank accounts). In 2017, the region had roughly 135 distinct mobile money deployments, 338 million accounts, and \$20 billion worth of transactions (see Figure 1, GSMA 2017). However, a large share of the use of mobile money remains person-to-person (P2P) transactions. Bank transactions are currently focused on large firms and individuals at the top of the income distribution and have little business or government integration, especially for the poor. As Figure 2 below shows, the fraction of adults with an account at a financial institution remains low in sub-Saharan Africa, even while two thirds of the unbanked in the world have a mobile phone (Demirguc-Kunt, Asli, Leora Klapper, Dorothe Singer, Saniya Ansar, and Jake Hess 2017). In order to tap into the economic potential of these technological advancements, recent policy discussions and private investments have focused on broadening the transaction base into government-to-person (G2P), business-to-person (B2P) and person-to-business (P2B) transactions (Suri 2017).

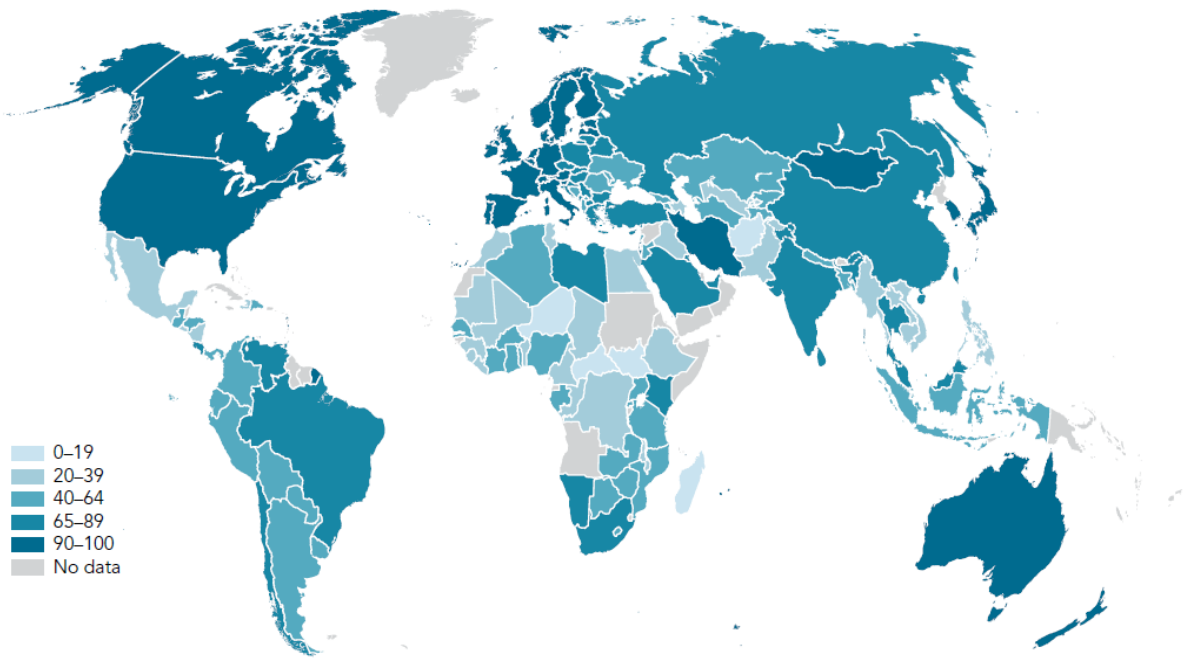
At the same time, policymakers in sub-Saharan Africa are increasingly investing in biometric identity (ID) systems, partly to enable broader use of digital payment systems and to promote digitization of services more generally. Some countries (such as Ghana and Kenya) have already created biometric voter registration databases over the last several years, although often these cannot be used for other purposes. They are now building, or considering, foundational national biometric ID systems that can be linked to a range of public and private services. The ongoing investments in far-reaching digital payment systems would make these links much easier.

Figure 1: Mobile money deployments by region



Source: Demircuc-Kunt et al. 2017

Figure 2: Percent of Adults with An Account (Financial Institution or Mobile Money), 2017



Source: GSMA 2017

1.2 Gains to the digitization of payments

There are potentially a wide range of gains to the digitization of payments in the public sector. Public spending in developing countries often does not translate into the actual quantity and quality of public goods available or accessible to households. Weak institutions and poor accountability often enable corruption, ineffective program implementation, and a flourishing informal economy, all of which claim large portions of public resources. In addition, transaction costs in these economies are extremely high, further diminishing access and reducing the resources available for public goods and other policy programs.

The Public Expenditure Tracking Surveys (PETS) have been widely adopted as a tool for tracking the flow of resources for a particular good or service, in order to assess whether these resources are being appropriately allocated. These serve as a useful tool in illustrating the magnitude of the “leaky bucket” problem in many African countries. For example: a 1996 PETS survey of public schools in Uganda showed a leakage rate of 87 percent in Uganda’s education spending, which fell to 20 percent after the publication of the findings: in Tanzania, a 1997 PETS found 57 percent leakage in education and 41 percent in health spending; and in Ghana, a 2000 PETS found 50 percent leakage in education and 80 percent leakage in health. Similar methods to estimate corruption in welfare programs in India and Indonesia (Sukhtankar and Niehaus 2013; Suryadarma and Yamauchi 2013) have shown that only a fraction of the funds spent on vital services reach the intended beneficiaries. Digitization has the potential to reduce discretion and increase communication, thereby reducing corruption and leakages in program delivery (Banerjee et al. 2016; Callen and Long 2015; Muralidharan, Niehaus, and Sukhtankar 2016).

In addition, given the high transaction costs in these economies, payment and service

distribution incur large costs for delivery (Aker, Boumnijel, McClelland and Tierney 2016; Jack and Suri 2014). Accessing these payments and services also impose transaction costs on recipients, for example, forgone wages to walk to a bank or complex administrative processes. The burden of these transaction costs can be significantly higher in emergency or disaster situations, i.e. when the need for emergency response or public insurance is the strongest. The digitization of these payments could therefore have a profound effect on reducing some of these transaction costs (Aker, Boumnijel, McClelland and Tierney 2016; Suri and Jack 2016).

The informal sector, which accounts for a substantial portion of total economic activity and employment in the poorest countries, adds an additional layer of inefficiency (La Porta and Shleifer 2014; Gollin 2002). The International Labor Organization (ILO) estimates that about 63 percent of the labor force in sub-Saharan Africa works in the non-agricultural informal economy (ILO 2018). In countries like Malawi, 93 percent of businesses are unregistered (Campos, Goldstein and McKenzie 2019). The informal sector is not only adding to the congestion in public infrastructure, but it is also restricting the fiscal revenues of the government. Tax evasion from informal firms is one reason, but not all informal firms may be eligible for taxation. Informality may also restrict firm growth, further impacting the potential tax base.

Dehn, Reinikka, and Svenson (2003) characterize the breaks in the chain between public spending and services into four categories:

1. Governments spend on the wrong goods/wrong people (and perhaps not at all on some people);
2. Leakages in the pipeline prevent resources from reaching frontline service providers;
3. Poor incentives exist for agents to actually providing the service; and
4. Even when the service is provided, households may not take advantage of them.

The first three of these are supply-side failures, while the last is a demand-side failure. The supply-side failures could be a result of lack of information, misaligned incentives (including political career concerns and poor monitoring), graft, high transaction costs limiting access to the hard to reach households, etc. The demand-side failure could reflect a wide variety of constraints such as information asymmetries, prohibitive costs, and behavioral irrationalities. This provides a useful framework for understanding how digitization of payments and/or ID systems in various segments of the public sector can help ensure public spending actually leads to the creation of the intended citizen services and improve public revenue generation.

1.3 Understanding IDs

Identification (ID) systems broadly fall into two categories (Gelb and Clark 2013): (1) *foundational* systems, which provide general identification for members of a population, often through a national ID or civil registry (which may extend to non-citizens); and (2) *functional* systems, which offer identification for the delivery of specific goods or services, such as voter IDs, tax IDs, drivers licenses, passports, health insurance, and more. The physical IDs linked to these systems come in many forms – from traditional paper-based ID cards to digital-only records to biometrically-enabled smartcards.

Increasingly, countries worldwide –including many in Africa –are either introducing new or replacing old foundational systems with biometric IDs that assign unique identification numbers to all citizens in a country. By collecting basic demographic data and biometric indicators –such as fingerprints and iris scans –and completing a deduplication process to ensure uniqueness, these IDs are intended to provide reliable verification of an individual’s identity.

Overcoming the problems associated with a lack of identification might have powerful

implications. A digital repository may make it easier to implement and target government programs, while also enabling citizens to participate in the digital economy, with technology playing a key role in assimilating information and automating transactions. Since these IDs can function as a universally valid proof of identity, they can easily be linked to existing functional systems—like bank accounts and payroll, asset registries, insurance, and school records—to avoid corruption and siphoning of resources, as well as double counting and targeting errors in beneficiaries. By easing processes to obtain voter IDs, drivers' licenses, telecom services, and banking facilities, IDs can mobilize citizens' political and economic participation. Additionally, IDs can catalyze the growth of a country's fiscal capacity by not only minimizing tax evasion but also by being instrumental in promoting financial inclusion and growth of the formal economy.

With the broad impacts that IDs can potentially have, there is little research around how digital IDs can affect implementation of welfare programs, how these programs affect citizens, and what externalities result from having access to IDs and their associated technology.

In Malawi, for example, where a strong biometric ID system was rolled out over 2017 and 2018, research can play an important role in helping the government understand both the social benefits and potential cost savings of linking functional services—e.g. social protection schemes, know your customer (KYC) frameworks, health insurance, and more—to this new foundational digitized system. In Uganda, where the Ministry of Interior is interested in integrating their biometric ID with other sectors, research could help assess how the national ID may be used in tax reform—possibly along with linkages to mobile money payment systems—for assisting the collection of personal and presumptive taxes. In Côte d'Ivoire, where a new regionally-integrated ID system is planned for both citizens and non-citizens, research may play an integral role in

understanding effective enrollment strategies and incentives, as well as the marginal benefits of reaching the last-mile users of ID systems, including the estimated 700,000 stateless persons currently residing in the country. Reaching these individuals with an ID may have important implications for improved service delivery and economic integration for this vulnerable population.¹

The implications of government investments in ID systems and their link to payment systems are particularly significant for sub-Saharan Africa where governments are marred with poor accountability and low state-capacity, and where a vast majority of the global poor reside. Many countries in Africa suffer from conflict, high disease burdens, and poor infrastructure, all of which make efficient and effective government assistance particularly vital. ID systems can help link citizens to the government directly. The traditional fiscal link between governments and the citizens is weak in Africa, considering many governments benefit from rich resource deposits. Dependence on natural resources, however, opens an economy to seasonal and price variation. ID systems and technology in governance can bolster the fiscal infrastructure towards an economy that is robust to price fluctuation.

1.4 DigiFI Africa

How do these rapid changes in the digitization of payments and the proliferation of biometric IDs affect the lives of citizens? How can they best be structured to lead to the most benefit? Are any groups adversely affected by these reforms? As government reforms in both IDs and payments advance, rigorous research can help them answer questions about how these reforms impact citizens, including providing insights into design questions as reforms scale up.

¹ For more information, please review the DigiFI Africa team's summary of scoping work undertaken in a number of African countries [here](#).

The Digital Identification and Finance Initiative in Africa (DigiFI Africa) aims to set up a research agenda around the digitization of payments and the use of biometric ID systems² especially in the public sector. DigiFI Africa aims to foster experimental research that explores the potential benefits these technologies may bring to both citizens and governments in sub-Saharan Africa, particularly as these IDs are linked to a variety of public and private services via payments, enabling digitization and automation of these services. Furthermore, DigiFI aims to better understand how the digitization of government to person payments or person to government payments can have implications both on the government and its citizens.

The digitization of payments is well underway through mobile money and (less so) banks. More recently, African countries like Malawi, Senegal, and Uganda have rolled out national biometric ID systems, while other countries including Ghana, Kenya, and Tanzania are in the process of implementing mass registration campaigns for their new biometric IDs. More still, including Ethiopia and Nigeria, have announced plans to start enrollment for such IDs in the coming months and years. These systems will facilitate improved record keeping and will generate administrative data on all individuals in the country. There are accompanying plans to link these ID systems to digital payment systems with a view to making public services more efficient and accessible. These policy changes set the stage for establishing the digital financial services and technology necessary to help eliminate leakages and enhance the accuracy of transactions, as well as the ability to monitor them. Both these functionalities have promising capabilities to address the four research areas we outline.

² Throughout this paper, we use “ID systems” to refer to digital, biometric ID systems unless otherwise noted.

In this white paper, we summarize the channels through which the knowledge and technological benefits of digital payments and digital IDs can catalyze change in the implementation of welfare initiatives and household decisions surrounding these programs. We highlight four open areas of research that DigiFI is interested in for African countries—supply-side channels, demand-side channels, supply- and demand-side together, and externalities.

2 Supply-side channels

2.1 Inclusion and exclusion error

Accurate targeting is a fundamental component of a successfully implemented social assistance program (SAP). Targeting in social programs is usually based on a means-testing approach where beneficiaries are determined based on income thresholds. However, when people are involved in informal or agricultural jobs, it is often difficult to accurately measure or verify income of potential recipients. This challenge is intensified by the absence of advanced social security or tax records. This lack of information can cause some undeserving beneficiaries to enter the program (inclusion error) and leave other vulnerable households outside the safety net (exclusion error). The inadvertent denial of benefits to legitimate participants can also undermine public support for reform.

Biometric IDs and digital financial services (DFS) have the potential to address both these errors. However, the risk of technology failures leading to exclusion of eligible beneficiaries remains if access to biometric IDs is not universal. This could especially be a problem if more vulnerable populations are left out of the ID system.

Evidence from India shows that the introduction of a new technology in a government transfer program reduced leakages to ghost-beneficiaries (Banerjee et al. 2016; Barnwal 2015; Muralidharan, Niehaus, and Sukhtankar 2016). The evidence also suggests that these reductions in corruption did not come at the cost of program delivery or access.

Introducing electronic fund transfer systems and testing their impacts on leakages as well as quality and quantity of public services in the African context is essential as the interaction of technology with the existing institutions and political economy may lead to impacts that differ from the literature. From a policy point of view, understanding the holistic impacts of technology in governance can ensure that policy reforms in this direction are not ignorant of what is feasible given the institutional constraints.

Some populations, including refugees, migrants, and other 'stateless' groups, may be particularly challenging to reach or may inherently be excluded from specific ID systems on the basis of nationality/citizenship. In such cases, complementary ID systems may be necessary to reach these populations, in order to facilitate access to social services and increase economic integration. For example, in Kenya, UNHCR has established a biometric database of refugees and asylum seekers that runs parallel to their national registration system (Opile 2019; World Bank 2016). Elsewhere, efforts are in place to introduce regional ID systems that extend beyond national identity. In West Africa, for example, the West Africa Unique Identification for Regional Integration and Inclusion (WURI) program is being piloted in Côte d'Ivoire and Guinea to provide identification to citizens and non-citizens alike, with the goal of reaching vulnerable populations and facilitating access to services at both the country and regional level (World Bank 2018).

Recent research on efforts to improve targeting looks at reducing dependence on income or self-reported information as the diagnostic tool, and instead turns to peers to evaluate eligibility (Alatas et al. 2012; Bernhardt 2018). With limited access to banks and the necessary documentation to enable it, administrative data on the economic worth of households remains absent among poor populations. Community targeting is therefore a low-cost, creative tool for identifying beneficiaries. However, the introduction of ID systems and DFS provides a basis to broaden financial inclusion by solving the identification barrier. Inclusion in the formal financial system enables documentation of

a person's financial transactions that can be used to create indices for eligibility.

The integration of ID systems with payments is not, however, a fool-proof solution to targeting problems. Collusive rent-seeking equilibriums could form due to imbalanced power dynamics and adverse incentives, leading to unfavorable criterion for selection of beneficiaries. For example, local bureaucrats may establish sharing agreements where a cash transfer is approved in return for a fraction of it, once it is received by the beneficiary. Empirical evidence of detecting collusive equilibriums is limited (Khan et al 2014) and there is tremendous scope to develop methodology that document their existence. A combination of household surveys along with administrative data on payments associated with biometric IDs could provide tools to diagnose the existence of such equilibriums. Similar methods have been used to measure corruption by Sukhtankar and Niehaus (2013). Experiments to detect and help prevent these alternate equilibriums will address important policy concerns while pushing the frontiers on collusive equilibriums.

2.1.1 Open avenues for research

- Can ID systems help achieve accurate targeting and efficiency in public programs?
- Can IDs create digital data systems that allow for better targeting in environments with high variability in income (and hence poverty) from year to year?
- Does reduction in corruption activities have negative externalities in terms of adverse collusive equilibria?
- Can such ID systems ensure more equality for hard to reach and/or marginal citizens?
- Can digital payment systems improve the effectiveness of disaster response systems without compromising access?

2.2 Organizational structure

With digital payment platforms in place, a fundamental question that arises is whether the implementation of transfers should be centralized at a higher tier of government or

decentralized to lower levels. An argument can be made for either side:

- *Centralized:* The theoretical literature on corruption has reflected the view that streamlined organizational structures are better to prevent malfeasance (Shleifer and Vishny 1993; Banerjee 1997; Banerjee, Mullainathan, and Hanna 2012). Centralization may eliminate leakages in the pipeline³, rent-seeking behavior, and agency costs from misaligned incentives in getting resources transferred to the beneficiary, but may be at a disadvantage with respect to local knowledge about potential beneficiaries and ground realities of logistical problems with program implementation.
- *Decentralized:* Targeted payments often involve screening mechanisms. Local knowledge may be valuable to successfully implement such payment schemes and identify/monitor beneficiaries. If screening needs to occur on parameters beyond information that is available through the ID system, then there is a trade-off between the cost of potential leakages and benefits of local knowledge.

The organizational structure of program implementation is therefore important in determining the program's efficiency and effectiveness. Banerjee et al. (2016) argue that the effect of electronic fund transfers from a higher to a lower level of government is ambiguous—it could reduce leakages from improved monitoring and transparency or increase rent-seeking if officers across levels of government collude to share the ill-gotten pie. Weak state capacity would imply that the latter scenario would dominate. Empirically they find that in India, with the introduction of electronic fund transfer, leakages in a workfare program went down, improving implementation efficiency. In the context of African governments where monitoring may not pose a credible threat to corruption, introducing electronic fund transfer by itself may be detrimental. Testing for ways to curb these effects would be valuable to learn about the existing weaknesses in

³ This is not to say that corruption levels will go to zero. As postulated by Banerjee et al. (2016), there may be a corrupt collusive equilibrium.

state and how policies can be implemented by getting around them. While Banerjee et al. (2016) study the effects of eliminating tiers between governments, the effects of eliminating tiers between G2P programs remain ambiguous. Basurto, Dupas, and Robinson (2019) study the trade-off between the informational advantage of decentralization with elite-capture in the context of two large-scale subsidies in Malawi using panel data. While they detect nepotism, the authors claim that resources are allocated towards those with higher returns, leading to a more productively efficient allocation. The counterfactual in this study is a means-testing approach. Conducting research that compares centralized and decentralized structures with the use of ID and payment systems can isolate variation that is purely in the organization and is not influenced by flaws in the methodology used in any other step of implementation.

Many SAPs partner with service providers to carry out last-mile delivery. In Indonesia, Banerjee et al. (2017) outsourced the last-mile of food delivery and found that this reduced costs without diluting quality when there was sufficient competition at entry among contractors. Such outsourcing decisions may also be affected by the introduction of ID systems since digital financial services and biometrics make it easier to monitor the actions of contractors. In Ethiopia, for example, the government has recently begun piloting digital payments for a subset of beneficiaries of its Productive Safety Net Program (PSNP) – a social protection scheme that reaches approximately 10 million beneficiaries throughout rural districts of the country. This newly digitized system relies on local agents to process beneficiary payments, presenting both a possible avenue for leakage or for efficiency gains (World Bank 2016).⁴

2.2.1 Open avenues for research

- What type of organizational structures are most effective for implementing a social

⁴ Also see the DigiFI Africa team's summary of scoping work undertaken in Ethiopia [here](#).

program that uses digital financial services?

- Which type of contracting arrangements (between government agents or between the government and a service-provider) are most efficient in implementing last-mile delivery in the presence of ID systems?
- To what degree does the digitization of social protection and wage payments expand the payment grid or agent network by guaranteeing transaction volume and incentivizing account usage?

2.3 Incentives

Taking the benefits of direct deposit via digital financial services to the implementer side, several governments, including Ghana, Liberia, and Nigeria have begun using biometrically authenticated IDs to digitize salary payments to civil servants (Gelb and Clark 2013). These programs are meant, in part, to clean existing government payrolls, removing possible “ghost workers.” However, to date, these systems have primarily been limited to specific government departments and have not yet been fully integrated with foundational digital ID systems.

Pure digitization of salaries is underway in Ghana and Senegal (Gelb and Clark 2013). Irregular payment could dampen effort and lead to rampant absenteeism among public servants. Digital payments have been known to reduce delays and uncertainty in payments in a G2P setting (Muralidharan, Niehaus, and Sukhtankar 2016). While a literature on incentivizing effort among government employees exists (Duflo, Hanna, and Ryan 2012; Dhaliwal and Hanna 2013; Duflo, Dupas, and Kremer 2015; Muralidharan and Sundaraman 2013; Ashraf, Bandiera, and Jack 2014), digital finance and biometric IDs provide an opportunity to expand this evidence base in the African context by examining at the impact of improved state capacity and institutions on the performance

of government employees. This is particularly useful for frontline service providers, such as health workers and teachers, but could also be studied in the context of other civil servants to make their efforts incentives compatible with the government's intentions.

In decentralized payment structures, whether these are government programs or private payment platforms (banks, telecoms, third-party organizations), local agent networks play a crucial role. In Kenya, for example, Suri and Jack (2016) use agent density to show that better access to digital payment technology has long-term effects on poverty reduction. While the size of the agent network is important, there is little work documenting the evolution of the supply chain and the impacts of that on the ultimate consumer. The introduction of technology in payment programs can affect the size of the agent network by either ensuring volumes of transactions or through high-powered incentives for agents. This 'priming-the-pump' through incentives may also make the agent market competitive and lead to inimical impacts on households through agents exiting the market, or diluting quality of service.

2.3.1 Open avenues for research

- Can digital ID systems allow for building better and robust incentive systems in the public sector?
- What is the impact of improved state capacity on performance of public servants?
- What can governments do to ensure robust agent networks are able to effectively administer digital payments even in remote areas?
- What design features and incentive structures can be built into public sector wage payments to boost the productivity of front-line public servants?

2.4 Payment Design

While there is a literature that studies the impacts of payment programs that are both

cash and in-kind payments, there is limited work on the design of the payment program. Baird, McIntosh, and Ozler (2011) assess the role of conditionality in a cash transfer. They find that the effects on school dropout are highest in the CCT arm, but the UCT ensures welfare effects for those who drop out of school by reducing teenage pregnancy and marriage rates.

The importance of design in other payment set-ups have been studied and shown to have effects. Casaburi and Willis (2018) find that upfront payment of insurance premium hinders the low demand for agricultural insurance, but take up increases by 67 percentage points if the buyer of the crop deducts the premium at the time of harvest. In another context, innovation in microfinance contracts that affect repayment timelines and asset collaterals reduced default rates and enhanced entrepreneurial investment (Field et al. 2012) and children's schooling outcomes (Jack et al (2017)). Additionally, making credit available at the time of harvest allows farmers to use storage facilities and take advantage of the arbitrage opportunity that allows farmers to buy low and sell high (Burke 2017). Other design nuances that are known to have positive effects are labeling savings accounts (Ashraf, Karlan, Yin (2006); Dupas and Robinson (2013)) and giving recipients choice over resource allocation of their transfer (Ashraf, Aycinena, Martinez and Yang (2015)).

With the seasonal nature of income and the uncertainty of shocks, the timing of payment for receipt of cash or in kind goods in any program could be pivotal in ensuring universal outreach and welfare effects for beneficiaries. Stronger IDs and digital finance services potentially make cash transfers a more feasible option by diminishing the risks of leakages and enhancing overall efficiency. In countries where commodity transfers are more common, the introduction of biometric IDs and DFS can enable a shift toward cash transfers, yet it is unclear whether such a shift from in kind transfers (such as food, fuel,

fertilizer) will be efficient and improve household accessibility to these programs and household welfare. Similarly, governments simultaneously run several transfer programs, each with different eligibility requirements. This could make it complex for households to keep track of all the programs they may be eligible for and the time and effort required to reap the benefits in the future may outweigh the costs in the present. ID systems may in fact enable governments to create more bundles to understand the potential gains and costs of consolidating disparate social protection programs under a single payment program.

Therefore, aspects of program design like timing, eligibility, and nature of transfer could play a significant role in determining welfare impacts. With the advent of IDs and digital payments, it is possible to further our understanding of how best to design payment programs, whether government run or privately implemented.

Open avenues for research

- What design elements could be layered onto digital social protection payments to improve their welfare impacts and efficiency of the system (examples include but are not limited to account labelling, savings defaults, giving recipients choice over resource allocation)?
- What are the potential gains and costs of consolidating disparate social protection programs under a single payment program?
- What are the welfare impacts (across population segments) of migrating in kind subsidies or welfare programs (such as fuel, fertilizer, food subsidies) into direct payments?
- Should governments maintain commodity subsidies rather than convert them into cash? Are there particular regions and/or populations (for example, food insecure regions or regions with poorly functioning food markets) where a migration to

cash would be detrimental?

3 Demand-side channels

3.1 Linked services and take-up

Biometric ID cards can improve the effective implementation of several government programs by eliminating administrative barriers and reducing transaction costs. For example, health insurance and maintenance of health records is a major policy where having an ID system in place makes it easier to maintain databases and facilitate payments. Numerous African countries, including Ghana, Malawi, and Tanzania, are looking to incorporate existing health services and health insurance schemes into their new national ID systems⁵. In Ghana, for instance, the government plans to link the National Health Insurance Scheme to the new biometric GhanaCard, once they have reached critical enrollment for this new system. In addition, the government has begun piloting digital payment options for subscribers to process their annual renewal fees via mobile phone, in an effort to reduce transaction costs for both the government and beneficiaries by eliminating the need to appear in person to complete this task⁶.

Low coverage of functional programs could result from demand-side or supply-side constraints. For the implementers, the fixed cost of putting together demographic information on the population could be dramatically lowered. Processes like generating electoral rolls and voting IDs, dissemination pensions, agricultural benefits to farmers, education-linked programs, and driver's licenses can be simplified.

⁵ For more on this, see <https://www.nia.gov.gh/faq.html> on Ghana, <https://mw.one.un.org/malawis-national-id-project-praised-at-africas-largest-forum-on-digital-identity/> on Malawi and for Tanzania http://www.id4africa.com/2018_event/Presentations/PS2/1-2-2_Tanzania_Alphonse_Malibiche.pdf.

⁶ For more on this, see <http://www.nhis.gov.gh/News/bawumia-launches-mobile-renewal-and-e-receipts-for-nhis-5221>.

On the demand-side, a variety of factors could contribute to the high transaction costs in accessing government programs, such as poor access, administrative complexity, a need for documentation, cognitive burdens, a lack of trust in the government, and social norms/stigmas against accepting government programs. Reducing such costs can play an integral role in encouraging take-up of programs linked to IDs that are beneficial for the citizens and yet are underutilized. Currie (2004) documents that in the United States and the United Kingdom, lack of information and complex eligibility/entry rules hinder the take-up of social programs. Automatic/default enrolments have been found to lower administrative barriers and enhance take-up of government programs. Gupta (2017) finds that in India two-thirds of eligible women are not enrolled in a program that pays a substantial pension to young widows and divorced women. And, in addition to providing information, reducing the complexity of entry increases enrolment for vulnerable individuals. Blumenstock, Callen, and Ghani (2018) show that default enrollment in a financial savings scheme that is linked to the mobile phone in Afghanistan increases take-up by addressing behavioral constraints. They conclude that the lack of take up is a result of inattention. Additionally, present bias and cognitive burden of the selection process could be other mechanisms to explain low take-up.

However, if targeted individuals cannot be identified in advance or if the government program is freely available and overused, the target beneficiaries need to be screened by encouraging self-selection and imposing entry costs (Alatas et al 2016; Kleven and Kopczuk 2011). Improved targeting by increasing costs has been studied in the context of malaria treatment (Cohen, Dupas, and Schaner 2015). The authors find that a higher price for malaria pills or an over-the-counter rapid test improves targeting of treatment to those who need it. Therefore, the type of constraint determines a different approach on screening costs to improve targeting. By bringing together administrative data and digital transactions, ID cards provide the infrastructure to diagnosing the binding constraints for different government programs and studying the costs of benefits of their effective and efficient implementation. For example, there is limited work on

default enrolments in developing countries, likely due to the lack of ID systems that are essential to implement and monitor such a scheme.

Irrespective of transaction costs, ineffective implementation from governments could reduce the trust in its ability to provide public goods, leading to low take-up. For example, according to the Afrobarometer data for 16 African countries between 2016-18, over 60 percent of the population felt that the government had performed poorly in narrowing income gaps and ensuring there was enough to eat. In 14 of these 16 countries, the coverage of social protection programs in the poorest quintile remains below 50 percent (ASPIRE data, World Bank). Information interventions on the use of technology to improve implementation may be able to bolster trust and hence take-up of programs. However, the malfunctioning of technology could backfire and reduce trust in institutions leading to adverse outcomes (Marx, Pons, and Suri 2018).

3.1.1 Open avenues for research

- What are the impacts of linked-services, and how can their implementation be improved and made more effective and efficient?
- What is the role of transaction costs in affecting take-up for different government programs? How can take-up of underutilized programs be improved, and over-utilized programs be streamlined?
- What is the resulting impact of the more effective implementation of government programs on citizens/poverty?
- Do digitization of payments and ID systems improve citizen trust in government programs? If not, what functionality is required to do so?

3.2 Political consequences

Several countries that are rolling out ID systems intend to have them double-up as voter IDs. This could have implications on the voter franchise, depending on take-up. If citizens

of some specific social or geographic groups face constraints to accessing IDs, then those citizens will effectively have been disenfranchised from voting. These constraints could be due to difficulties in enrollment, illiteracy, or the failure of biometric technology for groups with certain occupations or lifestyles—for example, fingerprints of individuals who work in agriculture may not always be machine-readable due to soil residue. On the other hand, if take-up for voter cards was previously low and the national ID is successful in overcoming those implicit barriers without imposing additional constraints, then it could lead to increased enfranchisement. Evidence of technology (electronic voting machines) enfranchising the poorer, illiterate sections of society and thus affecting policy outcomes that reflect the median-voter can be seen in Fujiwara (2015). Apart from allowing more citizens to exercise the right to vote, biometric IDs can prevent voting malpractices by ensuring every voter can only vote once. In addition to affecting voter enfranchisement, the use of technology in building capacity and reducing leakages could affect public perception of incumbent governments, or government as an institution in general. Measuring these outcomes on trust in government as a result of technology could help understand the effects of reform on political perceptions and the elasticity of voter beliefs. With several African countries struggling with implementing free and fair elections, biometric IDs that double up as voter IDs present a promising opportunity to study strengthening the democratic process in these countries.

3.2.1 Open avenues for research

- How do IDs affect voter participation, the fairness of elections and electoral outcomes?
- Does the resulting increased enfranchisement affect policy decisions? In which direction?

3.3 Benefits of direct payment and digital finance

3.3.1 Financial inclusion

Digital financial services linked to national IDs can enable reliable, direct payments to the intended beneficiary. This would require that the ID must be linked with any formal instrument to which money can be deposited—like bank accounts, postal schemes, or mobile money accounts, thus catalyzing financial inclusion of unbanked populations. For example, in India the Aadhaar program facilitated an electronic know-your-customer (e-KYC) process. This resulted in a large reduction in the cost of onboarding each new customer (Gelb and Metz 2018).

Ghana's eZwich payment system—a unique, biometrically-authenticated identification system linked to the majority of licensed banks and non-bank financial institutions in the country—facilitates the payment of government salaries, wages, pensions, and loans, which can be accessed at any point of service or eZwich ATM.⁷ In 2016, the Ministry of Women, Children, and Social Protection began using this system to deliver payments for Ghana's leading social protection scheme—the Livelihood Empowerment Against Poverty (LEAP) program—as a way of disbursing social subsidies to poor and vulnerable households.⁸

These linkages can have significant impacts on poverty reduction through increased mobilization of money that bridges liquidity gaps (Burgess and Pande 2005). However, access to financial services is imperative to reap the benefits of financial inclusion. If low access to financial services becomes the binding constraint, then poor populations are at a risk of becoming worse off from losing out on government transfers and other benefits of formal finance.

3.3.2 Empowerment of weaker populations

⁷ For more on this, see <https://ghipss.net/products-services/e-zwich>.

⁸ For more on this, see https://btca-prod.s3.amazonaws.com/documents/312/english_attachments/Country_Diagnostic-Ghana_full_report.pdf?1506490992.

Digital ID technology can be instrumental in empowering beneficiaries through monetary transfers. The unitary household model has been refuted with evidence showing that different members of the household choose different consumption allocations (Duflo and Udry, 2004). Household dynamics may affect the way money gets consumed based on who receives the income shock, leaving some members with low bargaining power at a loss. Direct deposit of payments to more vulnerable household members could affect the bargaining weights within households and potentially improve the allocation of income and consumption. Recent work by Field et al. (2016) shows that direct deposits of payments from a workfare program to a woman's bank account increased labor supply for women despite unchanged wages. Duflo (2003) also shows that pension payments made to women had large effects on the anthropometric outcomes of girls in the family. Similarly, Qian (2004) shows that an income shock to women improved nutrition outcomes for daughters relative to income shocks for men. These direct payments may also be in kind, for example, fuel, fertilizer, or food subsidies. Beyond just households, effects on 'empowerment' can be observed at the village level if transfers/public goods are targeted towards the socio-economically vulnerable groups.

Empowerment extends beyond labor market participation and includes a gamut of things like financial inclusion, financial literacy, returns to capital in solo-run businesses, fertility decisions, civic participation, political engagement, and household/village decision-making and participation, to name a few. There is a tremendous scope of research pushing the boundaries of 'what counts as empowered', 'what causes empowerment', and 'empowered with respect to whom' (e.g. other men/social groups or the status quo of women/vulnerable social groups) with ID cards creating a suitable platform to target resources tied to empowerment (Glennerster, Walsh and Diaz-Martin 2018).

3.3.3 Hedging against risk

Since social assistance payment programs are aimed towards enabling households to smooth consumption and ensure a minimum income, it is important to study whether these programs affect resilience. Work by Suri and Jack (2016) and Bharadwaj, Jack, and Suri (2019) shows that mobile money can play a role in enhancing resilience to shocks to some extent. Asset transfer programs such as BRAC's Targeting the Ultra-Poor (TUP) have been shown to have holistic effects on the welfare of beneficiaries (Banerjee et al. 2015). Greater speed and reduced costs of a universal payment connection could also improve the effectiveness of programs that help citizens deal with the consequences of negative shocks, programs like disaster relief or agricultural insurance. The introduction of ID systems, especially tied to payments, in the African context may have direct impacts on the ability of households to deal with unexpected negative events and hence improve their resilience and their longer term welfare, and may even compound this by improving the efficiency of existing social insurance programs.

Taking a broader perspective, if payment programs enable impoverished households to maintain consistent income and deal with shocks, households will treat payments as a change in permanent income. Observing a holistic set of outcomes over a period of time to study household consumption, assets and liabilities, food security, time-use, decision-making responsibilities, civic participation, and beliefs would improve our understanding of households' perceptions and responses to payment programs and determine if these programs set them on an upward consumption trajectory.

3.3.4 Open avenues for research

- Do ID-linked payments reduce corruption and leakages while improving targeting?
- Is identification a major binding constraint to financial access? How does enabling financial inclusion through IDs affect short- and long-term poverty outcomes?

- Do ID-linked payment schemes 'empower' traditionally weaker members of a household and affect allocation of household resources?
- Are the resulting (more efficient) government programs instrumental in helping citizens escape poverty traps?

4 Demand- and supply-side together

4.1 Fiscal capacity

ID systems can help improve the tax base by improving the accounting of all economic agents, including individuals and firms. As discussed above, access to banking facilitated by ID systems could help individuals and firms transition out of the informal economy into the formal sector, spurring their growth trajectory. This is an important outcome since the informal sector accounts for a substantial portion of total economic activity and employment in the poorest countries (La Porta and Shleifer 2014; Gollin 2002).

The contribution of the informal sector is even greater in many African countries – in Malawi, for example, 95 percent of firms are not registered with the government. There could, however, be push and pull forces at play here. While formalization may open a gamut of opportunities and allow firms to grow in size, it may also impose regulations and tax payment obligations that hinder growth. It is interesting to disentangle both mechanisms and explore whether ID systems facilitate one over the other.

Some experimental work has studied the impact of encouraging firms to formalize and enter the tax base. Campos et al. (2019) find that firms have no incentive to register for taxation and Benhassine et al. (2018) show that encouraging firms to formalize by providing assistance has effects but is not cost effective. ID reforms combined with DFS provide a stage to test whether financial inclusion and the prospect of bridging credit constraints overpowers taxation disincentives and increases rates of formalization, tax payment, and firm growth simultaneously. In addition, they could have an impact on the

intensive margin of tax collection for already formalized firms as they make tax payments easier and more transparent (and possible also reduce leakages in tax collection).

Apart from increasing the tax base on the extensive margin, ID systems can make it easier to pay taxes by encouraging tax payment behavior from those already in the formal economy. For example, in Uganda, the government is discussing using the national ID in tax reform, including integration with mobile money to help in collecting personal and presumptive taxes. On the government's side, ID cards and direct payment of taxes may eliminate corruption and rent-seeking behavior by tax-collectors. In Côte d'Ivoire, Dupas and Houeix (in progress) have begun research on the impacts of transitioning from a cash to an electronic tax collection system in urban municipalities on not only total revenue collected, but also on tax collectors' performance. Khwaja and Olken's (in progress) work in Pakistan on studying incentives for tax collection provides evidence that eliminating corruption when there is human interaction is difficult, considering citizens would always prefer to pay fewer taxes. Therefore, the government stands to benefit from reduced tax evasion and corruption on the intensive margin.

4.1.1 Open avenues for research

- Can the expanding formal economy be an avenue to increase the tax base through incentives and simplified processes introduced by payments and digital IDs?
- Do digital payments and/or ID systems have an impact on the intensive margin (i.e. for firms who already pay taxes) of tax collection and hence on tax revenues by reducing transaction costs involved in making tax payments, improving transparency and reducing leakages in tax collection?

5 Externalities

5.1 Interaction effects

Government payment schemes are large-scale by design and therefore are likely to affect a range of market indicators. Studying interaction effects is imperative to understanding the full scope of impacts in any program evaluation. Government transfers could have distortionary effects, which could attenuate the direct gains from the program. For example, one concern about transitioning food subsidies to direct payments is that this may give too much market power to local traders, who may drive up food prices. Evidence of market distortion from transfer programs is documented by Barnwal (2018), where dual pricing of in-kind transfers led to arbitrage in the black market. The author shows that a government policy using biometric IDs and direct deposit bridged the price gap in the dual-price system and reduced leakages as well as the size of the black market. However, the substitution effect of a policy reform that improves access to a “good”, like affordable and clean fuel, on the consumption of a “bad”, like dirty fuels, is an understudied phenomenon.

Without rigorous evaluation, there is no way of knowing conclusively whether interacting negative effects are occurring. On the other hand, there could be positive externalities. Muralidharan, Niehaus, and Sukhtankar (2018)’s work on the general equilibrium effects of the NREGA workfare program in India finds that the program increased wages, time spent working, and household income (largely driven by market wages). Traditional economic theory would predict that a rise in wages would lead to fall in private sector employment. The finding that private employment goes up despite the increase in wages suggests that either productivity goes up or that labor markets in the region are oligopsonistic. With several governments in Africa now working towards introducing ID systems, similar studies to understand market effects of transfers can help us learn more about linkages in African economies.

5.1.1 Open avenues for research

- What is the impact of digital ID and payment systems on market-level general

equilibrium effects?

- What are the impacts on wages and employment as outside options change in response to these systems? Are there impacts on occupational choice or migration?
- Looking at relative prices, do income shocks affect only demand for consumption or do they also improve production? Does inflation reverse any direct benefits of the program?
- What are the spillovers on non-beneficiaries of the payment schemes?

5.2 Private sector impacts

Possession of IDs could affect economic decisions of households outside the realm of public goods. Lack of identification in developing countries remains a major obstacle for accessing formal finance or formalizing businesses. For example, Gine, Goldberg and Yang (2012) show how fingerprinting for credit led to less adverse selection and lower moral hazard in the credit market in Malawi.

Informal sources of finance are characterized by usurious practices and can lead to debt traps that accentuate poverty. A large fraction of small businesses falls outside the purview of the formal economy and have limited access to resources, making them susceptible to shocks. While other constraints may deter them from entering the formal economy, ID systems may make it one step easier for entrepreneurs to formalize their transactions by enhancing the ability to maintain accurate asset registries, land records, and personal identification could spur engagement with formal finance vastly and allow businesses to make profitable private investments. They can allow banks to monitor and incentivize their clients better by enabling them to maintain uniquely identifiable records, thus improving repayment rates (Gine, Goldberg and Yang 2012).

With unique identification and accurate records of transactions, the judicial system may

be better able to address cases on small claims and land disputes. For example, in Uganda, the government rolled out a new tier of courts for small claims that had simplified legal procedures and accepted informal evidence of transactions. These fixed costs could be eliminated by improving the quality of evidence through biometric identification being linked to transaction records. This strengthening of institutions could further impact private investments positively. Recent work by Boehm and Oberfield (2018) shows that in India, weak enforcement by courts (measured by delays/backlogs) distorted the type of investments made by firms, as well as their organizational structure and hierarchy. Experimentally advancing this line of study may make it possible to unpack mechanisms through information treatments surrounding court access and procedures that are simplified by ID systems.

5.2.1 Open avenues for research

- Can ID systems spur formalization of finance for businesses? Do these reforms reduce entry costs to entrepreneurship and enable productive investment?
- Can ID systems help strengthen law-enforcing institutions and in turn affect private investment?

6 Conclusion

As digital biometric ID systems are rolled out in sub-Saharan Africa and governments work to digitize G2P and P2G payments, there are many open research questions about how these systems – especially given the costs of the infrastructure needed to build and maintain them – will impact citizens in these economies, in terms of access to both public and private goods and services. The design of these reformed digital systems is important since they contribute to the ongoing process of building institutions and capabilities in the public and private sector with potentially far-reaching effects on citizens. It is also critical to understand how the average improvements compare to improvements within subsets of beneficiaries, to allow for improved scheme design and better targeted

implementation. Without an evidence base on when ID systems and DFS are successful and what circumstances are essential for their policy impacts to flourish, it is difficult to fully understand the returns on investment to governments for building these systems.

Furthermore, conducting and communicating rigorous research about the impacts of different design choices for digital payments will allow governments to structure these payments in the most cost-effective manner possible. This includes analyzing the impact of linking digital government payments to digital IDs and studying how best to structure these linkages. More information on the benefits (and risks) of design decisions may inform policymakers as they attempt to set up the infrastructure and regulations for digital IDs and digital payments.

This white paper lays out the research agenda of DigiFI Africa in understanding the impacts of biometric ID systems and their interactions with payment systems on citizen welfare (including access to services, financial inclusion, poverty, household and business income and wealth, and growth) and how to make these investments as efficient and effective as possible.

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