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# Fintech Payments in Public Financial Management: Benefits and Risks

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Naomi Nakaguchi Griffin

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**Fintech Payments in Public Financial Management: Benefits and Risks**  
**Prepared by Gerardo Una and Alok Verma, Majid Bazarbash and Naomi Nakaguchi Griffin**Authorized for distribution by Cigdem Aslan and Naomi Nakaguchi Griffin  
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**ABSTRACT:** Fintech payments leverage large digital platforms to fill gaps in the traditional payment system. They have made great strides in increasing access to payment services in several countries around the globe. At the same time, like any innovation, the new payment models are exposed to risks in their operating environment. We review the main fintech payment models (mobile money, internet-based fintech payment, and digital money) and discuss operational and financial risks as well as challenges they face. We then explore how public financial management (PFM), especially treasury payments and non-tax revenue collections, could benefit from fintech payments by providing examples of early fintech applications in different countries and discuss the challenges of integrating them into the public sector. The use of fintech in public finance could bring various benefits—including strengthening fiscal transparency, improving budget planning and execution, and upgrading cash management—if public sector institutional and technological capacities are strengthened and risks are adequately mitigated.

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WORKING PAPERS

# **Fintech Payments in Public Financial Management: Benefits and Risks**

Prepared by Majid Bazarbash, Naomi Nakaguchi Griffin, Gerardo Una, and  
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# Introduction

Financial technology, or fintech, is defined as “technologically enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services” (Financial Stability Board, 2022). Fintech firms can be start-ups, incumbent companies, or platform-based businesses. Like any innovation, fintech business models bring about benefits, face challenges, and introduce new risks to their operating environment. On the benefit side, fintech aims to enhance the speed, affordability, convenience, security, and transparency of transactions.<sup>2</sup> On the challenges side, fintech firms are exposed to risks related to malfunctions in the technology and financial service delivery, and compliance with relevant rules and regulations. Regulation and supervision of systemic fintech players are becoming increasingly important to ensure the stability of the financial system and to protect user rights (Dobler et al. 2021).

In this paper, we study how public finance could benefit from fintech developments in the private sector, focusing on public financial management (PFM). According to Cangiano, Curristine, and Lazare (2012), PFM is an “umbrella” concept that covers a set of systems aimed at producing information, processes, and rules that can help support fiscal policymaking as well as provide instruments for its implementation, including how governments manage the budget in its established phases (formulation, approval, and execution). While the literature has broadly explored the impact of digitalization on public finance (e.g., Gupta et al. 2017), there is no specific study to date that explores the opportunities and challenges of incorporating fintech applications for PFM. Among various fintech services,<sup>3</sup> we focus on fintech payments and their applications in PFM. More specifically, we look at treasury payments and non-tax revenue collection, two areas where the IMF’s Fiscal Affairs Department has been providing capacity development to member countries. These are two key functions related to how governments transfer and receive financial resources. Together, they can help realize the full potential gains in effectiveness and transparency that PFM systems can offer (Cangiano, Gelb, and Goodwin-Groen, 2019). Fintech payment systems have developed rapidly in recent years and its applications have increased presence in the public sector, especially for cash transfer social programs (for example, as a part of the COVID-19 pandemic responses adopted by governments worldwide) and for tax and non-tax collections. These developments could provide the foundation for more advanced fintech applications in PFM.

Successful adoption of fintech applications in specific PFM functions to date have demonstrated that they could substantially increase the speed of transactions and expand government interactions with citizens, and therefore could improve the efficiency of specific PFM functions. Table 1 illustrates areas that fintech applications could be utilized in different areas of PFM related to government-to-persons (G2P), government-to-business (G2B), persons-to-governments (P2G), and business-to-government (B2G) payments, and the main benefits of its adoption related to strengthening fiscal transparency, improving budget management, and upgrading treasury cash management.

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<sup>2</sup> In the rest of the paper, we refer to fintech business models as “fintech models.” While fintech innovations can be carried out by various types of business entities, we define fintech firms as those companies in the financial sector that offer fintech services.

<sup>3</sup> Fintech innovations span the entire spectrum of finance—payments, debt or equity financing, investment and asset management, insurance, tax services, and regulatory and compliance (Bank for International Settlements 2018; Goldstein, Jiang, and Karolyi 2019; He et al. 2017).

Table 1. Fintech Payment Applications in PFM

		Fintech Payment Types		
		Mobile Money	Internet-based Fintech Payments	Digital Money (mainly CBDC)
Areas Where Fintech Can Improve PFM	Treasury Payments	<i>Cash transfer programs (G2P)</i>	<i>Salaries and pensions (G2P); payments to vendors, such as food suppliers (G2B)</i>	<i>E-vouchers for health services; cash transfers (G2P)</i>
	Non-Tax Revenue Collection	<i>Park entrance fees; transit fines (P2G)</i>	<i>Highway tolls; passports fees; agricultural services charges (P2G &amp; B2G)</i>	<i>All categories of non-tax revenue (P2G &amp; B2G)</i>
Benefits of Fintech in PFM	Greater Fiscal Transparency	<i>Generation of high frequency and reliable data that can be published in the public domain through fiscal transparency portals; enhanced accountability and traceability of payment data</i>		
	Better Budget Planning and Execution	<i>Better information for resources allocation in the planning phase of projects; improved budget execution, especially for cash transfer social programs, by utilizing fintech applications for payments delivery</i>		
	Improved cash management	<i>Stronger treasury single account operations and improved daily cash management based on timelier and more precise data</i>		

Source: Authors' elaboration.

Note: CBDC = central bank digital currency; PFM = public financial management; G2B = government-to-business; G2P = government-to-persons; B2G = business-to-government.

The rapid growth of fintech payments and their business models—both influenced by economies of scale—imply risks and challenges to the payment system and users. Both technological and financial risks are significant for fintech firms. We discuss a number of key challenges: risks related to technology and operations (such as fintech firms' operational complexity, and infrastructure to deal with AML/CFT and cybersecurity); market conduct and prudent governance to safekeep customer funds; customer rights and data privacy concerns in working with digital data; systemic risks arising from the large scope of fintech activities; lack of substitutability for underserved populations; and interconnectedness and compliance with rules and regulations.

In addition to the general enabling conditions for fintech development in the private sector, a successful integration of fintech in public finance depends inter alia on the development of government financial management information systems (FMIS), the digital infrastructure, and a government's approach to digitalization. To reap the most benefits, governments may need to develop a digitalization strategy tailored to their specific circumstances—a wholistic perspective that informs how intended changes advance the efficiency of public finance, strengthening simultaneously core public sector information systems. At the same time, this digitalization strategy could establish the necessary preconditions to successfully adopt fintech applications in the PFM arena, as discussed in this analytical work.

The public sector is also exposed to risks and challenges that arise when working with fintech payments, including PFM IT systems structural deficiencies that could set back the adoption of fintech applications. FMIS IT systems are of particular concern. For example, the FMIS present technological weaknesses to exchange data automatically with the fintech sector, and the authentication of citizens may prove difficult, principally if

digital ID robust solutions are not in place. Weaknesses (or strengths) in institutional and technological capacities of finance ministries could also play a key role in hampering (promoting) the adoption of fintech applications in PFM. There are also important PFM challenges in implementing digital money generated with certain specific characteristics, especially in the case of crypto assets. These challenges relate to treasury management, government accounting and fiscal reporting, and internal oversight capacities to analyze the crypto assets ecosystem, among other topics.

Because the PFM fintech applications discussed in this paper have not been fully tested under a variety of circumstances, our presentation should be considered exploratory options rather than recommendations. Building on previous literature, we first analyze the core value proposition of major fintech payment models in the private sector—consisting of mobile money, internet-based fintech payments (e-payments), and digital money—and discuss their challenges and risks and in relation with other stakeholders (section 2). We then present potential adoption of fintech applications in public financial management, focusing on treasury payments and non-tax revenue collections, including examples of implementation in different countries. We also describe three main advantages of incorporating fintech in PFM since the informational gains generated by the digital footprints of fintech applications can: support initiatives to strengthen fiscal transparency; improve budget planning and execution (mainly for cash transfer social programs); and upgrade cash management practices (section 3). Finally, the main challenges and risks specific to the public sector—issues related to strengthening institutional capacities, ensuring that core PFM information systems are in place, and emerging cybersecurity risks—are discussed in section 4. Concluding remarks are offered in section 5.

## I. Fintech Payments Developments

Fintech as a contemporary phenomenon in finance builds on three waves of digital technology advancements. First, wide user access to digital platforms via cellular and internet networks has facilitated cheap and convenient outreach to a widespread population, including the unbanked (Sahay et al. 2020). Second, digitization—converting analog information such as hand-written documents, sounds, and pictures to computer-readable format—has enormously expanded data on users, suppliers, and markets. Digitization has both expanded information by generating new data from digital footprints and made otherwise outdated information available to analyze. Digitization services are provided by businesses that interact with fintech companies in the back end, most notably biometrics (Bertoni et al. 2022; Bollaert, Lopez-de-Silanes, and Schwiendbacher 2021; D’Acunto, Prabhala, and Rossi, 2019). Third, advances in big data analytics, artificial intelligence/machine learning, and computing capacity have facilitated analyzing a large amount of data and incorporating the analysis into financial decision-making (Bazarbash, 2019). Building on these developments, fintech firms have adopted digital strategies that have fundamentally shifted the delivery of financial services (Gobble, 2018a).<sup>4</sup>

Fintech payment models are primarily developed to fill gaps in the traditional payment system. For example, mobile money could reach users in remote areas where access to bank branches is difficult. Internet-based payment models could automate payments and facilitate large transactions outside traditional working hours. In general, fintech could contribute to the payment system in several ways. First, fintech firms play the role of aggregator by developing digital payment platforms with access to a large user base that enable users to

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<sup>4</sup> Digitalization, a technical process of generating digital data, goes beyond digitization and involves making the best use of digital technology to transform digital data into economic value (Gobble 2018b). By adopting a digital strategy and not the technology per se, fintech has fundamentally changed the consumer experience and reshaped the business management approach to meet customer needs (Hanelt et al. 2021; Kane et al. 2015).

transact with various counterparts. The network effect crucially depends on the quality of service and adoption rate by the population.<sup>5</sup> Second, as money can be accessed digitally through fintech platforms, customers could hold digital money balances to store value, especially when the value of digital money is linked to strong currencies such as the U.S. dollar and the euro. Third, fintech firms provide digital wallet accounts that function as a one-stop account for providing a whole slew of payment services to users. Finally, building on the transaction activity and digital footprints of the users of digital payment platforms, fintech firms provide data services and facilitate customer due diligence, as well as business, industry, and market analysis. Such data services could be used to offer more advanced financial services.

The three main operational steps involved in executing a payment are: (i) verification of payment details, (ii) authorization, and (iii) request for transfer (i.e., the payment). The platform verifies the payment details, including the identities of the payor, the payee, and the corresponding outgoing and incoming accounts. It then checks whether the payor holds sufficient funds in their account (or have sufficient credit limit in case of a credit) at the time of the transaction. After authentication of the payment authorization, the payment becomes final (i.e., the funds are debited from the payor's account and credited to the payee's account). These operational steps also apply in a broad sense to public sector payments. The platform may be required to keep records of transaction data and customer information that is used for compliance with various payment system regulations, such as demonstrating compliance with AML/CFT regulations.

## A. Mobile Money

Mobile money is a payment account on a user's phone which enables users to deposit, transfer, and withdraw funds without necessarily owning a bank account (Jack and Suri, 2011). Mobile money, therefore, differs from mobile banking, which provides access to the user's bank account through a mobile phone. The idea behind mobile money was inspired by the prepaid airtime service offered by telecom companies, also called mobile network operators (MNO). Under this scheme, a customer prepays for using a defined limit of telecom services such as making calls, messages, and data. By analogy, a mobile money account is created when a customer pays cash to an MNO agent in exchange for balances—called e-money—in their mobile money account (less the associated commissions and fees). E-money is defined as an electronic store of monetary value on a technical device without necessarily involving a bank account that may be widely used for making payments to entities other than the e-money issuer (European Central Bank, 2016).

At the time of account registration, the agent identifies the customer by collecting basic customer information along with a government-issued ID card, serving the equivalence of Know-Your-Customer (KYC) rules as required by the authorities. The customer could cash out their e-money balances with a mobile money agent. To meet customer demands for cash-in and cash-out, the mobile money agent should maintain sufficient liquidity, which is an inventory of e-money and cash or money in a bank account with immediate access (Suri, 2017). The mobile money agent is, therefore, an inexpensive alternative for most teller services, without requiring a brick-and-mortar bank branch, an ATM, or internet connection. The mobile money agents could have their shops or other main businesses while offering mobile money services, which further reduces the

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<sup>5</sup> The experience of mobile money in Sub-Saharan Africa, notably Kenya, Tanzania, and Uganda, is a stark example. Consequently, fintech is emerging as an important driver of financial inclusion, particularly in low-income and emerging economies (Espinosa-Vega et al. 2020; Khera et al. 2021; Sahay et al. 2020).



fixed cost of agency services.<sup>6</sup> As a result, the number of agents in a region could far exceed bank branches and agents could even be in locations where it is economically unviable to build a bank branch.

Mobile money is a popular payment option, especially in emerging markets and developing economies (EMDEs), where access to banking services or internet connections is limited. Mobile money has successfully expanded access to the payment system for the underbanked and unbanked population in EMDEs. The main characteristics that make mobile money desirable in these economies are the already extensive network of phone users and the possibility of developing payment services based on messaging capability (Espinosa-Vega et al. 2020). Mobile money is used widely by individuals, corporations, governments, and financial institutions for commerce, tax collection, as well as person-to-person transfers.

Some of the most successful mobile money deployments in EMDEs are M-Pesa in Kenya by Safaricom, GCash in the Philippines by Globe Telecom, and EasyPaisa in Pakistan. The size and reach of mobile network operators suggest they have become systemically important payment service providers in these countries. For example, in Kenya payments in mobile money represents 85 percent of all non-cash payment transactions, although only 10 percent of total national payments in value in 2019, according to the Central Bank of Kenya.

## B. Internet-based Fintech Payments (e-payments)

Internet-based payment methods, or e-payments, could process large transactions without being subject to the structural limitations of mobile money. This type of fintech platform can process much larger transactions, building on internet network and digitization.<sup>7</sup> Two common applications of internet-based fintech payments that we discuss in this section are online payments and mobile banking.

Online payments applications were developed as an easy way to make online purchases and payments following the rapid growth in the online presence of many businesses. For retail customers, the onboarding process is initiated by the customer's agreement to a digital contract. This is followed by digitally collecting customer information to verify their identity and financial account information, such as the bank account or credit card used for making transactions. Account holders could send money to individuals or businesses who hold accounts with different banks, at different jurisdictions (international remittances), and in different currencies.<sup>8</sup> In addition, the e-payment provider offers to the merchant account a "payment gateway" that acts as a secure bridge between the merchant and the customer. Like a point-of-sale terminal at a physical cash register that reads a payment card's chip to ensure the validity of the card and legitimacy of the payment, the payment gateway carries out these functions for online payments without the need for physical presence. When a customer makes an online purchase on an online marketplace, their payment information is sent to the gateway, which encrypts that information and shuttles it to a series of approved payment processes and networks for authorization. Once the payment is accepted, the gateway sends the transaction to payment processors, who transfer the money from the customer's bank account to the merchant account.

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<sup>6</sup> To avoid legal connotations with the term "agent," in some jurisdictions they are called "merchant" or "retailer" (GSMA 2010).

<sup>7</sup> For example, as of October 2022, a verified PayPal account linked to a bank account or a credit card can send any amount in total, with a single transaction limit of \$10,000 (*PayPal website*).

<sup>8</sup> For example, in August 2021, PayPal had presence in more than 200 countries/regions, supported 25 currencies, had more than 400 million active users, and had processed more than 4.7 billion transactions (*PayPal website*).

In a similar vein, Big Tech firms are now proposing payment models by integrating online payment processing services into their existing platforms (Frost et al. 2019). Digital platforms offer innovative value propositions to connect independent actors from demand and supply sides, including individuals and businesses (Bakos, 1998). They have a distinctive advantage to enter the fintech space since they have already developed a fully functional platform with many users and often apply data analytics to analyze users' activities to offer services. Benefiting from the synergies in offering financial services is a natural step for most platforms. Notable examples of digital platforms are e-commerce platforms, like Alibaba and Amazon, payment platforms like PayPal and AliPay, peer-to-peer sharing business platforms like Airbnb and Uber, search platforms like Google, and crowdfunding or crowdsourcing platforms like InnoCentive and Kickstarter (Wirtz, 2020).

In the case of mobile banking applications, many fintech firms have developed mobile apps with user-friendly interfaces that facilitate making online payments. Payment apps tailor their services to their target clients. This includes small peer-to-peer payments, international payments, and small businesses. The payment is made in nearly real-time for domestic transactions and at often a lower fee compared to alternative ways for contactless payments. These apps offer a variety of additional services, including comprehensive transaction tracking over time, digital receipt keeping, expense management, automatic follow-up on invoices, identity security through multi-factor authentication, and extensive interoperability.

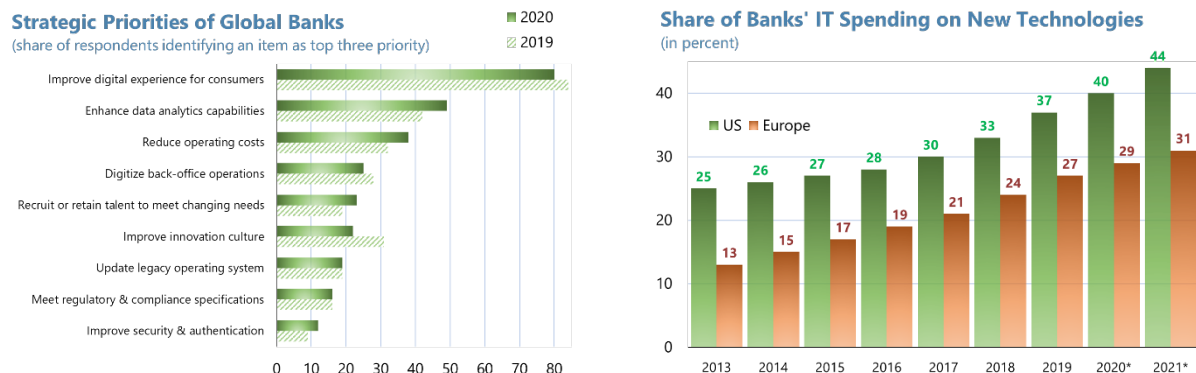
Fintech payments have also been developed in the traditional banking sector. On the one hand, a new generation of banks, called digital banks, have emerged. They offer their services entirely online without having any branches. On the other hand, traditional banks have aimed to augment the productivity of their services by taking two important steps. First, they have collaborated with fintech firms through partnership or acquisition to take advantage of complementarities with their business models and technological solutions. Fintech payment platforms could bring in a new class of users that banks traditionally do not target and act as an aggregator and connector to banking services, while banks leverage their expertise and experience in regulatory compliance and scaling up (Sahay et al. 2020).

Second, traditional banks have developed mobile and online platforms to increase clients' digital access to almost any services traditionally offered in branches, thereby curtailing expenditures on bank branches, ATMs, and front-line workers who deal with routine customer business.<sup>9</sup> These online banking platforms, also called internet banking or web banking, allow users to deposit checks, transfer funds between accounts and to others, view account information, and make online bill payments. Automated alerts of account activity and automatic payments are enabled via mobile and online banking, further increasing the convenience of holding an account with banks. Investing in digitalization has remained a strategic priority for banks. A survey of a panel of global financial services leaders for their top three priorities in 2019 and 2020 shows a clear focus on digitalization to improve users' online experience, strengthen analytical capabilities, and reduce operational costs in which automation plays a key role (Figure 1). With the advent of digital technologies like mobile and web banking, customers can access their funds to make e-payments. As a result, bank deposits could be considered as form of digital money in the banking system.

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<sup>9</sup> Some large banks, like Barclays and Lloyds, have invited fintech companies to develop their in-house incubators and innovation labs.

Figure 1. Digitalization in Global Banking



Sources: Both charts from Statista. Left chart, based on survey results in The Financial Brand's "Digital Banking Report 2020," displays share of respondent who identified the item among their top three priorities for 2020 (The Financial Brand 2020). Right chart shows share of spending in new technologies in total IT spending in U.S. and European banks (Deloitte 2020). Asterisks indicate forecasts.

## C. Digital Money

Various forms of new digital assets have been developed in fintech, some of which have money-like features that compete with traditional means of payment, such as cash and bank deposits (Adrian & Mancini-Griffoli, 2021). We discuss two major fintech developments: digital money and crypto assets.

Digital money, as the name suggests, is a means of payment that exists digitally, and therefore can be used as a digital means of payment and store of value, often pegged to a national currency. The advantage of existing on a digital platform overcomes limitations of cash and check. Three common forms of digital money are Central Bank Digital Currency (CBDC), eMoney, and stablecoins (International Monetary Fund, 2021a).

These forms of digital money have different characteristics. CBDC is publicly issued, denominated by the national currency, and backed by the central bank balance sheet. CBDC can come in two forms: retail (available to all domestic users) and wholesale (available to selected financial institutions). Making the payment system more diverse and cost-effective, enhancing financial inclusion, and improving cross-border payments are among the aims of issuing CBDC (Adrian, 2021). eMoney is a privately issued digital alternative to cash, such as prepaid cards, e-vouchers, and electronic wallet, and are redeemable at face value. It is backed by reserve assets of the issuer that should be highly safe and liquid (Dobler et al. 2021).

Stablecoins, a subset of crypto assets,<sup>10</sup> are privately issued assets that operate on distributed ledger technology. Stablecoins are backed by safe assets/currencies, such as the price of gold or the U.S. dollar, to ensure stability of their value and are redeemable at their face value or market value. Depending on their design, stablecoins could be used as money or as security. By contrast, crypto assets are issued in their own denominations, are not backed by other assets, and are not redeemable. Crypto assets' minting and burning

<sup>10</sup> A broader definition of crypto assets includes asset-backed stablecoins. For our purposes, crypto assets are unbacked securities.

rely on specific protocol algorithms that can determine how crypto is minted (and in some cases burned) and a consensus mechanism that aims to provide for a single, trusted and honest ledger in the absence of a centralized coordinating actor among the network of participants who can add and verify information (Bains, 2022). Crypto asset prices have been highly volatile; investor and user sentiments for large crypto assets, pump and dump schemes for more illiquid crypto assets, and uncertainty about regulations across different jurisdictions regarding production and use of crypto assets have contributed to demand and supply volatility.

## D. Risks and Challenges

While fintech payment developed very rapidly in recent years, payment providers face certain common risks and challenges arising from the two sides of their business model (i.e., technology and finance). These risks may relate to a failure in technology and operations; market misconduct and imprudent governance; violation of customer rights and users' data privacy; disruption in the payment system; or noncompliance with financial sector rules and regulations. Fintech services adopted in the public sector also need to address these challenges to mitigate the risks of failure, particularly when fintech firms become systemic players. We additionally discuss PFM-specific risks of incorporating fintech in public finance in the last section.

### Technology and Operations

**Operational complexity.** Fintech firms need to have strong operational capacity to manage a complex system comprising multiple customers and stakeholders to provide a diverse set of fintech services. The activities of fintech payment providers typically involve issuance of e-money, operating the mobile money and telecommunication (for mobile money providers) or internet (for internet-based fintech payment providers) platforms, fund management, and management of an agent distribution system (for mobile money providers) (Dobler et al. 2021). They also work with many counterparts. Their customers can be individuals, businesses, merchants, corporations, utilities companies, and government. They also need to establish business relationships with banks, credit card providers, and payment processors, and support a wide variety of devices.

**Operational robustness.** Fintech payments should establish robust technical, technological, and data infrastructures to execute operational steps in processing payments seamlessly, efficiently, and in a timely manner. A compromise in the robustness of the system that risks cyber-attacks could undermine the ability of the system to identify fraudulent activities. In the same vein, the system should be able to ensure security of users' transaction data, thereby protecting privacy rights. Since payments are linked to economic activities, payment providers should have the operational capacity to service payments during peak times. The payment infrastructures should be built in a resilient way to accommodate integration and interoperability with other payment services. This is of particular significance in the context of incorporating the operational design of fintech payments into public financial management. Interoperability helps with integrating multiple public sector services, some of which we discuss in the next section.

**Size of payments.** The mobile money model faces growth limitations due to challenges in delivering large payment services. By structure, the branchless network of mobile money relies on mobile money agents that often have limited capacity to hold cash and e-money. This limitation is partly because, unlike bank branches, mobile money agents may not have the security infrastructure in place to allow them to hold large amounts of liquidity. Consequently, this limits the network's capacity to absorb heightened liquidity demand for cash-out requests, especially in geographically remote areas.

## Market Conduct and Prudent Governance

**Fund safekeeping.** Prudent fund management of the cash or transfers that e-money providers receive from customers is critical for the issuer's ability to honor one-to-one redemption of e-money balances. The funds are held at an escrow or trust account with a bank or multiple banks. The risk of failure of the bank or banks where reserve funds are held should be minimized, especially because the size of the deposit will be substantially higher than the deposit insurance limit. In cases where funds are partly invested, issuers should have a treasury function to invest the funds in liquid securities with minimal risk, such as treasury securities, and avoid taking on undue credit or liquidity risk. The funds backing e-money should be segregated from cashflow and from any other line of business of the e-money issuer (Dobler et al. 2021).

## Customer Rights and Data Privacy

**Digital footprint and transaction data.** An equally important aspect of payment services is the valuable stream of information on user activity, which can be used in extending more advanced financial services such as credit (Carriere-Swallow and Haksar, 2019). Banks have traditionally used transaction activities of clients to help them track their performance. Banks are then able to manage their own risks and support clients when they face liquidity shortages. Mass migration of payments from banks to fintech firms would create a large concentration of information for fintech firms and limit the services that banks could offer based on transaction data and their intermediation role in the financial system. This could lead to generation of new models whereby new players join to bridge fintech firms and banks (or other advanced financial services providers) by receiving raw data from fintech firms, converting it to useful business intelligence, and then selling it to financial service providers. As such, a monopoly of information may weaken banks' ability to perform credit risk assessment adequately. Regulation and supervision may need to be updated frequently to keep up with the pace of fintech developments and address potential risks introduced by the expansion of fintech activity.

## Risks to the Payment System and Regulation Compliance

**Systemic risks.** Once fintech payments become widely adopted, their operators may evolve into systemic players in the payment system. Large fintech payment providers would become an integral part of macro-financial linkages. Failure of a large fintech payment provider could significantly disrupt the functioning of the payment system, including treasury payments if fintech applications were adopted in the public sector. Such a failure could have severe welfare consequences for retail users—households and micro and small businesses—that have limited access to alternative payment sources, for instance in countries where fintech is promoting financial inclusion. When fintech payments are critically engaged in macro-financial linkages, their failure could have macroeconomic consequences by disrupting economic sectors that are interconnected with fintech payments (Dobler et al. 2021).

**Disintermediation of banks.** If users decide to hold balances with fintech payment providers beyond their immediate transaction needs, their digital money accounts de facto act like deposit accounts. This means that this source of funding will not be accessible to banks. Transaction deposits have traditionally been a low-cost source of financing for banks, particularly in jurisdictions with a less developed banking sector. A significant reduction in access to this source of financing could have important implications for bank profitability, hence their risk-taking capacity and liquidity management. As a result, it may have financial stability consequences and limit intermediation services offered by banks. The change in industry structure and finance supply chains to accommodate such developments may be slow and would need careful monitoring by regulators and policymakers.

**Compliance with Rules and Regulations.** In addition to enhancing the efficiency of delivering financial services, fintech firms may enjoy more lenient rules and regulations compared to large service providers, especially in their early growth stage. However, once fintech firms become systemic players, they should have the infrastructure to meet the compliance requirements of financial regulatory and supervisory institutions. This may involve hiring professional auditors and accountants to produce standardized financial reports.

### **Risks and Challenges of CBDC**

The design of CBDC could have implications for anonymity of transactions. CBDC could be designed as account-based or token-based. Account-based CBDC involves establishing an individual account with the central bank, or indirectly via intermediaries to make payments much like a commercial bank account. Token-based CBDCs are very similar to bank notes and coins. As anonymous account holders or token owners, users should only prove that they possess CBDC, without necessarily having to show their identity. As settling transactions requires external verification of tokens, the extent of anonymity depends on whether the wallets of payor and payee are registered and if transaction information is recorded. While token-based CBDCs are fully anonymous by structure, the degree of anonymity of account-based CBDCs depends on the information disclosure design by the central bank. Technological failures or exposure to cybersecurity breaches could potentially compromise the anonymity of account-based CBDC (Mancini-Griffoli et al. 2019).

CBDC should meet operational requirements for a large payment platform, as the use of such a platform could expose the central bank and the payment system to risks and challenges. On the operational side, CBDC would require investments in and maintenance of a seamless technological infrastructure that could interface with customers' digital wallets; ensure effective AML/CFT controls, including CDD and transaction monitoring; and operate compatibly with other platforms (e.g., when providing cross-border payment services and with other payment service providers). The failure in satisfying any of these requirements could have significant consequences for users and their trust in the payment system.

Depending on the specific design, a wide adoption of CBDC could mean migration of bank deposits to CBDC, which may put pressure on the funding sources of banks. The impact on liquidity and profitability of banks is likely much more significant if the banking system is underdeveloped.<sup>11</sup> Moreover, limited deposit funding would also reduce bank lending. Therefore, the central bank should keep monitoring to ensure that the intended social benefits from CBDC in the payment system holds and does not lead to unintended weakening or financial disintermediation by banks.

## **II. Potential Fintech Applications for the Public Financial Management**

Fintech applications could be adopted in different PFM areas, such as treasury payments, tax and non-tax revenue collection, and debt management,<sup>12</sup> enhancing their operational efficiency and transparency.

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<sup>11</sup> On the other hand, increased competition in a concentrated market could prompt improved services by banks.

<sup>12</sup> For example, Brazil and Mexico have started a process to allow citizens to directly invest in public debt through specific fintech applications developed by their treasuries.

Digitalization of payments substantially strengthens core PFM functions, such as making timely and regular payments, reaching the correct beneficiaries, enhancing accounting and fiscal reporting, and strengthening accountability by generating more reliable audit trails (Cangiano, Gelb, and Goodwin-Groen 2019). In addition, fintech applications offer the possibility of substantially enhancing financial data collection timeliness. They could also increase the speed of transactions and facilitate government interactions with citizens, since fintech applications typically leverage emerging technologies and business models that offer innovative approach to rethinking traditional information systems. Based on these characteristics, integrating fintech applications into digital public finance solutions can help achieve greater potential gains in efficiency of specific PFM functions. Promising areas include payments of government salaries, social program cash transfers, and improved collection of tax and non-tax revenues. Fintech adoption could also further improve fiscal transparency, budget planning, and execution of social programs, especially those related to cash transfers, as well as treasury cash management functions.

The gains from integrating fintech applications to PFM depend on prevailing circumstances and structural factors in each country. These considerations include the maturity of the government's existing digital solutions, especially its financial management information system (FMIS); its readiness to adopt new digital technologies; preexisting institutional capacities; the capacity to face cybersecurity threats; and general enabling conditions. In addition, working with fintech firms (which could be startups and have fewer years of experience) does not come naturally for PFM stakeholders, who historically work mainly with large IT companies that provide corporate information systems. Some examples will help illustrate potential challenges that countries could face to adopt fintech applications without key prerequisites in place, for example, an operational FMIS. First, it may be difficult to capture all relevant data for controlling payments against commitments and budget appropriations during the budget execution. Second, ensuring a consistent flow of information on payments between the FMIS accounting database and the government's bank accounts may be challenging. Third, timely registration of financial transactions in FMIS accounting systems may be difficult.<sup>13</sup> In countries where FMISs are already supporting improvements in PFM functions, such as Brazil, Republic of Korea, or India, or in countries that are looking for modernizing their PFM digital solutions, the benefits of adopting fintech applications could complement and amplify the benefits of FMIS, for example, by making it possible to track more granular levels of payment transactions and enforcing controls over financial transactions.

In the next section we discuss the main features and selected benefits of adopting fintech applications specifically for treasury payments and collection of non-tax revenues, as well some of the main risks and challenges associated. The focus of the analysis remains on treasury payments and non-tax collections (two key functions related to how governments transfer and receive financial resources) and how fintech applications can help realize PFM information systems potential gains in efficiency and transparency<sup>14</sup>. In addition, this section includes some illustrative references to fintech applications in tax collection, an area where fintech applications also have significant potential. In-depth coverage, however, is beyond the scope of this paper. As these topics are evolving and these emerging applications have not been fully tested in different economic environments, the ideas presented in this section should be treated as exploratory suggestions rather than prescriptive recommendations.

<sup>13</sup> For an assessment of the most important shortcomings of FMIS operations in 42 developing countries, see Una, Allen, and Botton (2019).

<sup>14</sup> Public Financial Management I and II Divisions of the Fiscal Affairs Department have been providing capacity development support to IMF member countries on these topics.

## A. Treasury Payments and Fintech Applications

Utilization of fintech solutions could yield higher efficiency for treasury payment operations and coverage, particularly in countries where fintech have filled the financial inclusion gap in the traditional banking system. Depending on a country's level of economic development and the extent to which it has adopted fintech payments, government payment systems could leverage the mobile money network to make transfers to the unbanked and underserved population and use the channel to enhance specific government-to-person (G2P) payments as well as government-to-business (G2B) small payments. For large transactions, governments, especially those in developing countries, can sidestep cash and checks by leveraging payment platforms provided by online and mobile banking solutions. An example is large G2B transactions, such as large payments related to supply of products to the public sector and payments for public investment projects. Another application is recurrent G2P payments, such as public sector payroll or pensions. For low value G2P payments mobile money transfers, which utilize less strict KYC processes and mobile money agents instead on traditional commercial banks are a suitable option (Table 2). The utilization of online and mobile banking solutions is more common in advanced economies since these countries have a higher level of financial inclusion of individuals and business. In the future, CBDC could also be a powerful mean of payment for government treasuries across different countries.

**Table 2. Fintech Payments in Treasury's G2P and G2B: Main Applications, Operational Benefits, and Enablers**

	Government Payments (selected examples)		Fintech Payments Utilized	Main Operational Benefits	Main Enablers
	Recurrent	Not Recurrent			
<b>Persons (G2P)</b>	<ul style="list-style-type: none"> <li>- Salaries</li> <li>- Pensions</li> <li>- Welfare programs</li> </ul>	<ul style="list-style-type: none"> <li>- Emergency support</li> <li>- Subsidies</li> </ul>	<ul style="list-style-type: none"> <li>- Mobile money</li> <li>- e-payments (<i>on-line payments &amp; online banking</i>)</li> </ul>	<ul style="list-style-type: none"> <li>- Reaches unbanked population (mobile money)</li> <li>- Facilitates access to financial services (e-payments)</li> </ul>	<ul style="list-style-type: none"> <li>- Adequate operation of PFM digital solutions, especially FMIS</li> </ul>
<b>Businesses (G2B)</b>	<ul style="list-style-type: none"> <li>- Payments for goods and services</li> </ul>	<ul style="list-style-type: none"> <li>- Grants</li> <li>- Subsidies</li> <li>- Payments for public investment projects</li> </ul>	<ul style="list-style-type: none"> <li>- e-payments (<i>on-line payments &amp; online banking</i>)</li> </ul>	<ul style="list-style-type: none"> <li>- Improves payment timeliness</li> <li>- Enhances fiscal reporting and produces more disaggregated payment data</li> <li>- Strengthens generation of audit trails</li> </ul>	<ul style="list-style-type: none"> <li>- Adoption of digital ID initiatives</li> <li>- Adequate integration between PFM digital solutions and financial sector</li> <li>- Appropriate connectivity infrastructure</li> </ul>

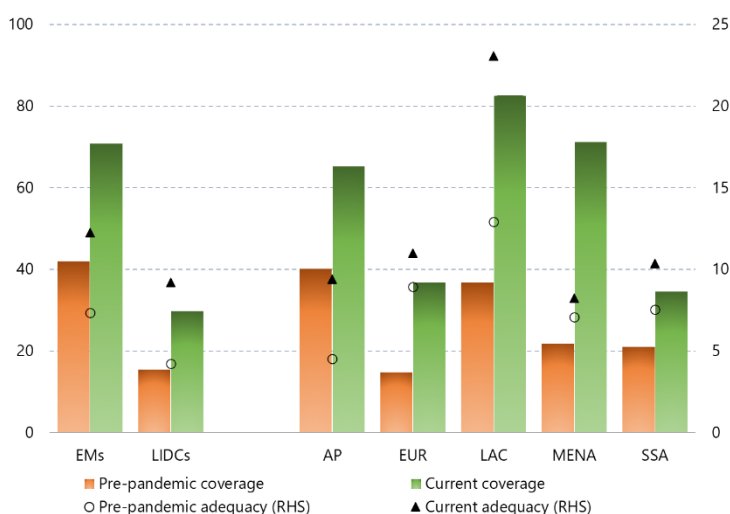
Source: Authors' elaboration.

Note: FMIS = financial management information system; PFM = public financial management; G2B = government-to-business; G2P = government-to-persons.



G2P payments facilitated by fintech have been at the center of government responses to the COVID-19 pandemic. Many governments provided direct cash transfers to protect vulnerable households following the economic and social emergency, adopting mobile money, e-payments, and online banking solutions to deliver these lifeline transfers. The utilization of mobile money payments played an instrumental role in reaching large populations while maintaining social distancing measures during the pandemic (Bazarbash et al. 2020; Una, Allen et al. 2020). During 2020, developing countries launched more than 155 programs that leveraged digital payments for the delivery of either new or expanded social assistance programs (Gentilini et al. 2021). Figure 2 depicts the expansion of cash transfer programs across regions during the pandemic.

Figure 2. Social Safety Nets, before and during the COVID-19 Pandemic



Sources: International Monetary Fund (2021b).

Note: Adequacy is the total transfer amount received by beneficiaries as a share of pretransfer total income. Coverage denotes the share of population that receives social assistance. AP = Asia and Pacific; EMs = emerging markets; EUR = Europe; LAC = Latin America and the Caribbean; LIDCs = low-income developing countries; MENA = Middle East and North Africa; SSA = Sub-Saharan Africa.

An impressive example of adopting mobile money for cash transfers is the *Novissi* program in Togo.<sup>15</sup> At the start of the COVID-19 pandemic, the Togolese government, over a span of 10 days in April 2020, built and launched a digital mass payment platform, allowing beneficiaries to enroll and receive mobile money payments within 120 seconds via basic mobile phones—without internet (Chowdhury et al. 2022). During its first phase, *Novissi* used an occupation-based targeting approach by taking advantage of the country's recently updated voter ID database. In the second phase, the program leveraged satellite imagery, cellphone metadata, and machine learning to identify the most vulnerable individuals (mainly informal workers) within the 200 poorest districts. Despite the absence of a national social registry, Togo managed to distribute \$34 million in mobile money to a quarter of its adult population. Likewise, adopting fintech payments to deliver cash transfers can increase program operational efficiency by sidestepping cumbersome processes that are characteristic of in-person registration and cash payment distributions.

<sup>15</sup> *Novissi* means solidarity in the Éwé language.

In India, the government transferred funds directly to the bank accounts of almost 500 million beneficiaries under its 2020 COVID-19 relief packages. To enable these payments, India leveraged its existing beneficiaries database in the Public Financial Management System (PFMS), and other IT systems, including commercial banks systems, as well as accessing beneficiary data from various welfare schemes that also operate through the PFMS (Verma and Raj, 2020). In Brazil, the number of beneficiaries of direct cash transfers surged from 14 million to 50 million after the government leveraged the scalability of cloud-based solutions for online banking applications (Una, van Eden, et al. 2020). Eswatini also migrated from cash and check payments to pay elderly grants (old-age pension payments). The country leveraged its strong cash-out network and national identity system to make digital payments using mobile money solutions.<sup>16</sup>

These examples show how fintech applications have helped developing countries reach intended beneficiaries during an emergency, and how mobile money expanded financial inclusion of their unbanked population. However, in advanced economies, the situation could be different due to structural differences in financial inclusion rates and banking system coverage. In advanced economies, payments are usually done through digital means, like mobile and online banking system, and via electronic fund transfers. Therefore, the level of adoption of mobile money has been less significant than in developing countries.

Digitalizing of G2P payments, in combination with the review of associated business processes, offers several operational benefits, including more timely payments, reduced cost of transactions, and better service delivery to citizens. For example, by avoiding travel costs to post offices or banks to collect checks or cash, the cost of transactions could be reduced and the service delivery to citizens improved (Klapper and Singer, 2014). In addition, the experience of various countries underscores economic gains from digitalizing government payments. In Niger, utilizing mobile money to implement a social transfer program mitigated logistical challenges and had a noticeable antipoverty impact. Digitizing payments is estimated to reduce administrative costs of cash transfers by 20 percent compared to manual cash transfers, and additionally benefit program recipients by reducing travel and wait time by 40 minutes (Aker et al. 2013, 2016). In the mid-1990s, Mexico began transitioning to electronic payments. This was a period when federal government spending was highly decentralized, and payment processes involved long delays and confusion. Extensive paperwork was required to show entitlement and administrators had wide discretion on the timing of executing payments. The shift to digital payments that began in 1997 generated annual cost savings of \$1.27 billion, or 3.3 percent of total expenditure on salaries, pensions, and social transfer programs (Babtaz, 2013).

More recently, the IMF helped Costa Rica improve its G2P payment system for cash social programs and to adopt fintech applications that promote financial inclusion amongst beneficiaries, especially women. Through a “hackathon”<sup>17</sup> carried-out in 2019, digital prototypes were developed to centralize cash transfer social program payments at the National Treasury. To ensure payments were traceable, digital payment means such as e-wallets and mobile banking were adopted. In late 2021, Costa Rica implemented a PFM digital solution based on the hackathon prototypes and has started to deliver cash transfer payments directly to beneficiaries’ banks accounts through a digital platform called SUPRES.<sup>18</sup> During the first quarter of 2022, nearly 300,000 beneficiaries received payments through this new platform, which is connected to the national Costa Rica Payment System (SINPE) managed by the central bank. The platform has reduced travel costs and allowed

<sup>16</sup> Statement by Eswatini prime minister, April 01, 2020.

<sup>17</sup> A hackathon is a competition to provide an innovative technology solution for a defined challenge / problem within a short period (24 to 48 hours) by participants with different backgrounds.

<sup>18</sup> *Sistema Único de Pago de Recursos Sociales* is a module of the national treasury information system.

access to multiple financial services provided by SINPE's e-wallet, while making improvements in the efficiency of the treasury operations at the same time.

Wider adoption of fintech payment applications would also allow government treasuries to digitalize almost all G2P and G2B payment operations, both in developing countries and advanced economies. Banking activity remains low in developing countries, especially those with large informal sectors. Consequently, government treasuries (including regional and municipal administrations) still rely on cash and checks to make general payments to individuals and businesses. As the unbanked population and businesses adopt fintech applications, the treasuries in these countries will have a viable option to digitalize its payments. In the case of advanced economies, where almost all individuals and businesses have bank accounts, the adoption of fintech applications could promote the utilization of e-payment alternatives for G2P and G2B transactions, improving its efficiency and reducing operational costs related to managing (mainly) payments by checks.

Government treasuries should play a central role in adopting fintech applications for G2P and G2B payments to maintain and increase the treasury single account (TSA) coverage. The TSA is a prerequisite for modern cash management and relies on digital means of payments. The TSA is an effective tool for treasuries to establish oversight and centralized control over government cash resources as it involves setting up a unified structure of government bank accounts (Pattanayak and Fainboim, 2011). Government banking arrangements are critical for ensuring that: (i) all tax and non-tax revenues are collected, and payments are made, in a timely manner; and (ii) government cash balances are optimally managed to reduce borrowing costs, or to maximize returns on surplus cash. Adopting fintech payment solutions for G2P and G2B should not involve moving funds out of the TSA coverage (i.e., they should not be managed by separate line ministries or agencies with different banks accounts). Fintech payments applications should facilitate the inclusion of all public resources in the TSA by automatizing their transfer and fund reconciliation process with the treasury information systems, that retaining a key TSA role in managing government cash.

However, the successful adoption of fintech applications in G2P and G2B payment operations will depend on the existing conditions and structural factors that impact the functioning of the PFM digital solutions, especially the FMIS. In some developing countries, the FMIS presents severe functional weaknesses, including a lack of well-designed and enforced internal control mechanisms or deficient cash management procedures; poor connectivity infrastructure, hardware obsolescence, lack of technical support, and system maintenance issues; and inadequate capacity to face cybersecurity threats. In addition, there are difficulties identifying and validating recipients of direct cash transfers, particularly in low-income developing countries and emerging market economies, which often have large informal sectors. This makes it more difficult to deliver the payments effectively and securely. Despite the advances achieved by several countries in this regard during COVID-19 pandemic, there are still important challenges in digital ID solutions in developing countries.<sup>19</sup> Issues in FMIS and digital ID solutions, among others, would present major challenges for reaping the benefits of adopting fintech solutions in treasury payments. This is further discussed in the point related to risk and challenges of adopting fintech applications in PFM developed later in this section.

## B. Non-Tax Revenue Collection

There are two main categories of non-tax revenue in the public sector. The first is non-tax revenue generated by royalties, such as those from extractives sectors and dividend payments from state-owned enterprises. The

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<sup>19</sup> For details, see Prady (2020).

second is non-tax revenue from fees for good and services provided by government agencies, such as passport issuance, port fees, agricultural services charges, police fines and penalties, as well as some health and education services. The public sector has leveraged the fintech payment features discussed earlier by offering additional avenues for making payments using e-payments platforms and in some cases mobile money. Fintech payments allow users to make payments anytime and anywhere, using multiple payment platforms, which could include CBDC in the future. (Table 3).

**Table 3. Use of Fintech Payments in Non-Tax Revenue Collection**

<b>Fintech Payment</b>	<b>Features</b>	<b>Enabling Conditions</b>	<b>Benefits</b>	<b>Risks and Challenges</b>
<b>Mobile Money</b>	-Bank accounts are not required. -Large cash-out network. -Low information technology infrastructure requirements.	-High penetration of mobile networks. -Large number of mobile users. -Integration of mobile network operators, banks, and government service providers.	-Easier to pay -Low operating costs	- Reconciliation of transactions between accounting system and banks -Lack of internal controls could lead to accounting errors and financial fraud.
<b>e-Payments</b>	-Easy authentication for the high value payments. -Anytime, anywhere banking.	-Access to internet and banking services. -Integration of FMIS and banking systems.	-Online collection of large amounts of revenue related to government services (e.g., port fees and dividends from state-owned enterprises).	
<b>CBDCs</b>	-An evolving area; may help governments with non-tax revenue collection, but this depends on the architecture.	-Integration of the CBDC into existing government payment and settlement system infrastructure.	-Electronic proof of payments for service delivery.	

Source: Authors' elaboration.

Note: PFM = public financial management; CBDC = central bank digital currency, FMIS = financial management information system.

The use of fintech in non-tax revenue collection requires a data exchange process covering the cost of the service / good provided by the government, or the amount of the fines / penalties, and a payment gateway to collect it from users. Therefore, a non-tax revenue collection system may require integration with several public service delivery systems operated by government agencies to capture the cost of services / goods. Once the non-tax revenue is collected these service delivery systems are automatically updated to provide proof of payment. This functionality could also be included as a module of the FMIS. If specific service delivery systems do not exist, or if they cannot be integrated, the payment interfaces used by the payers will need to be configured so that proof of payment is assured.

Moreover, to utilize fintech payments in non-tax revenue collection, public sector treasuries must either developed their own payment gateways or integrate their gateways with those developed by external service providers. In either case, the systems must be updated to list the services and its accounting classifications to update the accounting system in the FMIS. The system should also ensure adequate backend integration with government bank accounts for timely collection of funds. Therefore, utilizing fintech payments requires the treasury to update existing business processes and FMIS configuration. A close coordination with the agency responsible for providing the goods and services is key to ensure accurate collection, accounting, and reconciliation of funds related to non-tax revenue collection

Several successful collection platforms have been launched. In India, a non-tax revenue portal has been integrated with banks and aggregators to provide a single platform for users to pay for non-tax revenues using internet banking and debit/credit cards. The portal allows users to select the services for payment, which are linked to accounting codes and the government's collection accounts in the banking system. After authentication, the payments are internally credited in the bank accounts and reconciled online using a unique transaction ID. The government has coordinated with the banks for the smooth exchange of transaction ID and reconciliation of funds. A similar solution was adopted in Dominican Republic to collect payment related to different type of non-tax revenues by utilizing on-line and mobile banking applications.

Another example is Rwanda, where a comprehensive GovTech solution for government services, called IremboGov, was introduced in 2015. This solution allows users to apply and pay for a range of public services, including community-based health insurance, driving test registration, and visas, using digital means of payments, such as mobile money. In early 2020, about 300,000 service requests were successfully processed each month through the platform. IremboGov both facilitates access of users to government services and

### **Box 1. Fintech Applications in Senegal for Tax Collections**

In Senegal, a 2016 “hackathon” organized with IMF support, led to several digital initiatives in the tax administration, including for mobile payments. One hackathon solution was “M-Tax” (or “Mobile-Tax”), a system for small businesses and individuals to declare and pay tax using SMS (texting), as well as Unstructured Supplementary Service Data (another protocol for sending text messages), and interactive voice server channels. In addition to M-Tax, the Senegalese tax administration continued to develop and implement digitalization solutions, including electronic filing solutions designed specifically for small businesses, and other solutions designed for medium and large taxpayers; electronic filing of annual financial statements; electronic monitoring of tax audit activities; a data warehouse system; automatic validation of taxpayer location to validate registration; and electronic purchase of tax stamps using a single-use QR code. Between 2016 and 2019, there have been visible compliance improvements, including the following:

M-Tax – small businesses declaring and paying taxes increased from 0 to 70 percent.

E-Tax – online declarations and payment by large-size taxpayers grew from 1 to 100 percent, and medium-size taxpayers from 0 to 65 percent.

Electronic filing of annual financial statements grew from 0 to 91 percent (large-size taxpayers) and to 42 percent (medium-size taxpayers); and

Electronic monitoring of audit activities increased from 0 to 100 percent.

improves government revenue collections while cutting costs by reducing leakage, improving transparency, and decreasing administrative expenditures. A similar non-tax revenue collection platform was adopted in Tanzania, called Government e-Payment Gateway. This platform provides a good example of integration between PFM processes and fintech applications. Administered by the Ministry of Finance, it provides e-payment collection services to all government agencies, improving their efficiency and transparency. Tanzania's e-payment gateway process payments via on-line banking, credit cards, and mobile money. In a similar vein, fintech applications have a great potential to modernize and improving tax collection processes by revenue agencies. Box 1 illustrates how Senegal tax authorities enhanced tax collection using fintech.

To improve non-tax revenue collection, closer integration of the information system of the Ministry of Finance and those of different line ministries and public agencies is needed. It requires alignment of data definitions, coding of organizations, and non-tax revenue codes in the chart of the accounts. Brazil is adopting an innovative digital platform to collect non-tax revenues called PagTesouro. This platform was developed by the National Treasury and operated over the Brazilian Payment System (SPB), managed by the central bank. It allows public agencies to collect different types of fees, such as fees for sanitary inspections, educational services, and fines. The PagTesouro platform exchanges information with the accounting system and the treasury system, registering revenues automatically in the FMIS's general ledger and immediately transferring funds to the TSA. Similar initiatives are underway in advanced economies. For example, the U.S. treasury utilizes collection and processing services from the General Lockbox Network, which supports federal agencies in processing and digitalizing paper checks and other remittance documents (not related to taxes) that are received by mail.<sup>20</sup>

Successful adoption of fintech payments to collect non-tax revenue has specific requirements: existing IT systems in treasury need to be updated, banking and service providers need to be integrated with the FMIS, business processes to facilitate online collection need to be developed or updated, and bank reconciliation must be flexible enough to allow adoption of fintech applications. A partial adoption of the solution may lead to a loss of information, fraud, and challenges for accounting and reconciliation of the funds.

### III. Benefits of Fintech Applications in PFM

The FMIS main objectives, as a key fiscal management tool, is to generate timely, relevant, and reliable financial data and reports that support financial decision making and improvements in fiscal discipline, expenditure control, and fiscal transparency (Una, Allen, and Botton 2019). The informational and operational gains generated by adopting fintech applications in PFM, in terms of accuracy, timeliness, and granularity of financial information can help achieve the main FMIS objectives by tracking more detailed transactions information, improving timelines of fiscal reporting, and enforcing control over transactions. Implementing fintech applications could complement and enhance PFM digital solutions related to government payments and collections. It could, for example, strengthen fiscal transparency, improve budget planning and execution (mainly for cash transfer social programs), and upgrade cash management practices. These three main benefits are described in this section.

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<sup>20</sup> For more information, visit <https://www.fiscal.treasury.gov/gln>.

## A. Strengthening Fiscal Transparency

Fintech payment applications could help improve fiscal transparency and public sector accountability by enhancing the reliability and disaggregation of payments data. And it could enforce controls over the financial transactions in the PFM digital solutions. Digitalization of government payments along with robust beneficiary identification and management systems, digital ID, and strong bank reconciliation processes, could provide higher frequency, reliable payment data which could be anonymized, grouped, and published in fiscal transparency portals promoting better social accountability for citizens.

Public sector digital solutions have, especially in the case of FMIS, an important role to play in enhancing fiscal transparency and accountability based on their capabilities to process, store, and report financial information regarding all the payments performed by the treasury. However, for some type of G2P payments, like cash transfers to households, there may be certain shortcomings in the current PFM procedures and FMIS processes. Instead of processing direct payments to each beneficiary, the treasury may transfer an aggregate amount of resources to subaccounts in the TSA or individual bank accounts of one specific public agency, for example Ministry of Social Development. After receiving these resources, the public agency transfers them to its commercial bank, along with the beneficiary's bank information, to process the individual payments, which could be done even over the counter with checks or cash. By adopting this payment process, the availability of disaggregated information for individual payments registered and processed in the FMIS is restricted. If this G2P payment process is operationalized by utilizing fintech applications, the individual transaction-level information on payments could be recorded in a centralized database and transmitted to FMIS database. Such a transaction level information could improve the fiscal transparency and the accountability of the treasury payments.

The benefits in strengthening the transparency in designing, implementing, and overseeing the responses to COVID-19, supporting in some cases by fintech applications, were key to ensure their legitimacy and accountability. During the pandemic, different countries adopted fintech payment applications to deliver direct cash transfers, such as Cambodia, Chile, Peru, and Togo. The applications generated timelier and better-quality information, which was published in general fiscal transparency portals or dedicated COVID-19 spending portals. Some of these improvements were related to the geographical distribution of the beneficiaries and the payment dates, always taking in consideration the privacy issues by not publishing any kind of personal information in accordance with the legal framework of each country. In addition, the centralized databases utilized by fintech payment applications—with full audit trails that can keep track of past activities and disclose information on the individuals who created, authorized, and edited financial records—is a good platform to reinforce accountability. However, how the auditors will access this trail and who exercises control over it is an important topic to be considered.

Fintech payment applications could also improve the decentralization of financial operations to the line ministries by using electronic authentication of payment transactions by ministry users, while strengthening centralized controls and fiscal transparency. Therefore, execution of payments can be delegated more freely to line ministries if FMIS controls are adhered to and complied with. This creates new opportunities for more decentralized operations (at the level of line ministries) to better integrate financial management with the policy execution, while strengthening the budget execution and payments controls through the FMIS. To take advantage of these opportunities, however, it is important to achieve progress in other areas of government, such as authenticating policy target groups (via digital ID) and ensuring that targeted groups can receive

payments digitally through the establishment of unified end-beneficiary databases that can be accessed by line ministries and the treasury.

## B. Improving Budget Planning and Execution (Mainly for Cash Transfer Social Programs)

The adoption of fintech applications to support PFM digital solutions can help improve budget planning and execution efficiency of social programs, especially in those focused on cash transfers. The applications can facilitate regular and timely payments to beneficiaries, help to identify and reach the correct beneficiaries, improve the accounting and reporting of cash transfer transactions, and strengthen accountability by providing a reliable audit trail. Sound PFM digital solutions can play a key role in identifying accurately and validating the information on intended beneficiaries by cross-checking data from different sources (to ensure a comprehensive coverage of the targeted population) and streamlining cumbersome government procedures for processing benefits.

Nevertheless, the lack of good quality and timely information on the beneficiaries can lead to leakages and inefficient and untargeted spending through fraud, corruption, or errors in coverage. The design and execution of income-support programs exposes the government to two main challenges (IMF, 2018):

- *Exclusion errors (also called non-take-up problems)*: when eligible individuals do not, or only partially, receive benefits to which they are entitled; and
- *Inclusion errors (also called leakage problems)*: when knowingly or not, individuals are appropriated social benefits or services to which they are not entitled.

Generally, the government faces a difficult trade-off related to these two challenges: either to adopt tight eligibility criteria to ensure that no “undeserving” beneficiary receives support, thus running the risk of excluding some eligible people; or to cast the net wider so that most of the poor are taken care of at the risk of including many “undeserving” cases among the beneficiaries. Loose criteria will also increase the risk of fraud. Adopting fintech payment applications as a part of PFM digital solutions could help tackle these two problems related to cash transfers, contributing at the same time to better budget planning and execution.

In the case of exclusion errors, the adoption of fintech payment applications helped governments reach the unbanked population during the COVID-19 emergency. Mobile money and e-payment solutions were utilized in low-income developing countries, despite severe challenges in properly identifying beneficiaries and the necessary adjustments to government information systems (Prady, 2020; Una, van Eden et al. 2020). Paraguay provides a good example of a fintech payment application adopted to face the non-take-up problems. By adopting mobile money as the main mean of payment, its cash transfer program, called *Pytyvõ*,<sup>21</sup> reached workers in the informal sector. During the first disbursement of the program, 90% of the beneficiaries received their payment by electronic wallet (Bordon et al. 2022).

In the same way, by collecting, processing, and publishing timely and better information related to the payments performed by fintech applications and integrated in the FMIS, it would be possible to help to mitigate inclusion errors by increasing transparency and control over the emergency response measures. Iceland,

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<sup>21</sup> *Pytyvõ* means “support” in the Guaraní language.



Indonesia, Peru, and United Kingdom created webpages during the COVID-19 emergency to allow citizens to find information on aid for vulnerable households (Wendling et al. 2020).

In addition, the information generated by utilizing fintech payments to deliver cash transfers can also be used to enhance resource allocation during budget planning. Adopting fintech payments, alongside digital ID<sup>22</sup> and socio-economic information data bases initiatives, generate more reliable and timely data on the total number of expected beneficiaries. Based on additional and more accurate data, social agencies can enhance the projection, and therefore the allocation, of appropriate budget resources to cover the eligible identified population.

From the PFM perspective, the benefits of adopting fintech payments for cash transfers during the COVID-19 outbreak have helped improve social programs budget execution. Budget execution has become more responsive and efficient, as *Novissi* program in Togo has shown, even in a context of social distance and restrictive mobility, and more reliable and timely data on the total number of expected beneficiaries has improved budget planning.

### C. Upgrading Cash Management

By adopting fintech payment applications, the cash position of treasuries can be established faster and more precisely. Fintech payment applications allow: (i) real time exchange of debit and credit transaction information with a unique identifier for reconciliation between PFM digital solutions and fintech applications, and (ii) configuration of virtual and zero balance accounts in the banking system. As it was discussed before, for certain payments finance ministries transfer the bulk of resources to line ministries, which then transfer the funds to commercial banks for individual payments. Due to this procedure, FMIS could lose track of the information at the transaction level. Therefore, fintech adoption could facilitate capture disaggregated information of the payments and expand the coverage of the TSA, since more payments could be processed automatically in fintech applications, which are connected to the FMIS.

Adopting fintech payment applications and expanding the coverage of the TSA are important steps toward fully automating payment workflows and bank reconciliation (which is key to establishing treasury cash positions). Real-time knowledge of the cash position allows more active management of TSA surpluses and deficits. In addition, it helps maintain all controls within the umbrella of the FMIS. This strengthens commitments control—for instance, the FMIS could be configured to disallow a payment where the purchase order is not created in the system.

Payments utilizing fintech applications should not jeopardize treasury's cash position in the TSA. The treasury must assure that when utilizing fintech payments public resources will not be sitting idle with the operator of the mobile wallet or e-payment platform. The same argument applies with regards to payment of different types of tax and non-tax revenue into the TSA using fintech channels. For example, in Nigeria, the treasury's objective of avoiding idle funds outside of the treasury's bank accounts was achieved through the Central Bank of Nigeria and Nigerian Communication Commissions regulatory framework for Mobile Money Services. This framework requires the settlement of mobile money transfers through the Nigerian Interbank Settlement

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<sup>22</sup> Digital identity systems are an important component of the public infrastructure to facilitate the adoption of digital means of payments. Examples include Aadhaar in India, MyInfo in Singapore, and e-identity in Estonia.

System infrastructure and the Central Bank of Nigeria Funds Transfer System. Using this infrastructure facilitates instant payment to end-users directly from the TSA, thereby reducing the level of idle funds usually kept in bank accounts for mobile money operations.

## IV. Risks and Challenges of Fintech Applications in PFM

The adoption of fintech applications in PFM implies different risks and challenges that should be attended and mitigated. These risks and challenges are related to public sector institutional and technological capacities as well as with certain specific characteristics of the digital money, especially crypto assets and CBDC. This section provides a high-level overview of these topics.

### A. Public Sector Institutional and Technological Capacities to Adopt Fintech Applications

Public sector institutional and technological capacities should be strengthened in order to adopt fintech applications in PFM. In some countries, PFM IT systems have structural weaknesses that could hamper the adoption of fintech applications. For example, the FMIS and other public finance-related IT systems may work in silos, hampering information exchange. Sometime core FMIS functionalities,<sup>23</sup> present important flaws in functional aspects and its embedded controls (Una, Allen, and Botton, 2019). Besides, FMISs frequently do not have technological capabilities to automate the data exchange with the financial sector (in general) and fintech sector—the mechanism to exchange information are manual, presenting important operational risks. Connectivity issues and hardware platforms also present severe limitations. (See Table 4.)

Table 4. Main Weaknesses of the Core FMIS

#	Topic	Main Weaknesses of the Core FMIS
1	Accounting and fiscal reporting	1.1. Problems in the generation of accurate and timely fiscal reports
		1.2. Failures to integrate the chart of the accounts and the budget classifications
		1.3. Absence of a data warehouse or detailed accounting and budget reports
2	Tracking of cash flows and bank reconciliation	2.1. Deficiencies related to track payments and bank reconciliation with the financial institutions
3	Budget execution and internal controls	3.1. Weaknesses in supporting the management and control of expenses and revenues along the entire budget cycle
4	Treasury and cash management	4.1. Insufficient support for government banking functions and cash management

<sup>23</sup> Core FMIS functionalities are composed by accounting, budget, treasury, and financial reporting. See Una, Allen, and Botton 2019.

5	Technological platform	5.1. Software licenses expired, limited hardware capacity and/or inadequate database maintenance
		5.2. Poor or non-existent connectivity in regional or remote locations
6	Interoperability and data sharing capabilities	6.1. Absence of shared information with other PFM systems (e.g., debt management, public procurement, payroll, and public investment projects)
		6.2. Weaknesses to share information with financial institutions a
7	Institutional coverage	7.1 Incomplete coverage of central government ministries and agencies

Source: Una, Allen, and Botton (2019).

In addition, authentication of citizens and businesses in connection with establishing digital payment solutions may prove difficult if digital ID solutions are not well established. Therefore, a strategy to promote the adoption of fintech applications in PFM should consider, as a key enabler, initiatives to strengthen the ministry of finance institutional and technological capacities.

Regarding digital risks, the biggest concerns in implementing fintech solutions in the public sector come from cybercrimes, biases in automated decision making, breaches in data privacy, and new avenues for tax evasion and fraud. Criminals target government PFM systems to steal digital assets, seek ransoms (using ransomware), undermine government operations, and disrupt financial services. Fraud is also a common way to exploit weaknesses in internal controls and steal funds from poorly designed PFM information systems, as experienced by Malawi and Kosovo.

Integration with databases that identify the eligibility of the receiver of cash transfers is important for targeted social transfer. Even if there is a large fintech payment network, it would be practically impossible to carry out targeted social transfers utilizing fintech applications without robust beneficiary identification processes and/or information systems, complemented by digital ID initiatives

Finally, privacy concerns should be taken into consideration to adopt fintech in the public sector. Through PFM IT systems, government treasuries collect sensitive information on suppliers, public employees, cash transfer beneficiaries, and taxpayers that must be compliant with the legal requirements that protect privacy. For example, programmability of CBDC to better track and target government expenditures requires striking a balance between efficient delivery of service and maintaining user privacy.

Therefore, a strategy to promote the adoption of fintech applications in PFM should also include initiatives to strengthen MoF institutional and technological capacities, improve its capacity to deal with digital risks, and to build a digital ID ecosystem in the country.

## B. Potential PFM Risks and Challenges in Implementing Digital Money

Currently, there are only a few experiences of countries adopting digital money—El Salvador’s adoption of Bitcoin as a legal tender and The Bahamas’ issuance of a CBDC called the Sand dollar. These limited experiences need to be assessed in more details to better understand how public finances might be impacted by digital money. Nevertheless, there are potential PFM risks and challenges in implementing digital money as a legal tender, especially crypto assets, as following:

### *Crypto assets*

*TSA functioning and cash management:* High volatility in crypto asset prices might lead to unpredictable cash requirements—a challenge for cash management. Crypto assets could also disrupt a centralized model of TSA (an essential element of treasury management) by introducing crypto asset e-wallets to existing subaccounts and bank accounts of TSA. This can weaken a treasury’s active cash management practices, tangle liquidity management, and may require significant resources to adjust TSA design and operations. The public sector could also face issues around protocols to create new invoices/addresses to send and receive funds from individuals and businesses.<sup>24</sup>

*Government fiscal accounting and reporting:* Measurement of value and registration issues may arise in accounting due to the high volatility in crypto assets prices. The value of payments will hinge on the timing of conversion of the crypto assets, which could also impact the accuracy and reliability of fiscal reporting.

*Internal and external oversight:* Internal and external audit functions should develop the necessary institutional capacities to analyze the crypto assets ecosystem, including nodes and transactions, to properly audit crypto asset operations. If these procedures are not in place, some risks could materialize, like rent-seeking risk produced by slow settlement processes (i.e., between the crypto currency e-wallet and the treasury, in the context of highly volatile crypto asset prices).

*Storing private crypto assets in government treasuries:* Crypto assets could be stored and managed in different ways ranging from privately managed crypto exchanges, mobile wallets, or cold stored (e.g., offline wallet-ledgers like Trezor<sup>25</sup>). Depending upon the type of solution, managing private keys is very complicated and requires a high level of personal accountability. Losing a private key could mean permanent loss of public resources and there may not be ways to restore assets. In addition, protecting this type of digital asset from cybercrime will require sophisticated technologies and high technical capabilities within government treasuries, in particular, and the public sector in general.

*Fiscal risks:* In the case where a crypto asset is adopted as legal tender, fiscal risks would be amplified. There could be significant fiscal costs associated with promoting the adoption of the crypto asset as legal tender (and contingent liabilities) if, for example, convertibility to fiat currency is guaranteed by the government and the operationalization of the e-wallet is under the responsibility of a state-owned enterprise. However, the adoption of crypto assets as legal tender by countries is not a widespread practice. One exception is El Salvador, which became the first country to adopt a private crypto currency, Bitcoin, as a legal tender (alongside the U.S. dollar). In June 2021, a law was enacted establishing that the U.S. dollar will be used as a reference currency for accounting purposes, mandating the acceptance of Bitcoin by economic agents in exchange for goods and services. The law also guarantees automatic conversion from Bitcoin to U.S. dollars, through a trust fund. IMF (2021c) notes that: “Initiatives to improve financial inclusion are welcome, but Bitcoin use carries significant risks and Bitcoin should not be used as an official currency with legal tender status. Narrowing the scope of the

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<sup>24</sup> Another aspect to consider is the management of errors in government payment transactions. In the event of an error, governments can initiate a process of rolling back transactions. And, in the event of fraud, banks, in cooperation with the government, can freeze bank accounts and assist in stolen asset recovery. However, with crypto assets, errors in payment transactions cannot be reversed because transactions are executed using distributed ledger technology, such as blockchain, which create an immutable record. Therefore, if the beneficiary database is not updated properly with the beneficiary information, the erroneous payment cannot be reversed by the banking system and only a new transaction must be initiated to reverse payment by the final recipient.

<sup>25</sup> Trezor is a hardware wallet providing advanced security for handling Bitcoin and other cryptocurrencies private keys.

Bitcoin law will contain some of the macroeconomic risks. Strict regulation and supervisory oversight are needed to mitigate remaining fiscal, financial integrity and financial stability risks.”

Thus, the adoption of crypto assets as an option for public finance should not be considered without establishing an adequate regulatory framework and accompanying processes, systems, and procedures to address the related risks.

### *CBDC*

Innovations in digital money, more specifically the utilization of CBDCs, could create opportunities and challenges for treasury payments and for treasury operations in general. The programmability aspects of CBDCs could be incorporated whenever a particular digital payment is used by a particular individual (digital identity) for a particular purpose or geographical region. This characteristic could be utilized by the government treasury to enhance public spending accountability and transparency. In addition, such programmability could be used to address income and regional disparities and could be another tool to design and implement new fiscal policies. Moreover, the transactions data collected by public sector entities could unlock new insights into public policy implementation. However, depending on how the rollout of CBDCs unfolds, governments will have to recognize the trade-off between expenditure targeting and individual data privacy. Also, the impact of adopting CBDC on government banking arrangements, cash management, and the TSA design and operation should be analyzed. In sum, CBDCs could have particular appeal for EMDEs, but could also have merit in advanced economies. That will depend on their design, especially whether governments can monitor all or just some individual transactions with CBDCs and use this information to design and implementation of policies, also considering the anonymity aspects.<sup>26</sup>

### **Box 2. Utilizing e-vouchers in India**

E-vouchers to pay for particular types of services are another type of digital money. The National Payments Corporation of India,<sup>27</sup> for example, is considering e-vouchers for health services payments. The users of this seamless one-time payment mechanism will be able to redeem vouchers without a card, digital payments app, or internet banking access, at any merchant able to accept the Unified Payments Interface (UPI). The e-RUPI, issued by India’s National Health Authority, would be distributed to beneficiaries for a specific purpose or activity via SMS or QR code. This payment mechanism will allow the government to make direct payments to beneficiaries, which will help it better target subsidies or social sector payments. It will also prevent “leakages” by organizations. To adopt this type of solution, a robust digital ID solution needs to be in place and the technological capacities of the Ministry of Finance need to be accessed.

<sup>26</sup> Anonymity could be desirable for some payment types (e.g., state park fees). For others, such as paying fines by citizens, some level of identification is desirable.

<sup>27</sup> The National Payments Corporation of India is an umbrella organization for operating retail payments and settlement systems.

## V. Concluding Remarks

Financial technology innovations provide new opportunities to enhance the delivery of financial services and increase access to financial services for underserved populations and businesses. New information—generated through the digital footprints of fintech users—creates new possibilities to strengthen data-reliant financial services in the private and public sectors. Fintech can expand the scope of financial services to remote locations and vulnerable citizens and enable governments to provide cash transfers and lifeline support more securely and rapidly. A case in point is the fiscal response to the COVID-19 pandemic; some countries have adopted measures to encourage the use of mobile money to facilitate contactless payment transactions. Fintech applications could lead to better policy designs and implementation if adopted in specific public financial management areas to increase its operational efficiency and effectiveness.

Fintech developments related to payments in the private sector could be incorporated in PFM, generating important efficiency gains in fiscal operations. We conceptually describe how fintech innovations, which have been built on opportunities provided by digital technological advancements to mitigate financial frictions, have increased citizen's access to alternative finance. Building on this analysis and considering the early experience of some countries, we explore the adoption of fintech applications in PFM. We specifically focus on the value of adopting fintech in two key areas: treasury payments and non-tax revenue collection, and found promising results. Nevertheless, the adoption of different fintech payment applications is different between low-income countries, emerging markets, and advanced economies. During COVID-19, mobile money helped governments in low-income countries reach intended beneficiaries with the emergency support. This included the unbanked population. In advanced economies, payments in general, including treasury payments, are done mostly through digital means, like mobile and online banking systems, utilizing electronic fund transfers due. Because financial inclusion rates and banking system coverage is higher in these economies, the level of adoption of mobile money has been less significant than in developing countries. The benefits of adopting fintech payment, however, are important for the treasury across all groups of countries. Implementing fintech applications could complement and enhance the benefits of implementing PFM digital solutions related to government payments and collections. They can strengthen fiscal transparency, improve the responsiveness of the budget execution for cash transfer social programs, and upgrade cash management practices, amplifying and complementing the expecting benefits, or improving those ones already achieved, in different countries by adopting FMIS.

Fintech developments are emerging, and their implications for financial development, financial stability, and economic growth have not fully materialized. As the sector and applications evolve, new opportunities and challenges will emerge, requiring regulations from authorities and policymakers, and timely and appropriate responses. To successfully adopt fintech, governments need to overcome internal challenges of legacy information systems, inefficient business processes, possibly inconsistent data, and limited institutional capacity. They also need to deal with operational risks, notably cyber risks, and challenges arising from digital money. The spread of crypto assets and their impact on public finances and data privacy issues are other considerations. In addition, the adoption of a robust digital ID is another key enabler to facilitate the adoption of fintech applications in PFM.

Assuming successful adoption and integration of fintech applications in public financial management, we discuss its implied benefits for PFM. Increased efficiency and effectiveness of resource allocation and fiscal policy implementation (such as cash transfer social programs) generated by the adoption of fintech applications as a mean of payment could aid to improve budget planning and execution. Fiscal transparency could be

strengthened by using reliable and more granular high-frequency payment data from fintech applications adopted by the treasury to deliver payments or collect resources. Maintaining data privacy should always be addressed. Finally, integrating fintech payments with treasury management and government banking arrangements the cash position of treasuries can be established faster and more precisely and result in upgraded cash management practices. The adoption of fintech in public finance, as well as in other parts of the economy, has already started. These innovations will bring benefits to the public as well as risks and challenges that need to be handled by authorities and policymakers with attention and care. This paper offers some initial ideas to explore these possibilities.

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# PUBLICATIONS

**Fintech Payments in Public Financial Management: Benefits and Risks**  
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