TOWARDS INCLUSIVE DIGITAL FINANCE IN INDONESIA

A Literature Review and Landscape Analysis

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Introduction

Well-functioning financial services markets are essential tools for economic growth and poverty alleviation. Properly designed and targeted financial products can help low-income people overcome constraints and grow income, while providing insulation against poverty-inducing shocks (Karlan et al., 2014, 2016). Yet despite robust progress in recent years, as of 2017 an estimated 1.7 billion adults worldwide were completely shut out of formal financial services markets (Demirguc-Kunt et al., 2018); additionally, many others remain underserved in that they only have access to products that are costly, difficult to use, or fail to meet key needs.

One of the most promising recent developments in financial inclusion has been the rapid global spread of mobile phones and internet access, which is beginning to transform the financial services landscape in many low- and middle-income countries (LMICs). Digital financial services (DFS) have played a key role in enabling this transformation. There are several ways DFS can address market failures that hinder financial inclusion in LMICs. First, digital technologies can *reduce the transaction costs* of providing basic banking and money transfer services. Second, digital products use and generate data, which can *close information gaps* that hamper markets. Finally, DFS can enable entirely *new models of service delivery.*

Yet if new products do not meet the needs and preferences of low-income users, DFS risk exacerbating inequality by disproportionately serving the better off and better educated. These concerns are especially relevant in countries like Indonesia, where DFS are being rapidly adopted by individuals at the top of the socioeconomic pyramid (InterMedia, 2017b). Yet Indonesia has made bold, clear commitments to financial inclusion: in 2016, the country launched its National Strategy for Financial Inclusion (*Strategi Nasional Keuangan Inklusif* or SNKI), which aims to provide universal access to affordable, quality, and safe formal financial services. Since then, formal financial account ownership has increased from 35.1 percent in 2016 to 55.7 percent in 2019 (SNKI, 2019).

There is clear potential for innovation in the DFS space to advance Indonesia's ambitious financial inclusion goals and support inclusive growth. However, there is relatively little evidence–especially from Southeast Asian settings–to guide policymakers and firms committed to this agenda. To address this gap, *J-PAL Southeast Asia is launching the Inclusive Financial Innovation Initiative (IFII), which aims to (1) share evidence on how DFS can be marshalled to support shared economic prosperity while (2) kick-starting a new wave of research on DFS for inclusive financial sector and economic development in Indonesia.* To support these objectives, this launch report reviews existing evidence on the impact of DFS and associated policies on development outcomes, provides an overview of the Indonesian context, and identifies promising areas for future research and policy innovation. The first part of the report details the results of a global literature review, which synthesizes the growing evidence on the impact of DFS in LMICs. The second part of the paper presents an assessment of Indonesia's DFS landscape. We close by summarizing promising research topics that would fill pressing evidence gaps while supporting evidence-based policymaking in Indonesia.

Global Literature Review

Our literature review focuses on insights related to use cases we believe are most relevant to the Indonesian market–electronic money and payment technologies, savings, credit, and e-commerce–and highlighting evidence gaps and areas for future research.[1]

This review draws primarily from experimental or quasi-experimental literature on our four use cases of electronic money and payment technologies, savings, credit, and e-commerce. We conducted an extensive keyword search in Google Scholar and expanded this by screening for additional studies' literature reviews on the topic (Aron, 2018; Suri, 2017), consulting bibliographies of relevant publications and J-PAL's internal knowledge database. From this range of publications, we selected a subset that presents empirical evidence on digital finance, with a particular focus on literature that identifies causal relationships between DFS use or polices and the impacts on the lives of those living in poverty. After screening 111 publications, 64 were included in this review.

1 Electronic Money and Payment Technologies

Broadly, electronic money or e-money refers to any digital currency. In our review, we focus on forms of e-money that can be transferred through basic mobile phones (the prevalent use case in many LMICs, often referred to as mobile money), smartphone-based apps (commonly found in Indonesia), stored value cards, and other internet-based applications. Many types of payments can be made using e-money, including: person-to-person (P2P), person-to-business (P2B), business-to-person (B2P), government-to-person (G2P), and people-to-government (P2G).

E-money *reduces transaction costs* by making payments faster and cheaper, which can have downstream welfare impacts by facilitating risk sharing and informal insurance mechanisms. It can also help *close information gaps* by generating an electronic record of payments–an important advantage for governments looking to trace payments, for example, for social protection programs and procurement. Finally, e-money promotes *new models of service delivery* leveraging digital platforms.

1.1 P2P Payments

Evidence on products that enable digital P2P payments indicates they help households weather economic shocks and can even reduce poverty; however evidence on impact pathways is mixed.

A growing body of research from sub-Saharan Africa and South Asia finds that e-money facilitates P2P remittances, which help low-income households smooth consumption (Jack and Suri, 2014; Batista et al., 2018; Riley, 2018) and stay out of or exit poverty (Suri and Jack, 2016; Lee et al., 2017). Suri and Jack (2016) study the impact of Kenya's M-PESA (M is for mobile and Pesa is money in Swahili), one of the most successful e-money services in the world. The authors estimate that access to this service increased per capita consumption, lifting 2 percent of households out of poverty over a period of six years, with especially large effects for female-headed households. Although overall there is strong evidence that e-money facilitates remittances, which in turn boosts resilience to shocks, some studies (e.g., Wieser et al. (2019)) find limited impacts on consumption. This may partially reflect limited take-up and statistical power.

There is less consensus as to e-money's impact on other aspects of economic activity. For example, in some settings researchers find that it leads

[1] Our review is not intended to offer comprehensive coverage of all financial services; rather, we focus on services where digital innovations are near-term relevant in the Indonesian market. See Karlan et al. (2014) and Karlan et al. (2016) for wider-ranging reviews with less explicit focus on digital products.

households to shift away from agriculture, often towards nonfarm employment (Suri and Jack, 2016; Wieser et al., 2019; Batista et al., 2018), while in other contexts it reallocates resources away from business towards agriculture (Aggarwal et al., 2020). There is also evidence that access to e-money encourages rural-to-urban migration (Lee et al., 2017; Batista et al., 2018), which is in line with the hypothesis that reducing transaction costs of remitting increases the effective return to migration. These varying labor market effects may reflect differences in the economic environment across contexts; e-money may help individuals invest more in agriculture in settings where the marginal return to farm activity is especially high but may reduce agricultural employment in settings where marginal returns in the nonfarm sector are high. More research on how e-money reshapes household labor supply–and how this is mediated by broader economic conditions–is needed to test this hypothesis.

The net effect of e-money on savings is theoretically ambiguous. E-money accounts may reduce the transaction costs associated with saving, which could increase savings levels. On the other hand, remittances facilitate informal insurance, and better-functioning insurance networks could reduce precautionary savings motives. To date, most studies that examine overall savings find either increasing effects (Suri and Jack, 2016; Lee et al., 2017) or null effects (Aggarwal et al., 2020; Wieser et al., 2019).[2]

1.2 G2P Payments

There is strong evidence from South Asia that digitizing G2P payments can improve program efficiency and reduce leakage. Other literature explores how digitizing payments and design features enabled by digital payments can have broader, program-specific impacts on beneficiaries' economic lives.

Increasingly governments are leveraging technology to digitize payments to beneficiaries of social assistance programs (J-PAL Africa, 2019; García et al., 2008), although over 20 percent of LMICs still use cash for social benefits payments (García et al., 2008). By creating electronic payment records, digitizing G2P payments can *reduce information gaps*. In India, there is strong evidence that various forms of digitization improve functioning of social protection programs while reducing corruption and leakage (Banerjee et al., 2016; Barnwal, 2018; Muralidharan et al., 2016). Digitization can happen at various points of implementation, and design details vary across studies.[3] One worry is that digitizing benefits exclude the marginalized (namely those failing to meet identification requirements, those without an accessible account, or those with limited financial capabilities). Research on this has been mixed regarding payments with biometric authentication, with Muralidharan et al. (2016) finding no evidence of exclusion from India's national workfare program (MGNREGS), but Muralidharan et al. (2020) finding significant exclusion error in the country's food distribution program. The authors compare across contexts and argue that design is key: systems and features that emphasize the beneficiary experience over fiscal savings may help mitigate exclusion error.

A related body of literature focuses on the downstream effects of digitizing G2P payments and digital G2P design features. In India, Muralidha-

[2] E-money also facilitates new models of service delivery by offering a platform that can host mobile savings products. A growing body of literature examines the impact of offering these "add-on" products to mobile money users. In general, the evidence shows that these products can be effective at increasing savings for a specific goal or purpose, but that impacts on overall savings are harder to come by (see Section 3 for more detail).

[3] For example, Barnwal (2018) finds that having beneficiaries buy fuel at full price and then receive an automatic subsidy transfer to their bank accounts reduced leakages relative to buying the fuel at a subsidized price. The digitized subsidy transfer, however, was part of a broader restructuring of payments and incentives for intermediary agents selling fuel. Muralidharan et al. (2016) evaluate the impact of transitioning digital payments to smart cards with biometric authentication; here biometrics were likely key as the accounts linked to this card could only be used to cash out payments. Banerjee et al. (2016) study the effect of digitizing and streamlining the transfer of funds between government bodies.

ran et al. (2017) found that transitioning MGNREGS payments to "smart cards" with biometric authentication–which improved the quality of program implementation–raised work hours, wages, and household income.[4] Field et al. (2020) showed that training women on how to use newly-opened agent bank accounts, coupled with signing women up for "direct digital deposit" of their MGNREGS wages, increased female labor force participation and liberalized social norms around women's work. In Mexico, Bachas et al. (2020) found that linking the country's (already digital) conditional cash transfer program with a debit card increased saving, arguably because the ATM cards made it easier for beneficiaries to check their balances, facilitating greater trust in the financial system. Studying the same rollout, Higgins (2020) found that the debit card policy had market-wide effects on corner stores' adoption of point-of-sale machines and non-social protection beneficiary consumers' use of ATM cards. This finding is important, as it highlights how G2P program reforms can have downstream effects on entire markets.

The lion's share of recent rigorous G2P research has focused on a small number of countries and programs. More research on programs in other settings is needed to build our understanding of how program design and economic context mediates the impact of digitizing G2P payments.[5] Here, there is scope to do more work to understand both the overall effects of transitioning to digital payment systems and the effects of specific design features enabled by digital systems.

1.3 B2P Payments

Evidence on digital B2P payments suggests they may provide a pathway to utilizing and therefore reaping the benefits of other financial services.

B2P payments, for example, direct deposit of wages to workers, can both *reduce transaction costs* for firms and workers and enable *new models of service delivery*. Evidence from Afghanistan, India, and Bangladesh broadly indicates that electronic wage payments into bank or mobile money accounts increase account use, though impacts on downstream measures of welfare are less clear (Blumenstock et al., 2015; Somville and Vandewalle, 2018; Breza et al., 2017). Digital B2P payments can also be linked to accounts that leverage behavioral insights like defaults or commitment devices to promote savings (Blumenstock et al., 2018; Buehren et al., 2018).

1.4 P2G Payments

Evidence on digital P2G payments is limited, though they have scope to streamline government payment and revenue collection processes

High-quality research on the impacts of digital P2G payments is currently scant, in part because these payments are not widely used in many LMIC settings. Recent estimates suggest only 28 percent of LMICs use digital P2G for government taxes and 18 percent use digital P2G for government services (Mundial, 2016). Still, many policymakers acknowledge the potential for digitized P2G payments to improve enrollment and payment collection (Dalberg, 2016). Given the limited scope of P2G payments and experimental evidence, research topics are quite open and include questions related to impacts on revenue collection, leakage/evasion, and P2G's interactions with broader financial inclusion.

2 Credit

Evidence on digital credit products is sparse and much needed, especially as interest rates tend to be high, and there is little regulation to protect users.

Digital credit products have become increasingly

[4]The authors argue that these effects were likely driven by improving the workfare program rather than changing the financial inclusion landscape because the wage payments were sent to accounts with very limited functionality.

[5]Some work in this area is in progress, for example, an ongoing J-PAL SEA study on digitizing Indonesia's food transfer.

common, as many mobile money providers have begun to offer them. According to a 2018 GSMA (Groupe Speciale Mobile Association) survey, 23 percent of providers presently offered a credit service, and 41 percent were planning to launch one the next year (GSMA, 2019). Most digital credit products are short-term, high-interest loans made to consumers (e.g., M-Shwari in Kenya), though the industry is rapidly innovating to develop new loan products for non-consumers. Digital credit has potential to *reduce transaction costs*, with nearly instantaneous loan approval and disbursement; *close information gaps*, by leveraging alternative credit scores and lending to individuals without collateral; and promote *new models of service delivery*, by offering customized products.

Little is known about the impact of digital credit in LMIC settings, though early learnings are encouraging: Bharadwaj et al. (2019) found that M-Shwari loans improved financial access and household resilience. Building the evidence base in this sector is important, as interest rates offered on digital credit loans are often quite high, and there is limited regulation to ensure consumer protection. Much like payday loans (for a review of this literature see Freeman and Gorham (2015)), digital credit holds the promise of offering timely financial support when it is most needed but with the risk that easy access to expensive credit will lead to costly debt cycles and financial distress.

As e-money and agent banking models spread through LMICs, there is also scope for "traditional" lending products to be digitized. Transitioning to digital disbursement and repayment could substantially reduce costs for high-touch lending models like microfinance. There are also potential benefits for consumers: Riley (2020) found that converting to e-money disbursement of microfinance loans in Uganda significantly increased business profits, particularly for women who reported greater pressure to share income within their household. On the other hand, in the Philippines, digitized loans decreased savings, driven by weakened peer effects among microfinance groups and increased exposure to transaction fees through digital channels (Harigaya, 2017). What explains these contradictory results? One possibility relates to women's social capital and pressure to repay. The Ugandan intervention did not change repayment policies (women receiving mobile disbursement still had to repay in weekly group meetings), while the intervention in the Philippines gave women the ability to repay digitally outside of group meetings. This suggests that close attention to design details and a well-developed understanding of users' needs is critical for developing high impact products.[6]

Looking ahead, there is ample scope for research on digital credit to explore the impact of products, shedding light on who benefits most/who is potentially harmed by digital credit, and to assess how design features contribute to product impact and user welfare. There is also a need for more research on digital credit scoring algorithms: for example, how to optimize them (Björkegren et al., 2020), whether or how they are biased, and how they can be designed to address challenges like shared phones and fuzzy digital identities. The portfolio of research housed under the Center for Effective Global Action's (CEGA's) Digital Credit Observatory will fill some of these gaps and provide evidence-based policy and product recommendations (see The Center for Effective Global Action (2020) for more information on the Digital Credit Observatory and its activities).

3 Savings

Existing evidence on mobile-linked savings accounts suggests that these accounts usually do not increase

[6]Evidence from the savings literature suggests there may be technology-driven solutions for preserving social capital: for example, receiving feedback by text message increased savings for microcredit clients in Chile by almost as much as being a member of a self-help group (Kast et al., 2018).

the total amount saved but can shift where savings are stored and what savings are used for.

Mobile-linked savings accounts and agent banking have the potential to bring financial services to remote areas. Digital accounts served by a well-developed agent network can *reduce transaction costs* to users, making it cheaper and easier for people to save. Digital accounts can also promote *new models of service delivery* by enabling novel account features (e.g., reminders, nudges, and defaults) that leverage insights from behavioral economics to optimize financial decision-making.

Two evaluations of mobile-linked savings products find limited impacts on savings; people seem to shift from one form of saving to another, rather than increase overall stores of resources (Gautam et al., 2018; De Mel et al., 2018).[7] However when mobile savings accounts are tailored for a specific goal/purpose, there is evidence that these accounts help users reach these goals, for example, enrolling children in secondary school (Jack and Habyarimana, 2018); purchasing subsidized sanitation services (Lipscomb and Schechter, 2018); and investing in agricultural inputs (Batista and Vicente, 2020). There is also evidence that encouraging savings in formal digital products may reduce informal risk sharing and transfers (Dizon et al., 2020).[8]

There is scope for future research to deepen our understanding of when and for whom mobile savings products are most effective (e.g., crowding out existing savings could be less in settings where there are few formal sector alternatives). Another open area is exploring scope to "digitize" informal savings arrangements (like rotating saving and credit cooperatives) and quantifying digitization's downstream impacts.

4 E-Commerce

Evidence on e-commerce suggests the service can increase access to markets and provide benefits to consumers, particularly in remote areas, though barriers to small-firm growth remain.

E-commerce, or the buying and selling of goods facilitated by the internet, is expanding rapidly in Indonesia and across the globe. For consumers, e-commerce can *reduce transaction costs* and *close information gaps* encountered when shopping by facilitating product search, increasing access to product variety, and making price information more accessible and easily comparable. For producers, e-commerce may improve access to markets, with implications for productivity and growth. Especially in LMIC settings, both consumers and producers could also benefit from downstream impacts on financial inclusion if e-commerce drives take-up of electronic payments and other digital financial services. Finally, e-commerce has also been highlighted for its potential to alleviate constraints to labor force participation faced by women, by making it easier to run a business from home on a flexible schedule (Teltscher, 2002; World Bank, 2019).

Overall, there are just a few high-quality studies on e-commerce impacts, many of which are concentrated in China. Couture et al. (2018) report on an RCT (randomized controlled trial) where e-commerce terminals were randomly assigned to a subsample of Chinese villages, increasing e-commerce access for both rural consumers and producers. Terminal access reduced prices paid by a subset of better-educated, younger, and more re-

[7] Beyond savings, Gautam et al. (2018) found that female entrepreneurs that were offered an m-savings account reported greater control over how business income was spent and greater life satisfaction.

[8] In these cases, it is unclear whether these effects were solely due to the digital nature of the product or whether a traditional savings account may have helped users meet the same needs.

[9] The finding that e-commerce differentially benefits those in remote areas is echoed by the nonexperimental analysis in Fan et al. (2018), who found that e-commerce expansion in China increased aggregate domestic trade in part by reducing trade costs associated with distance. In other non-experimental work Luo et al. (2019) found evidence that e-commerce expansion favored rural, poor households.

mote consumers, with limited effects observed on rural producers.[9] Also in China, Bai et al. (2018) found that small early demand shocks (in the form of a randomized order for a new-to-the-platform firm) temporarily boosted firm sales. Randomized reviews with information on product quality also had a positive impact on future sales. Overall, the authors concluded that there are substantial search frictions on the platform, which tends to be dominated by a small number of "superstar" firms.

In addition, nonexperimental evidence suggests e-commerce can reduce price dispersion (Fan et al., 2018; Jo et al., 2019) and may increase product variety by reducing the costs of servicing new markets (Jo et al., 2019). Evidence of reduced price dispersion on e-commerce platforms is also consistent with previous research on the impacts of information and communications technologies (Goyal, 2010; Jensen, 2007; Aker, 2010).

This early evidence suggests e-commerce can have important benefits–particularly for less well-connected consumers, but there remains much to learn, especially on the firm side. Future research could shed light on, for example, barriers to growth faced by small firms and ways in which platforms can facilitate better identification and expansion of high-potential micro, small and medium enterprises (MSMEs). More research is also needed to understand gendered impacts. For example, access to e-commerce could encourage greater business activity among women by alleviating constraints related to job flexibility and social norms. On the other hand, participation demands a certain amount of digital literacy; thus, proliferation of e-commerce could widen inequalities rather than diminish them–especially if platforms tend to favor large, well-known sellers. Finally, more rigorous research is needed to understand how e-commerce can drive broader financial inclusion, particularly in low- and middle-income countries where cash-on-delivery remains a common payment method for online transactions (McKinsey Global Institute, 2016; Asian Development Bank, 2018).

5 Cross-Cutting Issues

A well-functioning enabling environment, which refers to the collection of institutions, technologies, and regulations that shape both the *de jure* and *de facto* circumstances faced by DFS users is a necessary, although not a sufficient, condition for inclusive and impactful DFS. While policies and regulations conducive for financial inclusion are on the rise globally, impediments continue to exist–particularly for women (Global Microscope, 2019). Below we discuss key components of the enabling environment–regulation, infrastructure, and socioeconomic context–and what role they play in shaping the DFS landscape.

DFS must be guided by regulation that supports robust, well-functioning financial services (Pazarbasioglu et al., 2020). It is also critical that regulation address some of the risks that come about as a result of the spread of DFS–particularly issues related to consumer protection. Concerns including fraud, cybersecurity, misuse of identifying or sensitive information, and privacy rights remain inadequately addressed in most LMICs, even in the face of rapid DFS growth (Global Microscope, 2019). There is a large evidence gap on how to best protect consumers in these contexts, especially when users have limited human capital and past experience with formal financial services. A forthcoming white paper written as part of Innovations for Poverty Action's Consumer Protection Research Initiative outlines strategic areas for future research and will be instrumental in driving experimental work on this topic in emerging markets (Giné et al., 2020).

Appropriate infrastructure, including strong agent networks, are at the heart of successful digital financial systems and are pivotal for advancing financial inclusion. While well-identified research in this space is often infeasible, policy analysis suggests that network size, network distribution, network sustainability, service reliability, agent quality, and agent demographics all matter (Helix Institute of Digital Finance, 2017). DFS providers must be well managed and able to support their agents, and

the agents must be equipped to serve their clients and deliver quality services. How best to improve agent performance, for example, through training or incentives (Acimovic et al., 2020; Knowles, 2019), remains an open question. There is also much to learn about how to leverage agent networks to encourage financial inclusion and support of marginalized groups (e.g., women, the less educated). For instance, Annan (2020) found that female customers were more likely to experience misconduct by mobile money vendors, highlighting vulnerabilities women face in using DFS.

Another key piece of infrastructure relevant for Indonesia and other LMICs is digital identification systems and technology. Digital IDs are particularly important for enabling efficient G2P transfers and inclusive DFS. We discuss Indonesia-specific issues related to digital IDs in Section 6.1. For a comprehensive review of existing evidence and open questions related to digital identity see J-PAL Africa (2019).

Finally, socioeconomic factors, a term we use to broadly refer to both individual-specific characteristics and society-wide constructs, can play a powerful role in determining how–and whether–individuals interact with DFS. First, given that DFS often require LMIC consumers to adopt entirely new technologies, financial and digital literacy gaps present barriers to inclusive uptake. Second, social norms and related factors may be important mediators of DFS use. Such issues are particularly relevant for women, who in many LMICs work less, earn less, and have less agency than their male counterparts. Gender norms that center women's lives around the home and child rearing risk limiting women's engagement with labor markets (Jayachandran, 2020), which can deprive women of compelling DFS "use cases"; in some settings norms also directly stigmatize DFS use (Barboni et al., 2018). Nonetheless, DFS also has the potential to increase women's economic empowerment–for an in-depth review of theory and evidence, see Heath et al. (2020).

There are two potential approaches to addressing socioeconomic barriers to DFS use: a first is to directly address the constraints, with the aim of making existing products more appealing to users. There is a large and growing body of experimental evidence on the impact of financial education. For instance, this is the focus of a recent global meta-analysis by Kaiser and Menkhoff (2017). Overall, they find that financial education has bigger impacts on knowledge as opposed to behavior, though interventions–especially those that focus on rules of thumb and teachable moments–can significantly change behaviors. Even so, effect sizes are relatively modest and smaller for less-educated individuals and those in LMICs. Comparably little is known about the effect of campaigns that attempt to directly change norms on financial services use. Social norms are typically thought to be difficult to change, though there is some evidence that "misperceived" norms (a case where the norm diverges from private beliefs) can be corrected with simple information interventions (Tankard and Paluck, 2016; Bursztyn et al., 2018).

An alternative approach is to intentionally design DFS that meet users' needs given their existing socioeconomic constraints. This has been a major focus of the human-centered design movement in DFS (Pulse Lab Jakarta, 2018; Sneller, 2016). Here, we see a role for research in quantifying the extent to which new approaches and products translate into meaningful changes in DFS use, as well as in systematizing learnings regarding what works to break through different types of constraints.

With the global evidence base in mind, we now turn to the Indonesian context. The aim of this part of the paper is threefold:

1. Summarize the institutional, technological, and socioeconomic context as it relates to digital financial inclusion, including policy roadblocks and priorities (Section 6).

2. Describe *status quo* financial inclusion in Indonesia, highlighting both gaps and opportunities (Sections 7 and 8).

3. Identify promising areas for future research and knowledge gaps that need to be filled to support evidence-based policy (Section 9).

To do this we draw on a literature review, policy analyses, interviews with over forty key stakeholders in the public and private sectors, and analysis of the following four datasets: (1) the 2018 Financial Inclusion Insights survey (FII); (2) the 2019 National Socioeconomic Survey (SUSENAS); (3) the 2017 Survey on Financial Inclusion and Access (SOFIA); and (4) the 2018 Village Potential Statistics (PODES). Both the FII and SUSENAS datasets are nationally representative of adults 15 years and older, while the SOFIA dataset is representative of adults 17 years and older living in East Java, West Nusa Tenggara, East Nusa Tenggara, and South Sulawesi. PODES is a spatially-explicit dataset containing a variety of village-level characteristics, including locations of the nearest financial services access points. Code and documentation for our analyses are publicly available and archived here.

6 Context and Background

Indonesia has foundational policies and a strong political appetite to expand inclusive DFS, particularly through further digitization of social protection transfers; however, improved infrastructure, technology, and coordination must be prioritized to ensure success.

In 2016 the President of Indonesia, Joko Widodo, issued a decree outlining a national vision and a set of objectives for the expansion of financial inclusion (Perpres 82/2016), including an ambitious goal of increasing bank account ownership to 75 percent of adults by 2019, which is now revised to 90 percent by 2024 (InterMedia, 2017b). Indonesia has made important strides in financial inclusion since the publication of the decree (see Section 7 below), though challenges remain. In this section, we review the current policy and regulatory landscape, priorities, and the social context particularly as it relates to women's account use. We also highlight policy pain points and areas that need attention if Indonesia is to fully realize its financial inclusion vision.

6.1 Policy and Regulatory Landscape

We begin with a brief overview of three important governing bodies that shape Indonesia's DFS landscape.

Dewan Nasional Keuangan Inklusif (DNKI) DNKI (the Council of National Strategy for Financial Inclusion), established in 2016, is the highest institution in the inclusive finance agenda lead directly by President Joko Widodo. Its establishment codified financial inclusion as a cornerstone to accelerate growth and reduce poverty. As a coordinating body, DNKI is responsible for orienting progress toward six priority areas that promote financial inclusion (see Appendix A for further detail). Coordinating regulations and policies can be complex as DNKI is not an implementing body; instead, the priorities established by the initiative are implemented across fifteen agencies and ministries, each with their own set of goals, governing bodies, and structures. Moreover, multiple ministries and agencies shape the DFS and financial inclusion regulatory space, each with different policy priorities. Among these agencies, BI (Bank Indonesia)

and OJK (The Financial Services Authority) play critical roles in shaping the landscape since they directly regulate and oversee fintech firms, banks, and other formal financial institutions.

Bank Indonesia (BI) As Indonesia's central bank, BI performs various important functions to promote efficient, safe, and reliable digital payment systems. It regulates and supervises payment service providers (such as banks and fintechs), ensures compliance with regulations, and provides oversight of the security and reliability of the payment system for disbursing government aid. It also supervises activities of agents that facilitate e-money payments (called Layanan Keuangan Digital or LKD agents; see section 6.3 for more detail) and all aspects of server-based and card-based e-money. Additional functions particularly pertinent for poor and vulnerable groups include supporting the digitization of social protection programs of various government agencies and promoting the utilization of e-commerce platforms for MSMEs.

Otoritas Jasa Keuangan (OJK) OJK provides independent oversight of Indonesia's financial regulations and services, with a dual mission of ensuring consumer protection and promoting trustworthy systems to compete in the global economy. Non-payment fintech, cooperatives, pensions, insurance, and the non-payment service operations of banks all fall under OJK's domain.[10] OJK also oversees the activities of banking agents (called Laku Pandai or LP; see section 6.3 for more detail). Financial inclusion is a cross-cutting theme in many of OJK's policies and regulations, with a separate financial inclusion division that coordinates efforts across each of the various departments. For example, OJK's fintech department, IKD (Digital Financial Innovation), requires all fintech applicants to incorporate financial literacy programs in their business plans.

Key DFS Policies and Regulations Initial DFS regulations focused on the expansion of e-money, with BI allowing banks and non-banks to issue e-money starting in 2009. In 2013 and 2014, branchless banking programs were piloted and established (for more background, see Salyanty et al. (2018)). In recent years, the focus of DFS regulations has been to promote transparency in the sector, build infrastructure, expand branchless banking, promote the digitization of government aid, and protect consumers and their personal data. Policies of particular importance include e-commerce expansion and safety (PP 74/2017), new tax regulations requiring firms to have a tax identification number and pay income tax (PMK 210/PMK.010/2018), and harmonization of consumer protection mandates (PP 82/2012, POJK 1/POJK.07/2013, PBI 16/1/PBI/2014, Permenkominfo 20/2016).

Indonesia has also established multiple regulations to expand, support and improve the safety of using digital identities to access financial services.[11] Yet, the system still lacks the fundamental elements necessary to ensure it runs smoothly and efficiently, including appropriate information technology infrastructure and communications, as well as coordination among government agencies to set up digital identity networks. Improving this infrastructure is a critical priority for strengthening Indonesia's digital payment systems for social protection programs.

[10] As mentioned above, payment services are regulated by BI. This means many financial service providers fall under the regulatory purview of both institutions; overlapping areas of jurisdiction can increase the complexity of policy reforms that require coordination across bodies.

[11] These include: (1) the e-KYC (electronic Know Your Customer) procedure as stipulated by Law 8/2010 and 3/10/PBI/2001, (2) the Ministry of Home Affairs (MoHA) as the biometric data custodian as stipulated by Law 24/2013, and (3) validity of certified e-signature and digital identity for electronic transactions as stipulated by the Ministry of Information, Communication and Technology (ICT) regulation 11/2018.

6.2 Social Protection Programs and G2P Payments

Indonesia's social protection system is made up of a diverse set of programs implemented across multiple ministries (see Table 1 for an abbreviated list). In 2017, the Government of Indonesia (GoI) incorporated these programs into its broader financial inclusion vision by providing mandates for digitizing cash and in-kind transfers (Perpres 63/2017). This process has already begun, including for the national food transfer (Program Sembako)[12] and two conditional cash transfer programs–Program Keluarga Sejahtera (PKH) and Program Indonesia Pintar (PIP). Some social protection programs rolled out following the COVID-19 pandemic (see e.g., Kartu Prakerja, which was initially envisioned as a skilling program and provides training and transfers to unemployed workers in sectors like the gig economy) also leverage digital payments. Historically, the GoI has faced challenges in targeting, benefit delivery, and coordination across programs and ministries, and the government continues to work to address these issues (OECD, 2019; The World Bank, 2017).

The method by which social assistance funds are digitally disbursed differs by program, location, and by the implementing bank partner. Payments are typically channeled through a basic savings account (BSA) linked to a social protection card. In general, beneficiaries of in-kind programs like Sembako receive payments to a specialized e-wallet,[13] while beneficiaries of cash transfer programs (PKH, PIP) receive funds directly into their BSA. Cash transfer-linked BSA functionality varies depending on the implementing bank, though basic services like deposit, withdrawal, and money transfer are enabled across providers.

Beneficiaries of multiple assistance programs may own multiple accounts and cards; for instance, PIP recipients receive Kartu Indonesia Pintar (KIP), while PKH and Program Sembako beneficiaries receive funds on the Kartu Keluarga Sejahtera (KKS). In cases where local governments coordinate the assistance, bank account cards from regional banks are also issued to facilitate disbursement. To retrieve payments, beneficiaries can use ATMs, bank branches, e-warung (small retailer) agents, and other government-sponsored disbursement points. It is important to note that regardless of how funds are dispersed, in-person ID verification

Table 1: Social Assistance Programs Targeted for Digitization

	Program Sembako	**PIP**	**Prakerja**	**PKH**	**LPG**
Type	Food e-voucher program	Conditional cash transfer	Conditional cash transfer	Conditional cash transfer	Direct price reduction
Delivery	E-voucher linked to bank account	Cash deposited into bank account	Cash deposited into e-money or bank account	Cash deposited into bank account/ paid to service providers	Price subsidy for LPG purchase (not yet digitized)
Eligibility	Households below the poverty line	Households below the poverty line with students between the ages of 6 and 21 enrolled in school. Schools identify beneficiaries to the government	People who lost their jobs because of COVID-19. All individuals self-register on the official website and the GoI randomly chooses from eligible people	Poorest 20% of households with pregnant women, with children under age 21, or as of 2016 the elderly and disabled	Anyone who has a 3kg LPG container
Conditions	None	Continued enrollment in school	Completing online job training coursework	Continued use of a specific set of health and education services	None

[12]It was previously known as RASKIN, RASTRA, and BPNT. All of which are the government's in-kind food assistance program.

[13]While e-wallets are linked to BSAs, some banks do not "activate" the BSA for transactions other than withdrawing from the e-wallet.

Box 1: Indonesia's G2P 4.0 Plan

The National Planning Ministry's G2P Payment 4.0 Roadmap is a set of proposed reforms to Indonesia's digital social protection system. These reforms aim to enable more efficient, sustainable, and accurate social protection delivery, improve beneficiaries' experience with the programs, and deepen beneficiaries' engagement with financial institutions.

Improved technology is at the center of the proposed design. New infrastructure would be developed to allow for better program targeting as well as more efficient coordination between implementing government agencies and payment system providers in onboarding the programs' recipients. This includes establishing a centralized beneficiaries' database and a secure and functioning digital ID system.

Expanding choice for beneficiaries is also a key component of the proposal. Beneficiaries would be given more options as to where their assistance funds are deposited and how they can be retrieved and used. Incentives would be used to encourage participation by diverse payment service providers, with an emphasis on interoperability of payment methods and G2P touchpoints.

is still required for initial enrollment and account opening (TNP2K, 2018).

Multiple cards, limited account functionality, poor local financial service delivery, and incomplete information on the part of beneficiaries are some of the key issues with the present system that limit the scope for G2P payments to contribute to deeper financial inclusion. Policy stakeholders are well aware of these challenges, and the National Planning Ministry (*Badan Perencanaan Pembangunan Nasional*, or BAPPENAS) has recently outlined a vision for "G2P 4.0," which would address these and other pain points (see Box 2 for more information on the plan). At the time of writing, BAPPENAS is building support for the vision across government and policy stakeholders, with the aim of solidifying supporting regulation by 2022. Systems changes are targeted to start later the same year. We expect implementation of G2P 4.0 to provide fertile ground for research-policy collaborations in the coming years.

6.3 Branchless Banking and Agent Networks

Especially given Indonesia's vast geography, branchless banking and agent networks are a key pathway to bring G2P payments and financial services to unbanked or under-banked people and businesses in remote areas. In Indonesia, the two main agent systems are Laku Pandai (LP) and Layanan Keuangan Digital (LKD), which are regulated by OJK and BI, respectively (for a summary of key details on agents, see Table 2).[14] Although both types of agents offer ways to engage in branchless banking, there are key differences in how agents can be used and who can recruit them. Entities that can issue e-money (including both banks and non-banks) can engage LKD agents to facilitate e-money transactions, including cash-in, cash-out, and money transfer. LP agents, on the other hand, can only be deployed by banks, and offer banking services, including loan repayment and opening/operation of BSAs. Fintech and e-commerce companies also deploy agents who are not LP or LKD. Generally, these agents are individuals or small business owners who offer basic services related to the type of firm they support (e.g., balance top up for ride sharing, goods purchase for e-commerce).

Agent network expansion, especially to rural areas, is hampered by challenges related to the lack of interoperability among service providers, high costs of agent establishment and maintenance, and

[14] According to OJK, there are over 1.1 million LP agents in Indonesia: https://www.ojk.go.id/id/Pages/Laku-Pandai.aspx. We lack official statistics for LKD and fintech agents, but anecdotal reports suggest they number in the millions.

Table 2: Branchless Banking Agents: Description and Functions

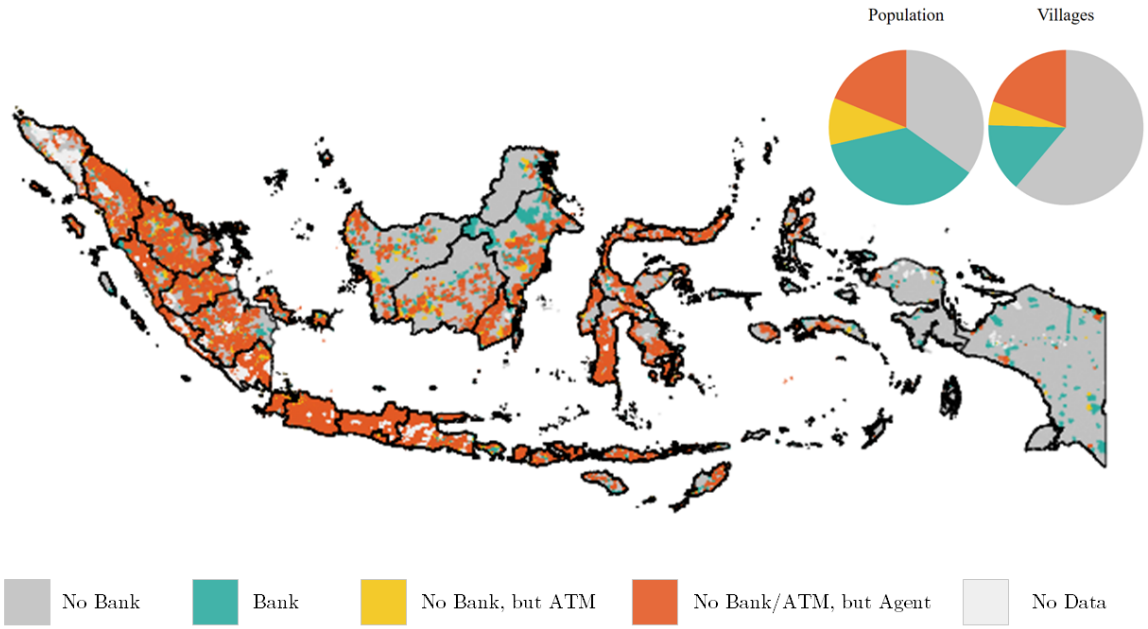
	LP Agent	LKD Agent	Fintech/e-commerce agent
Regulator	OJK (POJK 19/2004)	BI (SEBI 18/2016)	Not formally regulated
Owners	Banks	Banks and other e-money issuers	Fintech/e-commerce
Services	Basic saving account services, loan repayment, CICO service, and transfer	CICO service, transfer, bill payments. There are two types of LKD account: unregistered and registered, with registered accounts allowing for bigger deposits.	Cash-in to e-wallets, cash out (only for agent which are commercial establishment), bill payments, payment points e.g. e-commerce transaction
Agent Profile	Business entities or individual	• Business entities or individual for banks' LKD agents • Business entities for non-banks' LKD agents	• Business entities or individual • Some agents may also provide services as LP and/or LKD agents, while others are neither LP nor LKD
Account Opening	Requires national ID and an approval and verification process from a bank officer	Unregistered accounts only require a mobile app and mobile phone number, while registered accounts require national ID or e-KYC for simplified registration	Similar to LKD account opening regulation
Regulatory restrictions	• Agent exclusivity - one agent can only work for one bank • Partnership with third-party agent network managers are not allowed	• Banks are allowed to recruit any business entities or individuals, but non-banks (including fintechs/e-commerce) are only allowed to recruit business entities • Partnership with third-party agent network managers are not allowed	Are not yet fully leveraged to offer full financial services (as in the case of LP and LKD) because many are not yet formally regulated.

restrictive regulations, particularly on agent recruitment and management. These challenges reduce incentives to expand, reduce the number of services offered, and impact service quality. In other countries, outsourcing agent management to a third party has helped reduce these costs (Kapoor and Kumar, 2018); however, this is prohibited under current regulations.

Bank agent coverage varies across the archipelago, and expansion of agent networks is thought to be a key pathway to facilitate take-up and use of financial services (Pulse Lab Jakarta, 2018). Figure 1 uses data from PODES 2018 to map spatial heterogeneity in access to financial service points in each village in Indonesia. Villages are categorized in one of four ways: have a bank office, have an ATM but not a bank office, have bank agents only, or do not have any of these service points. The two pie charts in the upper right show what percentage of Indonesians and what percentage of villages fall into each category. The figure highlights two important features of Indonesia's financial landscape. First, most villages, particularly those in the east and south, remain unbanked. Among villages with financial service points, bank agents (shown in orange) are the most common. Second, when weighting villages by population, the relative importance of bank agents declines. This is because more people live in covered communities. Even so, under coverage remains a major issue, and expanding ATM and agent networks–issues notwithstanding–remains a more cost effective way of increasing access than building full service branches.

This map does not capture non-bank agents, namely LKD agents and representatives of independent fintech business networks, including ride-

Figure 1: Village-Level Access to Financial Services



Notes: The bottom panel shows spatial distribution of financial services access points, with data from PODES 2018 (village-level financial access points) and BPS 2019 (village shapefile). The top right panel shows the population-weighted access (left side; population data from 2011 PODES) and by village (right side, data from 2018 PODES).

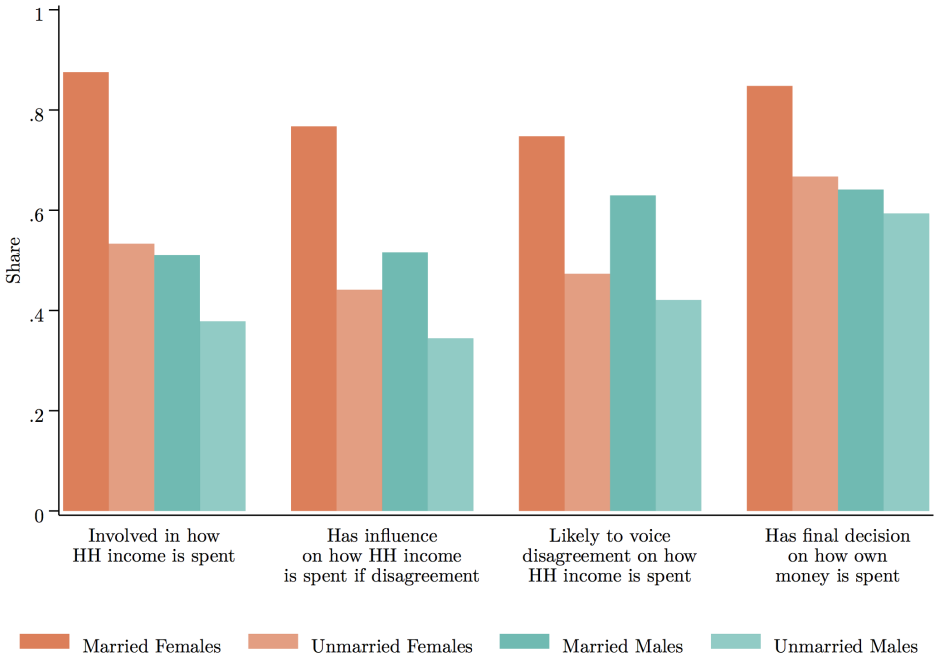
hailing drivers and warung (small shops) and retail stores. Financial services can be offered by these entities, although scope varies widely depending on the agent. For example, drivers typically can only facilitate top-up of app-based e-money balances, while warung or retail stores can offer a more diverse set of services, like bill payment, airtime purchase, and even e-commerce purchases. Due to current legislation prohibiting individuals recruited by non-bank entities from offering LKD services, most of these agents are limited in the type of services they are able to provide.[15]

Another persistent challenge is agent viability. For example, according to a recent study, a number of the "e-warungs" offering Program Sembako benefits opened only on days when government disbursements were given, "limiting the potential to use these agents for other financial transactions" (Panggabean et al., 2019). Additionally, agent networks face challenges with viability, productivity, and profitability, and, in particular, this is occurring outside the Greater Jakarta area (Kapoor et al., 2017). This translates into poor awareness, despite the comparatively broad footprint of the agent network: whereas 6.4 percent of women and 2.6 percent of men do not know how far away the closest bank branch is, a notable 47.7 percent of women and 40.8 percent of men do not know where the closest Laku Pandai agent or other purveyor of DFS is located.

Furthermore, agent transaction fees and knowledge of these fees may also constrain demand. In 2019, research from the University of Indonesia's Institute for Economic and Social Research found that those who believe LP products are cheap were 15.8% more likely to own an LP account compared to those who believe it was expensive. On the other hand, awareness of LKD fees was not significantly

[15]LKD agents must be registered businesses, while many fintech agents are not formally registered as they operate in the informal sector.

Figure 2: Influence on and Involvement in Household Financial Decision-making



Notes: Weighted estimates using 2018 FII data. Bars show percent of individuals who report influence over or involvement in four types of household financial decisions. Individuals are considered involved in how household income is spent if they report being somewhat or very involved. Individuals are considered to have influence on how household income is spent if there is a disagreement in the household if they have almost all or most of the influence over the decision. Individuals are considered likely to voice disagreement over how household income is spent if they are somewhat likely or very likely to voice disagreement. Individuals are considered to have final say over how their own money is spent if they report somewhat agreeing or strongly agreeing with the statement that they have the final say.

correlated with account ownership (Sastiono and Nuryakin, 2019).

6.4 Gender Norms and Financial Decision-Making

While formal institutions and regulations play a clear role in financial inclusion and access, *informal institutions* can be equally important.[16] In many LMIC contexts, gender norms, defined as the set of socially defined, gender-specific behaviors that society deems acceptable (Bicchieri and Muldoon, 2011), dictate many aspects of women's lives. In much of Indonesia, qualitative research suggests gender norms governing financial and household decision-making are less restrictive compared to other LMICs; women often have control and authority over household finances (Manderson, 1983), regardless of their own contribution to the household's income (Papanek and Schwede, 1988). It is common for a male household head to give his earnings to his wife, who then handles various household expenses and gives out pocket money for spending (Papanek and Schwede, 1988). Researchers posit this norm is borne from a common belief that women have more thrift and greater foresight in

[16] Although Indonesia is the world's largest Muslim country, its Islamic financial service market is relatively small. Given this, we focus our discussion on gender, as understanding gender norms is important for understanding Indonesia's (lack of) gender gaps in financial inclusion and gender-specific use cases for DFS.

money handling than men (Geertz, 1989; Koning et al., 2013).

Our analysis of self-reported involvement in financial decision-making using the 2018 FII data is in line with these findings. Figure 2 shows the percentage of men and women by marital status who report: (1) being somewhat or very involved in decisions related to how household income is spent, (2) having some or full influence on how household income is spent in the event of a disagreement, (3) being somewhat or very likely to voice disagreement on how household income is spent, and (4) having final say over how their own money is spent. Across the board, married women are more likely to report having a dominant role in financial decisions, as compared to married men. In addition, married women are substantially more engaged than unmarried women. This is important, as it suggests women may have use cases for DFS regardless of whether they earn an income. It also raises the possibility that Indonesian women may be less motivated to use financial services to exert control within the household as compared to women in other LMIC settings.[17]

With this background in mind, we now turn to available secondary datasets to describe the current state of financial inclusion in Indonesia.

7 Current State of Financial Inclusion

Access to and use of formal financial services has been on the rise in Indonesia, but a steep socioeconomic gradient remains. Moreover, overall knowledge and use of digital services remains low, despite relatively widespread "digital readiness" in the population.

We begin this section by providing some basic summary statistics on overall rates of financial inclusion, the prevalence of leading DFS products (namely e-money), and typical patterns of use. We do not devote extensive space to documenting differences in use across demographics (see SNKI (2019) for a detailed analysis using the 2018 FII). Rather, in the spirit of generating hypotheses about barriers and triggers, we marshal machine learning tools to identify background characteristics that are most strongly related to financial inclusion.

7.1 Overview of Access and Use

In 2019, approximately 57 percent of both men and women aged 15 and older reported having an account with a formal financial institution (see the final row in Table 3). Basic products–namely ATM cards and savings accounts–were by far the most common, while others, including loans and investments, are rarely used (see column 3 of Table 3). Here it is worth noting that just 36 percent of men and 34 percent of women reported having a savings account at a bank. Thus, while Indonesia has made impressive progress towards financial inclusion, the majority of the population remains unbanked.

There are strong gradients in financial inclusion across key socioeconomic characteristics. The first column of Figure 3 shows prevalence of account ownership segmented by educational attainment, urbanicity, and age. We see a particularly steep gradient across education levels, with significantly higher ownership among those with higher levels of education. We also see differences across age groups, with individuals 55+ the most likely to be financially excluded.

[17] This is an open question for research and does not mean these concerns will be completely absent, or that they will not be relevant for men.

Figure 3: Account Ownership and E-Money Usage Across Socioeconomic Status

Notes: Weighted estimates using 2018 FII data. Whiskers show 95 percent confidence intervals, based on robust standard errors clustered at the provincial level. Bars display percent of individuals who have ever owned a financial account (left-side panel) and the percent of individuals who have ever used server-based e-money (right-side panel).

Table 3: Use of Financial Services by Males and Females

	Males	Females	Overall
Has ATM Card	0.38	0.35	0.36
Has Savings Account at Bank	0.36	0.34	0.35
Has Basic Savings Account	0.03	0.06	0.05
Has Savings Account from Microfinance	0.01	0.02	0.02
Has Savings Account from Cooperative	0.03	0.04	0.04
Has Loan at Bank	0.09	0.09	0.09
Has Loan from Multifinance	0.12	0.10	0.11
Has Loan from Pawnshop	0.03	0.05	0.04
Has Loan from Microfinance	0.03	0.04	0.03
Has Loan from Cooperative	0.03	0.03	0.03
Has Electronic Money	0.04	0.04	0.04
Has Investments	0.02	0.02	0.02
Has an Account - Unknown	0.03	0.03	0.03
Any Formal Account Ownership	0.56	0.58	0.57

Notes: Weighted estimates using 2019 FII data. Those with accounts at unknown institutions reported owning an account but did report owning an account at the specific institutions.

Table 3 also highlights the limited penetration of e-money (see Appendix B for a list of e-money providers): just four percent of men and women reported using the service in 2019, even though use of electronic money has been rising rapidly. Between 2018 and 2019, BI reported a 53.7 percent increase in application-based and card-based e-money account ownership,[18] translating into 257 million accounts (Bank Indonesia, 2019). The large number of accounts coupled with the low rate of e-money adoption in the general population indicate that a small number of consumers own the lion's share of accounts. Indeed, in interviews, stakeholders indicated that providers still have ample room to expand market share among better off, urban consumers, leveraging a surge in e-commerce and low-value, high-frequency transactions, such as transportation and food delivery.

Like patterns in account ownership, we see strong relationships between e-money usage and socioeconomic status. Figure 3, column 2 shows e-money usage is concentrated among urban dwellers and the highly educated. There is almost no usage among those in rural areas, those who are 55+, and those with little education. FII data also suggests that awareness of DFS is quite low. For example, only 30.3 percent of women and 34.0 percent of men report knowing what server-based electronic money is.

Table 4 explores patterns of account use. We focus on bank account owners, with a focus on transactions performed in the past six months. Most Indonesian account holders are relatively active, with 85 percent performing at least one withdrawal in the past six months and 54 percent reporting at least one deposit. ATMs are by far the most common way to withdraw cash (row 3 shows that 89 percent of people who withdrew did so at an ATM at least once). Notably, women are six percentage points less likely to withdraw at an ATM and four-to-five percentage points more likely to use tellers and agents; this may reflect less comfort with technology among women or a more general preference for in-person interaction. A human touch appears to be more important for deposits: 60 percent of depositors reported using a teller, while 48 percent reported using an ATM. Finally, the table highlights the small share of transactions captured by agents,

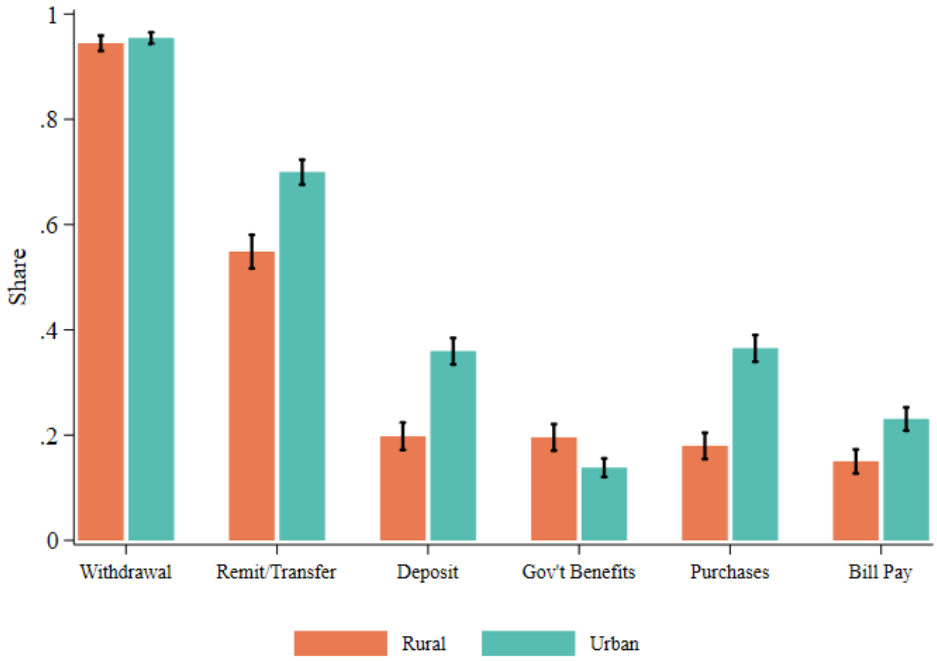
Table 4: Method of Account Withdrawals and Deposits

	Males	Females	Rural	Urban	Overall
Any Withdrawal	0.86	0.84	0.82	0.87	0.85
Teller	0.17	0.22	0.26	0.15	0.19
ATM	0.92	0.86	0.82	0.93	0.89
Agent	0.06	0.10	0.14	0.04	0.08
Any Deposit	0.56	0.51	0.49	0.57	0.54
Teller	0.61	0.60	0.70	0.55	0.60
ATM	0.50	0.47	0.30	0.59	0.48
Agent	0.15	0.16	0.25	0.10	0.15

Notes: Weighted estimates using 2018 FII data. This survey only asked of individuals who report currently having an individual or joint savings account at a bank. Captures their transactions from the past six months.

[18] Application-based platforms, as opposed to SMS/USSD-based technology common in other LMICs, are the most common mechanisms for the use of electronic money in Indonesia, although card-based accounts also exist.

Figure 4: Types of Uses for ATM Cards in Urban and Rural Areas



Notes: Weighted estimates using 2018 FII data. Whiskers show 95 percent confidence intervals, based on robust standard errors clustered at the provincial level. Bars display share of individuals who have ever used their own ATM card(s) for each of the listed functions. This data only includes respondents who reported ever used an ATM card or debit card in their own name (N=2511)

even in rural areas: just 14 percent of rural withdrawers reported using an agent (as compared to four percent in urban areas), while 25 percent of rural depositors used agents (10 percent in urban areas). This likely reflects, at least in part, the issues with agent networks discussed earlier. ATMs, on the other hand, appear to be well trusted and widely used, even in rural areas.

In addition to depositing and withdrawing cash from accounts, transfers/remittances are an important driver of account use in Indonesia. Figure 4 examines the most common uses of ATM cards for urban and rural ATM card users. After withdrawals, transfers are the second most common use of the cards, cited by 70 percent and 55 percent of urban and rural cardholders respectively. It is also worth noting that 14 percent and 20 percent of urban and rural cardholders report using their card to receive government benefits.

7.2 What Predicts Financial Inclusion?

As Indonesia still has ample scope to deepen financial inclusion, it is important to understand *why* people do/do not own accounts at present; *what* are the key barriers and entry points to meaningful engagement; and *how* might digital financial services complement more traditional products like bank accounts. In this subsection, we take an agnostic, data-driven approach to generating hypotheses along these lines.

To do this, we use a machine learning algorithm called random forest to ask (1) how well do "observable" characteristics in the FII survey predict whether or not someone owns an account? (2) what characteristics are most effective at separating account holders from non-account holders? and (3) do key predictors vary by gender? While this analysis only reveals correlates of use and not causal effects, the results point to potential on-ramps for

males and females that may inform future research. Conceptually, we also see advantage in using an algorithm, rather than researcher priors, to generate a short list of key predictors.

The core of random forest is a "decision tree", which attempts to separate the sample according to an outcome variable–in this case, account ownership–based solely off of other observable characteristics ("features" in machine learning parlance). The algorithm uses a large number of decision trees (the forest) that were built off of random subsamples of the data, to improve classification accuracy and avoid overfitting.[19] Key for our purposes is that random forest ranks each input feature by assigning it an importance value that represents its role in reducing incorrect classification. Higher values represent a greater contribution to decreasing incorrect classification.

Using the 2018 FII data, we look at the predictors of account ownership in the entire population and then separately for men and women. We focus on an indicator for whether an individual reports holding an account at a financial institution or having an ATM card. A total of 403 features (potential predictors) were input into the model (see Appendix C for the complete list). The list includes measures of digital engagement (e.g., mobile phone ownership and use), identity ownership (e.g., possessing a drivers license or passport), economic/socioeconomic characteristics (e.g., asset ownership, education, work status), demographic and other characteristics (e.g., age, marital status), and agency/trust indicators (e.g., role in decision-making and trust in financial systems).

Our first finding is that observable characteristics matter: for all three models, random forest significantly improved overall classification accuracy (column 2 in Table 5), as compared to accuracy based solely on the distribution of the data (column 1 in Table 5). Specifically, in the full sample our random forest model correctly assigned account use to 74 percent of the "testing" dataset when pooling genders.[20] In contrast, when we classified individuals as owners versus nonowners at random, with the probability of being an owner equal to the share of owners in the overall sample, we classified individuals correctly 51 percent of the time. Hence, random forest improves classification accuracy by nearly 50 percent (23 percentage points). Of note, all models have lower sensitivity (true positive rate) than specificity (true negative rate), indicating the models are relatively better at using observable characteristics to identify nonowners.

As might be expected based on the relatively small gender gaps in account ownership and strong norms around women managing household finances, gender was not one of the top predictor variables in the overall model (it was number 47, see columns 2 and 3 of Panel A in Table 6). However, we do find interesting differences in feature importance across genders. Figure 5 shows high-level patterns in 100 of the top-ranked features for the male and female

Table 5: Random Forest Model Accuracy

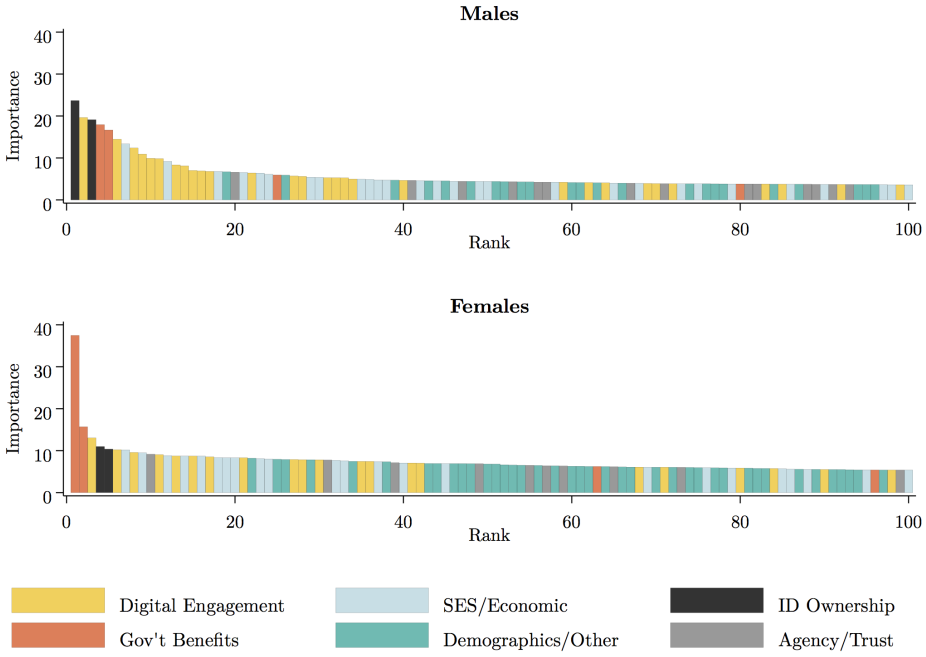
	No Information Rate	Overall	P-Value*	Sensitivity	Specificity
Full Sample	50.8	74.0	0.00	70.8	77.2
Females	50.7	71.4	0.00	68.7	74.0
Males	50.9	75.1	0.00	71.4	78.6

*The null hypothesis is no difference in random forest overall accuracy and the no information rate.

[19]For a more in-depth explanation of random forest, refer to Liaw and Wiener (2001).

[20]To avoid overfitting, we first estimated the model on a "training" dataset and then used the results to make a prediction in an independent testing dataset. To build these sets, we took the full 2018 FII sample and allocated a randomly selected 80 percent to training and 20 percent to testing.

Figure 5: Top 100 Predictor Variables from Random Forest Modeling



Notes: Unweighted data from 2018 FII. Each panel displays the category and importance of the top 100 variables identified by the random forest modeling. Ranking is based on the variables' value in decreasing Gini impurity. For a more in-depth explanation of random forest and its components, refer to Liaw and Wiener (2001).

models. These have been colored based on the category of the indicator and sorted by their variable importance, with higher values representing greater contribution to decreasing incorrect classification. In the female model, importance is concentrated in the top indicator–whether the woman receives government assistance. For males, importance is less concentrated, with top-ranked features relating to identity ownership, digital engagement, and receipt of government benefits.

What can we learn from these patterns? First, they suggest that *demographics are not destiny*. Features related to demographics, socioeconomic status, and economic engagement rarely rank highly. In contrast, *institutional attachment matters*, both in terms of government benefits and identity ownership. Here, one must keep in mind that feature importance tells us about classification power but not directionality–thus, we cannot know from Figure 5 whether government benefit receipt tends to identify owners or nonowners. In a separate analysis (not shown), we replicated the analysis using lasso regression and found a significant, positive relationship between government benefits receipt and financial inclusion–this suggests GoI's push to digitize benefits has already paid dividends in terms of advancing inclusion, especially for women.

Finally, our results suggest that *digital engagement matters*. Owning a mobile or smartphone is important for both males and females, as is the ability to perform phone-related tasks. Our results are not causal so this does not imply that training individuals on how to use phones will move the needle on financial inclusion; however, it is striking that tech-savviness and engagement appear to be more important than indicators of human capital like education.

This finding is especially important given that

many of Indonesia's most promising DFS innovations run on smartphone-based platforms. If Indonesia is to build a truly inclusive DFS ecosystem, building comfort, engagement, and attachment to phones will likely be important. In the next section, we build on these insights while spotlighting parts of the DFS ecosystem with substantial promise to contribute to inclusive finance.

Table 6: Top 10 Most Important Variables in Random Forest Model

Feature	Rank	Importance
A. Overall		
Receives Government Assistance	1	39.08
Ever had BPJS Health	2	37.57
Owns any Mobile Phone	3	31.34
Has Drivers License	4	29.99
Owns Smartphone	5	28.35
Ever had BPJS Labor	6	26.81
Has Tax Card	7	26.74
Highest Education: HS/Vocational	8	21.57
Has done two basic phone tasks in past week	9	20.89
Has done two basic phone tasks in past month	10	18.98
Female	47	11.03
B. Males		
Has Drivers License	1	23.69
Owns any Mobile Phone	2	19.64
Has Tax Card	3	19.12
Ever had BPJS Health	4	17.95
Ever had BPJS Labor	5	16.67
Owns Smartphone	6	14.46
Highest Education: HS/Vocational	7	13.36
Has done all five phone tasks	8	12.39
Has complete ability to make/receive a call on a mobile	9	10.92
Has done all three advanced phone tasks	10	9.92
C. Females		
Receives Government Assistance	1	37.47
Ever had BPJS Health	2	15.70
Owns any Mobile Phone	3	13.05
Has Tax Card	4	10.98
Has Drivers License	5	10.38
Owns Smartphone	6	10.22
Receives scholarship	7	10.19
Has done all three advanced phone tasks	8	9.58
Housewife	9	9.50
Trusts Financial Providers to Keep Personal Information Private	10	9.15

Notes: Unweighted data from 2018 FII. The table displays the ten most important variables identified by the random forest modeling, as well as the ranking for the female variable in the overall model. Ranking is based on the variables' value in decreasing Gini impurity. For a more in-depth explanation of random forest and its components, refer to Liaw and Wiener (2001).

8 Areas of Opportunity for DFS Development

While use remains concentrated among better educated, urban individuals, we see important opportunities for e-money and e-commerce to facilitate meaningful financial inclusion; the COVID-19 pandemic may hasten adoption of these technologies and increase the return to engagement with them. Alongside, the government has an important window of opportunity to strengthen G2P payments' contribution to financial inclusion, especially as Indonesia works towards the G2P 4.0 vision.

8.1 Digital Readiness

As described earlier, just 4.6 percent of the population reported ever having used e-money in 2019, with use concentrated among the most educated. Thus, the technology–which in Indonesia is largely smartphone app-based–has a long way to go in terms of inclusion. Yet, as we describe in Box 2, DFS use may accelerate during the COVID-19 pandemic. A key question is whether Indonesians have the skills and devices needed to rapidly adopt new DFS technologies as the need arises.

Box 2: DFS Transitions During the COVID-19 Pandemic

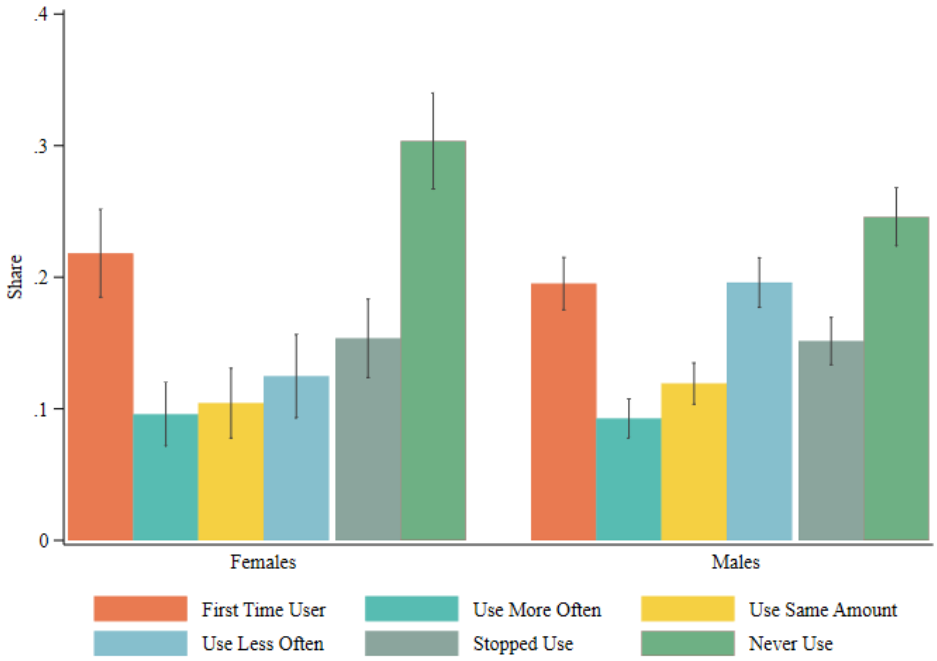
The COVID-19 pandemic has profoundly affected economic and social life in Indonesia, as over three million people have been laid off or furloughed (Akhlas, 2020a), and Indonesia's economy is projected to contract this year (Asian Development Bank, 2020; Akhlas, 2020b). The crisis has also affected how individuals engage with markets and search for goods. A push towards remote transactions could have important implications for DFS adoption, but we lack concrete data on the extent to which individuals are adopting (or abandoning) DFS and what key use cases are. To address this gap, we conducted an online survey in Indonesia with approximately 2,000 respondents to gauge how the pandemic has impacted DFS use, including digital banking, e-money, and e-commerce.

We used the Google Surveys platform, which uses convenience sampling. The online survey respondents are younger, more likely to live in urban areas, and more likely to live in Java. Estimates are weighted to match demographic characteristics in Indonesia's 2019 socioeconomic survey (SUSENAS, 2019), though this cannot fully address the fact that the online survey respondents are a highly selected, digitally-engaged group. Even so, many had never used DFS prior to the pandemic (52 percent of women and 45 percent of men). Thus, our results provide a snapshot of how a group of "likely adopters" is faring during COVID-19.

Overall, roughly one in five respondents (21 percent of women, 22 percent of men) adopted DFS for the first time during the pandemic (Figure 6). But at the same time, 15 percent of both men and women reported stopping DFS use; thus, while there is net growth in the user base, attrition is nontrivial and may reflect increased economic strain. Users cited various motivations for engagement, including a need to procure: goods online (17 percent), better prices online (20 percent), safety/ease of use (19 percent), and money transfer (13 percent). In terms of service use, approximately 67 percent of all respondents (DFS users and nonusers) reported using digital banking and 60 percent have used e-money, while 90 percent of DFS users have purchased goods online.

It remains unclear whether these patterns will persist when life normalizes; roughly half of DFS users expect to use DFS less after the pandemic, with 20 percent of individuals expecting to discontinue engagement completely. Ensuring high-quality service delivery and paying special attention to the needs of new users during the pandemic may therefore be critical for sustaining gains in DFS adoption over the longer term.

Figure 6: DFS Use Transitions and Frequency, by Gender



Notes: Weighted estimates using data from authors' online survey with a total of 556 females and 1539 males. The survey was hosted on Google Surveys, which uses convenience sampling. Estimates are weighted to match demographic characteristics in the SUSENAS (2019). Whiskers show 95 percent confidence intervals. Respondents are younger and more likely to live in urban areas and in Java.

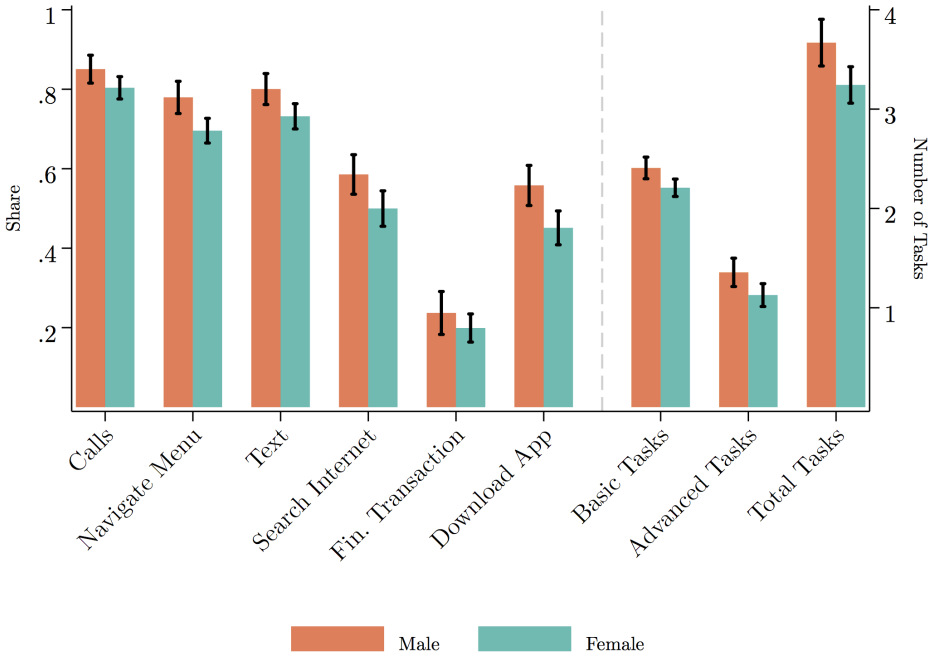
The 2018 FII data shows that Indonesia has relatively high rates of individual mobile phone use (70 percent) and smartphone ownership (46 percent), although ownership remains correlated with socioeconomic status (SNKI, 2019). Our own analysis of the data supports these findings; further, we found gender gaps in phone capability. The 2018 FII survey asks respondents to rate their ability to perform six different tasks on a mobile phone.[21] We divide these into three basic tasks (make/receive calls, navigate the menu, and send/receive text messages) and three advanced tasks (search the internet, make a financial transaction, and download an application).

Overall, ability to perform basic tasks is higher than ownership–over 80 percent of respondents had some or complete ability to make/receive calls, and 74 percent could send/receive texts. Advanced usage was lower, with 49 percent able to search the internet and 45 percent able to download an application. These rates are substantially higher than rates of e-money use; hence many nonusers have the fundamentals needed to convert. Figure 7 presents these results separately for males and females, demonstrating that females are significantly less likely to report their ability to perform each of the six tasks; on average, women performed nearly

[21] Options included no ability, little ability, some ability, and complete ability. Respondents who reported some or complete ability were considered able to perform the task, with I don't know responses coded as inability.

[22] We caveat that these skills are self-reported. Another possibility is that there is no hard-skills gap, but women are less confident in their abilities. Interestingly, while we saw no significant gender difference in overall DFS use in our online COVID19 survey; women were significantly less likely than men to use e-money (52.7 percent versus 62.1 percent, respectively (p=0.068)).

Figure 7: Phone Capabilities by Gender



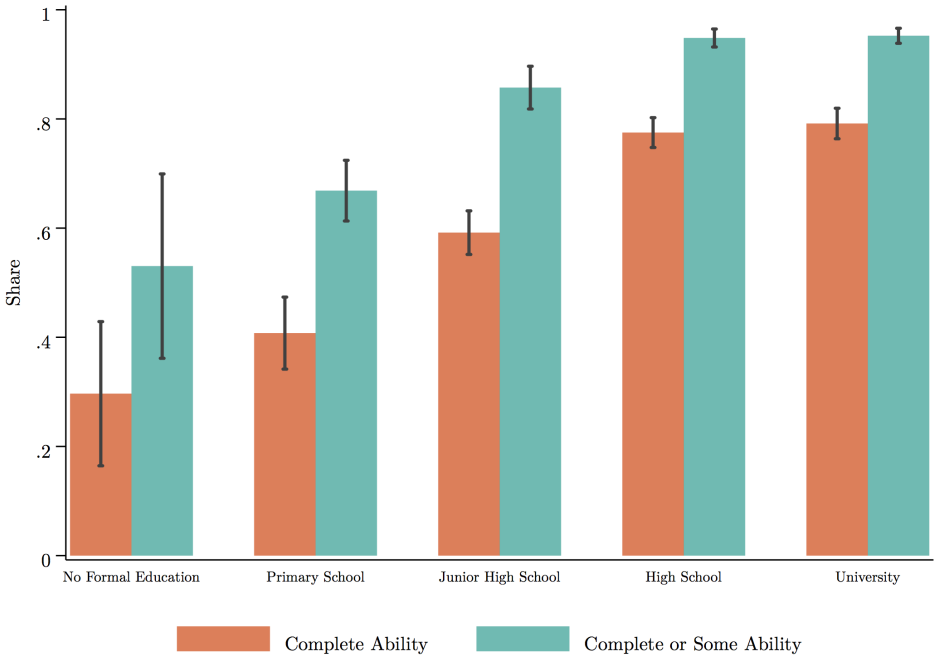
Notes: Weighted estimates using 2018 FII data. Whiskers show 95 percent confidence intervals, based on robust standard errors clustered at the provincial level. Bars to the left of the dotted line show share of respondents who report they are able to complete each of the tasks. Bars to the right of the dotted line show total number of tasks the respondent reports they are capable of. Each respondent selected no ability, little ability, some ability, or complete ability for each task. Respondents who reported some or complete ability were considered able to perform the task, with I donât know responses coded as inability. There were a total of three basic tasks (make/receive calls, navigate the menu, and send/receive text messages) and three advanced tasks (search the internet, make a financial transaction, and download an application).

half a task less than males (3.1 vs. 3.5 tasks in total).[22] Building women's comfort level with phones may therefore be paramount for sustaining equitable financial inclusion as the importance of DFS grows in the coming years. A bright spot is that although Indonesian women are slightly less equipped than males in terms of using mobile phone, these discrepancies are smaller than seen in other countries, including India and Bangladesh (InterMedia, 2017a, 2019).

While only 9.5 percent of smartphone owners in the 2018 FII survey used e-money, we estimate that 89 to 93 percent are "digitally ready" (defined as possessing complete or partial ability to download applications or conduct internet searches). Moreover, readiness spans education levels, as shown in Figure 8. Although smartphone owners with the least education report significantly lower digitally readiness, over half have either some or complete ability to search the internet or download an app. Simply converting all digitally ready individuals would have a massive impact on e-money adoption, boosting the adoption rate to 42 percent.[23]

[23]This figure is based on the authors' calculations. In addition to existing e-money users, this includes every individual who owns a smartphone and who has at least some or complete ability to use the internet or download an application.

Figure 8: Advanced Phone Capabilities Among Smartphone Owners Across Levels of Education



Notes: Weighted estimates using 2018 FII data. Whiskers show 95 percent confidence intervals, based on robust standard errors clustered at the provincial level. Bars show the share of individuals in each education level who report that they either have complete or some ability to complete each of the tasks. Each respondent selected no ability, little ability, some ability, or complete ability for each task. This only includes those who reported they own a smartphone. Tasks included in the survey were searching the internet and downloading an application.

8.2 Use Cases

8.2.1 Remittances

Even if individuals are digitally ready, they will not adopt DFS without a compelling use case. One promising opportunity is using e-money and digital banking to facilitate remittances. Below, we use both 2018 FII and 2017 SOFIA data to explore remittance patterns, although neither dataset provides a complete picture. The SOFIA data is older and only represents a subset of the country.[24] Additionally, the data likely under represents digital methods of sending remittances as respondents are instructed to select only the most common way they send instead of all the ways they have sent money.

Although the FII data is more recent, the survey was not designed for in-depth analysis of remittances: for example, questions about sending and receiving money did not explicitly exclude individuals living under the same roof (e.g., a transfer from husband to wife), and the only method of remittance transfer directly addressed is ATM cards. Although neither data source is perfect, we can use them together to gain a basic understanding of the potential opportunity that comes with digitizing remittances.

Despite the differences in the two datasets, both provide similar estimates of remittance use in the country (see Table 7). FII survey estimates are higher, particularly among females–this could reflect both increases in use over time, or women (who tend to manage household finances, refer back to

[24]The SOFIA dataset is representative of adults 17 years and older living in East Java, West Nusa Tenggara, East Nusa Tenggara, and South Sulawesi.

Section 6.4) reporting intra-household money transfers as remittances, or a combination of the two. Regardless, we see that remittances are very common, especially among women, with over 60 percent of Indonesians reporting sending or receiving money in the past year. Moreover, Schaner and Theys (2020) found that domestic remittances are particularly important for vulnerable groups, namely female-headed households, who are often reliant on support from family for sustenance.

Table 7: Estimates of Remittance Use

	FII	N	SOFIA	N
Rural				
Male	0.63	408	0.68	5566
Female	0.85	485	0.63	7280
Urban				
Male	0.69	304	0.70	2825
Female	0.88	364	0.69	3968

Notes: Weighted estimates using the 2018 FII data and the 2017 SOFIA data. The SOFIA data are representative of adults 17 years and older living in East Java, West Nusa Tenggara, East Nusa Tenggara and South Sulawesi. FII data has been subset accordingly. Remittance use is captured by a series of questions in the FII including receipt of remittances in the past year, use of ATM cards for remittances, and the use of the post office for remittances. In SOFIA, respondents are asked if they sent or received money in the past year.

Figure 9 turns to the SOFIA data to show the percentage of individuals who have sent or received remittances: (1) only ever using cash or (2) using a digital method.[25] Cash is by far the dominant method, typically cited by four out of five individuals. This suggests there is significant scope to transition cash-based transfers to digital methods, which would change the way millions of Indonesians transfer money. Realizing this potential will likely require addressing issues with the agent network, as well-functioning, reliable agents are thought to be critical for building the value proposition for remittances (GSMA, 2013).

8.2.2 G2P Payments

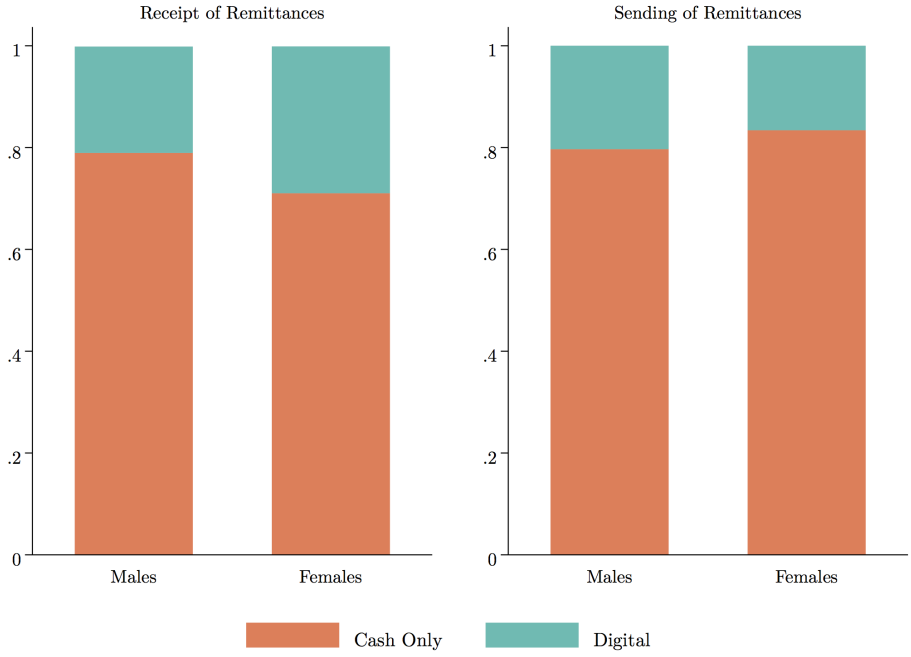
Social protection programs are important to many poor and vulnerable households, and digitization of these payments is a prime opportunity to expose beneficiaries to formal financial services. As our random forest analysis demonstrated (see Section 7.2), receipt of government benefits is an important predictor of financial inclusion, especially for women. At the same time, we find clear evidence of untapped impact: namely, our analysis of 2019 SUSENAS data suggests that many beneficiaries are not even aware that they own a financial account through their participation in government transfers. Figure 10 segments households by social protection receipt and shows the percentage of households that report having at least one savings account. Households participating in PKH and PIP should all have accounts given their enrollment in the programs. A subset of Program Sembako beneficiaries also have fully-functional accounts–yet on average only 60 percent of these households report having an account.[26] This lack of knowledge suggests a few things: (1) account penetration may be higher than reported; (2) our random forest analysis likely underestimates the relationship between ownership and government benefits; and (3) there is significant potential to leverage these existing accounts to expand financial service use, particularly among women.

This phenomenon is likely, at least in part, to be a product of poor communication. For the most part, the government and financial service providers do not prioritize introducing or promoting the capa-

[25] Digital methods include bank transfer, ATM card, and payment points. Questions were structured differently for receipt and sending of remittances. For sending, respondents could only select the most common way they sent. For receipt, however, respondents were allowed to select multiple methods. We coded individuals as "cash only" if they never reported a digital method.

[26] Our findings are consistent with Theis et al. (2020), who in a recent survey of PKH beneficiaries found that a staggering 85 percent of beneficiaries thought the only thing they can do with their account is make withdrawals.

Figure 9: Use of Digital and Cash for Remittances, by Gender



Notes: Source: Weighted estimates using 2017 SOFIA data. This sample is representative of adults 17 years and older living in East Java, West Nusa Tenggara, East Nusa Tenggara, and South Sulawesi. Bars show the most common method for sending and receiving either domestic or foreign remittances. For sending, respondents could only select the most common way they sent. For receipt, however, respondents were allowed to select multiple methods. If a respondent reported use of any digital method, they were recorded as having used digital. If they only reported cash, they were recorded as cash only.

bilities of social protection linked BSAs, other than for benefit disbursement. Exposing this group of already-banked households to the other possibilities available to them through their transfer-linked account is a unique opportunity to connect households to other, welfare-improving financial services. Here, we see the revised financial literacy modules currently being rolled out as part of PKH facilitator training as a potential entry point.

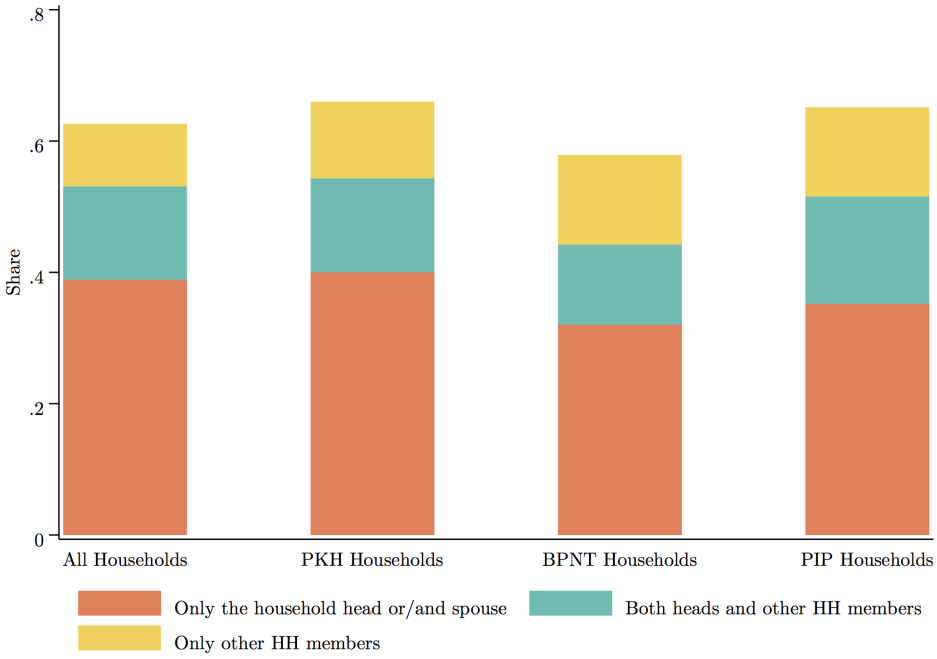
Another reason for underreporting may be that some of the accounts tied to G2P benefits have restricted functionality. Converting individual accounts to fully functional accounts and making sure users understand the implications could therefore provide a quick boost to nationwide financial inclusion.

8.2.3 Digital Credit and P2P Lending

Banks in Indonesia have approached the digital credit sector in three distinct ways–digitizing existing loan products; channeling loans through existing P2P lending fintech companies; and establishing and/or investing in digital-only subsidiary fintech firms. Fintechs offering digital credit are required to leverage P2P lending, which despite recent product growth and diversification, remains a niche market for obtaining consumer and business loans (see Appendix D for a summary of major P2P

[27]Registered online lending firms are allowed to operate under OJK intensive supervision until up to one year. After one year, OJK will either grant them a full online lending license or revoke their rights to operate, depending on the monitoring and evaluation result of firms' registration phase.

Figure 10: Share of Households Reporting Bank Account Ownership, by Beneficiary Status and Household Member



Notes: Weighted estimates using the 2019 SUSENAS data.

products). In December 2019, there were 164 online lending firms officially registered or licensed[27] with OJK that have collectively disbursed IDR 67.9 trillion (Indonesian rupiah) from 878,158 lenders to more than 15 million borrows over the past four years (OJK, 2019). Use of P2P products is heavily concentrated in Java, where 85.8 percent of loan disbursements occurred in 2019. Although the potential to use non-traditional types of credit holds promise for pro-poor lending, to date the P2P sector has been marred by predatory behavior from illegal and unregistered firms (Eloksari, 2019).

While we do not see P2P lending scaling among low-income populations in the immediate future, we do note that there are a handful of fintechs doing innovative work to deploy P2P for pro-poor purposes (e.g., through microfinance models). Here, there are opportunities to explore the effects of deepening the digital engagement of borrowers, through, for example, disbursing loans or facilitating repayment through e-money.

8.2.4 E-Commerce

E-commerce is one of Indonesia's largest and fastest growing digital services sectors. The value of merchandise purchased through the industry increased from $1.7 billion in 2015 to $21 billion in 2019, surpassing the value of several other digital services, such as online travel, ride hailing, and online media companies (Google and Temasek, 2019). Despite its growth, e-commerce is not covered in any of our secondary datasets so we are unable to provide analysis on individual or household use.

More data is available on the merchants who use e-commerce and how they engage with products. E-commerce is used by large and small businesses alike–the largest Indonesian e-commerce marketplace reports that as much as 94 percent of their sellers are micro-merchants (Tokopedia, 2019). Moreover, facilitating the use of e-commerce by MSMEs has been a priority for the GoI. For example, KOM-

INFO runs the MSMEs Go Online program, which aims to onboard 8 million MSMEs while also focusing on improving regulation, capacity building, and education to expand and sustain use (Kominfo, 2017). A critical challenge noted in our stakeholder interviews is ensuring micro-merchants are able to thrive once onboarded to the platform. In this regard, interventions on both the firm side (e.g.,

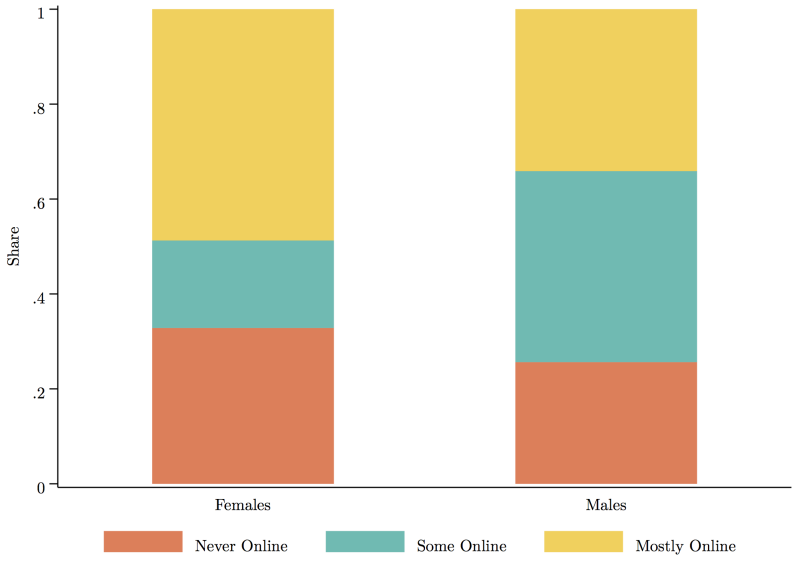
Box 3: E-Commerce Use During the COVID-19 Pandemic

Our online COVID-19 survey found sizable reliance on e-commerce during the pandemic. For example, 26 percent and 22 percent of urban and rural DFS users, respectively, reported that a need to buy things online was a main trigger for DFS use. Other than that, 26 percent of urban respondents also cited cheaper prices online. Overall, the majority of DFS users had purchased at least some goods online since the pandemic began. The pandemic also pushed 32 percent of DFS users to shop online for the first time.

Our data points to emerging gender polarization in e-commerce use, with female DFS users more likely to be both never and intensive e-commerce shoppers. Figure 11 shows that women are more likely to shop for basic needs exclusively offline compared to men (33 percent vs. 26 percent, respectively); however, a higher percentage of women reported that they buy most of their basic needs online (49 percent) as compared to men (34 percent).

E-commerce also appears to be an entry point for digital payment use during COVID-19, as online shoppers are much more likely to use cashless payments (especially digital banking and e-money) than those who exclusively shop offline. However, cash is still the most common payment method even among online shoppers (Indonesia has a number of innovative "offline-to-online" channels designed to help consumers make e-commerce purchases by paying an agent in cash), presenting an opportunity for more adoption of digital payment methods.

Figure 11: Frequency of Online Purchasing of Basic Goods Among DFS Users



Notes: The data represents weighted estimates from the authors' online survey with a total of 117 females and 409 males.

improving firms' ability to engage with the platform, building marketing skills, etc.) and the platform side (e.g., finding ways to better identify and showcase promising small firms) could be high value.

In addition, providing digital inventory procurement and allowing traditional merchants to sell various digital goods (e.g., utility and bill payment, airtime credit, train tickets, etc.) is an emerging business model that some e-commerce platforms have tapped into in their efforts to include more MSMEs into their digital ecosystem.

9 Research Opportunities

Our Indonesia-based research, combined with the global literature review, points to several high-potential areas for research where there is opportunity to inform policy while making a meaningful contribution to the academic literature. We summarize these below, before concluding in Section 10.

9.1 G2P Transfers

Many opportunities in this space are tied to reforms planned as part of G2P 4.0. Given that this initiative is still in its early stages, we expect the feasibility and specific nature of high-potential engagements to shift as implementation plans firm up. Here we highlight topics with *ex-ante* promise:

1. Part of the G2P 4.0 vision is to give beneficiaries greater choice over how they are paid (e.g., type of account, type of financial service provider). There is much to learn about how different payment modalities affect program performance, how benefits are used, and beneficiary economic activity and well-being.

2. Opening up programs to multiple payment modalities and transitioning new programs (like Indonesia's LPG (Liquefied Petroleum Gas) subsidy) to digital payment could impact beneficiary welfare, program performance, and the shape of local financial services markets. For example: Do transitions impact market structure and financial agent performance? Are there spillover effects on non-beneficiaries? Does competition between multiple providers (e.g., traditional banks vs. DFS agents) impact the quality of service delivery and user experiences?

    - Even absent major reform to G2P systems, there is scope to improve beneficiaries' knowledge of benefits-linked accounts and what they are capable of, for example, by channeling information through local program touchpoints like PKH facilitators or even agents themselves.

3. Another key part of G2P 4.0 relates to strengthening and scaling digital ID systems. Here, research collaborations could study how rolling out digital ID impacts program efficiency, inclusion/exclusion errors, and financial inclusion more broadly (see J-PAL Africa (2019) for an in-depth discussion of research questions related to digital ID).

9.2 Agent Networks and DFS Adoption

Indonesia's rural agent network does not yet live up to its promise, and there is scope for research to identify policies that improve agent performance. Issues with the agent network are often closely linked with DFS adoption since agents are key touchpoints for individuals outside of major towns and cities.

1. Current regulations restrict who can become an agent (e.g., fintechs can only recruit registered businesses to offer LKD services) and mandate that LP and LKD agents work for one financial service provider (though stakeholder interviews suggest that this is not always binding in practice). While changing regulations can be slow work, there is scope for research to shed light on how issues like agent exclusivity and (lack of) third party agent management impact agent performance and financial inclusion. Over the near term, it may be more feasible to investigate policies that

can be implemented without changing regulation: for example, how do agent compensation structures affect performance? How can financial service providers identify and retain high-performing agents? To what extent does the financial touchpoint matter for use and trust, for example, does use change if agents are women, store owners, local community leaders, etc.?

2. Our background research suggests that ATMs are widely used in both urban and rural areas in Indonesia. Research could study how installing ATMs in uncovered communities impacts financial service use, and how this compares to, for example, banking a village through an agent.

3. Is there scope to increase use of bank and DFS agents for domestic and international remittances? How do enhanced opportunities to remit impact migration and remittance patterns within the household?

4. The COVID-19 pandemic may accelerate adoption of DFS like e-money and e-commerce. Research could help policymakers understand to what extent adoption is "sticky", whether there are tipping points or network externalities in adoption, and how transitioning to digital payment systems impacts consumer behavior and welfare.

5. Both e-commerce firms and the GoI have a shared goal of supporting MSME growth on e-commerce platforms. Here we see scope to conduct high-impact research in several areas:

    - Can platform design changes, such as increasing visibility of MSME sellers or offering consumer-facing incentives to buy from MSMEs, boost sales? What does this mean for firms' DFS use, growth, profitability, and business networks?
    - How does firm capacity building affect MSMEs' ability to succeed on e-commerce platforms, and what does this mean for their broader business prospects?
    - What types of MSMEs thrive on e-commerce? Can platforms do more to identify and support high-potential small businesses? Does the platform differentially favor certain groups (e.g., male-owned vs. female-owned businesses)?

10 Conclusion

This is a critical time for Indonesia's digital financial services sector. The government's commitment to both financial inclusion and overhauling digital G2P payments is promising. Meanwhile, many digitally-excluded Indonesians already have the skills and smartphones needed to adopt new technologies. Although the COVID-19 pandemic presents a major challenge to the country, the crisis has also spurred innovation and expansion of social protection programs, potentially increased demand for remittances, and changed the ways many Indonesians are procuring goods and services. There is scope for DFS to support country-wide coping strategies while introducing individuals to new products and services that may be beneficial over the longer term.

Facilitating inclusive government reform and DFS expansion will, however, require thoughtful policy design grounded in evidence. Several fundamentals of Indonesia's DFS landscape (e.g., a reliance on smartphone-based technologies, weak rural agent networks, limited information about accounts linked to social protection benefits) disadvantage marginalized populations. This paper has endeavored to provide the necessary background for researchers and policymakers to tackle these and other challenges through thoughtful reform coupled with rigorous evidence generation. In doing so, our aim is to assist stakeholders in meeting the challenges of the moment while laying the groundwork for future pro-poor innovation in Indonesia's DFS sector.

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Appendix

A Main D-SNKI Programs from 2019

Strategy	Program	Planned/Targeted Activities
Financial literacy and consumer protection	• Founded National Savings Day on 20 August • Launched Indonesia saving movement • Promotes financial literacy and consumer protection information campaign	• National Savings Day is approved through Presidential Decision Celebration of National Savings Day on 20 August • Indonesia saving movement is participated by students, private sector employee, fishermen, women, and young people • CMEA regulation to ask support from related institution • Rate of complaint resolution by financial services player is 90%
Account opening expansion	• Increase the number of account opening of social transfer program beneficiaries • Increase the number of account opening for regional government, state-owned enterprises, and non-bank financial institution	• BPNT : 15.6 million people • Students : 4 million people • Private sector workers : 500 thousand people • Farmers - Farm Card : 13 million • Fisherman - KUSUKA : 700 thousand people • Women - MEKAAR : 2 million people • PKH : 10 million people • Amartha : 300 thousand people • Government officials : 250 thousand people
Accelerate the property right certification for collateral	• Accelerate the land certificate issued by government assistance program (SHAT) for bank loan's collateral • Promote the use of cattle-breed certificate for bank loancollateral	• Identify the number of SHAT & cattle breed certificate • A kick-off the use of SHAT & cattle breed certificate used as collateral
Agent banking service optimization	• Synchronize the LKD and LP agents • Expansion of fintech agents to be able to work as bank agents	• BI and OJK issue a joint-regulation about agent banking • The GOI issue a regulation to remove any tax for agent branding • BI and OJK issue a joint-regulation to allow the fintech agents to work as bank agents • Piloting the joint LKD and LP agents under BI's and OJK's regulation sandbox
Digital financial services and non-cash transaction	• Introduce digital payment for regional tax • Introduce digital financial payment for regional government • Mapping financial service point • Create the architectural concept of national identification database for e-KYC • Establish digital economy ecosystem for fisheries, agriculture, and migrant	• Operational of digital payment for regional tax 542 central and regional government institutions have used digital financial payment • Movement of opening financial account using e-KYC • Movement of registering e-money using registered mobile phone number • Issue the map of financial services access points in 2019 • Issue the survey of financial inclusion of 2018 • Development of integrated financial inclusion data centre

B Main E-Money Providers in Indonesia

	GO-PAY	**OVO**	**DANA (e-wallet)**	**LinkAja**
Cash-in	GO-JEK's driver, ATM, m-banking, mini-marts, and pawnshop (Pegadaian)	GRAB's driver, ATM, m-banking, gas station, cinema, mini-marts, and OVO offline booth	Bank, m-banking, direct debit, credit card, mini-marts	Mini-marts, ATM, official telco store, LinkAja agent (warung), post-office
Cash-out	Bank transfer	Bank transfer	Bank transfer	Mini-marts, ATM Link (SOE Bank's ATM), official telco store
Maximum Balance	IDR 2 million (unregistered); IDR 10 million (registered)			
Payment Method	QR Code	QR Code; Barcode; mobile phone number	QR Code (DANA generate user's bank accounts QR)	QR Code, NFC (near-field communication)
Payment Services	GO-JEK ride, flight, phone credit, GO-JEK services, driver's licence, electricity retail payment, online games, and more	GRAB ride, phone credit, electricity, cinema, GRAB's services, retail payment	Retail payment, phone credit, electricity, cinema	Flight, train ride, internet, electricity, LPG, petrol, insurance, toll roads, online games, driver's license

C List of Variables included in Random Forest Modeling

Number of HH Members	Job Sector	Owns Refrigerator	Any teenage girls in HH	Distance to Nearest Microfinance	Age of Household Head
Has KTP Card	Worker Type	Owns Scooter	Below Poverty Line	Literate	Religion of HH Head
Has Family Registration Card	Employment of Male	Involvement in HH Decisions	Number of Phone Tasks Done Today	Able to read Indonesian	Contribution to HH Income
Has Passport	Involved in Basic Spending Decisions	Number of Basic Phone Tasks Completed Today	Write Indonesian	Job Status	Has Gas Cylinder
Has School ID	Owns Mobile Phone	Involved in Beyond Basic Spending Decisions	Number of Advanced Phone Tasks Completed Today	Province	Mobile Phone is Shared
Has Tax Card	Owns Smartphone	Has Influence over Spending	Number of Phone Tasks Completed in Last Week	Urban	Gender
Has Drivers License	Has BPJS Health	Able to Voice Disagreement on HH Spending	Number of Basic Phone Tasks in Past Week	Highest Education of Female	Marital Status
Income from Fishing	BPJS Labor	Final Decision in Spending of HH Income	Number of Advanced Phone Tasks in Past Week	Highest Education of the Respondent	Number of Males 13 to 15
Income from Agriculture	Female-Headed Household	Final Decision on Spending Own Money	Number of Phone Tasks in Past Month	Type of Flooring	Females 16-18
Income from Government Assistance	Household Size	Level of Trust in Financial System	Number of Basic Phone Tasks in Past Month	Toilet Type	Males 16 to 18
Income from Domestic Remittances	Number of Males in HH	Distance to Nearest Bank	Number of Advanced Phone Tasks Past Month	Type of Cooking Fuel	Any Teenage Boys in HH
Income from Foreign Remittances	Number of Females in HH	Distance to Nearest ATM	Number of Phone Tasks Ever	Ability to Complete Financial Transaction on Phone	Ability to Download App on Phone
Income from Own Business	Females under 4 in HH	Distance to Nearest Post Office	Number of Basic Phone Tasks Ever Done	Distance to Nearest Sharia Microfinance	Number of Basic Phone Uses Able to Complete
Income from Government Employmnet	Males under 4 in HH	Distance to Nearest Laku Pandai Agent	Number of Advanced Phone Tasks Ever Done	Distance to Nearest Insurance Agent	Number of Advanced Phone Uses Able to Complete
Income from Business with less than 10 Employees	Females 5 to 8 in HH	Distance to Nearest BPR	Ability to Make and Receive Calls	Respondent Age	Distance to Nearest Broker
Income from Business with More than 10 Employees	Males 5 to 8 in HH	Distance to Nearest Cooperative	Ability to Navigate Home Menu	Distance to Nearest Money Change Agent	Females 13 to 15 in HH
Income from Educational Scholarships	Females 9 to 12 in HH	Distance to Nearest Pawnshop	Distance to Nearest Multifinance	Ability to Send and Receive Texts	Distance to Nearest ATM
Income from Pension	Males 9 to 12 in HH	Ability to Search the Internet			

D Main Online Lending Players in Indonesia

	Investree	**KoinWorks**	**Modalku**	**Amartha**
Types of Product	Invoice Financing, Merchant Cash Advance, Online Seller Finance (works with e-commerce platform for financing) Employee loans	Business Loan, Invoice Financing, Education Loan, Health/Medical Loan	Business Loan, Invoice Financing	Group lending for women micro enterprise owners
Lender's Minimal Investment	IDR 1 million	IDR 100,000	IDR 100,000	IDR 1 million
Possible Loan Value	IDR 2 million â IDR 2 billion	IDR 10 million â IDR 250 million	For business loan: IDR 50 million â IDR 2 billion. For Invoice financing: 80% of invoice value	Minimum IDR 3 million
Disbursement Value	IDR 3.17 trillion (IDR 2.56 trillion completed loan)	IDR 1.16 trillion	IDR 2.43 trillion	IDR 1.72 trillion
Interest rate range	11.4-26.8%	9 20%	12-20%	15%
Default Rate	0%	0.13%	0.5%	0.02%
Established	2015	2015	2016	2010
Share of female users	NA	NA	NA	100%