Binding Constraints on Digital Financial Inclusion in Indonesia: An Analysis Using the Decision Tree Approach

Firman Witoelar, Teguh Yudo Wicaksono, and Carlos Mangunsong

Abstract

Despite the concerted efforts of the Indonesian government to increase financial inclusion and the e-commerce–led growth of digital payment services, a large proportion of the country's population remains financially excluded. Much of the growth and innovation has mainly benefited those already financially included.

To understand this outcome, we use the decision tree approach developed by Claessens and Rojas-Suárez (2020), focusing on one of the products with the largest potential to increase financial inclusion in the country: e-money.

Our analysis finds that a crucial binding constraint on the expansion of e-money services is a regulatory framework that creates an unlevel playing field between banks and nonbank providers of digital financial services. Regulatory restrictions applied to nonbanks on cash-out services, agent recruitment, and know-your-customer processes are at the core of the problem. In addition, a perception of low benefits from the usage of formal financial services results in a lack of the critical mass of customers necessary to ensure the profitability of agents, particularly in remote and rural areas, and thus the expansion of e-money services.

We also find other constraints that are not binding at the national level but are binding for some specific groups. The low provision of digital infrastructure in rural areas outside Java is one of them. In addition, constraints such as low trust in providers, though not binding, should be addressed in order to maximize the gains that could be obtained from relaxing the binding constraints.

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Abbreviations

ATM	automated teller machine
BCA	Bank Central Asia
BI	Bank Indonesia
BNI	Bank Negara Indonesia
BPD	Bank Pembangunan Daerah
BRI	Bank Rakyat Indonesia
BSA	basic savings account
BTPN	Bank Tabungan Pensiunan Nasional (National Pension Savings Bank)
BTS	base transceiver station
DSP	digital service provider
EDC	electronic data capture (device)
FII	Financial Inclusion Insights
GNI	gross national income
GPN	Gerbang Pembayaran Nasional (National Payment Gateway)
KYC	know-your-customer
LKD	Layanan Keuangan Digital (Digital Financial Services program)
MINFO	Ministry for Communication and Informatics
MNO	mobile network operator
MSMEs	micro, small, and medium enterprises
OJK	Otoritas Jasa Keuangan (Financial Services Authority)
P2P	person-to-person
PODES	Village Potential Statistics
PoS	point-of-sale
QRIS	Quick Response Indonesia Standard

Foreword

Financial inclusion, especially through digital means, is broadly regarded as a catalyst for development and a driver of economic inclusion. While a large number of countries have implemented policy changes to advance digital financial inclusion, results are mixed and there is a substantial divide between countries that have achieved great success and those that continue to lag behind.

To support policymakers' efforts to improve the effectiveness of their financial inclusion strategies, in early 2020 CGD published an analytical framework, *A Decision Tree for Digital Financial Inclusion Policymaking*, that allows a systematic identification of the most problematic constraints in country-specific settings. Many constraints can restrict financial inclusion, but to different degrees. Therefore, the *Tree* aims at diagnosing which constraints are binding, i.e., impeding significant usage of digital financial services. Without this kind of analysis, gaps in financial inclusion strategies may persist and policymakers may focus attention on non-binding constraints, obstacles whose solutions will not deliver significant improvements unless other first-order impediments are addressed.

The Tree methodology uses a deductive top-down approach to analyze various potential demand and supply causes (branches in the tree). An important feature of the analytical framework is that it calls for analysis of the observed (or shadow) prices of digital financial services to identify the most pressing (binding) constraints. Application of the methodology involves benchmarking with a wide-ranging set of indicators, including aggregate and micro-level statistics as well as survey data to reflect providers' and consumers' perceptions.

In this paper, Firman Witoelar, Teguh Yudo Wicaksono, and Carlos Mangunsong apply the Tree methodology to the case of Indonesia.

The southeast Asia country has experienced a significant expansion of digital services in recent years. E-commerce in particular has become increasingly popular, and many innovations have taken place in this arena. However, the innovations and their benefits have mostly advantaged individuals who were already financially included. Improvements in efficiency and digital financial services functionalities have not reached the substantial population that remains excluded—over 50 percent of the adults, according to the most recent estimates.

In their price analysis for digital payments and store-of-value services, Witoelar, Wicaksono, and Mangunsong find that fees charged for e-wallet transfers are higher in Indonesia than in comparable countries, indicating the presence of supply-side constraints.

Indeed, the authors find that an unlevel playing field between bank and non-bank providers is a binding constraint. Regulations for non-bank providers ban their offering of cash-out services restrict agent recruitment and impose higher know-your-costumer costs than those applied to banks. They also reduce profitability and create substantial disadvantages to this group of suppliers, which in many instances would be better suited to serve unbanked populations. The authors also identify a coordination failure between suppliers and customers

as a binding constraint. The coordination problem manifests in the absence of a critical mass of users, which further hinders agents' profitability, limiting the offering of the services.

A deeper regional analysis shows the presence of additional binding constraints particular to populations in remote and rural areas outside Java. Specifically, the low provision of digital infrastructure and demand-side constraints such as customers' perceptions of low benefits from using digital financial services and lack of trust in providers are identified as impediments whose solution would increase the potential of digital financial services in Indonesia.

Indonesia's digital financial services landscape is peculiar, with almost costless basic savings accounts promoted by the government and a dynamic e-wallet market with multiple providers, including those with non-traditional agents, such as GoJek drivers (equivalent to Uber) that have many interactions with customers in urban areas. However, this promising environment has continued to yield disappointing outcomes. Solving the binding and severe constraints identified by Witoelar, Wicaksono, and Mangunsong could substantially benefit the over 100 million Indonesians that remain financially excluded.

This is the last in a series of five policy papers that employ the Decision Tree methodology that my colleagues and I developed to disentangle the most pressing constraints to financial inclusion in countries where the low levels of inclusion are truly concerning and a hindrance to prosperity. The other four papers study Ethiopia, India, Mexico, and Pakistan.

To learn more about this project, find these papers, and read additional material, please visit cgdev.org/page/policy-decision-tree-improving-financial-inclusion.

Liliana Rojas-Suarez
Director of the Latin America Initiative and Senior Fellow
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1. Introduction

In recent years, as countries have recognized the promise of increased use of modern financial services, exemplified in studies such as those of Suri and Jack (2016), Claessens (2006), and Beck, Demirguc-Kunt, and Peria (2006), national strategies for financial inclusion were adopted, programs were rolled out, and new regulations were introduced to facilitate financial inclusion. Indonesia, like many other middle-income countries around the world, has likewise put a concerted effort into increasing financial inclusion.

To understand the limiting factors that still constrain financial inclusion, a large number of studies, observational or experimental, have focused on particular determinants of financial inclusion or addressed a specific constraint. Such research has often led to a long list of policy or reform prescriptions, as many factors are indeed relevant for financial inclusion.

Different from previous studies, our paper takes a broader but also more nuanced approach by looking at a large set of potential constraints to identify the binding ones. We use the decision tree approach to the study of financial inclusion that was developed by Claessens and Rojas-Suárez (2020), who in turn adapted the growth diagnostic approach introduced by Hausmann, Rodrik, and Velasco (2005). The approach provides a framework to systematically assess potential constraints on both the supply and the demand sides of the markets for financial services, and to identify which of those constraints are binding. We use the decision tree methodology to identify the most important factors that prevent improvement in the adoption of two types of digital financial services in Indonesia—payments and store-of-value services[1]—and focus on electronic money (e-money) products, which offer both types of services, the latter through e-wallets. It is worth noting that e-money is provided in Indonesia by both banks and nonbanks.

Our definition of *financial inclusion* is based on usage metrics; however, ownership (of a device or account, for instance) may be used as a proxy[2] when usage data are not available. In Indonesia, data from Financial Inclusion Insights (FII) surveys[3] (SNKI and FII 2019) show that in 2018, around 45.5 percent of individuals 15 and older reported having owned and used either a regular bank account, a basic savings account (BSA), or e-money (Figure 1).[4]

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[1] We define *digital payments* (*digitally stored value*) as payments made (value stored) using any kind of digital infrastructure and delivered using any of various channels such as a basic mobile phone, a smartphone, the Internet, an ATM, or electronic data capture. Products for such purposes can come from various providers: banks, nonbank providers, or e-commerce platforms.

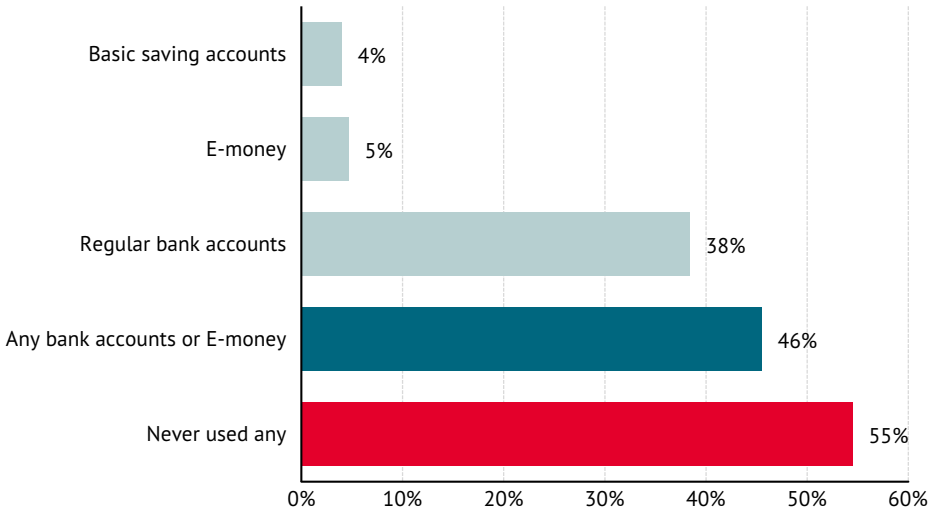
[2] This proxy, by definition, will overestimate financial inclusion, as some accounts will be open but dormant.

[3] The FII 2018 survey (SNKI and FII 2019) was a nationally representative survey conducted by the country's National Council for Financial Inclusion in 34 provinces. The sample design was a stratified multistage cluster sample of 6,695 adults in separate households, with urban-rural stratification.

[4] "Regular banking accounts" here include regular savings accounts, demand deposit accounts, and other products other than BSAs. The BSA is a low- or no-fee savings account with basic features, targeted to previously unbanked populations. Electronic money (e-money) is a financial product whose record of funds or value available to a consumer is stored digitally. E-money does not require a bank account. More precise definitions of terms used in the analysis are provided in Section 2.

This means that more than half of the population reported *never* having used any of these financial products. Thus, defining financial inclusion in terms of usage of these products means that less than half of the adult population is financially included. Although there has been remarkable growth in the percentage of the population with a bank account, from 35 percent in 2016 to 55 percent in 2018 (SNKI and FII 2019), there is still a significant unbanked share of the population.[5]

Figure 1. Formal financial products ever used, Indonesia, 2018 (self-reported use, percentage of adults 15+)

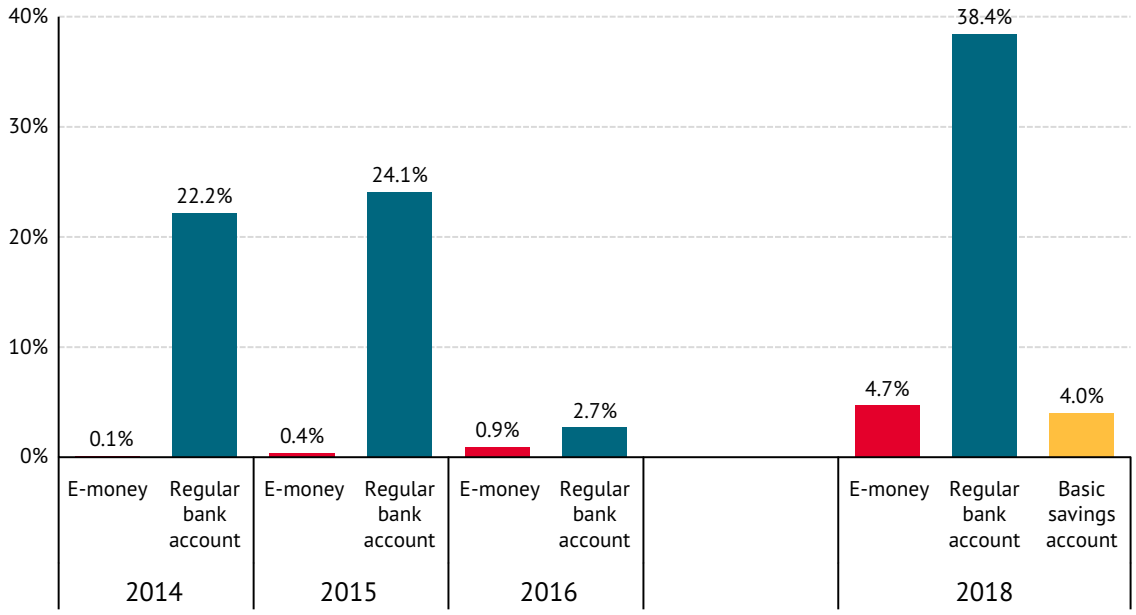


Source: Authors' calculation using FII 2018 data (SNKI and FII 2019).
Note: The bars show the percentage of the adult population who reported owning and using each of the products. Individuals may use more than one product.

The large proportion of the population that is financially underserved is striking, considering that in the last five years Indonesia has made significant progress in extending financial services. The use of regular bank accounts, for instance, experienced rapid growth. Between 2016 and 2018, the proportion of the adult population using a regular bank account increased by 11.4 percentage points, although that brought it up to only 38.4 percent (Figure 2), or approximately 50.3 million people, confirming that more than half of the adult population is still financially excluded.

[5] Note that the percentage shows ownership, not necessarily usage; usage numbers are closer to 45 percent. A significant proportion of the new account owners in 2018 were social assistance beneficiaries, who started to receive their social assistance via digital transfers that year.

Figure 2. Use of regular savings accounts, BSAs, and e-money, Indonesia, 2014–2018



Source: Authors' calculation using FII 2018 data (SNKI and FII 2019).
Note: The bars show the percentage of the adult population who reported owning and using each of the products. Individuals may use more than one product.

The introduction of digital financial services, particularly e-money, has been touted as a vehicle to achieve the goal of financial inclusion. In 2014, the government of Indonesia launched a national program to promote e-money, called Layanan Keuangan Digital (LKD), which translates as "Digital Financial Services," spearheaded by a number of state-owned banks. E-money users are not required to have a bank account, and this early version of e-money required only a feature phone.[6] These characteristics made it seem that LKD had the potential to extend financial services to the unbanked. At around the same time, regulators took a relaxed approach to e-money licensing, allowing a significant number of e-money providers, mostly nonbank providers, to flourish. However, although the use of e-money increased rapidly over the ensuing four years, overall usage remained low. Data show that in 2018, only around 4.7 percent of the adult population used e-money (SNKI and FII 2019).[7] In this paper we investigate the reasons behind the poor performance of e-money

[6] Around 46 percent of the adult population uses a smartphone, compared with 70 percent who own a feature phone. Nevertheless, even among smartphone users, e-money usage is low (9.5 percent of smartphone owners) (Moorena et al. 2020, using data from SNKI and FII 2019). Our calculation, using data from the same survey, shows that 38 percent of the financially excluded adult population use a smartphone. In 2019, four state-owned banks and a state-owned telecommunication company, through a subsidiary, launched a new e-money product called LinkAja to replace the e-money products introduced through the LKD program. LinkAja requires a smartphone.

[7] Based on a slightly different definition of mobile money use, which included online purchases and bill payments, the World Bank's Global Findex 2017 found usage in Indonesia to be around 6 percent (Demirguc-Kunt et al. 2018).

services in Indonesia, which can shed some light on the causes of the overall low levels of financial inclusion in the country.

While innovations in digital financial services are being developed rapidly—for payments, remittances, and credit—it seems that many of those who previously were not served by banks still cannot exploit the benefits of digital financial services. Instead, there are signs that the utilization of digital financial services has been more concentrated among the already financially included population.

The rest of the paper is organized as follows. In Section 2, we further discuss the landscape of digital financial services in Indonesia to provide context for the paper. The section presents the digital financial products that we are going to analyze and provides more precise definitions of a number of terminologies that we discuss in the paper. It also provides an overview of the state of digital finance, focusing on e-money. Section 3 describes the Claessens and Rojas-Suárez (2020) methodology of the decision tree. In Section 4, we undertake a price analysis that compares the fees charged for digital financial services offered in Indonesia with those in other selected countries; this analysis provides initial insights as to whether the binding constraints are on the supply or the demand side of the decision tree. In Sections 5 and 6, we assess each of the potential constraints affecting, respectively, the supply of and the demand for digital financial services, in order to determine which are binding. Section 7 provides key lessons and conclusions.

2. The digital financial system landscape: providers and products

The explosion of digital financial services in recent years has brought with it a number of new providers that offer different services, such as payments, loans, and insurance, either individually or as a bundle through specific products (e-money and a BSA, for instance). In a market that is still innovating, the lines between the different types of products are sometimes blurred, and there is not always a clear-cut definition that is uniform.

This paper focuses on analyzing the use of digital financial products for payment and store-of-value services—in particular, the digital financial product that may have the highest potential to expand financial inclusion: e-money. This product has both payment and store-of-value functionalities, though both are somewhat limited. Given the fast-growing adoption of e-money, even among those who do not own and use a bank account, there are reasons to believe that if some constraints were removed, its potential could be unleashed to reach the unbanked population.

Electronic money, or ***e-money***, is a record of funds or value available to a consumer that is stored digitally, whether on a microchip, a prepaid card, a mobile phone, or a computer system. An e-money account belonging to a customer is called an e-wallet. Transactions can be done via a basic mobile phone, a smartphone, a card, an ATM, or an electronic data capture (EDC) device, and the provider of the service can be a bank, a nonbank financial

institution, a mobile network operator (MNO), or an e-commerce platform.[8] As discussed later, many forms of e-money offered in Indonesia lack some important e-money features that are available in many other countries, most importantly the cash-out feature.[9] Although the main functionality of e-money is making payments, by allowing users to have a balance, it also offers store-of-value services, albeit for limited amounts.[10]

As in many other countries, e-money in Indonesia does not require a bank account and is issued by both banks and nonbanks. However, unlike in other countries such as Kenya, where mobile money has flourished using feature phones, in Indonesia, e-money providers typically issue server-based e-money that requires a smartphone,[11] and the market continues to move toward requiring these devices.[12] In Indonesia, the dramatic increase in transactions relying on e-money was spurred by e-commerce, which established e-money as an integral part of the big tech platform ecosystem.[13] One of the most prominent providers is GoJek, a ride-hailing service, which established GoPay, an e-money that was initially intended to let customers pay their drivers within the GoJek network.[14] In recent years, e-money has continued to grow, particularly through nonbank providers.

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[8] Most recently, one of the largest chains of convenience stores in Indonesia, Indomaret, issued its own server-based electronic money, called iSaku, that can be used for payments, transfers within the network, and purchases at participating merchants.

[9] A few other countries have similar restrictions on cash-out services. In India, for example, only providers with a banking license can provide cash-out services.

[10] Electronic money, as discussed in our analysis, includes both server-based and card-based e-money. Card-based e-money is similar to a debit card, in which the value is stored in a chip that is embedded in the card. Users can access their e-wallet by using the card. E-money issued by banks in Indonesia typically uses this technology and requires agents to use EDC devices. Server-based e-money typically does not require a card; instead, users access their e-wallet using a mobile phone. The value is stored, recorded, and managed centrally on the server of the e-money provider. This type of e-money allows customers to transfer money through smartphone other Internet-based applications.

[11] Several attempts to develop MNO-based mobile money failed to take off. As discussed in the analysis, part of the failure can be attributed to an uneven playing field in the regulations that puts MNOs at a disadvantage.

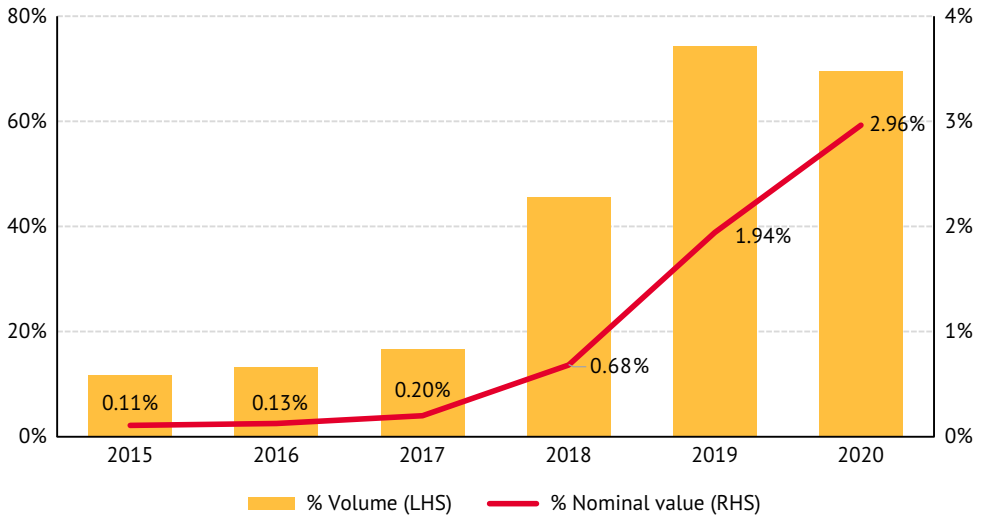
[12] For example, when a consortium made up of state-owned banks and the state-owned MNO introduced its own e-money called LinkAja in 2019, it chose to use server-based e-money that requires a smartphone to replace the feature phone–based e-money previously issued. Before establishing LinkAja, each of the state-owned banks had its own e-money, launched under the LKD program in 2014. The state-owned MNO, Telkomsel, offered the mobile money called T-Cash. Indosat, the second-largest MNO in Indonesia, exited the mobile money market in 2017 after three years. The third-largest MNO, XL Axiata, shut down its mobile money, XL-Cash, in 2020. We discuss the barriers faced by MNOs in entering the e-money market in Indonesia in Box 3. Except for the recent market reentry of Indosat with a feature phone–based mobile money product called IMkas, no major e-money is currently feature phone–based.

[13] The development of e-money in Indonesia seems to follow the mobile financial service model of China, whereby large tech platforms such as e-commerce companies set up their own payment systems to enable their customers to pay for their services (Demirguc-Kunt et al. 2018). For example, the e-commerce giant Alibaba provides its own payment system, Alipay, and customers in China use an Alipay smartphone app to access their accounts. Customers in Indonesia use a GoJek app to access their GoPay accounts. In contrast, in Kenya, mobile financial services are offered mainly by MNOs, and the accounts do not need to be linked to a bank account.

[14] Over time, as GoJek expanded its business model, including food delivery and logistics, it began allowing GoPay to be used for person-to-person and person-to-business transactions. GoPay has now transformed itself into a significant electronic payment service that can be used to conduct transactions both within and outside the GoJek ecosystem, including transactions with brick-and-mortar stores.

This solid growth of e-money providers can be attributed to the regulatory support of Bank Indonesia (BI). In 2020, BI approved 51 e-money licenses (see Appendix 1), an increase of 31 percent compared with 2019, when only 39 companies were approved to operate e-money. Figure 3 shows the rapid increase of transactions using e-money, in terms of both volume and value. Note that the figure includes e-money transactions using both server-based and card-based e-money. Finally, it is plausible that the growth reflects more an expansion at the intensive margin—that is, a subset of the population using more e-money—rather than at the extensive margin—that is, an increase in transactions due to more individuals using e-money.[15]

Figure 3. E-money transaction volume and nominal value as percentage of ATM and debit card transactions, Indonesia, 2015–2020



Source: BI (2021b).
Note: Percentage of volume is on the left-hand side (LHS) axis and percentage of nominal value is on the right-hand side (RHS) axis. Labels on the red line indicate the nominal value of transactions in billions of USD PPP.

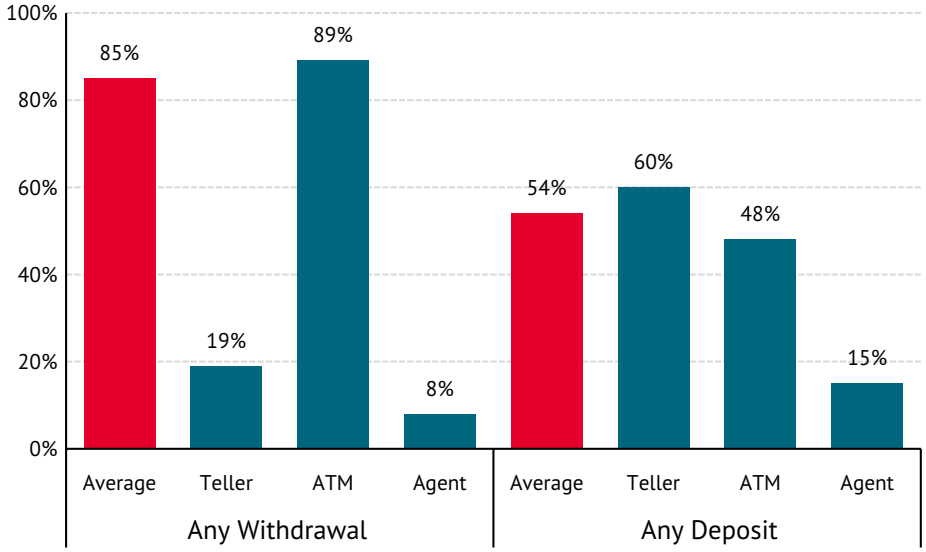
With regard to other digital payment and store-of-value services, in 2018, according to the FII 2018 survey (SNKI and FII 2019), around 36 percent of the adult population owned an ATM card,[16] which is close to the percentage of individuals with a bank account (regular and BSA combined). In contrast, the survey showed that only around 4.7 percent of the adult

[15] Publicly available data do not reveal the number of users. Thus, it is difficult to determine whether an increase in the number of accounts and transactions means a proportional increase in the number of users.
[16] Banks in Indonesia typically do not offer checking accounts (also called "current accounts") to regular savings account customers. The features of checking accounts are targeted to businesses and certain individuals with high transaction needs, and in fact, opening a checking account requires proof of a business license. Thus, checking accounts are very uncommon, and the tradition of making (digital) payments with a card seems to be well established.

population used e-money.[17] Among those who said they had used it, only 60 percent reported having "used it regularly in the past month," although its use has been increasing rapidly.[18]

In terms of usage, ATMs are also the most important channel used to withdraw or deposit money (SNKI and FII 2019). The survey also shows that 85 percent of individuals with a bank account withdrew money at least once in the past six months, and around 89 percent withdrew money through an ATM (Figure 4).

Figure 4. Method of making account withdrawals and deposits, Indonesia, 2018



Source: FII 2018 survey (SNKI and FII 2019).

Table 1 shows the major providers of digital financial services in Indonesia and the services they offer. Three of the banks listed in the table—Bank Mandiri, Bank Negara Indonesia (BNI), and Bank Rakyat Indonesia (BRI)—are state-owned banks. One of the nonbank digital service providers (DSPs) listed, LinkAja, is owned by a consortium of state-owned banks—Mandiri, BNI, BRI, and Bank Tabungan Negara (BTN)—and the state-owned MNO, Telkomsel. The table shows some key differences between the digital payment services offered by banks and nonbank DSPs, and whether they charge users for these services. Nonbank DSPs' services are restricted to payments, transfers between domestic accounts,

[17] Based on a slightly different definition of mobile money use, which included online purchases and bill payments, the World Bank's Global Findex 2017 found usage in Indonesia to be around 6 percent (Demirguc-Kunt et al. 2018).

[18] Payment statistics from BI (2021b) reported that between 2018 and 2019, ownership of app-based and card-based e-money accounts increased by 74.8 percent. The number includes accounts owned by businesses and individuals, and each group can have multiple e-money accounts, so the number is not directly comparable to the percentage of e-money users extracted from the survey.

and deposits (cash-in services), while banks also allow users to withdraw money (cash-out) and conduct international transfers, with some restrictions.[19]

Table 1. Major players in digital financial payment and store-of-value services, Indonesia

Service	DSPs					Banks				
	GoJek	OVO	LinkAja	Dana	ShopeePay	BCA	Mandiri	BNI	BRI	CIMB Niaga
Open account	Free	Free	Free	Free	Free	Paid	Free	Free	Free	Paid
Annual admin	Free	Free	Free	Free	Free	Paid	Paid	Paid	Paid	Free
Internal transfer	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free
External transfer	Paid	Paid	Paid	Paid*	Paid	Paid	Paid	Paid	Paid	Paid
International transfer	N/A	N/A	N/A	N/A	N/A	Paid	Paid	Paid	Paid	Paid
Withdraw from own ATM	N/A	N/A	N/A	N/A	N/A	Free	Free	Free	Free	Free
Withdraw from other ATM, domestic	Paid*	N/A	N/A	N/A	N/A	Paid	Paid	Paid	Paid	Paid
Withdraw from other ATM, international	N/A	N/A	N/A	N/A	N/A	Paid	Paid	Paid	Paid	Paid
Top up card or account	Paid	Paid	Paid	Paid	Paid	Free	Free	Free	Free	Free

Source: Compiled by authors from banks'/providers' websites (see Appendix 2).
Note: BCA = Bank Central Asia; N/A = not applicable. * GoJek has only started recently to allow ATM-based withdrawal in collaboration with BCA.[20]

To summarize, in terms of reaching the goal of financial inclusion, e-commerce–based e-money, as well as bank-issued e-money such as LinkAja, has the potential to introduce digital payment services to a substantial segment of the adult population who have smartphones, some of whom do not currently use bank accounts or e-money—around 31.7 percent of financially excluded adults own smartphones, according to our estimate from FII 2018 data (SNKI and FII 2019).

Appendix 3 completes the landscape section by discussing the key stakeholders and regulations that affect digital financial inclusion in Indonesia.

[19] E-money issued by banks can be cashed out under some conditions. Users must be registered, and registration requires additional know-your-customer documents. Most banks allow only agents that meet certain criteria—usually measured by their performance—to provide cash-out services. Nonbank DSPs must apply for a separate permit to offer cash-out services. Section 4 discusses more extensively the regulations governing this issue.
[20] Recently, verified and premium Gopay users can withdraw funds from ATMs if have BCA accounts, per Gojek's official statement accessed on July 19th 2021, from: https://www.gojek.com/blog/gopay/cara-tarik-tunai-tanpa-kartu-bca/.

3. Methodology: identifying binding constraints using the decision tree approach

This section discusses the application of the decision tree methodology to analyze binding constraints on the use of digital payment and store-of-value services. The methodology follows Claessens and Rojas-Suárez (2020), adapting the growth diagnostics approach developed by Hausmann, Rodrik, and Velasco (2005) and Hausmann, Klinger, and Wagner (2008). The details of the methodology are further described in Appendix 4.[21]

As previously noted, the goal of this paper is to identify the binding constraints on financial inclusion, focusing on digital payment and store-of-value services. The binding constraints are the main limiting factors that are currently impeding the development of financial inclusion in the country, and whose relaxation would yield substantial improvements in inclusion. The decision tree starts by acknowledging that the use of digital payment services is determined by supply and demand factors. Under each branch of the tree, the first-tier nodes represent factors that, based on existing theories and empirical literature, are identified to be constraints on the supply of and the demand for digital financial services. Again, based on the existing literature, each of these factors is known to be determined or affected by additional factors, which are listed in the second-tier branches.

We see that on the supply side, the three factors that are listed as potential constraints are the market structure of banks and DSPs, insufficient digital infrastructure, and low appropriability of returns (see Figure 5). The three factors that can potentially constrain the demand for digital payment and store-of-value services are perception of low benefits of usage, low trust in providers, and income and geographical factors.

The market structure of providers may limit the availability of digital payment and store-of-value products to only a narrow segment of the population. For example, limited competition can prevent providers from offering a wide range of services to large segments of the population. Increased competition has the potential to encourage providers to expand their services at the extensive margins as well as improve their services to existing users. Market structure is also determined by the regulatory environment—when the regulations treat alternative providers of similar products differently, it is likely that the disadvantaged providers may not be able to provide services at prices that are low enough to attract users.

Insufficient digital infrastructure, in terms of both quantity and quality, may prevent providers from reaching the population segments that will benefit from financial inclusion. Low availability of reliable digital infrastructure and high prices for usage of this infrastructure indicate constraints on the supply side, which can be a result of several factors, including limited competition and entrenched lack of interoperability between providers.

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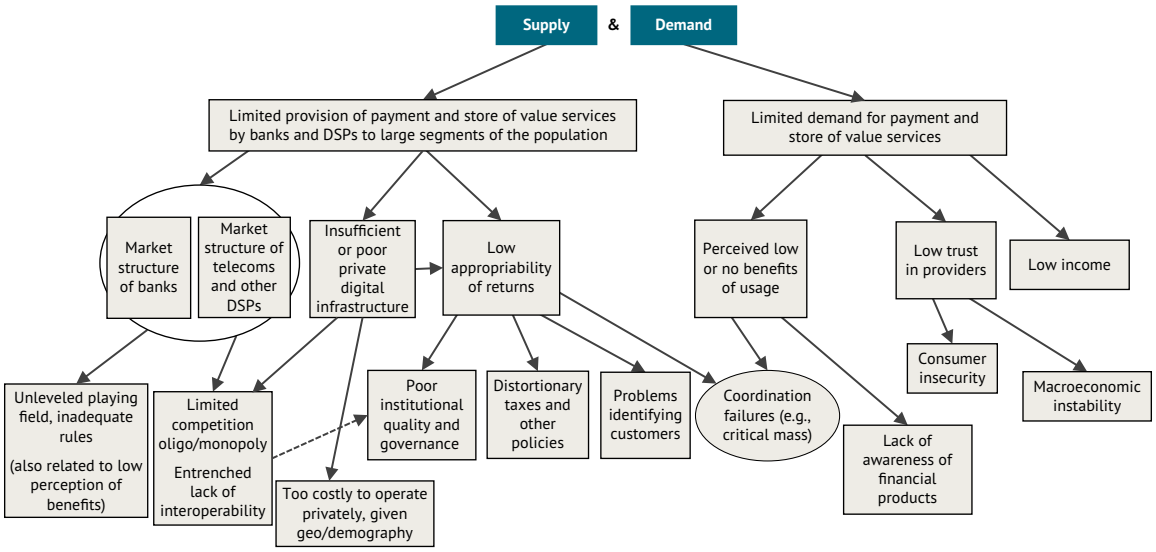
[21] Claessens and Rojas-Suárez (2020) provided two different decision trees—one for payment and transfer services and one for store-of-value services. The main difference between the two trees is the presence of two additional nodes in the store-of-value services tree that are not in the other tree, namely, financial literacy and macroeconomic instability.

Figure 5. Decision tree for payment and store-of-value digital financial services



Source: Claessens and Rojas-Suárez (2020).

The third supply-side factor that can constrain the supply of digital payment as well as store-of-value services is the low appropriability of returns. Providing digital services to the unbanked population may have high social returns. However, providers may find it difficult to appropriate these returns, and low private returns may discourage providers from entering the market. The difficulties in appropriating the returns can be due to four factors, which constitute the second-tier nodes of the supply branch. First, poor quality of institutions and governance may hinder the ability of providers to appropriate returns. Second, there could be distortionary policies or taxes that reduce profits and discourage providers from participating. Third, there may be difficulties in verifying the identity of customers. This know-your-customer (KYC) issue, both necessary as internal provider policy and imposed by regulations, may increase costs for both providers and customers. Finally, there could be coordination failures between the supply side and the demand side whereby, on one hand, providers are discouraged from entering the market due to the lack of a critical mass of users, and on the other hand, large segments of the population are reluctant to take up digital payment or store-of-value products due to lack of either agents that can provide the services or counterparts to transact with.

Returning to the first-tier branch on the demand side, the first factor that can limit demand is the perception that using digital products carries low or no benefit. For instance, to continue with the example of coordination failure above, when there are only a few agents available to provide digital payment or store-of-value services, customers may not find it worthwhile to take up these products. Lack of awareness regarding available financial products also causes a perception of low or no benefits.

The next factor that can affect demand is low trust in providers, which makes customers less likely to demand the products. Low levels of trust can stem from past experience with fraud, other sources of consumer insecurity, or macroeconomic instability. Because households' usage of financial services for store-of-value purposes is usually associated with larger monetary amounts than their usage for making payments, consumer insecurity and macroeconomic instability may be more important factors in the decision tree for store-of-value services than for payments.

Finally, the last factors that can constrain demand are low income and geography. For the segment of the population with very low incomes, even low prices of digital payment or store-of-value services can prove to be prohibitive. In countries with large geographical diversity, like Indonesia, there may be pockets of remote areas where high transaction costs restrain customers from demanding the services.

We apply the four principles proposed by Hausmann, Rodrik, and Velasco (2005), when possible, to each branch and sub-branch of the tree. The first principle is to consider the (shadow) price of the services to distinguish between supply and demand constraints, as low usage of services can be a result of either or both. High service fees indicate that providers are willing to provide only a limited quantity of services, and that only for a high price. When the price is high and the quantity of digital finance usage is low, then the constraint is on the supply side. On the other hand, when both the price and the usage are low, it is very likely that the binding constraint is on the demand side.

The second principle indicates that any movement in a constraint that is binding should produce significant movements in the objective function; that is, when a binding constraint is relaxed, usage of digital finance will likely increase significantly. The third principle states that if agents in the economy attempt to overcome or bypass a constraint, that constraint is probably binding. Any evidence of agents who are willing to incur additional risks or costs in order to circumvent a constraint provides an argument that the constraint is binding. Finally, the fourth principle suggests that agents who are less affected by a binding constraint will be more likely to thrive, and vice versa.

To proceed with the analysis, the first step we take is to look at prices of the relevant digital financial services for which data are available (Section 4). The price analysis will offer key signals that guide us in the search for binding constraints. We will then analyze each branch of the decision tree, both on the supply side (Section 5) and on the demand side (Section 6), using a set of indicators.

4. Prices for digital payment and store-of-value services

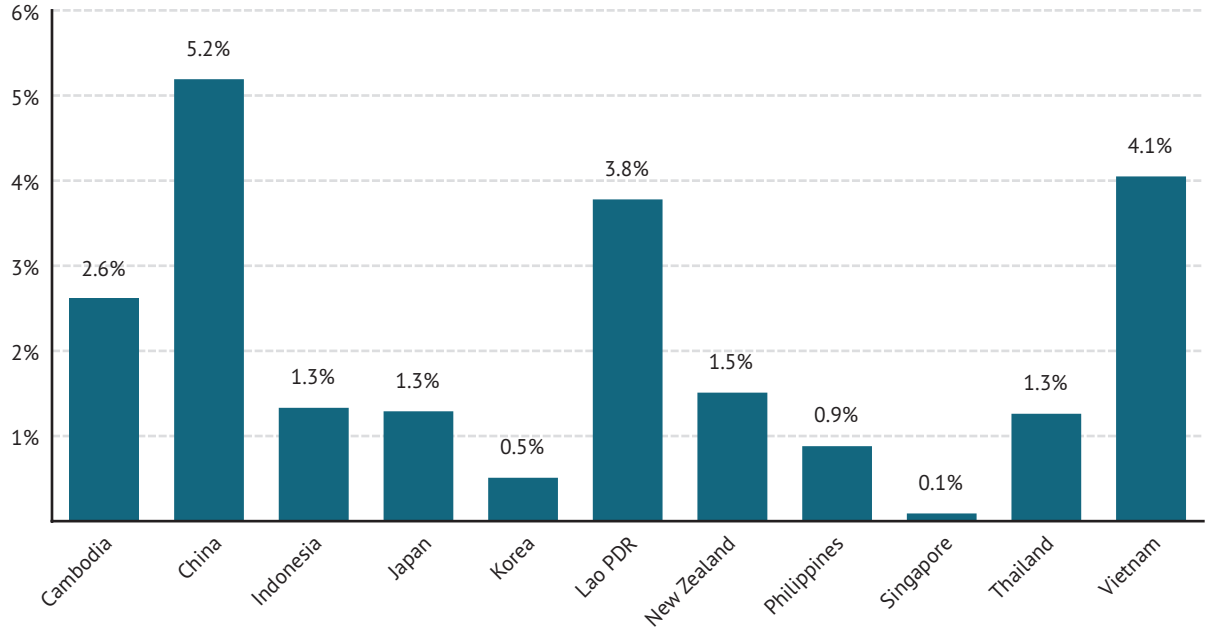
We start our analysis by examining the prices that are relevant for usage of digital payment and store-of-value services. We begin by looking at fees charged for using an ATM, which would be a good benchmark for cross-country comparisons, given the widespread use of ATMs not only in Indonesia but also in other countries. We then look at fees charged for use of an e-wallet, including external transfer fees and withdrawal fees. It is worth noting that ATM fees are also relevant for e-money, as many users may withdraw their funds via ATM.

Although we focus on e-money, it may be useful to compare this product with what may currently be the most popular digital payment product in Indonesia, namely, ATM cards (or debit cards in general). Indeed, before the advent of e-money in Indonesia, payments using an ATM card were the only digital payments available. Based on the data from SNKI and FII (2019), around 36 percent of the adult population owned an ATM card in 2018, which is close to the percentage of individuals with a bank account (regular and BSA combined). ATMs are also the most popular digital financial services used to withdraw or deposit money. From the same data, around 85 percent of individuals with a bank account withdrew money at least once in the past six months, and around 89 percent of them withdrew money using ATM cards (SNKI & FII, 2019). ATM cards are arguably also popular in other countries, a fact that allows us to assess the relative prices of ATM cards in Indonesia and other countries. Benchmarking with other countries in ATM card prices and usage gives us a perspective on how the price of digital financial services affects the use of such services.

We begin by looking at the cost associated with the use of an ATM. Figure 6 shows the average ATM fees to withdraw money from a regular savings account in Indonesia and in selected other countries as a percentage of daily GNI per capita (converted to US dollars and adjusted for purchasing power parity). The graphs show that while the fee is lower in Indonesia than in China, Laos, and Vietnam, it is still higher than in neighboring Malaysia, the Philippines, and Singapore. Note that while this fee tells us the market price of withdrawing money from an ATM, there are important indirect costs—such as access to the ATM itself, typically measured as the distance to the closest ATM or the number of ATMs per population—that determine the shadow price of ATM services. These nonpecuniary costs are relevant for both savings account users and e-money users who wish to withdraw cash from an ATM. Note that because e-money issued by nonbank DSPs does not have a cash-out feature, users of these types of e-money need to have a bank account to access an ATM.

The growth in the penetration of ATMs in recent times is likely to have lowered these indirect costs. The number of ATMs—accessible by people with a regular savings account and by those whose BSAs come with ATM cards—grew from around 13 per 100,000 population in 2010 to 55 in 2018 (World Bank 2020). Further, the interoperability between different ATMs that now allows virtually any bank card to be able to withdraw from any ATM is also growing.

Figure 6. Average bank ATM withdrawal fee as percentage of daily GNI per capita, 2020, Indonesia and selected comparator countries

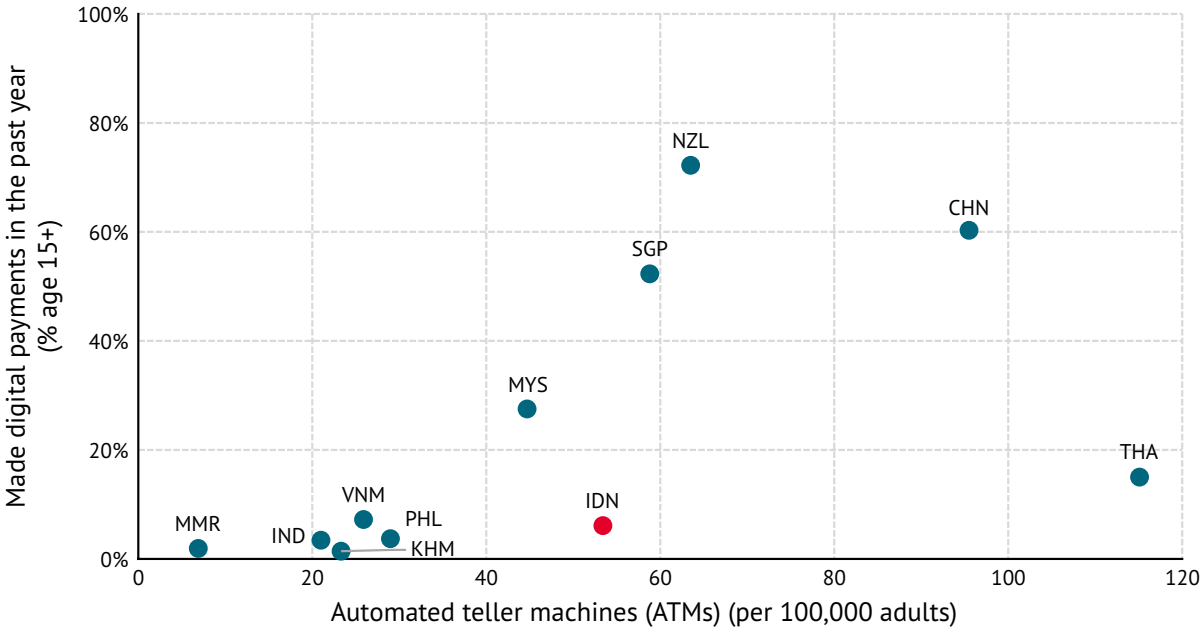


Source: Compiled by authors from providers' websites (see Appendix 2).

However, we can see in Figure 7 that the number of ATMs per population is still lower in Indonesia than in a number of neighboring countries, and it corresponds to a lower percentage of the population making digital payments.

In terms of geographical disparity, Figure 8 shows that the number of points of service for regular bank accounts and BSAs—including banks, ATMs, and branchless banking agents—is uneven across the country, implying that the costs are even higher for populations outside Java and other urban centers.

Figure 7. ATMs per population and usage of digital payments, Indonesia and selected comparator countries, 2020



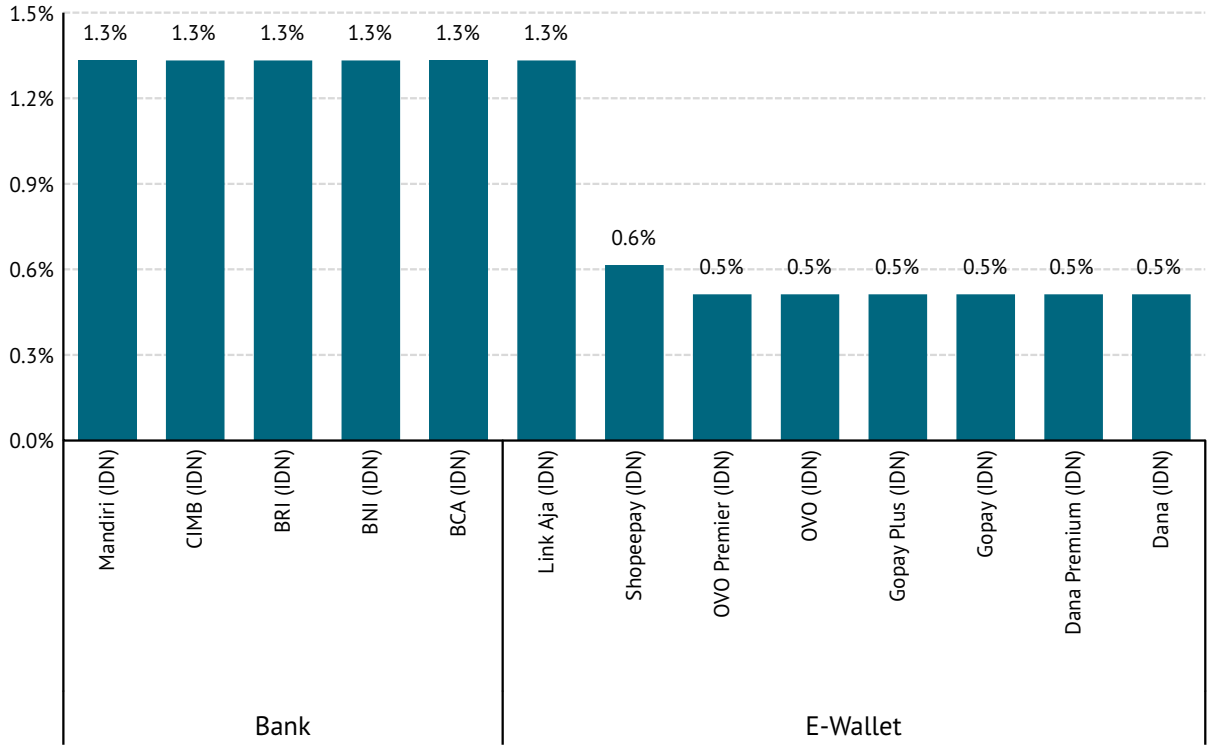
Source: World Development Indicators (World Bank 2020) and Findex 2017 (Demirguc-Kunt et al. 2018).
Note: India, Cambodia, and Viet Nam are the correct order of countries sorted in ascending order of ATM per 100,000 adults.

Figure 8. Number of points of service for BSAs, including banks, ATMs, and branchless banking BSA agents, Indonesia, 2018

Source: FII 2018 (SNKI and FII 2019).

For e-money users, one of the most relevant prices is the e-wallet transfer fee. Figure 9 shows the cost of transferring funds from a bank account or from an e-wallet issued by a nonbank DSP in Indonesia. The cost shown represents the fee that a user must pay to transfer funds to an account outside the same bank (for bank-issued e-money) or e-commerce platform. Note that for nonbank DSPs the transfer is always to a bank account and not to an e-money account in a different platform. The figure shows that for most nonbank DSPs except LinkAja, transferring funds outside the platform is cheaper than from a bank account.

Figure 9. External transfer fees for e-wallets of selected banks and e-money providers as percentage of daily GNI per capita, Indonesia, 2020

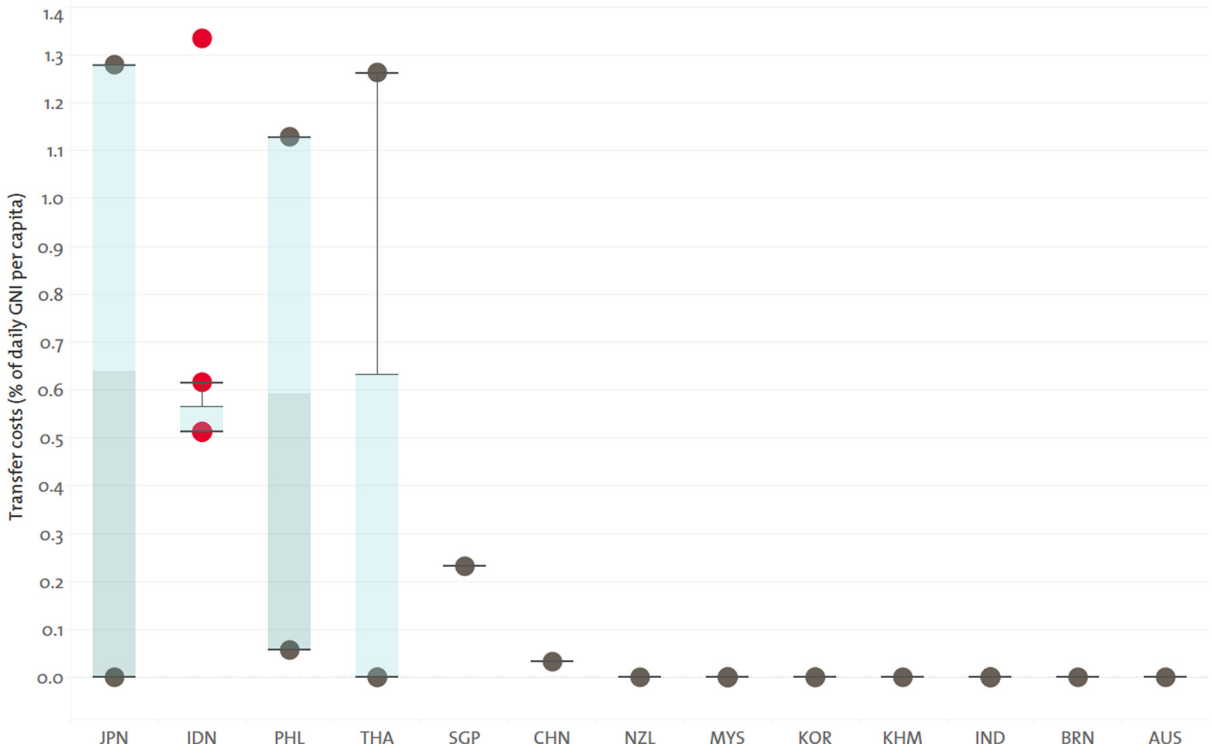


Source: Compiled by authors from providers' websites (see Appendix 2).

Figure 10 shows the fees for transferring funds from an e-wallet issued by a nonbank DSP in selected countries.[22] This is the cost that a user must bear to transfer funds from an e-wallet to an account outside the e-wallet's platform. For Indonesia, the transfer always means a transfer to a bank account. The figure shows that the fee for transferring funds in Indonesia is comparatively high.

[22] For most countries, we have data from one provider, except for Japan, the Philippines, and Thailand, from which we have two. For Indonesia, the data are from the major nonbank DSPs. Because the cost is nominal, we use the cost per 1,000 transactions, converted to US dollars and shown as percentage of daily GNI.

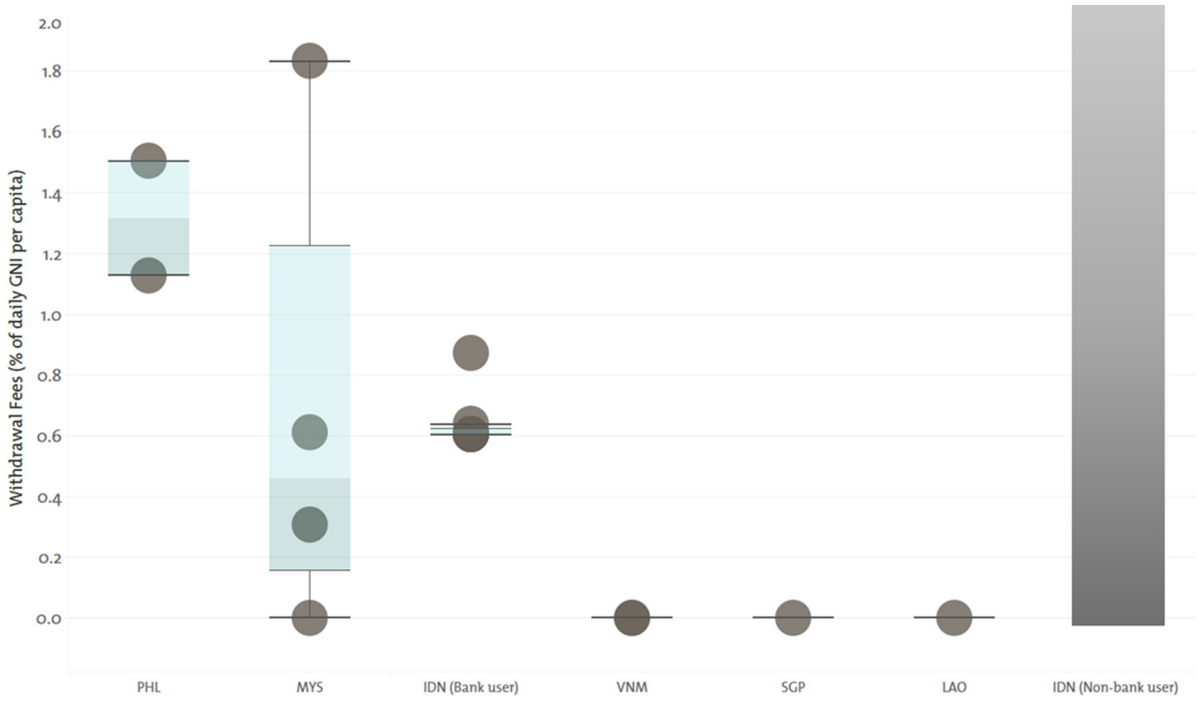
Figure 10. External transfer fees for e-wallet transfers, as percentage of daily GNI per capita, Indonesia and selected comparator countries, 2020



Source: Compiled by authors from providers' websites (see Appendix 2).
Note: For the first four countries in the figure, the box represents the 25th through 75th percentiles, and the large dots represent the outliers. Only countries with available data are shown in the figure.

Figure 11 shows the fees for withdrawing money from a nonbank DSP across countries. The bar for Indonesia represents the fact that in Indonesia nonbank DSPs are not allowed to perform cash-out services. Along with the previous graph, this suggests that the binding constraints on the expansion of e-wallet digital payment services might be on the supply side of the decision tree.

Figure 11. External withdrawal fee from e-wallet, as percentage of daily GNI per capita, Indonesia and selected comparator countries, 2020

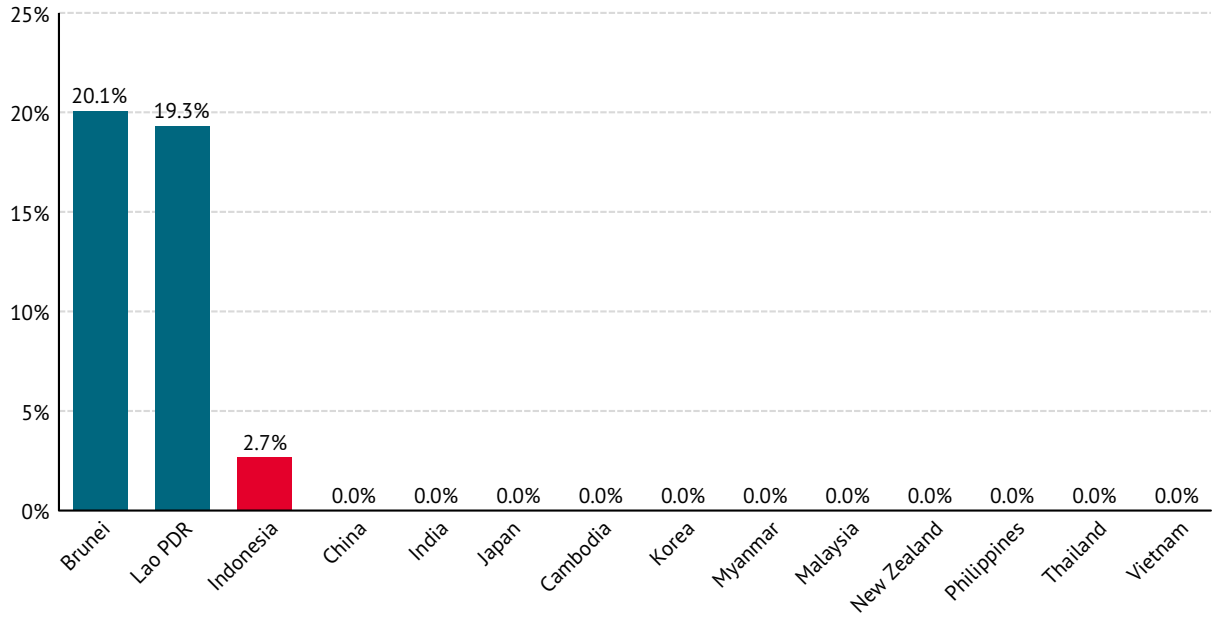


Source: Compiled by authors from providers' websites (see Appendix 2).
Note: In Indonesia, e-money issued by nonbank DSPs cannot be cashed out. Thus, we calculated two prices for Indonesia. For people with bank accounts, the cost of withdrawing cash from their e-wallet consists of the cost for transferring to their bank account plus the cost of withdrawing cash from that bank account. For those without bank accounts, no cashing out is allowed, which is represented by the dark vertical bar in the figure. For the first four countries in the figure, the box represents the 25th through 75th percentiles, and the large dots represent the outliers.

The fees related to the use of ATMs and e-wallets thus far point to binding constraints on the supply side, which potentially limit the use of e-money to provide payment as well as store-of-value services. The next set of figures shows the fees that are more relevant to traditional store-of-value services provided by savings products.

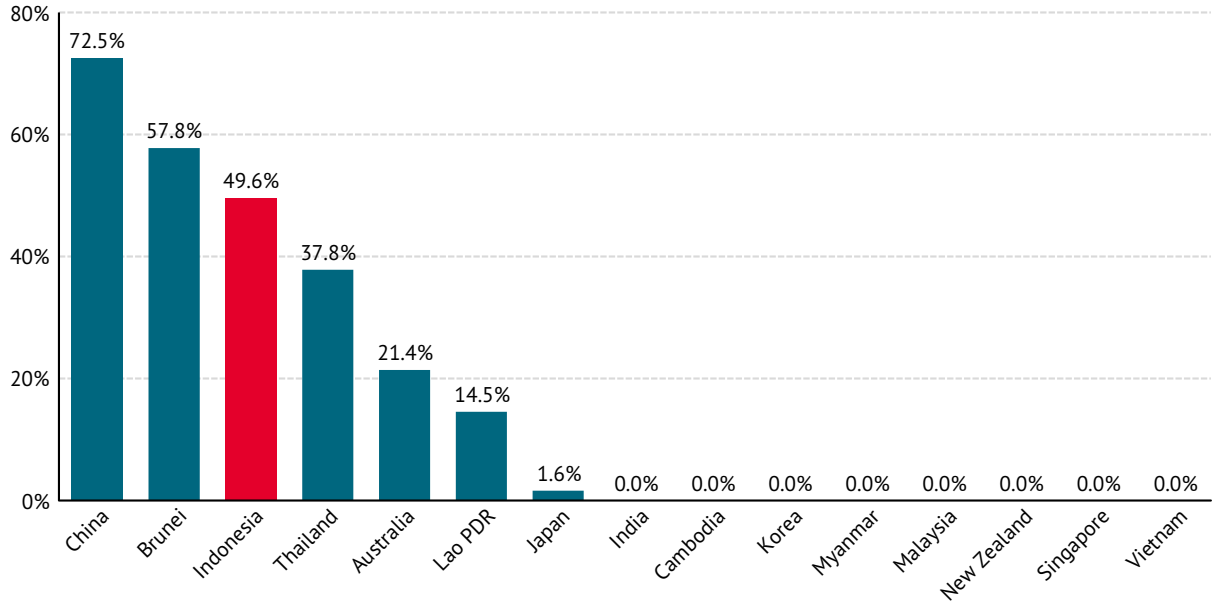
Figure 12 shows the average fee for opening a bank account, and Figure 13 shows the average fee for maintaining a regular savings account. Again, note that there are other, nonmonetary costs associated with opening an account, such as access to the financial institution and fulfilling application requirements related to KYC issues, that are not included in this analysis. Fees charged in Indonesia are higher than in most of the other countries shown in Figures 12 and 13, again signaling that the binding constraints are on the supply side.

Figure 12. Average fees to open a regular savings account, as percentage of GNI per capita, Indonesia and selected comparator countries, 2020



Source: Compiled by authors from providers' websites (see Appendix 2).

Figure 13. Average annual administrative fee to keep a bank account, as percentage of daily GNI per capita, Indonesia and selected comparator countries, 2020



Source: Compiled by authors from providers' websites (see Appendix 2).

To sum up, the fees for using regular savings accounts and e-wallets point to binding constraints on the supply side that prevent providers from offering these services affordably. We use these findings to guide our decision tree analysis in the following sections.

5. Supply-side constraints on payment and store-of-value services

We will start our analysis by going through each node of the tree, keeping in mind the observed (relatively high) fees discussed above. In keeping with the decision tree presented in Section 3, we will first focus on whether some of the aspects of the market structure of banks and other DSPs impose a binding constraint on the supply side. We then discuss whether digital infrastructure is a binding constraint and evaluate whether there are problems with investors' appropriability of returns. Each of these nodes has different subsections that address additional relevant factors.

5.1. Market structure of banks and nonbank digital service providers

The high fees charged for the use of a financial service and the limited availability of the product to a large segment of the population may be driven by a problematic market structure in which imperfect competition and/or regulation drives prices up. We consider two key factors characterizing the market structure dynamics. First, the regulatory environment determines whether the existing regulations treat all providers offering the same services the same way or give rise to an unlevel playing field between banks and other DSPs. Second, the degree of competition between the providers may also impact the provision of digital financial services; limited competition occurs when the number of providers is small. The resulting limited competition can, in turn, cause a lack of interoperability between digital networks that harms customers. These two factors appear as second-tier nodes under market structure in the decision tree, and we assess each node using the price analysis and the other methodology principles to determine whether each constitutes a binding constraint.

5.1.1. Unlevel playing field created by regulations

As discussed in Section 2, the current regulatory environment governing digital financial services in the country reflects the combination of a set of new regulations designed to specifically address the relatively new industry and the legacy of existing regulations governing the traditional banking and financial industries. In this section we identify three key issues stemming from the current regulations that create an unlevel playing field and, in turn, are likely to affect fees, both directly and indirectly, and limit the supply of services. The first issue is the restriction on cash-out services (cash withdrawals) that is imposed on some, *but not all*, e-money providers. The second issue is the different restrictions on and policies governing how different providers can recruit their agents. The third one is the different regulations on how providers can conduct their KYC processes of verifying their customers' identities. Each of these may limit providers' ability to increase the services they offer existing customers as well as to expand their markets on the extensive margins, thereby restricting the scope for financial inclusion. Next, we discuss how these key issues may create an unlevel playing field and whether the unlevel playing field creates a binding constraint for the expansion of digital financial services.

Restriction on cashing out and other services. BI regulations prevent nonbank digital financial services providers' agents from offering cash-out services. In order to be able to provide cash-out services, e-money issuers must apply for a completely separate license as money remitters, whereas branchless banking agents, which also provide services for e-money transactions, are exempted from this requirement.[23] In addition, nonbank providers wishing to provide person-to-person (P2P) transfers through their network of agents must have each agent individually apply for a money remittance license, which is a burdensome task. In fact, the requirement for a separate license may be one of the barriers preventing MNOs from getting a foothold in the e-money market in Indonesia.[24] These regulations prevent nonbank DSPs from offering full services, which limits their benefits to potential customers and potentially curtails the demand for the products.[25]

Users of a bank-issued e-wallet can withdraw cash from the bank's agents as well as from the bank's ATMs. For most nonbank e-wallet users, the only way to withdraw cash from their account is to send the money to a bank account and then withdraw money from that account using the bank's ATM. This regulation means that users without bank accounts have no easy way to take cash out of their e-wallet. This obviously has some implications on the uptake of the product itself, as customers may perceive fewer benefits due to the service limitations. We analyze this last issue on the demand side in Section 6.1.

Further, the extra step for withdrawing money entails other costs, beyond the direct cost of the withdrawal fee. The necessity of taking these additional steps could prove to be wasteful in both time and money for users, especially given that the process has to be done repeatedly. In conventional (bank) settings, the difficulty of cashing out from a bank could be the product of a lack of ATMs in a particular area. However, an increased penetration of ATMs would not solve the problems created by the restriction on cash-out services from e-wallets. Research has in fact suggested that robust cash-out (and cash-in) services may be necessary for the growth of noncash payment products such as e-money (Hernandez 2019). Where cash is still the dominant method of payment, such as in Indonesia, e-money users need to be able to withdraw cash easily to perform transactions that cannot be done digitally.[26]

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[23] Branchless banking agents are managed by the local branch of the bank, which is allowed to perform all kinds of transactions.

[24] If an MNO has a remittance license, to be able to take advantage of its network of airtime suppliers, each supplier must apply for an individual remittance license (CGAP 2010). As discussed in Section 2, other barriers to entry for MNOs include the requirement to include funds transfer as a business activity in the corporate articles, which proves to be prohibitive for some publicly listed MNOs.

[25] One argument put forward to justify the regulation was consumer security. Unlike money in savings accounts, the funds stored in e-money are not protected by any kind of deposit insurance. Partly because of that, the functionality of e-money in Indonesia is geared toward payment services, in which the amounts involved are relatively small, rather than store-of-value services. Ability to cash out may cause users to keep a higher balance in their e-wallet, turning it, functionally, into a savings product. Granted, this argument is at odds with the government's push to digitize social assistance so that the poor population can start saving by not withdrawing the full amount of the social assistance payment, in effect treating the social assistance e-wallet as a savings account. More important, this reasoning contradicts the goal of using e-money to increase financial inclusion.

[26] E-money users also need to be able to top up their e-wallets conveniently at points of service. This means easy access to agents that can provide cash-in services is also important, as discussed next.

Recently, GoPay has formed a strategic alliance with one of the largest private banks, Bank Central Asia (BCA), that allows GoPay users to withdraw funds from the partner bank's ATM without administrative fees and without a requirement that users have an account at BCA. BCA charges a withdrawal fee of 5,000 Indonesian rupiahs (IDR; about US$0.35). This fee, however, is lower than the withdrawal fee for other banks' debit cards when using BCA's ATM, which is around IDR 6,500. Previously, users of a non–BCA e-wallet (or bank) service would have to go through the extra step of moving their e-wallet balance to their bank account first, and then withdrawing the money afterwards.[27]

Applying principle 3 of the decision tree methodology to identify a binding constraint, the discussion above shows a clear example of actors finding a way to circumvent the constraint. There are several reasons why BCA may benefit from the partnership with GoPay. First, it may be able to tap into the huge network of GoPay users, leading to a significant increase in the usage of the BCA ATM network.[28] Second, since BCA is allowed to charge a fee for these withdrawals, the partnership can be lucrative for both parties. This is, however, an exception to a system in which generally, individuals find severe difficulties in withdrawing money from e-money services, negatively impacting their customer experience.

Finally, on top of the shadow costs, direct costs are also typically incurred by e-wallet users transferring funds to banks. Generally, transferring to a bank incurs a small transfer fee. While this fee is similar to an interbank transfer fee in a conventional setting, the relative availability of ATMs in recent years has made bank accounts more attractive than e-money options, at least in terms of cash-out services.

The combination of the above-mentioned shadow and direct costs for cashing out may well explain the reluctance of Indonesian users to store high values of funds in their e-wallet accounts, and hence the low prevalence of e-wallet use for nonpayment purposes in the Indonesian market.

Note that cash-out restrictions do not apply to BSAs. BSA customers can withdraw cash at branchless banking agents and, if the BSA account comes with an ATM card, they can withdraw cash from an ATM. Thus, this constraint is potentially binding for nonbank e-money services, but not for BSAs.

Restrictions on and policies governing agents' recruitment. At least two opposing forces are at work to create an unlevel playing field in agent recruitment. On the one hand, under the branchless banking model, banks are allowed to recruit agents to provide digital financial services with different requirements from those imposed on nonbank DSPs. In particular, BI Regulation No. 20/6/PBI/2018 provides that while digital finance agents can

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[27] The extra step of cashing out—that is, having to transfer the funds to a bank first—is not the only shadow cost associated with the process. There is also the factor of delayed receipt of the funds, since the funds transferred to a bank are not received instantly in many cases. While OVO users can transfer funds to their bank accounts instantaneously, other users (e.g., GoPay and ShopeePay users) are subject to a wait of one or more working days before the funds are successfully obtained by the receiving bank account.

[28] Unfortunately, we cannot find data on any increase in GoPay users resulting from this new collaboration.

be either individuals or legal entities, only banks can recruit individuals to be their agents. These agents serve as individual contractors and typically add digital financial services to their existing businesses. This means that a small and informal corner shop that meets a bank's internal requirements can serve as a bank agent. Nonbank DSPs, in contrast, can establish partnerships only with legal entities, which typically means larger and more formal stores or businesses; this substantially limits their expansion. Data from the country's Village Potential Statistics 2018 show the existence of around 3.2 million small stores, including informal ones, of which only around 43,000 (about 1.3 percent) are legal entities or formal businesses. Exceptions are given to "incidental agents," such as GoJek drivers. What this means is that agents of banks can have farther reach in the communities of potential users (especially low-income consumers and those in rural areas) while agents of nonbank DSPs are more likely to operate in urban and semi-urban areas. To the extent that the acquisition of new agents helps banks expand on the extensive margin, this restriction seems to disadvantage nonbank DSPs.

Further, this restriction means that users of e-money issued by nonbank DSPs, especially in rural areas, are facing higher shadow prices to conduct payment transactions because their agents are less likely to be found nearby, and consumers have to cover more distance to reach them.

Since the branchless banking agent program was launched in 2015, the number of bank agents has grown from around 60,000 in the first year to more than 1 million in May 2019 (BCG 2019).[29] However, despite this apparent success, transaction volume is low, with a median of 4 transactions per agent per day in 2017, compared with 15 in Pakistan and 30 in Bangladesh, Tanzania, and Uganda. Profitability is low (as further discussed in Section 5.3), and more than 30 percent of agents are dormant, having done no business at all after being recruited. A study conducted in 2018 on the harmonization of BSA and e-money regulations suggested that at the branch level, the majority of bank managers find branchless banking agents to involve too much cost for low returns.[30] Regulation governing the exclusivity of agents, discussed in Box 1, however, seems also to be working in favor of banks.

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[29] The other policy that affects growth in the number of agents, favoring banks, is the policy to use agents to disburse government social assistance. Since 2018, state-owned banks have been given mandates to use their existing agents and recruit new agents to disburse social assistance electronically.

[30] The study, commissioned by the country's Financial Services Authority (Otoritas Jasa Keuangan, or OJK) and BI, aimed to provide input on harmonizing the often conflicting regulations of the LKD e-money program, which is under BI and the BSA program (Laku Pandai). Harmonization of the regulation on agents is needed to improve the efficiency and effectiveness of LKD and Laku Pandai implementation, in order to support achieving the national financial inclusion target.

Box 1. Exclusivity of agents

By regulation, branchless banking agents in Indonesia are exclusive to a bank, allowing banks to invest in their agents without fearing that other banks will free ride on the investment. This regulation may have impacts on the competition between banks over e-money as well as other services offered, such as savings and transfers. As discussed above, nonbank DSPs are barely involved in the market for e-money in rural areas, partly because of restrictions on the types of agents they can recruit. Indeed, one of the arguments for exclusivity is the difficulty of finding qualified agents in some areas, an issue that potentially can be addressed by relaxing the restrictions on agent recruitment.

For nonbank DSPs, there is no regulation that imposes exclusivity between DSPs and the respective e-commerce platforms. Exclusive collaborations are formed for commercial reasons, whereby DSPs have all the incentives to be the sole payment providers for e-commerce platforms and can negotiate terms that are acceptable to both parties. Exclusivity matters less for users, who can easily download apps for different payment platforms.

The restrictions on agent recruitment are also related to coordination failures, a potential constraint that we will expand on later. Loosening the restrictions to allow nonbank DSPs to recruit individual agents in communities with unbanked populations is expected to spur nonbank DSPs to enter the market when there is a critical mass of users. At the same time, potential users may not be interested in taking up the new financial products unless there are enough points of service where they can perform transactions. Limiting the type of agents that can operate in the community—including those who perform door-to-door services, such as GoJek drivers—may prevent a critical mass from forming.[31] However, even if these types of agents are allowed to operate in the communities, the restriction on cash-out services, discussed earlier, will likely still prevent large gains in uptake.

Unlevel playing field in KYC processes. The need for providers to adequately identify customers in order to fulfill regulatory as well as internal requirements is an additional constraint holding down the growth of digital payment services at the extensive margin. As in many countries, the KYC process in Indonesia is operated under a tiered system in which the document requirements depend on the services offered or the risk involved (Gelb and Castrillón 2019).

For example, unregistered card-based e-money does not require any identification. Basic payment accounts with GoJek and OVO require applicants only to download the respective apps on their smartphones and fill in their names and email address in the online application form. However, in order to get more types of services, such as the ability to carry a higher balance, make transfers to bank accounts, and cash out at bank ATMs without a card, the

[31] The story about the expansion of GoJek ride-hailing services and GoPay payment in urban areas in Indonesia is indeed an example of the application of principle 2: loosening of a constraint that resulted in a huge increase in uptake of a new digital payment product.

requirements are more stringent. Upgrading to these "premium" accounts requires that the applicant also supply an official national identification card—a Kartu Tanda Penduduk (KTP) containing name, birthplace and birthdate, and address, or e-KTP, the electronic version of KTP containing the national identity number (NIK) that can be linked with central storage where verified fingerprint data are stored. Opening other services, such as a BSA, also requires a KTP and a paper application form. Regular savings accounts, in addition to requiring more documents, typically also require users to meet face-to-face with the bank. Table 2 summarizes these requirements.

Table 2. Requirements to open an account, Indonesia, 2020

Requirement	BSA (Laku Pandai)	Regular saving account	Card-based e-money	Server-based e-money	Premium server-based e-money
Paper application form	✓	✓			
Online/app-based form				✓	✓
Official identification	✓	✓			✓
Tax identification number (Nomor Pokok Wajib Pajak, or NPWP)		✓			
Minimum deposit		✓			
Card purchase fee			✓		
Self-verification (photo-or video-based)					✓

Source: Compiled by authors from banks' and DSPs' websites (see Appendix 5).

We use two measures as indicators of whether the KYC process constitutes an important constraint. First, we consider the costs of onboarding of customers, merchants, and agents into the network; among these, the cost of identity verification against the civil registry database is an important one. The second indicator is the time it takes for the onboarding process, where again, identity verification is an important component. Table 3 summarizes the cost and time needed to conduct the KYC process for e-money, a BSA, and a BSA targeted for social assistance.

Table 3. Costs and time for KYC process

Category	Nonbank e-money	BSA	BSA for social beneficiary
Cost of verifying customer's ID	IDR 1,600–IDR 16,000 (US$0.11–US$1.10)	IDR 6,200 (US$0.43)	IDR 400 (US$0.03)
Cost of verifying agent's/merchant's ID	IDR 3,000–IDR 32,000 (US$0.21–US$2.20)	IDR 1,650 (US$0.11)	IDR 1,650 (US$0.11)
Cost of onboarding customer	IDR 1,600–IDR 16,000 (US$0.11–US$1.10)	IDR 13,800–IDR 35,000 (US$0.96–US$2.43)	IDR 24,000–IDR 64,000 (US$1.66–US$4.44)
Cost of onboarding agent/merchant	IDR 4,500–IDR 115,000 (US$0.31–US$7.97)	IDR 170,000–IDR 195,000 (US$11.78–US$13.52)	IDR 170,000–IDR 195,000 (US$11.78–US$13.52)
Total cost	IDR 10,700–IDR 179,000 (US$0.74–US$12.41)	IDR 191,650–IDR 237,850 (US$13.28–US$16.49)	IDR 196,050–IDR 261,050 (US$13.59–US$18.09)
Time for onboarding customer	Up to 2 days	Up to 14 days	Up to 60 days
Time for onboarding agent/merchant	Up to 10 days	Up to 5 days	Up to 5 days

Source: Salyanti et al. (2020).

The table shows some differences in the monetary costs and time between banks and nonbank DSPs. The wide range of costs to onboard customers and merchants primarily reflects the variation in distance to the nearest provider. Onboarding BSA customers who are social assistance beneficiaries is more costly due to the need to check the names against the list of program recipients, which further reduces the profitability of agents and may explain the limited success that this program has had.

Nonbank DSPs face further restrictions in terms of the *quantity* of verifications they can do within a period of time (i.e., there is a monthly quota on the checks they can request) (Salyanti et al. 2020). Nonbank DSPs are allocated much smaller quotas than banks. While the cost of KYC processes for nonbanks is lower than for banks, the shadow cost of performing KYC faced by nonbank DSPs is higher than the price faced by banks.[32]

Finally, there are also some ambiguities in the regulations about who can perform KYC. Regulations on agent banking do not allow banks to outsource their KYC processes, forbidding them to use their agents to conduct KYC for store-of-value products. However, regulations on e-money allow banks to use their agents, including the small informal stores in rural areas, to conduct KYC for e-money accounts. While nonbank DSPs' agents can conduct KYC to open e-money accounts, the restrictions on who can be DSPs' agents, discussed above, mean that only formal stores that are legal entities can conduct KYC for DSPs.

[32] The shadow price includes higher costs faced by nonbank DSPs due to the longer application process to gain the "right to access" the relevant data, the requirement to renew the application more frequently than banks, and the smaller quota of checks that are allocated to them within a time period (Salyanti et al. 2020 and discussions with digital finance providers).

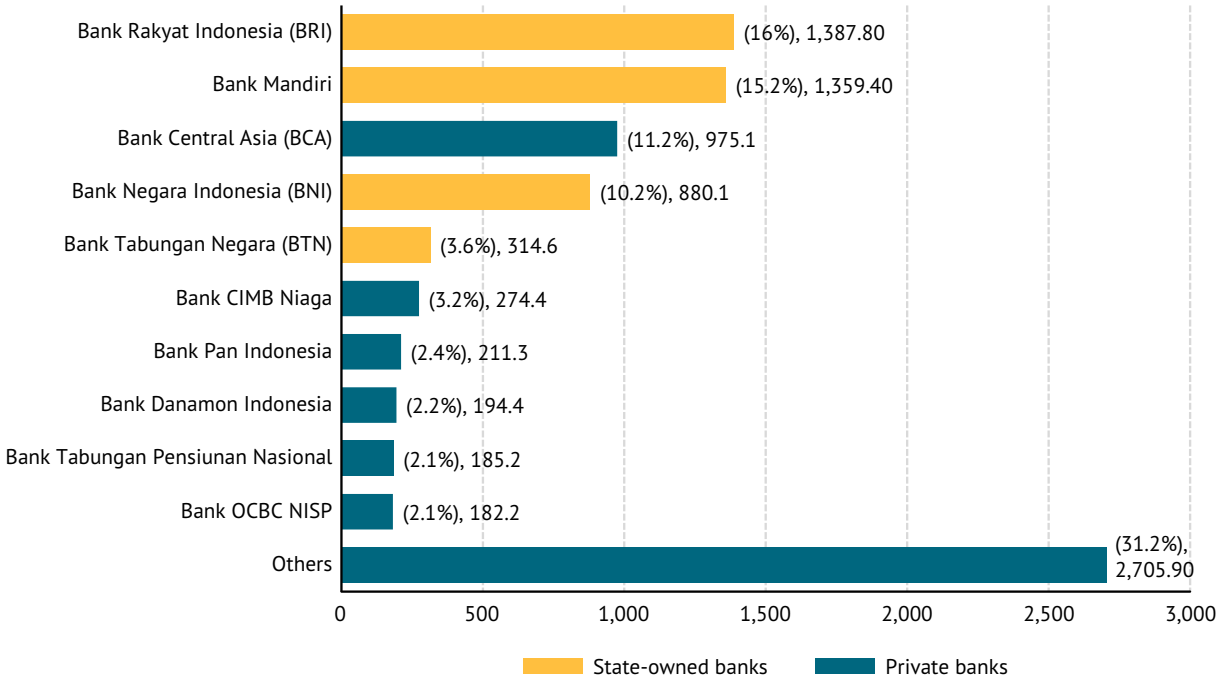
Altogether, the current regulations on cash-out services, agent recruitment, and KYC tip the playing field in favor of banks (and their agents) at the expense of nonbank DSPs. We consider these unfortunate regulations to constitute a binding constraint on the provision of e-money services.

5.1.2. Limited competition and entrenched lack of interoperability between providers

Insufficient competition, either within the banking sector or between banks and nonbank DSPs, could prevent the widespread usage of digital financial services. By restricting new players from entering the industry and keeping service fees high, insufficient competition could limit the industry's ability to fill the needs of the financially excluded population. In this section we examine whether limited competition prevents new players from entering the industry. To this end, we look at the dynamic interaction of providers within the banking sector and between banks and nonbank DSPs.

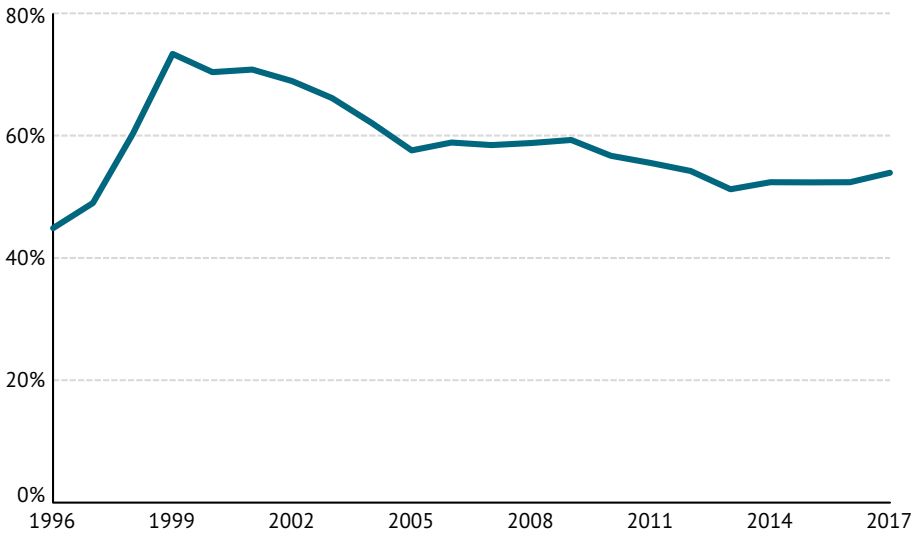
In 2019, there were around 100 commercial banks and 1,709 rural and credit banks (BPS 2021a). Despite the large number of banks, just a few large banks control most of the market share. Figure 14 shows that the four top banks—BRI, Mandiri, BCA, and BNI—account for more than half of total assets in the country, with no others accounting for more than 4 percent. Moreover, the market share of state-owned banks (Mandiri, BNI, BRI, and BTN) in the industry has been significant. In terms of assets, the state-owned banks account for 47 percent of market share. However, the trend of asset concentration in the top five banks has declined in the last few years (Figure 15). This may suggest that despite the high degree of asset concentration, the industry is moving toward a relatively more competitive environment.

Figure 14. Top 10 commercial and retail banks by total assets, Indonesia, 2020, IDR trillions (percentage of total assets in parentheses)



Source: Fitch (2020).

Figure 15. Five-bank asset concentration (percentage of all bank assets), Indonesia, 1996–2016



Source: World Bank (2020).

Another concern is that the dominant position of the top five banks (by assets) could prevent the expansion of financial services to the underserved, as these banks may focus only on currently served customers, who are perceived to be more profitable. However, the government has required these banks to extend banking services to unbanked groups through government programs. For example, after the Indonesian Financial Services Authority (or OJK, for Otoritas Jasa Keuangan) launched its flagship program, the BSA (or Laku Pandai), in March 2015, only six banks participated in the early stage of the program (June 2015), but these did include the five largest (see Table 4).

Table 4 shows that within six months after the program launched, the number of banking agents had increased by 1,528 percent. The number of BSAs increased from around 35,000 to more than 1.2 million, skyrocketing by 3,282 percent. The rapid increase of agents and BSAs was due to participation of the top five banks plus Bank Tabungan Pensiunan Nasional (BTPN, the national pension savings bank) and one regional development bank, Bank Pembangunan Daerah (BPD) of Kalimantan Timur state. Recently, all state-owned banks were tasked with channeling social assistance through their branchless banking agents, which has led to further expansion of agent networks. It appears that the top banks have played a central role in expanding financial services to unbanked groups, and we did not find any evidence that the concentration of assets in them has negatively impacted competition in the banking industry.

Table 4. Progress of Laku Pandai (BSA) program from June to December 2015

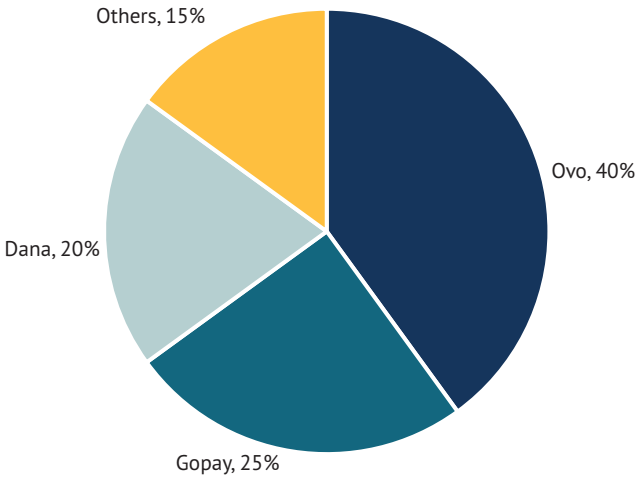
Indicator	June 2015	September 2015	December 2015	Change, June to December 2015
Bank participants	Bank Mandiri, BRI, BNI, BTN, BTPN, and BCA	Bank Mandiri, BRI, BNI, BTN, BTPN, and BCA	Bank Mandiri, BRI, BNI, BTN, BTPN, BCA, BPD Kalimantan Timur	+1
Agents	3,734	19,411	60,805	+1,528%
Accounts	35,984	1,061,076	1,216,952	+3,282%

Source: Otoritas Jasa Keuangan (OJK) (2020).

When we look at the competition between banks and nonbank DSPs, we find that they collaborate with each other to extend the services available to their own consumers, which may suggest that there are not significant competition constraints. For example, as discussed earlier, BCA collaborates with GoPay, allowing GoPay customers to cash out their money using BCA's ATMs at a reduced cost. BRI, the largest state-owned bank, collaborates with the fintech ecosystem such as Investree, one of the largest fintech companies focusing on providing loans. Indeed, the rapid growth of nonbank DSPs has led banks to improve their own digital payment services. For example, after BI launched QRIS (the Quick Response Indonesia Standard code), allowing interoperability of payments via QR codes, private banks like BCA innovated by integrating QRIS in their BCA mobile app.

Regarding competition within nonbank DSPs, we also see that the explosion of DSPs in recent years reflects a healthy competition among them. As of 2020, there were 51 companies with e-money licenses, around 70 percent of them nonbanks. Part of the rapid growth can be attributed to a relatively easy process to obtain a license. For example, in addition to being a legal entity, the company applying for the license must have a float fund of around IDR 1 billion (US$67,568), which is not particularly high.[33] Despite this increasing rate of new entrants, the e-money market is dominated by three players (Figure 16); similar to the banking industry, however, we do not observe serious competition problems.

Figure 16. E-money transaction market shares, Indonesia, 2019



Source: Lesmina and Noverdanius (2020).

To summarize, despite the high concentration of assets in a few providers, both banks and nonbank DSPs enjoy relatively healthy competition in providing digital financial services. The top banks have participated in the early stage of the government program to extend banking services to the underserved population, and DSPs have grown rapidly and created a strong competitive environment. This appears to suggest that competition is not a binding constraint.

In addition, we also observe that banks and nonbank DSPs have collaborated with each other to improve interoperability. Individuals can send payments or transfers through multiple applications or e-money, though there are some fees to conduct such transactions. However, payment systems, including e-money, are fully interoperable across DSPs—both banks and nonbanks—as described in Box 2.

[33] The process, however, may take at least six months. Specifically, new applicants enter a regulatory "sandbox," in which authorities observe, monitor, and test their business models (Emerhub 2018).

Box 2. Interoperability in digital payments

A potential constraint that could limit digital financial inclusion is lack of interoperability, which leads to lower demand for digital financial services. Lack of interoperability can be due to limited competition; given the evidence in this section on how dominant some players are in the Indonesian market, we may expect this to be a problem that harms user experience.

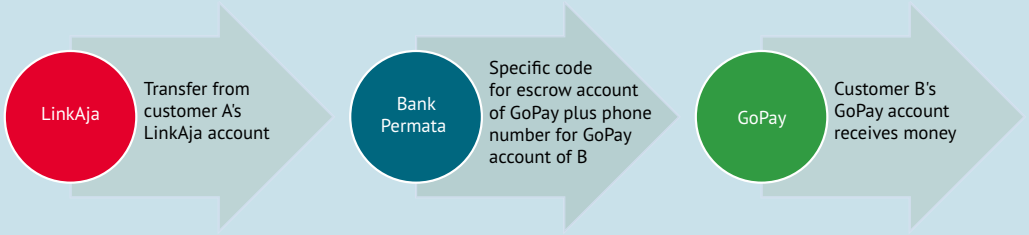
Observing how interoperability has evolved, we see that Indonesia's path reflects a situation described by Claessens and Rojas-Suárez (2020). In the early stage, the government did not impose interoperability, allowing private DSPs to invest in their networks through their own platform ecosystems. However, as the networks became more established, the government announced measures to promote interoperability. In addition, all players involved in digital payment services, including banks, nonbank DSPs, and even MNOs, have strong cooperation between them in the form of a "full integration model" (Bourreau and Valletti 2015) that is exemplified by two recent policy directions.

The first policy change is the introduction of the National Payment Gateway (known as GPN, for Gerbang Pembayaran Nasional) by the central bank in 2019, which is expected to improve the interoperability and switching of the national payment system. GPN is targeted to increase the efficiency of card-based transactions and reduce transaction costs. GPN uses domestic payment network firms that charge smaller fees than the multinational payment network companies. This is one of the major ways in which the program lowers transaction fees.

The second policy direction to improve interoperability in mobile payments is QRIS, launched by BI (the country's central bank) in 2019. With QRIS, merchants need only a single code that can be used for payments by customers with different e-money platforms. BI reported that by 2020, around 6 million merchants will have joined QRIS, 85 percent of them micro, small, and medium enterprises (BI 2021c).

Although the policy promotes interoperability through BI's channels, such as GPN or QRIS, there is also close cooperation between DSPs (banks, nonbanks, and MNOs) outside those channels, suggesting a model of full interoperability. This can be detected in the interoperability between LinkAja—a platform owned by Telkomsel (the MNO subsidiary of the state-owned PT Telkom) and state-owned banks—and GoPay, a nonbank DSP. Figure 17 illustrates how customer A, who has a LinkAja account, can transfer money to customer B's GoPay account. This process is conducted automatically. Despite having a bank in the middle of this process, the transfer cost is much lower than interbank transfer costs (more than 50 percent cheaper). In Indonesia digital payments are fully interoperable, and we therefore conclude that interoperability is not a constraint.

Figure 17. Transfer between e-money providers



Source: Authors' compilation based on information uploaded in Ecaraku (2021)/https://ecaraku.com.

5.2. Insufficient or poor private digital infrastructure

The low usage of digital financial services could stem from poor digital infrastructure, since such infrastructure is necessary for digital financial inclusion.[34] If the population does not have access to affordable digital infrastructure, they naturally will not be able to access digital financial services. In this section, we investigate whether poor digital infrastructure is a binding constraint on the use of digital financial services.

In the last five years, Indonesia has seen a rapid adoption of digital technology and digital devices. In 2015, around 56.92 percent of the population used mobile phones—including both smartphones and feature phones. By 2019, 63.5 percent of the population had used a mobile phone, an increase of 6.58 percentage points within four years. We also saw a rapid increase in the use of the Internet, from 21.98 percent of the population in 2015 to 47.69 percent in 2019, an increase of 25.7 percentage points in the same period (BPS 2021b). The same data show that most of those who accessed the Internet, around 91.45 percent, accessed it through cellular phones.

The rapid adoption of digital technology can be mainly attributed to innovations in information and communication technology that have made telecommunication devices more affordable.[35] Simultaneously, the development of digital infrastructure has been quite extensive and continues to play a central role in expanding digital access.

Figure 18 shows that the coverage of 3G and higher mobile phone service—a critical digital infrastructure for supporting app-based e-money—is rather significant. At the country level, digital infrastructure does not appear to be a binding constraint for the use of digital payment services, though it most likely was in the past. Still, as we dive into the quality of the networks across the nation, we see substantial variation across major islands.

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[34] For example, application-based transactions conducted through smartphones need 3G or higher networks to operate efficiently.

[35] Data from the National Socio-economic Survey 2019 (BPS 2019a) show that the average annual spending on cell phones is around IDR 1.34 million (US$89.50 at the exchange rate of US$1 = IDR 14,925), or about 2.55 percent of average annual household spending.

Figure 18. 3G and higher network coverage by village, Indonesia, 2018

Source: Calculated from PODES 2018 (BPS 2020b) at village level.
Note: Green indicates 3G and higher coverage, yellow below 3G coverage, and gray no data.

Two factors could explain this wide variation in the quality of digital infrastructure. First, it could be driven by limited competition in the MNO market in which, in order to maximize profits, the dominant players provide fewer services than they would in a perfectly competitive market. Another possibility is that infrastructure is too costly to operate privately, leading to subpar network quality in some areas.

5.2.1. Competition in the MNO market

Indonesia's mobile operator market has a significant number of players. By 2020, there were seven mobile operators competing in the Indonesian market: Telkomsel, Indosat, XL Axiata, 3 Indonesia, SmartFren, Bakrie Telecom, and Internux (Bolt). It is worth noting that Telkomsel is a subsidiary company of PT Telkom, the only state-owned enterprise operating telecommunication in the country. While the telecommunication services offered by Telkom Indonesia are rather extensive, the backbone of its revenue and profit comes from its mobile subsidiary, Telkomsel.

Telkomsel has built extensive mobile networks across the country. An estimate suggests that its 4G network reached more than 70 percent of the population in 2017. It also has the widest network coverage, with estimated 2G coverage of around 95 percent of the population and 3G coverage of around 60 percent.

Because of its extensive mobile infrastructure, Telkomsel reaped the lion's share of the mobile market in Indonesia. By 2018, it was estimated that the share of Telkomsel was around 50.4 percent of the total mobile service market (de Rosbo 2020), followed by Indosat Ooredoo, with 16.7 percent, and then 3 Indonesia, with 15.1 percent, and XL Axiata, with 13.8 percent (Table 5).

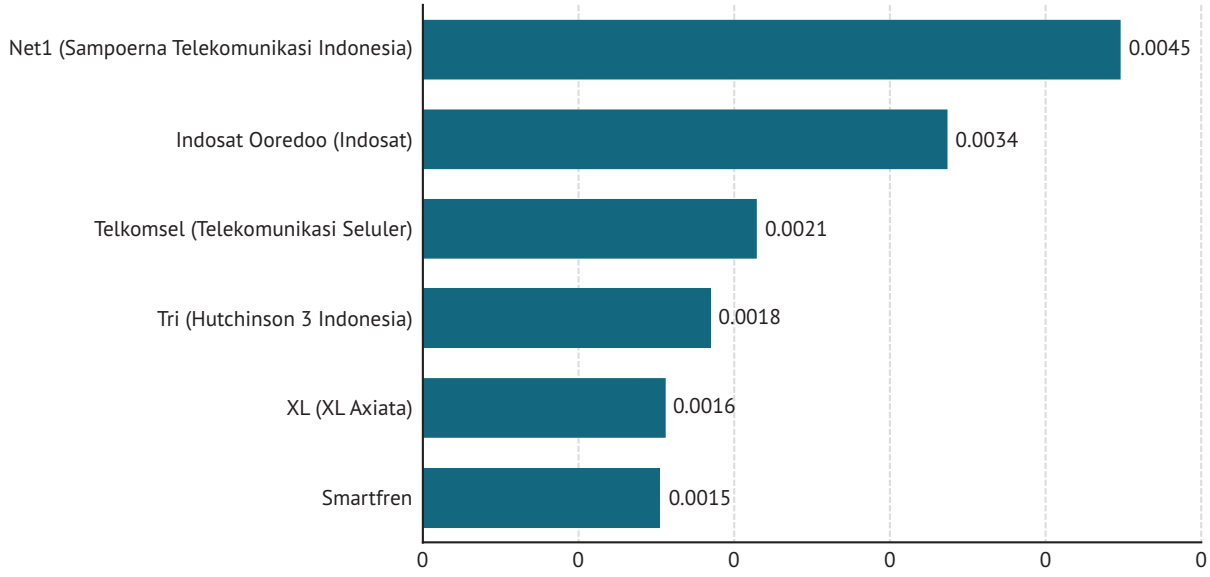
Table 5. Market share of MNOs, Indonesia, 2018

Operator	Subscribers (million)	Market share
Telkomsel	193.0	50.40%
Indosat Ooredoo	64.1	16.70%
3 Indonesia	58.0	15.10%
XL Axiata	52.9	13.80%
SmartFren	10.0	2.60%
Bakrie Telecom	1.0	0.30%
Internux (Bolt)	3.9	1.00%
Total	382.9	100.00%

Source: de Rosbo (2020).

Although the MNO market has been dominated by a single player, PT Telkom and its cellular subsidiary PT Telkomsel, it still appears to be competitive. To attract new customers, MNOs offer various data packages at relatively low prices, resulting in price wars (Gibran 2010). Figure 19 shows that most MNOs charge similar prices for Internet data, except for Indosat and Net 1, which are more expensive. By applying principle 1 of the decision tree methodology, we find that the relatively competitive prices in the MNO market suggest that (limited) competition is not a constraint.

Figure 19. Average price per 100 gigabytes of data (converted to US dollars), Indonesia

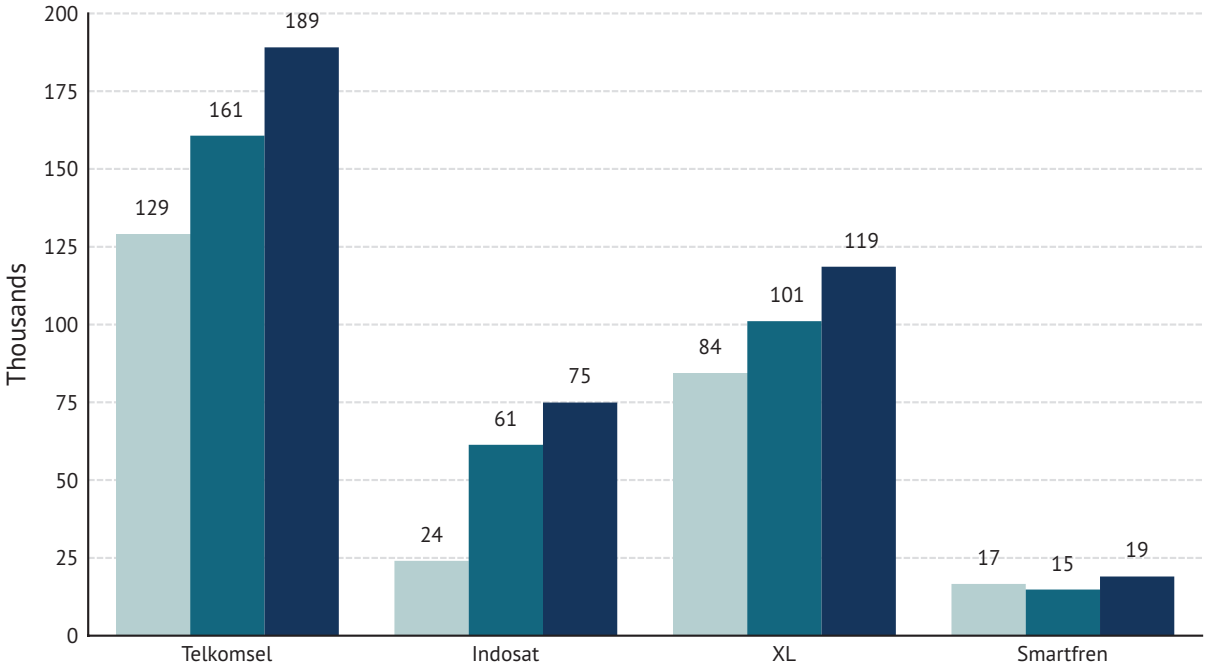


Source: Compiled by authors. Complete sources are provided in Appendix 6.

5.2.2. Is digital infrastructure too costly to operate privately?

Observing the rapid development of infrastructure in the last five years, we conclude that despite the high costs involved in their operations, the MNOs have been able to generate significant profits from expanding networks. As an example, there has been rapid growth in the number of base transceiver stations (BTSs), a critical cellular infrastructure. Between 2017 and 2018, for example, BTSs owned by PT Telkomsel grew by 18 percent, from around 160 thousand to almost 190 thousand BTSs; other companies expanded their BTSs as well (Figure 20).

Figure 20. Number of BTSs by provider, Indonesia, 2016–2018



Source: Katadata (2019).

MNOs continue to expand and develop their networks, suggesting that the MNO market is not yet mature and that providers continue to find enough profit to build necessary infrastructure. But they mostly expand the infrastructure in densely populated regions and Java, which can again be noted from the previous figure above (see Figure 18). In geographically challenging and less populated regions, the digital infrastructure expands slowly. Perceived low profit and high sunk costs prevent MNOs from serving these areas.

Although the development of digital infrastructure has been rapid in recent times, the quality of the country's networks is uneven. Better networks are concentrated in Java and Sumatra while most of the eastern part of Indonesia has less reliable access (see Figure 18). This correlates with the distribution of financial services that rely on digital infrastructure. The concentrated digital infrastructure is positively associated with the high concentration of financial services in certain areas, leaving behind rural and geographically challenging areas.

From this finding, we think poor digital infrastructure is a constraint that is binding in certain areas, although not at the national level.

A way to overcome these issues that affect advanced networks and smartphones would be to use simple mobile phones. However, the uptake of digital financial services through simpler mobile money services like the ones we observe in East Africa has been largely unsuccessful. Box 3 provides a summary of past fruitless efforts to use simple digital infrastructure to provide digital financial services.

Box 3. The failure of feature phone–based E-money

In the years from 2000 to 2010, Indonesia's MNOs attempted to provide financial services through feature phone–based e-money. In 2007, PT Telkomsel and Indosat developed mobile money. Telkomsel launched T-Cash and Indosat created Dompetku. Both products allow customers to make retail payments. MNOs also had an interest in tapping potential business from remittances. With the extensive outreach of digital infrastructure networks—greater than that of banking services—they attempted to provide P2P transfer services through telecommunication infrastructure, which was expected to generate substantial profits. Further, BI also had an interest in increasing the use of formal transfer channels among migrant workers. To encourage these services, BI set a regulation aimed at encouraging nonbank providers to offer remittance services.

However, instead of promoting MNOs to enter the digital financial services, BI Regulation (Peraturan Bank Indonesia) No. 8 Year 2006, concerning money transfers, had an unintended impact on the players (Flaming, Prochaska, and Staschen 2009). On the one hand, it allowed nonbanks to provide money transfer services as long as they obtained a remittance license to offer P2P transfers for both domestic and international customers. Yet on the other hand, some provisions of the regulation required MNOs, as nonbank DSPs, to explicitly stipulate in their articles of association or incorporation that fund transfer activities are one of their business activities. Thus, to comply and get the license, MNOs had to change their articles.

This proved to be a difficult process, as companies had to ask permission from all shareholders to change their articles. PT Indosat was one of the MNOs that faced difficulties in changing its articles because it was listed on the US stock market. As a result, PT Indosat did not get the remittances license; instead, it received a license to provide e-money. This is an example of how regulations may unintentionally create an unlevel playing field.

The MNOs' feature phone–based e-money, which went beyond the initial focus on remittances to become basically typical mobile money, did not gain a critical mass of users. This was mainly due to having more limited transaction services than existing commercial bank–based mobile banking. Some estimated that T-Cash had no more than 80,000 accounts (Flaming, Prochaska, and Staschen 2009). Later, PT Telkomsel shifted T-Cash to LinkAja, a server-based e-money. PT Indosat also abandoned its mobile money product.

In 2018, MNOs attempted to make a comeback through their e-wallet services. In 2018 PT Indosat launched Paypro and XL Axiata introduced XL Tunai. These e-wallet products could be accessed using either a smartphone or a feature phone, but they did not last long. Both are now defunct.

We see here that MNOs have entered and exited the e-money market a couple of times, which may suggest low barriers to entry into the industry. This reinforces our previous point that the competition level of the players providing e-money is not a constraint and there must be other issues behind this failure. We have seen previous evidence of an unlevel playing field that creates a barrier for MNOs to provide digital financial services. In subsequent sections, we will show that this barrier combines with customers' perception of low benefits to create a coordination problem constraining the usage of e-money services.

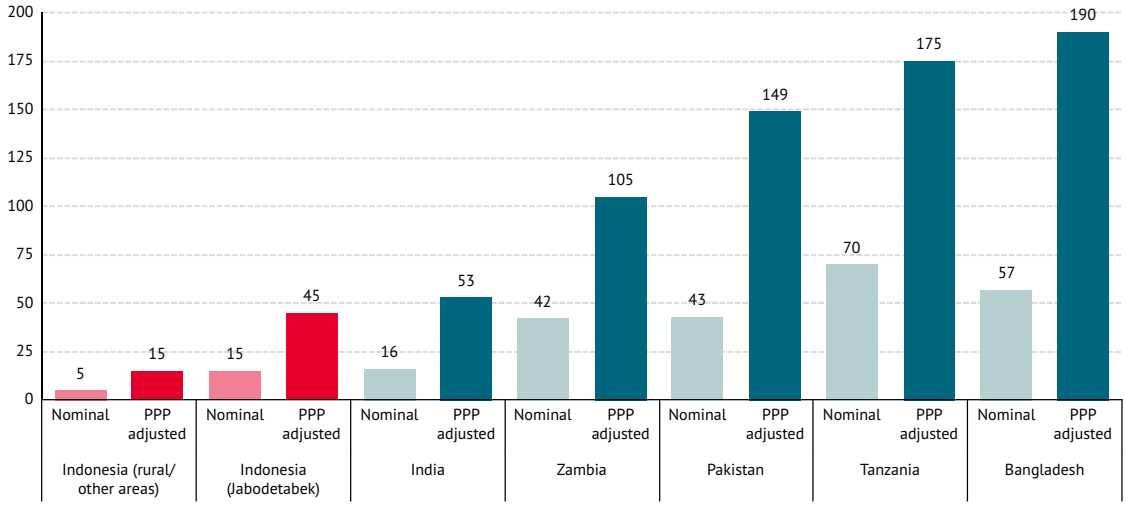
More recent attempts show some promising, but limited, results. Some banks have started to offer e-wallet services that combine both server-based and feature phone–based e-money in a single platform. CIMB Niaga, for example, launched a cell phone savings account that can be accessed by either a smartphone or a feature phone and does not require the account holder to have a bank account at CIMB Niaga. It appears that other banks are beginning to consider the same service. Whether this will be another failure of feature phone–based mobile money in Indonesia remains to be seen, but current constraints seem to suggest that it will not be a panacea for DSPs or for store-of-value services.

5.3. Low appropriability of returns

Poor institutions and weak governance, as well as distortionary taxes and other policies, may prevent digital finance providers from fully appropriating the returns from their investments, and thereby discourage the supply of DSPs. Problems verifying the identity of customers, related to KYC issues, can also limit the appropriability of returns. We now evaluate these two nodes of the decision tree, as well as the one on coordination failures.

To start, Figure 21 shows that returns from the business of providing digital financial services might be an issue in Indonesia, where agents—key intermediaries for financial inclusion—have very low levels of profitability. Comparator countries show better rates, confirming what has been discussed earlier: the expansion of branchless banking networks from 60,000 agents in 2015 to more than 1 million agents in 2019 is not all a success story. In addition, more than 30 percent of agents are dormant, and the transaction volume is low.

Figure 21. Median monthly profit (in US dollars) of branchless banking agents, Indonesia versus benchmarks of comparator countries



Source: BCG (2019).
Note: PPP = purchasing power parity.

5.3.1. Poor governance and weak institutions

Poor governance and weak institutions may contribute to low appropriability of returns and discourage providers from participating in the market, but whether these constitute the most binding constraints on digital financial services is a different matter. Low levels of governance quality and poor institutions present a risk on the appropriability of returns for private firms considering investing if, for instance, contract enforcement laws are weak.

A number of indicators collected by different institutions suggest that Indonesia does not rank highly in governance and quality of institutions. For example, in terms of civil liberties and political rights, in 2020 Indonesia was seen as "partly free" by Freedom House,[36] with a rating of 61/100, higher than Malaysia (52), the Philippines (59), and Thailand (32). Also, on rule of law, Indonesia was rated at 1 on a scale of 0–4 in terms of guaranteeing due process in civil and criminal matters and in terms of equal treatment. What is also interesting is that ratings from 2017 suggest that, if anything, Indonesia's institutions are getting weaker (Freedom House 2020).

In 2020, Freedom House also published a measure of freedom on the Internet, which measured obstacles to access, limits on content, and violations of users' rights. Indonesia was also rated "partly free" on this measure, with a score of 49/100. Some key findings on the obstacles to access are consistent with the evidence we have discussed in previous

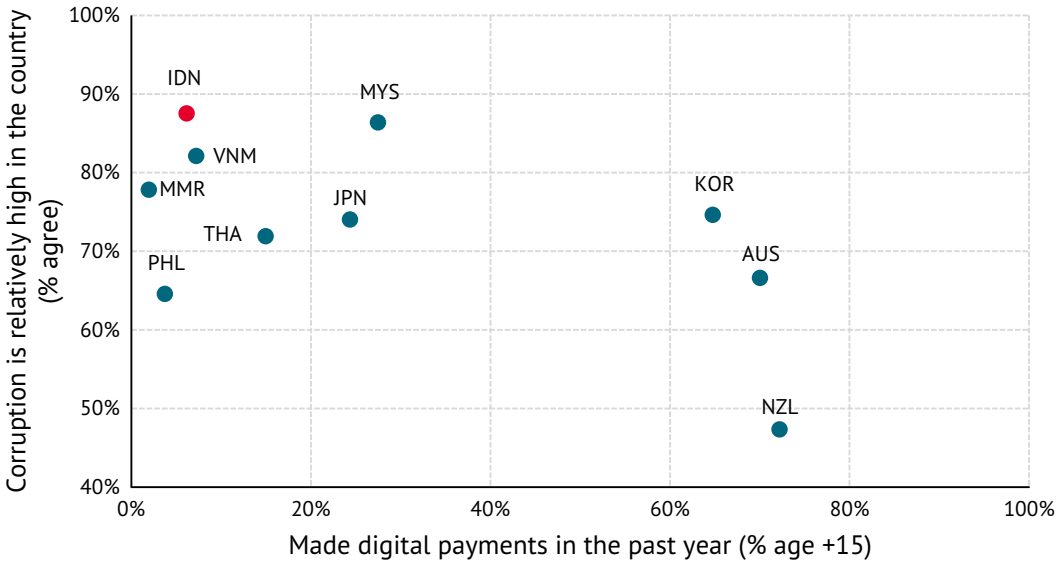
[36] Freedom House is a US-based NGO that rates people's access to political rights and civil liberties in 210 countries and territories. The rating is based on various indicators including electoral process, political participation, functioning of government, freedom of expression, and rule of law.

sections, including infrastructural limitations that restrict access to the Internet or the speed and quality of Internet connections in some parts of the country; prohibitively expensive Internet access that is beyond the reach of certain segments of the population; and a telecommunications infrastructure built by private providers, resulting in a distribution of BTSs that reflects the market dominance of the major players. Again, compared with 2017, there has been a steady decline in freedom on the Internet by this measure (Freedom House 2020).

Figure 22 shows an alternative metric for institutional quality that may also be relevant to the appropriability of returns: corruption. However, the figure shows that across countries, there is no clear correlation between the perception of corruption and the use of digital payment services. For example, while in Indonesia the perception of corruption is very high and the use of digital payments is low, in Malaysia, the perception of corruption is almost as high as in Indonesia, but the percentage of individuals making digital payments is considerably higher.

Despite the country's apparent issues with governance and institutions, there has been a steep increase in the number of private firms applying for e-money licenses (Appendix 1), which suggests that poor governance and weak institutions may not be a constraint preventing private firms from entering the market and operating digital financial services.

Figure 22. Percentage of adults making digital payments and perception of corruption, Indonesia and comparator countries, 2017–2020



Source: Demirguc-Kunt et al. (2018) and WVSA (2020).

5.3.2. Distortionary taxes and other distortionary policies

The Indonesian tax authority currently does not collect any tax (such as a value-added tax) on fee-based financial transactions. However, in recent tax policy discussions, there have been some proposals, not yet enacted, to collect taxes on the fees attached to certain financial services, such as cash withdrawals from ATMs. In other countries, taxes are imposed on certain types of fee-based services such as brokerage and safekeeping (for example, in EU countries) or on certain financial planning fees, notably fees related to initial planning, monitoring, and evaluation (in New Zealand, for instance). Other than those, financial services such as payment and store-of-value services are generally tax-exempt. This is the case in Indonesia where, under the current tax policy regime, taxes are clearly not a constraint.

5.3.3. Problems verifying the identity of customers

As argued earlier, the difference in requirements faced by nonbank DSPs and banks in the process of verifying customers' identities—the KYC process—is part of the evidence showing the existence of an unlevel playing field that limits the growth of digital payment usage.

In this section we discuss a different aspect related to KYC: how problems identifying customers may limit the appropriability of returns. Although the challenges of fulfilling KYC requirements are not, on their own, binding constraints for providers, here we discuss how the current state of the process may prevent all providers, including banks, from reaching the unbanked population faster.

While each provider and each product has a different KYC model at the front end, all verification processes involve checking consumers' ID documents against the national database.[37] This process is time-consuming and fraught with the risk of human error. A study estimated that from 30 percent to 60 percent of verification queries are rejected by providers because of blurry images of the ID due to poor-quality cameras (Salyanty et al. 2020). The cost of resources in terms of staff and time spent on this process can be significant, particularly for social assistance beneficiaries with BSA accounts.[38]

One fact that makes evident of how this process has been a constraint is the emergence of a small number of private firms that serve as a clearinghouse for KYC between the Ministry of Home Affairs and nonbank DSPs. This an example of principle 3 of the methodology at work: some providers are willing to incur extra costs to circumvent the constraint. While this constraint is not binding, as providers have found ways around it, the high cost of accessing civil registry databases means that the critical mass of users required for profitability of the

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[37] For banks, the KYC process for opening a BSA account starts with an agent collecting information on paper, along with photos of ID documents submitted by the customer, and sending the application to a bank branch. The bank performs a mostly manual verification against the civil registry. For e-money providers, this task can be done in-house or outsourced to a third party.

[38] From 1 to 3 days for the conventional bank branch–based model and nonbank DSPs, 3–14 days under the bank agent–assisted model, and up to 60 days for social assistance beneficiaries' BSA accounts.

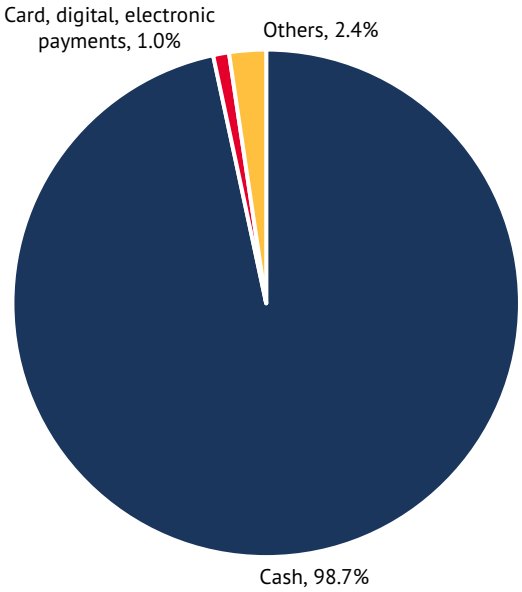
business is harder to reach.[39] Further, this costly process reduces the profits of agents that offer social assistance through BSA services and potentially hinders the expansion of agent networks. While likely not binding, this constraint is a severe issue, especially for the banks that are forced to provide BSA accounts to social assistance recipients.

5.3.4. Coordination failures

Given that the other sub-branches in this section have been discarded as potential binding constraints, coordination failures may be a strong candidate to be behind the low profitability of agents. Coordination failures may occur when demand and supply constraints interact and result in an equilibrium that leaves both sides of the market reluctant to enter. Without a critical mass of users, providers cannot take advantage of economies of scale in digital payment markets, and without enough points of service to perform transactions or enough other individuals to transact with, users may be reluctant to take up a product that is perceived to be of little usefulness.

An important indicator of coordination failures is a strong preference by the population to undertake cash transactions rather than use formal digital financial services. We do, indeed, observe this phenomenon in Indonesia. Based on the 2018 FII data, cash remains the main payment method (SNKI and FII 2019). Around 98.73 percent of individuals use cash as the main method for transactions, suggesting that a coordination failure may be present (see Figure 23).

Figure 23. Most-used payment methods, Indonesia, 2018



Source: FII 2018 (SNKI and FII 2019).

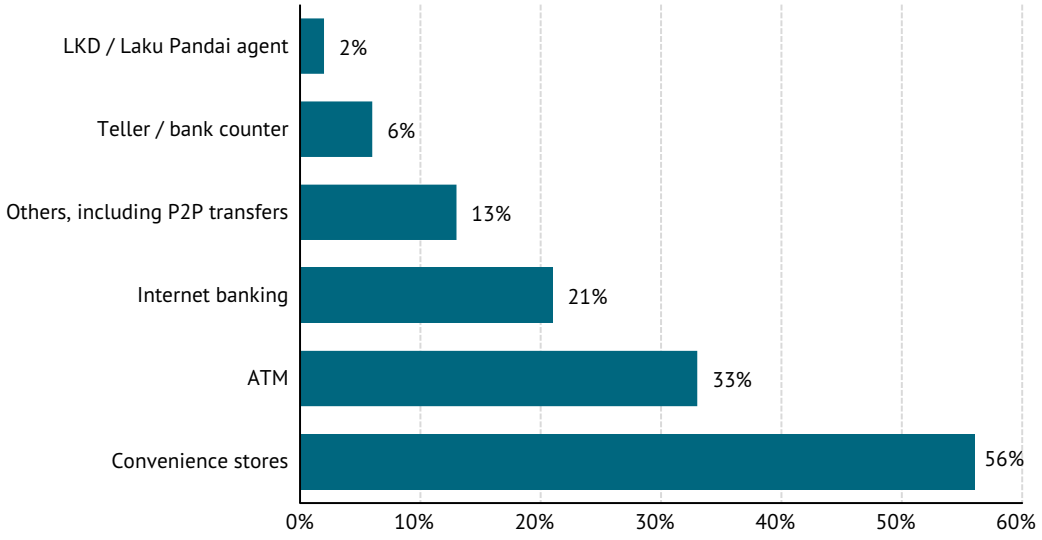
[39] Authors' discussions with fintech practitioners as well as experts on payment services suggest that biometric identification or another form of e-KYC may be an attractive alternative to solve the KYC problem.

We further argue that coordination failure is a binding constraint on e-money services in rural areas. We identify the low availability and profitability of agents, and the scarcity of point-of-sale (PoS) terminals, as two clear indications of coordination failures taking place and substantially hindering the development of digital payment services in Indonesia. We develop each of these cases below.

First, given that extending agent networks have nonnegligible fixed costs, a critical mass of users is required to ensure agent profitability. Unfortunately, coordination failures may be causing an equilibrium in which providers do not expand their networks due to the lack of a critical mass of customers, and this, in turn, dampens the willingness of users to adopt the services.

As e-money providers expand their networks and cooperate with other businesses outside their industry (see Section 5.1.2), access and convenience for individuals also increase. In some instances, e-money providers work with convenience stores, which serve as their agents and allow consumers to top up their e-money accounts. Figure 24 shows that more than half of e-money users go to convenience stores and use cash to top up their e-wallets. The more widespread availability of these agents would allow individuals in areas far from banks and ATMs to conduct digital transactions.

Figure 24. Where users top up their e-money accounts, Indonesia, 2018



Source: FII 2018 (SNKI and FII 2019).

However, as discussed in Section 5.1.1, not all convenience stores can be agents, as they need to be established as legal entities and apply for licenses. This issue is particularly problematic given that the majority of these stores are informal, especially in rural and remote areas. Moreover, the Village Potential Statistics (PODES) 2018 dataset (BPS 2020b) suggests that, generally, the number of such stores outside of Java and Bali is considerably lower than on these two major islands (Figure 25). The highest ratio of convenience stores and

supermarkets per 1,000 population is 0.43 in Bali (0.20 in Jakarta), and the lowest is 0.05 in three provinces, East Nusa Tenggara, Maluku, and West Sulawesi, all in the eastern part of Indonesia. These numbers demonstrate that the convenience stores, which can work as incidental agents, are scarcer in rural areas and outside Java. Figure 25 does not include the number of GoJek drivers, who also provide cash-in services to their customers. GoJek claims to have around 1.7 million drivers in around 170 cities and large towns in Indonesia, 25 percent of them in Greater Jakarta alone (Samboh 2020). Thus, all of these non-DSP agents, including GoJek drivers, have only a small presence in rural areas and outside Java and Bali.

While supply-side issues such as an unlevel playing field and poor digital infrastructure in rural areas harm agent network development, demand-side issues also feed into this problem. As explored in the next section (6.1), customers' perception of low benefits from using digital financial services, related to their lack of awareness about e-money, is a considerable problem that results in low demand. This low demand, in turn, reduces the profitability of agents and of providers more broadly, likely yielding a coordination problem.

Second, in relation to PoS availability, the low number of merchants that accept digital payments highlights an additional dimension of the "chicken-egg" problem that coordination failures present. If stores perceive that there are few users able or willing to make payments through digital means, they will not invest in providing this payment option. Simultaneously, if costumers think there are only a small number of stores where they can transact through digital means, their demand for these services will likely be depressed, resulting in a vicious circle and a low-level equilibrium.

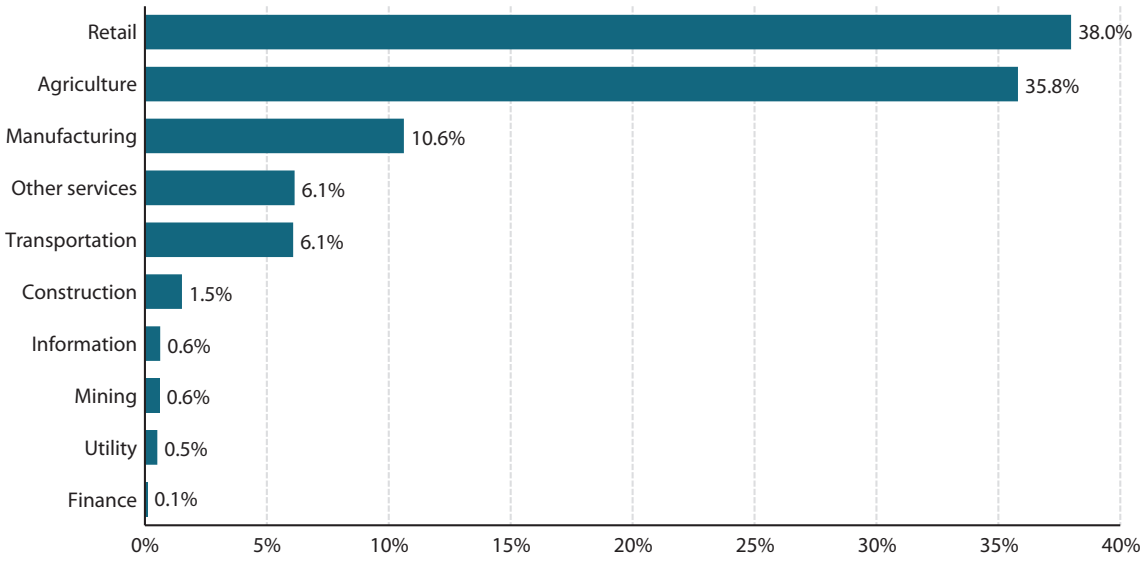
Figure 25. Convenience stores and supermarkets per 1,000 population, Indonesia, 2018

Source: Authors' calculations based on BPS (2018, 2020b).

The latest data from BI show that by April 2021 there were only 1.5 million EDC devices, which were operated by 1.06 million merchants (BI 2021a). At the same time, there were around 18.6 million micro, small, and medium enterprises (MSMEs) operating in retail sectors such as accommodations and restaurants (meaning that around 37.9 percent of

MSMEs were in such sectors) (see Figure 26). This implies that a large majority of MSMEs did not use electronic payment systems such as EDCs. This is consistent with the bank's survey result that 95.5 percent of merchants use cash (BI 2013) and shows how hard it is for consumers to use digital services to transact business. Because there are very few places to use digital means of payment, many potential users of these services will naturally perceive low benefits from using them. If they do not take up digital payment services, merchants will remain lacking incentives to operate more EDCs.

Figure 26. Distribution of MSMEs by sector, Indonesia, 2019



Source: BPS (2019b).

These two examples serve to identify coordination failures as a binding constraint in rural areas of Indonesia. We next study demand-side factors, including perceived low or nonexistent benefits, that can feed into these coordination failures.

6. Demand-side constraints on payment and store-of-value services

We now move on to the demand side of the decision tree. We assess three major nodes: perceived low or no benefits of usage, low trust in providers, and challenges associated with low income and geography.

6.1. Perceived low or no benefits of usage

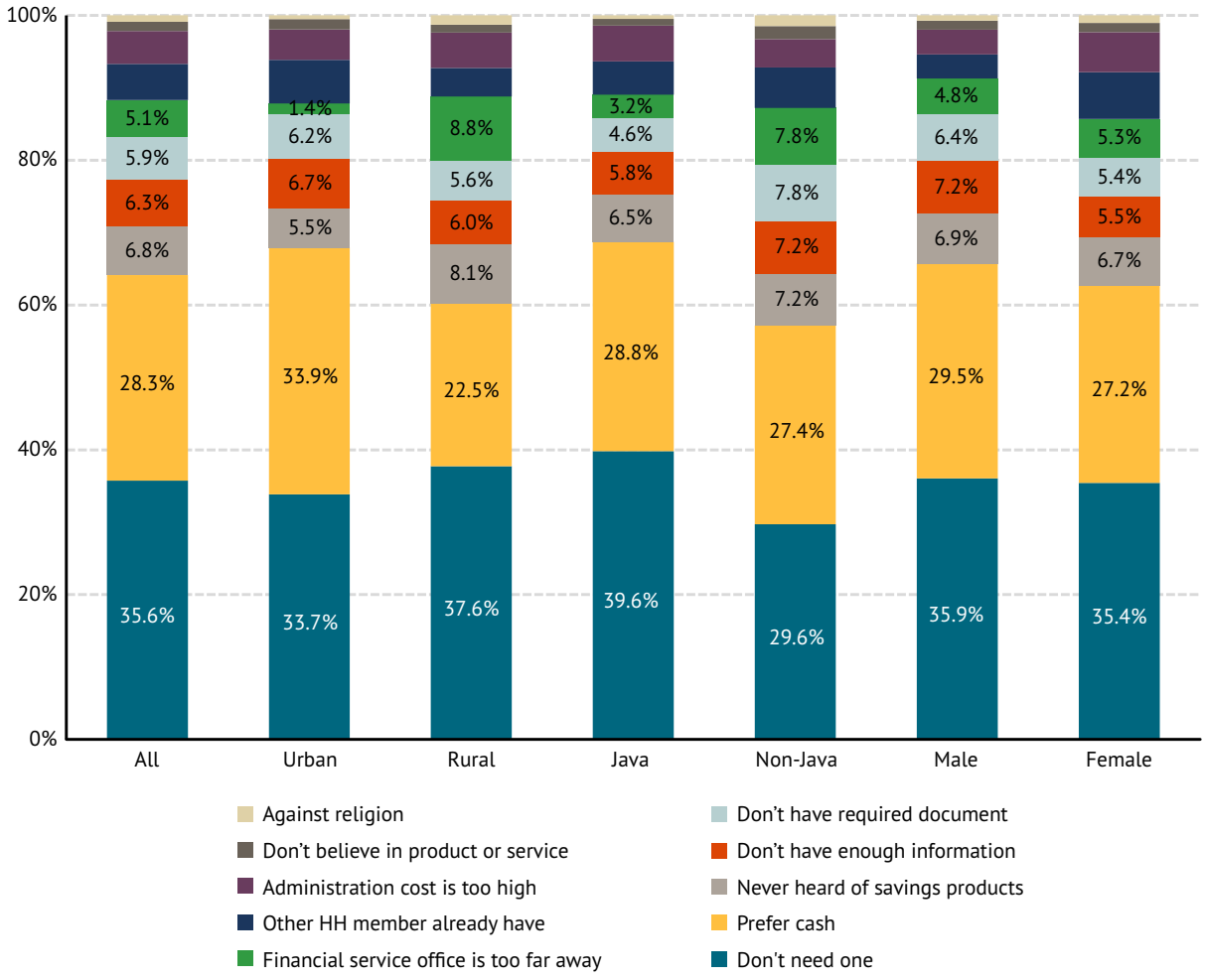
People might not use digital payments as much when they perceive that the services provide low benefits or none at all, and in this way the perception of no benefit could be a potentially severe constraint on the expansion of digital financial services. Data from FII 2018 (SNKI and FII 2019) show that around 35.6 percent of the adult population without a bank account[40] stated that the reason for not having a bank savings account is that they feel they do not need one, a strong proxy for perceived low benefits (Figure 27).[41]

In addition, the other important stated reason for not having a bank account was a preference for cash, which might also be taken as representing perceived low benefits from using formal financial services. Adding these two reasons ("don't need it" and "prefer cash), it's clear that perceptions of low benefits from having accounts in the formal financial sector are prevalent in Indonesia. When combined with supply-side constraints in the less populated and rural areas, these reasons contribute to the presence of the coordination failure discussed in section 5.3.4.

[40] The percentage of those without a bank savings account is around 61.6 percent. Following Harihareswara and Miller (2021), we exclude respondents answering that they "Don't have enough money" for an account from the analysis.

[41] As we break down the data into several characteristics, we do not observe significant differences, except between Java and outside Java, and between urban and rural areas. It is rather surprising that almost 40 percent of the population in Java, a well-developed region, felt they did not need a bank account. This is much higher than outside Java, which was 29.6 percent. On the other hand, around 37.6 percent of the rural population without a bank account reported that they did not need one.

Figure 27. Reasons for not having a bank account, by demographic characteristic (percentages)



Source: FII 2018 (SNKI and FII 2019).

We next investigate one of the potential reasons behind this apparent low perception of benefits among the unbanked population that particularly applies to e-money services: lack of awareness of financial products.

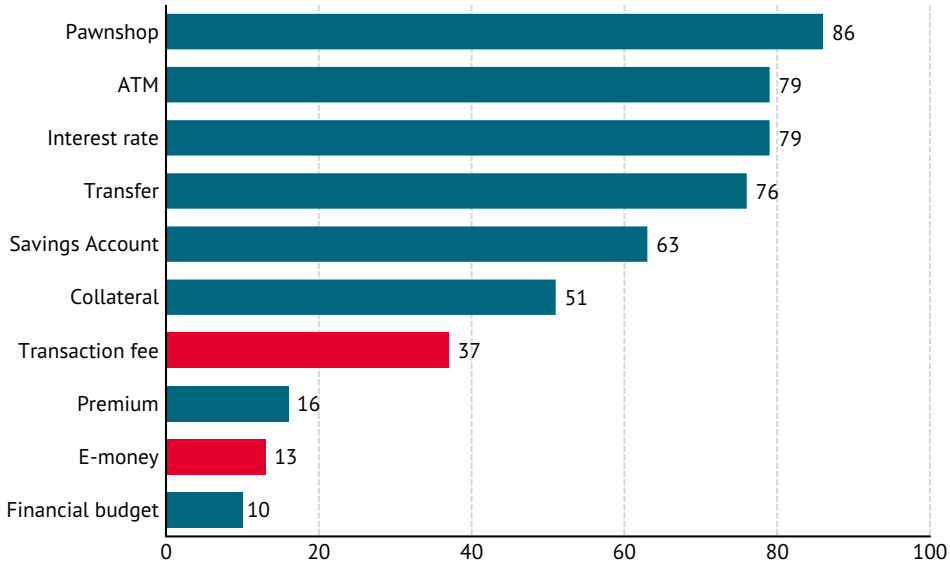
6.1.1. Lack of awareness of financial products

The perception of low benefits from digital financial services could be due to a low (or lack of) understanding about the advantages of those services, such as speed, convenience, safety, protections, and in some cases, costs. Individuals may not be aware of the options available to them and the potential benefits they may derive from using the services. They may also simply lack basic knowledge on how to use the services. The lack of awareness may prevent individuals from fully reaping the benefits of digital financial services. Numerous studies suggest that lack of information about the products (as well as customers' attitudes toward using financial services), rather than mere numeracy, are the most important components

of a broader, more rigorous concept of the financial literacy problems that may be responsible for the low usage of digital financial services (Hastings and Tejeda-Ashton 2008; Cole, Sampson, and Zia 2011; Hastings, Mitchell, and Chyn 2011; Behrman et al. 2012; Lusardi and Mitchell 2014).

A study on the landscape of government-to-person payments in Indonesia, conducted in 2018, asked individuals ages 18 and older whether they had heard of any of the financial terms that were read to them (Figure 28). While the majority of the adult population had heard the terms *interest rate, pawnshop, ATM,* and *transfer,* only a small proportion of them had heard of *e-money* (13 percent) and *transaction fees* (37 percent).[42] This suggests that new services are relatively unknown to a substantial portion of the population. As they are not familiar or comfortable with those products, they will not demand them. Low awareness of a new financial product will likely lead to a perception of low benefit from that product.

Figure 28. Knowledge of financial terms, Indonesia, 2018



Source: Authors' calculation using data from World Bank (2018a).

With such low levels of awareness about e-money, it is not surprising that large segments of the population say they do not perceive significant benefits from having an account in the formal financial system.

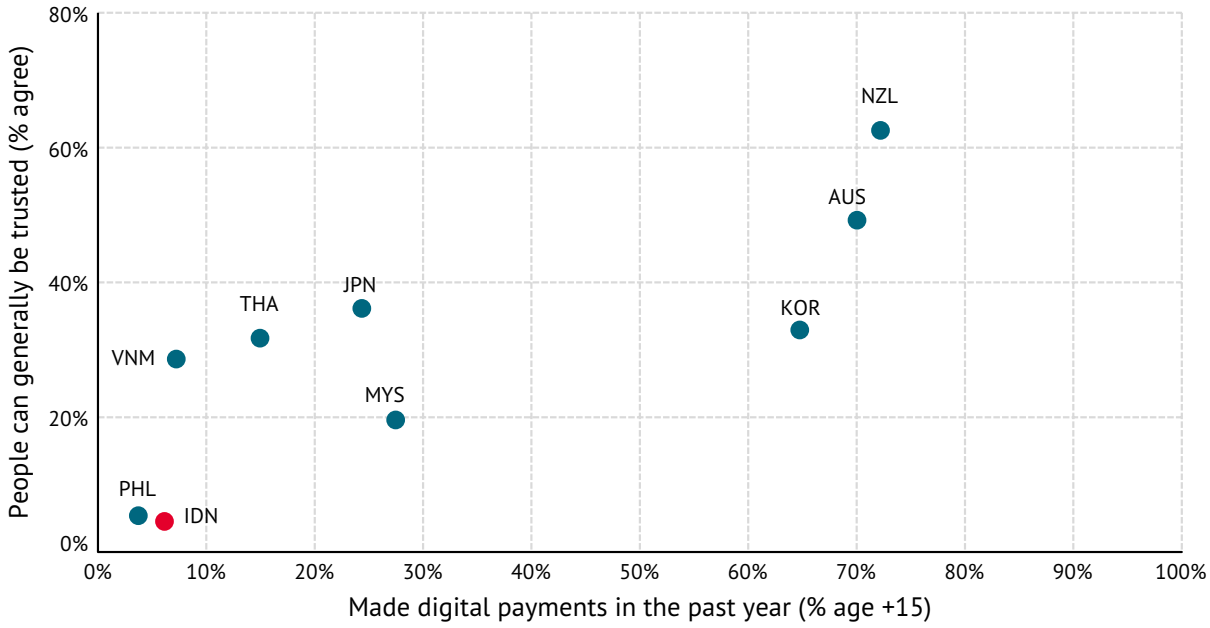
[42] We also observe spatial variation in the financial literacy index, measured as the number of financial terms that respondents knew, out of these 10: *financial budgeting, savings account, interest, ATM, electronic money, transfer, transaction fee, collateral, insurance premium,* and *pawnshop*.

6.2. Low trust in providers

Trust may be an important factor that affects whether customers are willing to shift from traditional to modern financial services, including digital ones, and from cash-driven transactions to those that go through formal financial institutions. We can think of three relevant trust issues—(1) trust in the modern financial services system, (2) trust in technology, and (3) trust in the providers—and all of these may be related to the overall level of trust in the society.

Indonesia ranks low in general trust compared with neighboring countries. More than 90 percent of Indonesians, when asked whether in general people can be trusted, responded "No, one has to be careful not to be taken advantage of." Figure 29 shows a positive correlation between the level of general trust and the use of digital payment in Indonesia and neighboring countries. A recent cross-country experiment measuring civic honesty also reported that Indonesia ranked 31 among 40 countries sampled (Cohn et al. 2019). So, Indonesia does not rank high either in general trust or trustworthiness, compared with many countries.

Figure 29. General trust level and digital payments, Indonesia and comparator countries, 2017–2020

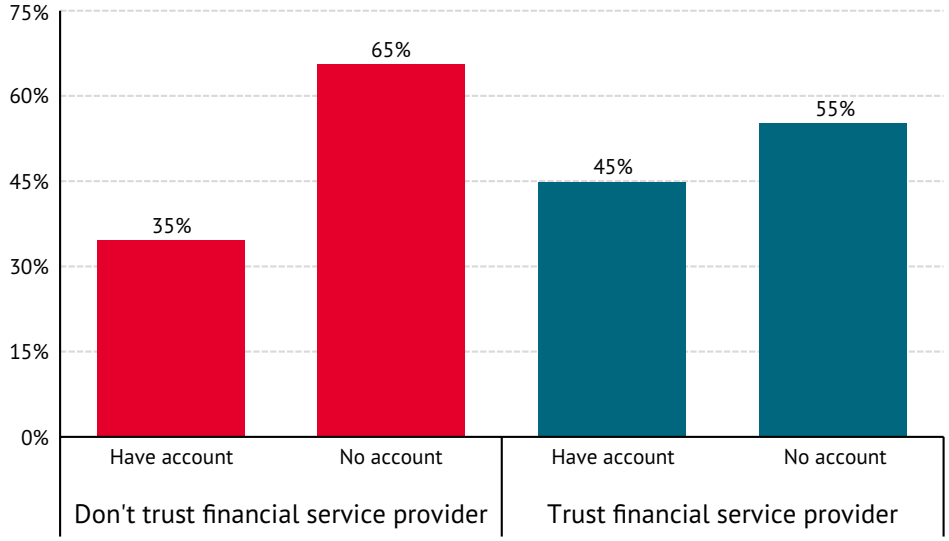


Source: Authors' calculation using data from Demirguc-Kunt et al. (2018) and WVSA (2020).

We use FII 2018 (SNKI and FII 2019) to look at the relationship between trust in financial service providers and ownership of accounts, studying different groups. Figure 30 shows that 65 percent of those who reported having low trust in financial providers did not have a bank account, but 35 percent of them did. The percentage of those who said they had high trust but did not have a bank account was 55 percent. Lack of trust may be an important constraint preventing uptake of modern financial services for some segments of the

population, but small numbers suggest that it is not a deterrent for a significant fraction of individuals who own an account. While this may indicate that the constraint is not binding, we later analyze two potential causes of these low levels of trust and whether they can be related to low financial inclusion, namely, macroeconomic instability and consumer insecurity.

Figure 30. Bank account ownership and trust in financial service providers, Indonesia, 2018



Source: FII 2018 (SNKI and FII 2019).

The lack of trust in new digital products may also be related to lack of information about the product, the agent, or the technology. A recent study on the effects of incentivizing branchless banking agents to increase uptake of a new financial product found that trust in banks, agents, and products affects adoption of the new product (Deserranno et al. 2021). In the context of a lack of clear information about new products, potential customers make decisions based on what is observable to them. For instance, the authors reported, when agents were offered high incentives for successfully signing up new customers and the incentives were public knowledge, there was low trust in the product, the bank, and the agent, resulting in low uptake.[43] In the following sections, we explore two channels affecting trust: consumer insecurity and macroeconomic instability.

6.2.1. Consumer insecurity

Consumers' low level of trust in providers and in the modern financial system in general may be related to insecurity. When people perceive that transactions conducted through

[43] With little information about a product, it is possible that public knowledge about high incentives could increase trust if these incentives are perceived as a signal of the quality of the product. However, it could potentially also lower trust if it leads to perception of being taken advantage of. The empirical findings of Deserranno and colleagues (2021) suggest the latter.

digital platforms are not secure, they may avoid using such services. In Indonesia in recent years, there have been high-profile breaches of customers' data on online platforms, raising serious public concern (Eloksari 2020). Table 6 presents some of the high-profile cases of fraud, crime, and data breach involving the digital economy just in the last few years. Several regulations have been introduced to increase consumer security or at least the perception of security.[44]

Table 6. Recent cases of fraud, crime, and data breach involving the digital economy, Indonesia, 2018–2020

Institution	Institution type	Period	Type of breach, fraud, or crime	Potential impacted users
Tokopedia	E-commerce	July 2020	Privacy breach on customer data	91 million consumers
Government of Indonesia	Government	June 2020	Privacy breach on COVID-19 test takers' data	230,000 citizens
MeMiles	Fintech	Jan. 2020	MeMiles conducted a Ponzi scheme using users' funds	264,000 users
Dompet Kartu & Pinjam Beres	Fintech	Dec. 2019	Misuse of personal data and harassment in debt collection	undisclosed
Incash	Fintech	July 2019	Misuse of personal data and harassment in debt collection	undisclosed
Dompet Gajah	Fintech	Oct. 2020	Misuse of personal data and harassment in debt collection	undisclosed
DanaCepat	Fintech	Oct. 2018	Misuse of personal data and harassment in debt collection	undisclosed
CoCo Tek	Fintech	Aug. 2019	Misuse of personal data and harassment in debt collection	undisclosed
Koperasi FKSS	Fintech	March 2020	Misuse of personal data and harassment in debt collection	undisclosed
TunaiCepat	Fintech	Jan. 2020	Misuse of personal data and harassment in debt collection	undisclosed

Source: Compiled by authors; sources are displayed in Appendix 7.

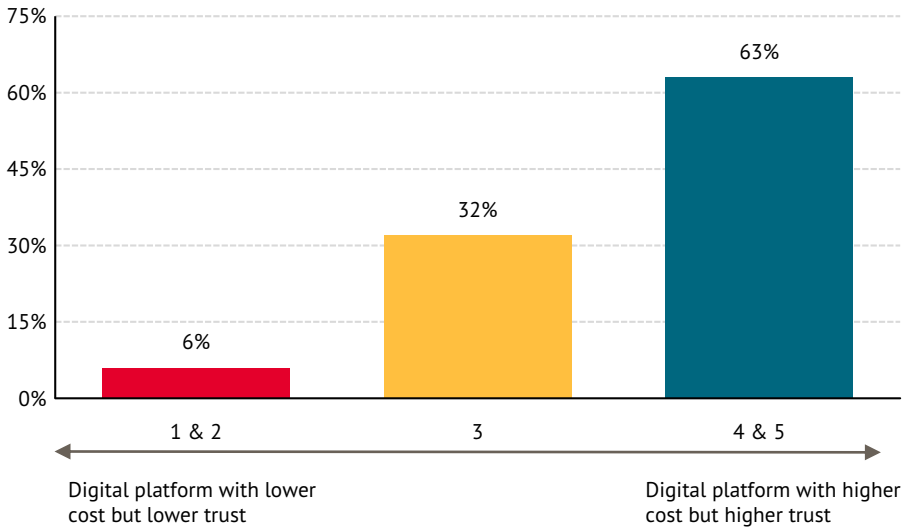
These cases may affect consumers' willingness to use digital financial services or restrict the amounts of the transactions they are willing to perform digitally. It is difficult to assess how much these cases affect perceptions of consumer security and trust in providers. However, according to principle 3 of the methodology, if we observe that consumers are willing to bear extra costs for more secure digital transactions, it may indicate that consumer security is a constraint.

[44] For example, BI issued a memorandum setting a national standard of six digits for ATM and debit card PINs. In addition, the OJK requires all registered fintech companies to state in all of their product promotions that they are registered and supervised by the OJK.

A 2019 study conducted by Microsoft and IDC suggested that around 44 percent of consumers of digital financial services believe that their data will be well protected (Microsoft and IDC 2019). When asked whether they would be willing to transact on a more secure platform even though it costs more or on a less secure platform that costs less, an overwhelming majority said they would prefer to use a highly trusted platform even if it is more costly (see Figure 31). This is related to principle 3 of the decision tree methodology, in which individuals are willing to incur additional costs to circumvent barriers. This appears to suggest that consumer insecurity is a constraint on the use of digital financial services.

However, according to the same study, around 56 percent of consumers did not have confidence that their data were secure. This perception may reflect consumers' assessment that the current national ID database is not robust and secure. Investing resources to improve this database infrastructure would restore consumer trust. It also may suggest that although consumer security is a constraint, it is not a binding one. Instead, robust KYC infrastructure is a critical constraint, a fact that brings us to the supply-side constraints, as discussed above.

Figure 31. Consumer preferences on the cost of and trust in digital platforms



Source: Microsoft and IDC (2019).

6.2.2. Macroeconomic instability

The financial sector thrives in an environment of high growth, but shocks to the economic system may quickly erode confidence in financial institutions, possibly with a significant effect on people's trust in storing their money in banks or other financial institutions. Note, however, that such a shock should not severely affect payment services, so the impact on e-money services may be more limited if consumers perceive such services to be mainly for payment purposes.

The story of the 1997/98 financial crisis affirms this line of reasoning. Indonesia is one of the countries that was severely affected by the Asian financial crisis of 1997/98.[45] The financial crisis, which evolved into a political crisis as well, triggered herd behaviors that led to a withdrawal of liquidity and bank runs. The latter were among the factors behind the collapse of the banking sector in Indonesia (Hill 1999). Although the government decided to intervene in the banking sector, bailing out several banks, many households lost their money.[46] Under such a situation, storing money in financial products and financial institutions is perceived as not a fully safe option.

In the medium and long term, macroeconomic instability could have a persistent impact on individuals' behavior. Those who were exposed to the macroeconomic volatility of 1997/98 may exhibit different risk attitudes than those who were not exposed to it. Extensive studies focusing on developed countries show that cohorts of individuals who have lived through economic volatility tend to exhibit lower rates of financial risk taking decades after the event (Malmendier and Nagel 2011; Sahm 2012; Dohmen, Lehmann, and Pignatti 2016; Guiso, Sapienza, and Zingales 2018; Shigeoka 2019).

In developing countries, which are prone to economic shocks from both global and domestic factors, policy options to mitigate economic fluctuations are limited. Thus, people in developing countries may anticipate such shocks by lowering their financial risk taking. This behavior may lead individuals to have a strong preference for holding cash or converting their wealth into assets other than savings—such as livestock or jewelry—with ramifications on the adoption of financial services.

Storing money in a financial institution—either bank or nonbank—could be a risky financial decision, particularly in a country with an unstable financial sector. However, in the past two decades, the government of Indonesia has built sound monetary policies and prudent fiscal policies (Basri and Hill 2020). On the monetary side, after the 1997/98 economic crisis, the government focused on supplying emergency liquidity, increasing the capital adequacy ratio of financially distressed banks, and restructuring poorly performing banks. The government also improved its supervision practices and institutionalized risk management systems for individual banks as well as a deposit insurance system. By 2004, the government deposit insurance corporation guaranteed deposits in banks up to IDR 2 billion. This reform has brought credibility to the banking sector in Indonesia (Basri and Hill 2020).

This assessment of Indonesia's macroeconomic condition in the past two decades suggests that the country has managed macroeconomic volatility thanks to significant institutional reforms. By the time of the global financial crisis of 2008/09, although Indonesia was not insulated, the impact was much less severe than that of the 1997/98 crisis. Nevertheless, real GDP growth slowed down from about 6.5 percent to 4.5 percent. The Jakarta Stock

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[45] The exchange rate of the country's currency, the Indonesian rupiah, collapsed from IDR 2,400 per US$1 to IDR 15,900 per US$1. The exchange rate was also extremely volatile, and inflation skyrocketed to more than 60 percent annually.

[46] Before the 1998 crisis, Indonesia did not have deposit insurance.

Exchange fell by about 50 percent at the end of 2008, and the growth in bank lending fell sharply, from an annual rate of about 32 percent before the crisis to 10 percent (Hill 2012).

Despite nervousness in the financial sector, Indonesia managed to avoid the worst impact of the 2008/09 global recession. Only one bank, Bank Century, faced a closure due to a liquidity issue, and the country did not see the bank runs that it experienced in 1997/98. While risks to macroeconomic stability remain, policy credibility has strengthened people's confidence in Indonesia's financial authority thanks to significant reforms (Hill 2012, Basri and Hill 2020).[47] Thus, we see that macroeconomic instability, despite posing risks, does not seem to be a binding constraint on the use of e-money.

6.3. Low income and geography

Low income is often cited as the major reason for low utilization of digital financial services (Cole, Sampson, and Zia 2011; Moorena et al. 2020). Experience in other countries suggests that although low income is correlated with low usage of e-money, it is not necessarily a binding constraint. Indeed, the ease of use of e-money, with just a simple phone, has proven to be one of the key strengths behind the growth of MNO-based e-money such as M-Pesa. This seems to be the case for Indonesia's e-money as well. However, in the Indonesian context, low income may prove to be an important constraint for a specific part of the population, namely the extremely poor living in the more remote parts of the country.

First, preference for cash is more robust among low-income people because they tend to live in areas where financial access is lower. As shown in Table 7, due to lower coverage of financial access points (banks, ATMs, and agents), reaching an access point results in additional costs that lower-income people tend to avoid. This condition is clearly observed for Bali and Nusa Tenggara but not very clear for the other islands. Based on the data in Table 7, it appears that the constraint is most likely an issue only for certain areas in Indonesia, particularly eastern Indonesia, which has plenty of smaller islands[48] where the cost is higher than in the rest of the country.[49]

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[47] Better policymaking can be attributed to Indonesia's democratic processes after the 1998 political turmoil and its institutions' effective management of these shocks (Hill 2012).

[48] As of 2019, BPS reported that the eastern provinces (e.g., Sulawesi, Maluku, and Papua provinces) comprise 9,730 (61 percent) of the 16,056 islands in Indonesia (BPS 2020a).

[49] According to World Bank (2018b) data, the average cost for one trip to an ATM in eastern Indonesia (the data were available only for Sulawesi province) is 45.8 percent higher than in the rest of Indonesia and 38.4 percent higher than the national average.

Table 7. Percentage of low-income people and ratio of PoS machines, Indonesia

Island	Percentage of population with low income	Number of PoS terminals per 1,000 people
Sumatera	28.1	1.99
Jawa	36.4	2.68
Bali and Nusa Tenggara	39.6	1.83
Kalimantan	20.5	2.11
Sulawesi	36.3	2.48
Maluku & Papua	25.2	1.67

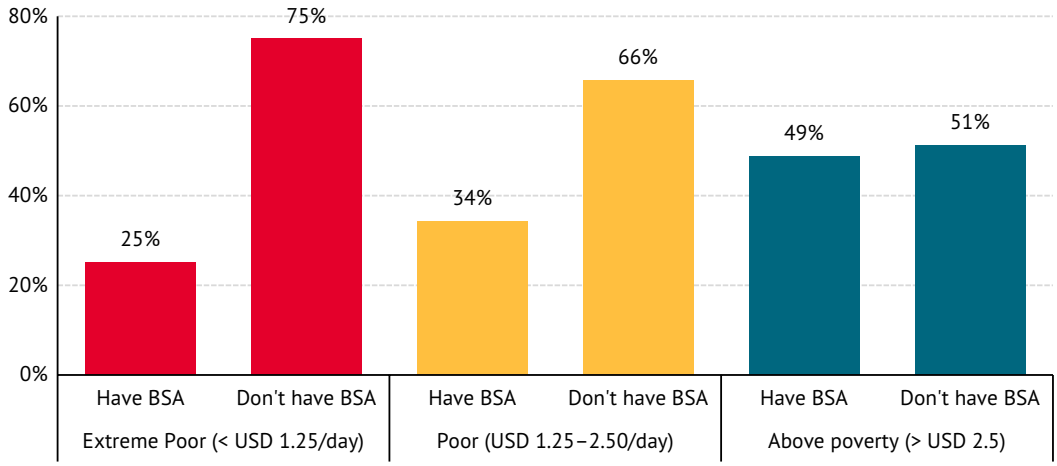
Source: Authors' calculation from BI (2021b) and BPS (2019a).

Second, DSPs have shifted away from processes that can be accessed through a simple, USSD-based phone[50] to apps that require a smartphone.[51] The low take up of USSD-based digital financial services, as discussed in Box 3, might be because many less sophisticated and poorer potential customers for this technology live in cash-based environments who see far less value from using it because it is not able to intermediate digital value into cash. The shift to smartphones may have further disenfranchised the low-income population with no access to smartphones, the very population that was supposed to be the main target for financial inclusion.

FII 2018 data (SNKI and FII 2019) show that ownership of a bank savings account is associated with having a higher income (Figure 32). For the poor population living in less developed regions of Indonesia (rural and outside Java), a low income may pose a constraint when combined with supply constraints that are binding. For the extremely poor in urban Java, where supply constraints are less severe, the low income itself may be a binding constraint.

[50] USSD (Unstructured Supplementary Service Data) is a protocol similar to SMS (Short Message Service).
[51] When the LKD (the generic name for the e-cash offered by banks) was launched in 2015, most banks went with USSD-based technology. Around the same time, the state-owned telecommunication company Telkomsel launched its own electronic money, T-Cash, also based on USSD technology and requiring only a chip attached to a simple phone. By 2019, however, LinkAja, based on a technology requiring a smartphone for access, was launched to replace the LKD.

Figure 32. Ownership of bank savings account and income level, Indonesia, 2018



Source: FII 2018 (SNKI and FII 2019).

In sum, we observe that while the binding constraints for digital payments are mostly on the supply side—namely in coordination failures and associated with the unlevel playing field between banks and nonbanks in terms of regulations on cashing out, KYC, and agent recruitment—there are important constraints on the demand side that are relevant for financial inclusion in Indonesia. Some of these demand-side constraints, such as perceptions of low benefits of usage, feed into coordination failures. Other demand-side constraints, such as low income, may be binding, but only for particular groups such as very poor urban populations in Java and poor populations in remote areas.

7. Conclusions

Although Indonesia has made significant progress in extending financial services over the past 10 years, a large proportion of the population is still financially underserved. The latest data from the FII survey (SNKI and FII 2019) show that in 2018, only around 45.5 percent of individuals 15 and older reported having owned and used either a regular bank account, a BSA, or e-money, despite the concerted efforts of the Indonesian government to promote financial inclusion. The e-commerce–led development of digital financial services, while remarkable, seems to have been mainly concentrated among the already financially included population.

This paper attempts to explain why the usage of digital financial services remains low by using the decision tree framework developed by Claessens and Rojas-Suárez (2020). We particularly focus on a product that has a large potential for financial inclusion: e-money.

Given the relatively high fees charged for the usage of digital financial services, our price analysis in Section 4 suggests the existence of binding constraints on the supply side. Our subsequent evaluation confirms that initial insight and identifies regulatory constraints creating an unlevel playing field between banks and nonbank providers of digital financial

services as a key binding constraint. We find other constraints to be binding for specific subpopulations. Specifically, a coordination failure between suppliers and customers of digital financial services, reflected in a strong preference for cash, and poor digital infrastructure are identified as additional binding constraints limiting the usage of digital financial services outside of Java and in rural areas.

The first binding constraint, the unlevel playing field between banks and nonbank DSPs, manifests in regulatory restrictions on cash-out services, agent recruitment, and KYC processes that unduly adversely affect nonbank DSPs. Second, we also observe coordination failures that are driven by the supply constraints identified above, as well as by potential customers' perception of low benefits from using e-money. The perception of low benefits, which is rooted in a lack of awareness of the existence and functioning of digital financial services, constrains the demand for these services and prevents the formation of the critical mass of customers necessary to make the activities of agents profitable, particularly in rural and remote areas outside of Java. In turn, the scarcity of agents feeds into perceptions that the services are of low benefit. This vicious circle keeps the market depressed in certain regions, leaving substantial parts of the population underserved. Finally, because of the spatial and geographic features of Indonesia, the uneven quality of digital infrastructure also presents a binding constraint for rural areas outside Java, which further contributes to the uneven distribution of financial services. Digital infrastructure is a particularly important issue if we think of the goal of reaching the last mile, the unbanked population in hard-to-reach communities where traditional services are not well established.

Additionally, to maximize the gains from relaxing the constraints that are binding, there are some constraints that, while not binding, need to be addressed. These include, on the demand side, improving trust in digital financial service providers, and on the supply side, delivering a robust and safe KYC architecture that will not only lower costs for all providers but also go a long way toward relieving consumer insecurity.

It can be argued that banks, with their resources, infrastructure, and array of products and services, would be better off serving markets at a higher level rather than low-end retail customers. Nonbank DSPs, with their limited products but nimble features, may be better placed to serve small-scale, retail-level, previously unbanked consumers. This is particularly true for nonbank DSPs with nontraditional agents, such as GoJek, whose drivers interact more directly with the community in urban areas.

Despite the multitude of constraints that exist, there are signs that banks as well as nonbank DSPs are trying to innovate within the current market and regulatory environment, by forming strategic partnerships to expand their networks and developing new products. Some of the most recent regulations (e.g., laws on the regulatory sandbox) also seem to be aimed to accommodate these innovations. We also see some banks adopting relatively low-level digital technologies aimed at reaching populations with limited access to digital infrastructure. For example, some banks are readopting the *rekening ponsel* ("mobile account"), which is based on the feature phone and could bring access to groups covered by mobile networks lower than 3G. These developments point in the right direction. However, unless the current binding constraints are relaxed, the markets for digital financial services will not really flourish.

8. Appendixes

Appendix 1. Electronic money licenses

Table A1.1. E-money licenses, Indonesia, 2020

Company	Operational as of	Product (server-based)	Product (chip-based)
Airpay International Indonesia	28-Nov-18	ShopeePay	
Artajasa Pembayaran Elektronis	21-Nov-12	MYNT Emoney	
Astra Digital Arta	18-Feb-20	AstraPay	
Bank BNI Syariah	30-Dec-19	Hasanahku	
Bank CIMB Niaga	27-Mar-13	Rekening Ponsel	
Bank DKI	3-Jul-09	Jakarta One (JakOne)	JakCard
Bank Jabar dan Banten	5-Mar-20	DigiCash	
Bank Mega	3-Jul-09	Mega Virtual	Mega Cash
Bank National Nobu	29-Apr-13	Nobu emoney	Nobu emoney
Bank OCBC NISP	2-Mar-20	One Wallet	
Bank Permata	23-Jan-13	BUM Money	
Bank QNB Indonesia	1-Mar-17	Dooet	
Bank Sinarmas	6-Dec-18	Simas E-money	
BCA	3-Jul-09	Sakuku	Flazz
Bimasakti Multi Sinergi	14-Jun-17	Speed Cash	
Bluepay Digital Internasional	8-Aug-18	Bluepay Cash	
BNI	3-Jul-09	Unikqu	Tap-Cash
BPD Sumsel Babel	4-Apr-17		BSB Cash
BRI	29-Dec-10	T-bank	Brizzi
Buana Media Teknologi	29-May-17	Gudang Voucher	
Cakra Ultima Sejahteira	5-Nov-18	Duwit	
Datacell Infomedia	7-Nov-19	Paydia	
Dompet Anak Bangsa (d/h PT MV Commerce Indonesia)	29-Sep-14	GoPay	
E2Pay Global Utama	4-Sep-18	M-Bayar	
Espay Debit Indonesia Koe	20-Jul-16	Dana (d/h Unik)	
Ezeelink Indonesia	8-Aug-18	Ezeelink	
Finnet Indonesia	1-Jun-12	Finpay Money With Mobile Cash)	
Fintek Karya Nusantara	22-Feb-19	LinkAja	
Indosat	3-Jul-09	IMkas (d/h Pay Pro d/h Dompetku)	
Intl Dunia Sukses	10-Oct-17	1Saku	
Kereta Commuter Indonesia	14-Nov-19		KMT

Company	Operational as of	Product (server-based)	Product (chip-based)
Mandiri	3-Jul-09	Mandiri e-Cash	Mandiri emoney
Mass Rapid Transit	25-Nov-19		MIT
Max Interactives Technologies	6-May-19	Zipay	
MNC Teknologi Nusantara	1-Dec-19	Spinpay	
Netzme Kreasi Indonesia	23-Dec-19	Netzme	
Nusa Satu Intl Artha	25-Mar-13	DokuPay	
Paprika Multi Media	6-Feb-20	Paprika	
Rpay Finansial Digital Indonesia	18-Mar-20	Yourpay	
Sarana Pactindo	30-Aug-19	PAC Cash	
Skye Sab Indonesia	3-Jul-09	Skye Mobile Money	Skye Card
SmartFren	16-Jun-14	Uangku	
Solusi Pasti Indonesia	20-Jul-18		
Telkom Indonesia	3-Jul-09	Flex Cash	iVas Card
Telkomsei	3-Jul-09	T-Cash	Tap Izy
Transaksi Artha Gemilang	11-Feb-19	OttoCash	
Veritra Sentosa Internasional	1-Jun-18	Paytren	
Visi Jaya Indonesia	6-Apr-20	Eidupay	
Visionet Internasional	22-Aug-17	OVO Cash	
Witarni Tunai Mandiri	5-Jan-15	Truemeney	
XL Axiata	29-Mar-11	XL Tuna	

Source: BI, cited in Lesmina and Noverdanius (2020).

Appendix 2. Sources for provider-level data

Table A2.1. Sources for provider-level cost and price data displayed in Table 1 and Figures 6 and 9–12

Provider	Country	Link
Android Pay	Australia	https://support.google.com/pay/merchants/answer/6288971?hl=en
Australia and New Zealand Banking Group	Australia	https://www.anz.com.au/personal/bank-accounts/everyday-accounts/access-advantage/
Commonwealth Bank of Australia	Australia	https://www.commbank.com.au/banking/everyday-account-smart-access/rates-fees.html
National Bank of Australia	Australia	https://www.nab.com.au/personal/accounts/transaction-accounts/nab-classic-banking
National Bank of Australia	Australia	https://www.nab.com.au/personal/help-and-guidance/personal-banking-fees-and-charges
National Bank of Australia	Australia	https://www.nab.com.au/personal/accounts/transaction-accounts/nab-classic-banking

Provider	Country	Link
Westpac Banking Corporation	Australia	https://www.westpac.com.au/personal-banking/bank-accounts/life-choice/?fid=bundle:2001:fom:bacat
Bank Islam Brunei Darussalam	Brunei Darussalam	http://bibd.com.bn/assets/pdf/resource-centre/SOT2019.pdf
BruPay	Brunei Darussalam	https://www.brupay.com/
ACLEDA Bank	Cambodia	https://www.acledabank.com.kh/kh/eng/ps_decurrentacc
Canadia Bank	Cambodia	https://www.canadiabank.com.kh/
Foreign Trade Bank of Cambodia	Cambodia	https://www.ftbbank.com/
TrueMoney Cambodia	Cambodia	https://truemoney.com.kh/
Wing	Cambodia	https://www.wingmoney.com/en/personal/fees/
Bank of China	China	https://www.bankofchina.com/au/forms/CBD_Schedule%20of%20Fees%20and%20Charges.pdf
China Construction Bank	China	https://www.asia.ccb.com/hongkong/doc/about_us/F1168-banking-services.pdf
BHIM Axis Pay	India	https://www.paisabazaar.com/banking/upi-charges/
Freecharge	India	https://www.freecharge.in/termsandconditions
HDFC Bank	India	https://www.hdfcbank.com/personal/save/accounts/savings-accounts/regular-savings-accounts/fees-and-charges
HDFC Bank	India	https://www.hdfcbank.com/personal/save/accounts/savings-accounts/basic-savings-bank-deposit-account/fees-and-charges
HDFC Bank	India	https://www.hdfcbank.com/personal/ways-to-bank/banking-in-person/atms/fees-and-charges
HDFC Payzapp	India	https://www.desidime.com/amp/discussions/payzapp-will-charges-3-5-gst-from-3rd-june-on-bank-transfer
ICICI Bank	India	https://www.icicibank.com/service-charges/regular-savings-account.page
ICICI Bank	India	https://www.icicibank.com/Personal-Banking/account-deposit/Outward-Remittance/Wire-Transfer.page
ICICI Bank	India	https://www.bankbazaar.com/debit-card/steps-to-use-icici-bank-debit-card-internationally.html
ICICI Pocket	India	https://www.bankbazaar.com/icici-bank-savings-account/pocket-savings-account.html#:~:text=Fees%20%26%20Charges%20of%20ICICI%20Pockets%20Savings%20Account&text=20%20per%20financial%20transactions%20and,financial%20transactions%20will%20be%20charged.&text=First%205%20financial%20and%20non,for%20financial%20transaction%20and%20Rs
JioMoney	India	https://www.jiomoney.com/faq.html#:~:text=Also%2C%20you%20may%20load%20a,no%20charges%20for%20using%20JioMoney
Mobikwik Wallet	India	https://www.mobikwik.com/termsandconditions/users

Provider	Country	Link
PayTM	India	https://www.livemint.com/money/personal-finance/paytm-wallet-charges-for-adding-money-and-making-bank-transfers-11578674249825.html
PhonePe	India	https://www.phonepe.com/en/terms.html
PhonePe	India	https://www.techsuvam.com/phonepe-wallet-to-bank-transfer-process-with-0-charge.html
State Bank of India (SBI)	India	https://www.ndtv.com/business/state-bank-of-india-sbi-service-charges-for-atm-card-usage-net-banking-fund-transfer-penalty-fees-fo-2004041
State Bank of India (SBI)	India	https://www.sbi.co.in/web/personal-banking/accounts/saving-account/basic-savings-bank-deposit-account
State Bank of India (SBI)	India	https://www.bankbazaar.com/ifsc/neft-sbi.html
State Bank of India (SBI)	India	https://www.ndtv.com/business/sbi-latest-imps-neft-rtgs-charges-1784440
Yono by SBI	India	https://www.financialexpress.com/money/good-news-sbi-waives-off-imps-charges-from-this-date/1641949/
Yono by SBI	India	https://www.sbiyono.sbi/wps/portal/tnc
BCA (Debit Paspor BCA Platinum)	Indonesia	https://lifepal.co.id/media/kartu-debit-bca/
BCA (Debit Paspor BCA Platinum)	Indonesia	https://www.bca.co.id/en/individu/produk/e-banking/atm-bca
BCA (Debit Paspor BCA Platinum)	Indonesia	https://pilihkartu.com/kartu-kredit/mandiri-visa-platinum.html
BCA (Debit Paspor BCA Platinum)	Indonesia	https://duwitmu.com/tabungan/transfer-uang-ke-dari-luar-negeri/
BCA (Debit Paspor BCA Platinum)	Indonesia	https://flip.id/biaya-transfer-antar-bank
BNI	Indonesia	http://gdputra.staff.ugm.ac.id/2014/03/19/cara-kirim-uang-ke-luar-negeri-via-bank-bni/#:~:text=Menurut%20standar%20BNI%2C%20biaya%20transfer,mata%20uang%20EUR%3A%2030%20EUR.
BNI	Indonesia	https://www.bni.co.id/creditcard/id-id/produk/informasibiayadanperhitunganbunga
BNI	Indonesia	https://flip.id/biaya-transfer-antar-bank
BRI	Indonesia	https://harga.web.id/melayani-pengiriman-valuta-asing-inilah-kisaran-biaya-jasa-wire-transfer-remittance-bri.info
BRI	Indonesia	https://duwitmu.com/kartu-kredit/kartu-kredit-bri/amp/
CIMB (CIMB Clicks and CIMB Mastercard Premium)	Indonesia	https://duwitmu.com/tabungan/transfer-uang-ke-dari-luar-negeri/

Provider	Country	Link
CIMB (CIMB Clicks and CIMB Mastercard Premium)	Indonesia	https://harga.web.id/info-lengkap-biaya-transfer-antar-bank-yang-ada-di-indonesia.info
CIMB (CIMB Clicks and CIMB Mastercard Premium)	Indonesia	https://www.sepulsa.com/blog/limit-transfer-dan-biaya-administrasi-bank
Dana	Indonesia	https://www.cindenian.com/cara-transfer-saldo-dana-ke-akun-lain-dengan-mudah/
Dana	Indonesia	https://technologue.id/perbandingan-biaya-admin-top-up-ovo-gopay-dana-dan-linkaja/
Dana Premium	Indonesia	https://www.cindenian.com/cara-transfer-saldo-dana-ke-akun-lain-dengan-mudah/
Dana Premium	Indonesia	https://technologue.id/perbandingan-biaya-admin-top-up-ovo-gopay-dana-dan-linkaja/
GoPay	Indonesia	https://www.gojek.com/blog/gopay/cara-transfer-go-pay/
GoPay	Indonesia	https://www.gojek.com/blog/gopay/cara-transfer-bank-go-pay/
GoPay	Indonesia	https://www.gojek.com/gopay/cara-top-up/
GoPay Plus	Indonesia	https://www.gojek.com/blog/gopay/tips-jitu-berhasil-upgrade-akun-go-pay/
LinkAja	Indonesia	https://www.linkaja.id/faq
LinkAja	Indonesia	https://technologue.id/perbandingan-biaya-admin-top-up-ovo-gopay-dana-dan-linkaja/
Mandiri (Debit Visa Platinum)	Indonesia	https://www.bankmandiri.co.id/tarif-layanan
Mandiri (Debit Visa Platinum)	Indonesia	https://www.mandirikartukredit.com/produk/platinum
Mandiri (Debit Visa Platinum)	Indonesia	https://flip.id/biaya-transfer-antar-bank
OVO	Indonesia	https://www.ovo.id/helpcenter/article/360025450012
OVO Premier	Indonesia	https://www.ovo.id/helpcenter/article/360025450012
OVO Premier	Indonesia	https://www.ovo.id/helpcenter/article/360025747491
ShopeePay	Indonesia	https://help.shopee.co.id/s/article/Bagaimana-cara-melakukan-Transfer-saldo-ShopeePay-ke-teman
ShopeePay	Indonesia	https://help.shopee.co.id/s/article/Bagaimana-cara-saya-melakukan-penarikan-dana-dari-ShopeePay
ShopeePay	Indonesia	https://www.viralorchard.com/cara-top-up-shopeepay-lewat-atm/
Japan Post Bank	Japan	https://tokyocheapo.com/living/japan-banks-comparison/
Japan Post Bank	Japan	https://origami-book.com/column/course-en/13868
Mitsubishi UFJ Financial Group	Japan	https://www.bk.mufg.jp/tesuuryou/furikomi.html
Mitsubishi UFJ Financial Group	Japan	https://tokyocheapo.com/living/japan-banks-comparison/
PayPay	Japan	https://yourstory.com/2019/08/paytm-softbank-yahoo-japan-digital-payment

Provider	Country	Link
PayPay	Japan	https://blog.paytm.com/our-qr-tech-now-powers-japans-qr-based-paypay-1b39ee3884c6
Pixiv Pay	Japan	https://pay.pixiv.net/
Rakuten Pay	Japan	https://www.rakuten.com/help/article/how-to-join-rakuten-360002101108
Rakuten Pay	Japan	https://global.rakuten.com/corp/news/press/2016/0926_01.html#:~:text=No%20transfer%20fees%20are%20charged,of%20165%20yen%20per%20transfer
Sumitomo Mitsui Financial Group	Japan	https://www.smbc.co.jp/kojin/fee/
Sumitomo Mitsui Financial Group	Japan	https://tokyocheapo.com/living/japan-banks-comparison/
Kakao Pay	Korea, Rep.	https://reviews.financesonline.com/p/kakaopay/#:~:text=The%20Kakaopay%20service%20is%20free,are%20no%20enterprise%20pricing%20plans
Kakao Pay	Korea, Rep.	https://m.blog.naver.com/PostView.nhn?blogId=the_esc&logNo=220706924398&proxyReferer=https:%2F%2Fwww.google.com%2F
KB Kookmin Bank	Korea, Rep.	https://bankmeister.com/korea/bank/kb#tab_fee
KB Kookmin Bank	Korea, Rep.	http://img2.kbstar.com/obj/eng/f_guide.pdf
KB Kookmin Bank	Korea, Rep.	https://obank1.kbstar.com/quics?page=C024835
KB Kookmin Bank	Korea, Rep.	https://obank1.kbstar.com/quics?page=C024843
KEB Hana Bank	Korea, Rep.	https://bankmeister.com/korea/bank/keb#tab_fx_fee
KEB Hana Bank	Korea, Rep.	https://www.kebhana.com/cont/mall/mall09/mall0906/mall090601/mall09060101/index.jsp
Naver Pay	Korea, Rep.	https://campaign.naver.com/npay/sendmoney_howto/#:~:text=%EC%86%A1%EA%B8%88%20%EB%B3%B4%EB%82%B4%EA%B8%B0,%ED%9A%9F%EC%88%98%20%EC%A0%9C%ED%95%9C%20%EC%97%86%EC%9D%B4%20%EC%88%98%EC%88%98%EB%A3%8C%20%EB%AC%B4%EB%A3%8C!
Naver Pay	Korea, Rep.	https://m.blog.naver.com/PostView.nhn?blogId=the_esc&logNo=220706924398&proxyReferer=https:%2F%2Fwww.google.com%2F
PayCo	Korea, Rep.	https://www.payco.com/
Samsung Pay	Korea, Rep.	https://reviews.financesonline.com/p/samsung-pay/
Samsung Pay	Korea, Rep.	https://www.samsung.com/sec/samsung-pay/finance/
Shinhan Bank	Korea, Rep.	https://bankmeister.com/korea/bank/shinhan#tab_fx_fee
Shinhan Bank	Korea, Rep.	http://img.shinhan.com/nexhpe/ko/news/201001280441159_1264643513000000173.pdf
Shinhan Bank	Korea, Rep.	https://bank.shinhan.com/en/index.jsp#015004020000
Shinhan Bank	Korea, Rep.	https://oldm.shinhan.com/pages/notice/mbanking_commission_info.jsp?select_cate=1
Toss	Korea, Rep.	https://blog.toss.im/2019/12/12/toss/guide/newtosscard/

Provider	Country	Link
Toss	Korea, Rep.	https://blog.toss.im/2019/03/06/toss/guide/toss-best-5-hidden-features/
Toss	Korea, Rep.	https://blog.toss.im/2020/07/01/toss/guide/toss-transfer/
Toss	Korea, Rep.	http://blog.naver.com/PostView.nhn?blogId=parosaone&logNo=221505687356
BigPay	Malaysia	https://www.bigpayme.com/fees-charges
Boost	Malaysia	https://www.myboost.com.my/product-disclosure/
Gopayz	Malaysia	https://gopayz.com.my/product-disclosure-sheet/
Maybank Anytime Everywhere (MAE)	Malaysia	https://www.google.nl/url?sa=t&source=web&rct=j&url=https://www.maybank2u.com.my/iwov-resources/pdf/personal/digital_banking/MAE_PDS.pdf&ved=2ahUKEwjR55C5oJbsAhXZbCsKHbv5B1wQFjABegQIExAI&usg=AOvVaw0ildlUVkbGOt59B8VH15Wl
MBSB Bank e-wallet	Malaysia	https://www.mbsbbank.com/storage/misc/FINAL%20e-wallet%20TC18082020_.pdf
ShopeePay	Malaysia	https://ringgitplus.com/en/blog/e-wallet/Shopee-Releases-Its-Own-E-Wallet-ShopeePay.html?utm_source=facebook&utm_medium=social&utm_campaign=my-fbsoc-gen-gen&utm_content=EWT-SPP-20190711&fbclid=IwAR3mIiOHg0rv9OZ2HVm-a-HEDkLpI_NVTiOarRWm6dP4d6zqkevxOaEsaSo
Touch 'n Go eWallet	Malaysia	https://www.google.nl/url?sa=t&source=web&rct=j&url=https://cdn-web.tngdigital.com.my/images/cdnimages/pds.pdf&ved=2ahUKEwjroeXmzpXsAhXDV30KHaSOAG0QFjAEegQIExAH&usg=AOvVaw0GCeBzRH_2kG67zatlm3l3
WeChat Pay	Malaysia	https://pay.wechat.com/en_my/faq.html
AYA Bank	Myanmar	https://www.ayabank.com/en_US/ayaworldremit/
CB Bank	Myanmar	https://www.cbbank.com.mm/en/consumer-banking/daily-banking/local-payment-transfer/local-fund-transfer-remittance
Kanbawza Bank Limited (KBZ)	Myanmar	https://www.kbzbank.com/en/accounts/saving-deposit-account/
Kanbawza Bank Limited (KBZ)	Myanmar	https://www.kbzbank.com/en/remittance/international-remittance/
M-Pitesan	Myanmar	https://ooredoo.com.mm/portal/en/mpitesantariff
Wave Money	Myanmar	https://www.wavemoney.com.mm/products-prices/wave-account/using-app/
ANZ	New Zealand	https://www.anz.co.nz/rates-fees-agreements/personal-accounts/
Kiwibank	New Zealand	https://media.kiwibank.co.nz/media/documents/Personal_banking_fees_and_limits_brochure_Mar20.pdf
Westpac	New Zealand	https://www.westpac.co.nz/assets/Personal/Your-Money-and-Tailored-Packs/Brochures/transaction_service_fees.pdf
BDO	Philippines	https://www.bdo.com.ph/personal/accounts/peso-savings-account/atm-savings
BDO	Philippines	https://www.bdo.com.ph/support-topics/vi-internet-banking-requesting-special-services/wire-transfer-there-service-charge
BDO	Philippines	https://fintechnews.sg/36161/fintechphilippines/philippines-banks-atm-fees-compared/

Provider	Country	Link
BPI	Philippines	https://www.bpiexpressonline.com/p/1/326/deposit-rates-savings-and-checking
BPI	Philippines	https://www.bpiexpressonline.com/p/1/691/account-maintenance-and-transaction-fees
BPI	Philippines	https://www.bpiexpressonline.com/p/1/694/international-wire-transfer
GCash	Philippines	https://help.gcash.com/hc/en-us/articles/900001636203-What-are-the-fees-I-may-encounter-in-GCash-
GCash	Philippines	https://debtbombers.com/qa/can-i-use-gcash-mastercard-abroad.html
Metrobank	Philippines	https://metrobank.com.ph/rates-and-fees
PayMaya	Philippines	https://www.negosyo.paymaya.com/merchant
PayMaya	Philippines	https://store.paymaya.com/pages/faq
PayMaya	Philippines	https://www.paymaya.com/terms-and-conditions
DBS Bank	Singapore	https://www.dbs.com.sg/personal/cards/debit-cards/dbs-visa-debit
DBS Bank	Singapore	https://www.dbs.com.sg/personal/deposits/pay-with-ease/international-transfers
AirPay	Thailand	https://app.airpay.in.th/en/home
Bangkok Bank	Thailand	https://www.bangkokbank.com/en/Personal/Other-Services/View-Rates
K Plus	Thailand	https://kasikornbank.com/en/rate
Kasikorn Bank	Thailand	https://kasikornbank.com/en/rate
Line Pay	Thailand	https://help.line.me/line/ios/pc?country=TH&lang=en&contentId=20013092
mPay	Thailand	https://www.ais.co.th/mpaypromptpay/en/
SCB Easy	Thailand	https://www.scbeasy.com/v1.4/site/presignon/en/srv/srv_ftb.asp
Siam Commercial Bank	Thailand	https://www.scb.co.th/en/personal-banking/rates-fees.html
TrueMoney	Thailand	https://www.truemoney.com/rates-en/
VietinBank	Vietnam	https://www.vietinbank.vn/web/home/en/fees/usd.html

Appendix 3. Key stakeholders and regulations

On the regulatory side, two governing bodies play critical roles in shaping the landscape of digital finance in Indonesia, namely, Bank Indonesia (BI) and Otoritas Jasa Keuangan (OJK, the Financial Services Authority). BI, the central bank of Indonesia, is the monetary authority as well as the regulatory and supervisory authority of the banking and payment system. On the other hand, OJK was established to promote and organize a system of regulations and supervisions that is integrated into the overall activities in the financial services sector, including nonbank financial institutions. Although the two institutions oversee different aspects of financial institutions, they have similar and occasionally overlapping initiatives related to financial inclusion policies. In addition to these two institutions, the Dewan Nasional Keuangan Inklusif (National Financial Inclusion Council) serves in a coordinating and advisory role on financial inclusion initiatives across different government institutions.

Other government institutions that indirectly shape the regulatory landscape of digital financial services are the Ministry for Communication and Informatics (MINFO) and

Ministry of State-Owned Enterprises. It was MINFO that issued Law No. 11 Year 2008 on Information and Electronic Transactions, which proved to be a key regulation behind the growth of digital financial services. The Ministry of State-Owned Enterprises, responsible for directing the long-term business plans of such enterprises, played a key role in setting up LinkAja, one of the major providers of e-money. The involvement of the state-owned MNO, PT Telkomsel, in LinkAja followed several failed attempts by MNOs to develop mobile money in Indonesia.

The last set of key stakeholders is the users and potential users of the digital payment services. Expanding digital financial services at the extensive margins is the goal of financial inclusion programs. Branchless banking agents, who provide financial services through both e-money and BSAs, as well as "accidental agents," such as GoJek drivers and merchants, who provide payment services using e-money, play an important role. For e-commerce-based providers like GoJek, expanding their users may not be limited to tapping into those who already have access to digital financial services, but also to segments of the population who are still excluded. E-commerce platforms, especially, will likely seek to expand their networks of merchants as well as users.

Several key regulations have affected the country's digital financial markets in recent years. Some of these regulations were formulated with the specific aim to promote digital financial markets and at the same time protect customers and providers alike. There are other regulations, both preexisting and new, that were not specifically formulated to govern the industry but nevertheless have consequences—sometimes unintended—on the market structures and degree of competition as well as other aspects of digital financial markets. As the digital financial services market has flourished, more regulations have been established to address issues brought about by new types of financial products such as P2P lending. Both BI and OJK have issued regulations regarding a regulatory "sandbox," aimed to accommodate innovations in digital financial services. Table A.3.1 summarizes the key regulations on digital financial services enacted through October 2020.

Table A.3.1. Key regulations on digital financial services, Indonesia, through October 2020

Year	Institution	Regulation	Description
2008	MINFO/ Federal government	Law No. 11/2008	On Information and Electronic Transactions
2012	Federal government	Government Regulation No. 82/2012	On the Implementation of Electronic Systems and Transactions
2016	MINFO/ Federal government	Minister Regulation No. 4/2016	On Information Protection Management Systems
2016	MINFO/ Federal government	Minister Regulation No. 20/2016	On Protection of Personal Data in Electronic Systems
2016	Federal government	President Regulation No. 82/2016	On National Strategy for Financial Inclusion

Year	Institution	Regulation	Description
2017	Federal government	President Regulation No. 74/2017	On E-Commerce Road Map
2020	Federal government	President Regulation No. 114/2020	On National Strategy for Financial Inclusion (Updated)
2006	BI	BI Regulation No. 8/2006	On Money Transfer
2009	BI	BI Regulation No. 1 1/2009	On Electronic Money
2009	BI	BI Circular Letter No. 11/2009	On Implementation of Card-Based Payment Instrument Activities
2012	BI	BI Regulation No. 14/2012	Revision on the Implementation of Card-Using Payment Instrument Activities (& Electronic Money)
2014	BI	BI Circular Letter No. 16/2014	On the Implementation of Electronic Money
2015	BI	BI Circular Letter No. 17/2015	Revision on the Implementation of Electronic Money (revised the cash-out limit)
2016	BI	BI Regulation No. 18/2016	Revision on Electronic Money (including payment system processing)
2016	BI	BI Circular Letter No. 18/2016	On the Implementation of Digital Financial Service and Electronic Money (revised limit for loan interest rate)
2017	BI	BI Regulation No. 19/2017	On Operation of Financial Technology (national payment gateway)
2017	BI	BI Board of Governors Regulation No. 19/2017	On Governance for Registration, Information Sharing and Surveilance for Fintech (including fintech regulatory sandbox)
2019	BI	BI Board of Governors Regulation No. 21/2019	On Payment using Quick Response Code Indonesia Standard—QRIS
2013	OJK	OJK Regulation No. 1/2013	On Consumer Protection in Financial Sector
2016	OJK	OJK Regulation No. 77/2016	On P2P Lending
2017	OJK	OJK Circular Letter No. 18/2017	On P2P Lending Risk Management and Governance
2018	OJK	OJK Regulation No. 13/2018	On Digital Financial Innovation in Financial Service Sector (including regulatory sandbox)
2017	Ministry of Public Works	Minister Regulation No. 16/2017	On Non-cash Transactions on Toll Roads (starting October 31, 2017)

Appendix 4. The decision tree methodology: further details

This appendix extends the discussion in Section 3 by providing additional details regarding the methodology used in this paper. The complete analytical framework, the principles of the methodology, and numerous examples can be found in "A Decision Tree for Digital Financial Inclusion Policymaking" (Claessens and Rojas-Suárez 2020).

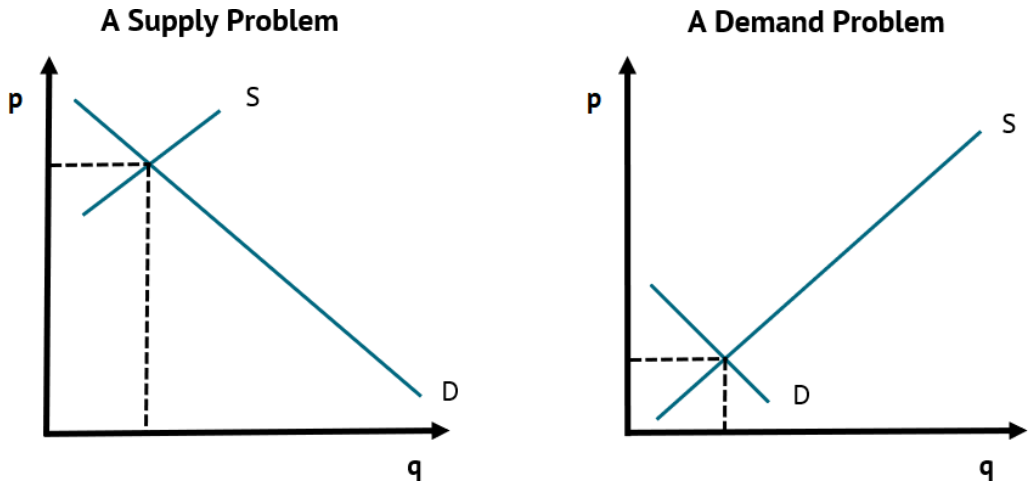
The methodology is inspired by work on growth diagnostics by Hausmann, Rodrik, and Velasco (2005) and Hausmann, Klinger, and Wagner (2008), who created a decision tree to identify the binding constraints on growth in developing economies—that is, the factors that are preventing countries from reaching their growth potential. The motivation behind this framework is to offer a diagnostic tool that will help policymakers prioritize areas where actions are needed the most and can have the largest impact. Many factors can be constraints—indeed, all the branches in the decision tree are determinants of financial inclusion—but the methodology seeks to find those that are *binding*.

Hence, the decision tree for digital financial inclusion outlines a set of potential constraints that analysts have to evaluate in order to determine which are binding, in the sense that they are the root causes limiting the expansion of financial inclusion. Claessens and Rojas-Suárez (2020) offered three different trees, for payment, store of value, and credit services, respectively, though some constraints are naturally common to the three trees. These trees have served us as a guide in the search for the binding constraints on digital payments and transfers in Indonesia.

The decision tree for digital payments and transfers is presented in Figure 5. We evaluate all the branches (and sub-branches) of the tree to identify the binding constraints on financial inclusion, applying the following principles:

1. ***Prices of financial services are key indicators to determine whether binding constraints are (likely) on the demand or the supply side.*** Observing low quantities (low usage) of a service does not indicate whether the constraints are affecting providers or consumers. Analysts can get an *initial* idea of whether binding constraints are on the supply or the demand side by considering prices, though they should evaluate all the branches in the tree individually. Generally, if the price of a service is relatively high compared with either another similar service or the (properly adjusted) customary price charged in other countries with similar levels of development, it indicates the existence of supply-side constraints (left graph in Figure A4.1). This situation suggests that providers are willing to supply the service only at a high price (due to high costs or other distortions related to supply-side constraints). These high prices, as a result, exclude significant proportions of the population, who cannot afford the service. On the other hand, a relatively low price would indicate a demand-side problem, since users are unable or unwilling to use the service despite its low price (right graph in Figure A4.1).

Figure A4.1. Distinguishing between supply and demand problems



Note: S and *D* represent, respectively, the supply of and demand for a financial service, and *p* and *q* represent, respectively, the price and quantity used of that service. Actual usage occurs at the intersection of both curves.
Source: Claessens and Rojas-Suárez (2020) taken from Hausmann et al (2008).

> In addition, in many cases, it is necessary to consider a broader definition of prices, accounting for potential unobserved shadow prices and other factors, such as opportunity costs, that affect the market equilibrium. A clear example is geographical constraints, whereby the opportunity cost of displacement is built-in for customers and might cause low demand.

The three other principles indicate that a constraint is likely binding in one or more of the following cases:

2. ***If relaxing the constraint results in a significant change in usage*** or other relevant behaviors—for example, if reducing or eliminating certain taxes on payment services causes a sharp rise in the usage of the services
3. ***If agents are trying to overcome or bypass the constraint*** by using either equivalent alternative services (such as informal lending in a study of credit markets) or a combination of other, less efficient, financial instruments
4. ***If agents less intensive in that constraint are thriving***—that is, if the constraint affects only a subpopulation and those not affected by it are largely financially included. For example, in countries where institutional and governance quality is low, the ability to use financial services may depend on factors other than those driving the sound conduct of business, such as political connections. If so, one should observe that those with privilege to use the services do better than would be expected given their capacities.

Further considerations to take into account when using the decision tree methodology include these:

- ***When assessing whether a constraint (branch in the tree) is binding, analysts need to consider as many indicators as possible, including hard data as well as surveys reflecting perceptions.*** Claessens and Rojas-Suárez (2020) suggested possible indicators to use on each of the branches, but analysts should select a set of indicators based on the specific characteristics and context of both the services and the country under study. Data should encompass both aggregate and microlevel statistics.
- ***Keep in mind that removing nonbinding constraints might be necessary to expose a binding constraint.*** For instance, allowing mobile money to operate by law can ease a constraint but, while necessary, it might not be sufficient to improve financial inclusion. Relaxing this constraint might instead help to uncover a truly binding constraint, such as the lack of a critical mass of customers (a coordination problem).
- ***Acknowledge that branches can interrelate.*** In some cases, to fully evaluate a branch requires analyzing others. Analysts should draw the necessary connections and assess which indicators to use to evaluate each of the branches.

Appendix 5. Sources for account registration requirements

Table A5.1. Sources of data displayed in Table 2, requirements to open an account

Account type	Source
BSA (Laku Pandai)	https://www.bankmandiri.co.id/tabungan-simakmur https://bri.co.id/tentang-brilink
Regular savings account	https://www.cermati.com/artikel/cara-buat-rekening-di-bank-bca-berapa-saldo-minimalnya https://lifepal.co.id/media/tabungan-mandiri-ini-pilihan-dan-syarat-buka-rekeningnya/
Card-based e-money	https://www.cermati.com/e-money/flazz-bca
Server-based e-money	https://www.gojek.com/gopay/kebijakan-privasi/ https://www.cermati.com/e-money/ovo
Premium server-based e-money	https://www.gojek.com/blog/gopay/tips-jitu-berhasil-upgrade-akun-go-pay/ https://keuangan.kontan.co.id/news/mau-upgrade-ovo-premium-tersedia-lima-langkah-ini

Appendix 6. Sources for telco provider–level prices

Table A6.1. Sources of data displayed in Figure 19, average price per 100 gigabytes of data

Provider name (company)	Package name	Source
XL (XL Axiata)	Xtra Combo Plus Reguler	https://www.xl.co.id/id/mobile/prabayar/paket-dan-tarif/internet/xtra-combo-plus
Telkomsel (Telekomunikasi Seluler)	Paket Internet OMG! Telkomsel Simpati	https://www.telkomsel.com/en/internet-telkomsel/paket-internet-simpati?page=3
Indosat Ooredoo (Indosat)	Freedom Combo	https://indosatooredoo.com/portal/id/psfreedomcombo
SmartFren	Unlimited MAXI	https://www.smartfren.com/en/explore/product/unlimited/
Tri (Hutchinson 3 Indonesia)	Mix Combo	https://tri.co.id/PaketMixTri
Net1 (Sampoerna Telekomunikasi Indonesia)	Paket Business Pro 50	https://net1.co.id/id/personal

Appendix 7. Sources for institution-level fraud data

Table A7.1. Sources of data displayed in Table 6, cases of institution-level fraud

Institution	Company type	Period	Type of breach, fraud, or crime	Potential number of impacted users	Source
Tokopedia	E-commerce	July 2020	Privacy breach on customer data	91 million consumers	https://www.thejakartapost.com/news/2020/05/04/tokopedia-data-breach-exposes-vulnerability-of-personal-data.html
Government of Indonesia	Government	June 2020	Privacy breach on COVID-19 test takers' data	230,000 citizens	https://www.thejakartapost.com/news/2020/06/20/hacker-allegedly-breaches-govt-database-on-covid-19-test-takers.html
MeMiles	Fintech	Jan. 2020	MeMiles conducted a Ponzi scheme using users' funds	264,000 users	https://mediakonsumen.com/2018/10/27/surat-pembaca/akun-akulaku-dibobol-penipu-yang-mengatasnamakan-akulaku
Dompet Kartu & Pinjam Beres	Fintech	Dec. 2019	Illegal fintech operation as classified by OJK; harassment and misuse of personal data in billing enforcement	Undisclosed	https://keuangan.kontan.co.id/news/kasus-vega-data-dan-barracuda-fintech-satgas-investasi-beri-apresiasi-ke-polisi?page=1

Institution	Company type	Period	Type of breach, fraud, or crime	Potential number of impacted users	Source
Incash	Fintech	July 2019	Illegal fintech operation as classified by OJK; harassment and misuse of personal data in billing enforcement	Undisclosed	https://wow.tribunnews.com/amp/2019/07/26/5-fakta-pinjaman-online-incash-setelah-viral-iklan-wanita-rela-digilir-untuk-bayar-utang?page=4
Dompet Gajah	Fintech	Oct. 2020	Illegal fintech operation as classified by OJK; harassment and misuse of personal data in billing enforcement	Undisclosed	https://m.cyberthreat.id/read/8995/Fintech-Ilegal-Dompet-Gajah-Muncul-Kembali-di-Play-Store-OJK-Itu-Mungkin-Aplikasi-Baru
DanaCepat	Fintech	Oct. 2018	Illegal fintech operation as classified by OJK; harassment and misuse of personal data in billing enforcement	Undisclosed	https://www.google.com/amp/s/www.bbc.com/indonesia/trensosial-46107193.amp
CoCo Tek	Fintech	Aug. 2019	Illegal fintech operation as classified by OJK; harassment and misuse of personal data in billing enforcement	Undisclosed	https://www.google.com/amp/s/www.inews.id/amp/news/nasional/nasib-pahit-ayu-korban-fintech-ilegal-pinjam-rp700000-dipaksa-bayar-rp36-juta
Koperasi FKSS	Fintech	March 2020	Illegal fintech operation as classified by OJK; harassment and misuse of personal data in billing enforcement	Undisclosed	https://www.google.com/amp/s/prfmnews.pikiran-rakyat.com/citizen-report/amp/pr-13347939/nasib-pahit-dedi-korban-fintech-ilegal-gara-gara-telat-bayar-nama-baiknya-dicemarkan
TunaiCepat	Fintech	Jan. 2020	Illegal fintech operation as classified by OJK; harassment and misuse of personal data in billing enforcement	Undisclosed	https://makassar.tribunnews.com/amp/2020/01/08/waspada-penjual-bubur-di-makassar-jadi-korban-fintech-ilegal-modusnya

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