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Working Paper

New financial technologies, sustainable development, and the international monetary system

ADB Working Paper, No. 1277

Provided in Cooperation with:

Asian Development Bank Institute (ADBI), Tokyo

Suggested Citation: Prasad, Eswar S. (2021) : New financial technologies, sustainable development, and the international monetary system, ADB Working Paper, No. 1277, Asian Development Bank Institute (ADBI), Tokyo

This Version is available at:

<https://hdl.handle.net/10419/249456>

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ADB Working Paper Series

NEW FINANCIAL TECHNOLOGIES, SUSTAINABLE DEVELOPMENT, AND THE INTERNATIONAL MONETARY SYSTEM

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No. 1277
July 2021

Asian Development Bank Institute

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Suggested citation:

Prasad, E. 2021. New Financial Technologies, Sustainable Development, and the International Monetary System. ADBI Working Paper 1277. Tokyo: Asian Development Bank Institute. Available: <https://www.adb.org/publications/new-financial-technologies-sustainable-development-international-monetary-system>

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This paper was prepared for an ADBI conference on “Digitalization and Sustainable Economic Development.” I am grateful to the conference participants for their helpful comments and suggestions, and to Sanket Jain and Aryan Khanna for their excellent research assistance.

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Abstract

New financial technologies—including those underpinning cryptocurrencies—herald broader access to the financial system, quicker and more easily verifiable settlement of transactions and payments, and lower transaction costs. Domestic and cross-border payment systems are on the threshold of transformation, with significant gains in speed and lowering of transaction costs on the horizon. For emerging market and developing economies, the digitization of finance carries a number of potential benefits, including broadening of financial inclusion, quicker and cheaper cross-border remittances, and increased convenience of domestic payments. But some of these developments could also increase these countries' exposure to volatile capital flows. Governments, central banks, and regulatory agencies will face difficult challenges in striking the right balance between fostering innovations and mitigating risks arising from them.

Keywords: fintech, payment systems, international payments, financial inclusion, capital flows, financial regulation

JEL Classification: G0, E5

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1. INTRODUCTION

This paper provides a broad analytical overview of how new financial technologies are likely to influence various aspects of the process of economic development. While the advent of decentralized cryptocurrencies such as Bitcoin has received considerable attention, a broader set of changes caused by advances in technology are likely to eventually have a more profound and lasting impact, particularly on emerging market and developing economies.

New financial technologies—including those underpinning cryptocurrencies—herald broader access to the financial system, quicker and more easily verifiable settlement of transactions and payments, and lower transaction costs. Domestic and cross-border payment systems are on the threshold of transformation, with significant gains in speed and lowering of transaction costs on the horizon. However, many of these benefits come with attendant risks and costs. For instance, the efficiency gains in normal times from having decentralized payment and settlement systems need to be balanced against their potential technological vulnerabilities and the repercussions of loss of confidence during periods of financial stress.

Multiple payment systems could improve the stability of the overall payment mechanism in the economy and reduce the possibility of counterparty risk associated with the payment hubs themselves. At the same time, privately managed payment systems without official backing could be severely tested in times of crisis of confidence and serve as channels for risk transmission. Decentralized electronic payment systems are also exposed to technological vulnerabilities that could entail significant economic as well as financial damage. Thus, governments and regulators face a difficult balance in fostering innovation and decentralization while keeping risks under control.

Meanwhile, rapid changes are underway that could change the structure of financial markets and the role of central bank money as a payment system. The potentially transformative potential of cryptocurrencies was highlighted by Facebook's 2019 announcement that it plans to issue a cryptocurrency called "Libra" (the project was recently renamed "Diem"). The cryptocurrency will actually be issued and managed by the Libra Association, although Facebook is likely to retain a dominant role.

Facebook envisions Libra as a digital currency that will be limited to serving as a medium of exchange and that will be fully backed by a reserve constituted of a basket of safe assets denominated in major hard currencies, an approach that is in some ways akin to the issuance of a currency under a currency board arrangement. According to Facebook, the goal is to create a more inclusive financial system as well as a more efficient and cheap payment system for both domestic and cross-border transactions. The fully backed nature of Libra suggests that it will provide a stable store of value and will not have any monetary policy implications. The latter proposition is of more direct concern to regulators, who are equally worried that Libra could serve as a conduit for the flow of illicit funds, both domestically and across national borders.

It is an intriguing, and in some ways disturbing, prospect that other large nonbank financial institutions and nonfinancial corporations could also become important players in financial markets, perhaps even issuing their own tokens/currencies. Such digital tokens issued by Facebook and other well-known nonfinancial corporations such as Amazon could end up being seen as stores of value as well, given the scale and financial might of these corporations. The major implications of such developments would not just be a reduction in the demand for central bank money as mediums of

exchange or stores of value, but the consequences they would have for the business models of banks and other existing financial institutions.

Financial institutions, especially banks, could face challenges to their business models, as new technologies facilitate the entry of institutions (or decentralized mechanisms) that can undertake financial intermediation and overcome information asymmetries. Banks will find it difficult to continue collecting economic rents on some activities that cross-subsidize other activities. The emergence of new institutions and mechanisms could improve financial intermediation but will pose significant challenges in terms of regulation and financial stability.

The rapid rise of new financial technologies and digital payment systems, including cryptocurrencies, has elicited a range of responses from central banks and governments, from trying to adapt the changes to their advantage to resisting certain developments due to concerns about monetary and financial instability. One response has been for central banks themselves to innovate in the means for producing money. In particular, many central banks are exploring the possibility of issuing digital versions of their fiat currencies.

At a basic level, central bank digital currencies (CBDCs) are digital forms of central bank money. The scope of CBDCs encompasses both retail and wholesale payment systems. Wholesale CBDCs entail some efficiency improvements but not fundamental changes to the interbank payment system managed by central banks, since balances held by commercial banks at the central bank (reserves) are already in electronic form. Retail CBDC, which would be a digital complement to, or substitute for, physical cash, would be more of a revolutionary change. Retail CBDC can take one of two forms—either token-based or value-based. These have very different implications for monetary and other policies.

The motives for issuing retail CBDC range from broadening financial inclusion to increasing the efficiency and stability of payment systems.¹ For instance, Sweden's Riksbank is actively exploring the issuance of an e-krona, a digital complement to cash, with the objective of "promoting a safe and efficient payment system." Both of these considerations are relevant for developing economies. CBDCs could function as payment mechanisms that provide stability without necessarily limiting private fintech innovations or displacing privately managed payment systems. Other central banks that have already issued, or are considering issuing, CBDC, especially those in developing economies, seem to give higher priority to providing households with easier access to electronic payment systems.

There are many potential advantages to switching from physical to digital versions of central bank money, in terms of easing some constraints on traditional monetary policy and providing an official electronic payment system that all agents in an economy, not just financial institutions, have access to. The basic mechanics of monetary policy implementation will not be affected by a switch from physical currency to CBDCs. However, other technological changes that are likely to affect financial markets and institutions could have significant effects on monetary policy implementation and transmission.

New forms of money and new channels for moving funds within and between economies could also have implications for international capital flows, exchange rates, and the structure of the international monetary system. The proliferation of channels for cross-border capital flows will make it increasingly difficult for national authorities to control these flows. Emerging market economies will face particular challenges in

¹ See Prasad (2021).

managing the volatility of capital flows and exchange rates, and could be subject to greater monetary policy spillovers and contagion effects.

This paper begins by examining the role of cash in a set of emerging and developing economies across three different regions of the world. Section 2 also includes a description of various indicators of financial inclusion and digitization in these economies. Section 3 provides an overview of how one country—India—has resolved some of the tensions in terms of the role of the government and the private sector in financial innovations. Section 4 discusses the implications of the digital economy for the international monetary system, including cross-border payments, monetary spillovers, and currency competition. The final section contains some implications for policymakers.

2. OVERVIEW OF FINANCIAL INCLUSION AND DIGITIZATION IN DEVELOPING ECONOMIES

Cash still remains an important method of payment in many economies, although a few of them are increasingly shifting towards electronic forms of payment for retail transactions rather than using cash. This is true of some advanced economies as well as some emerging market and developing economies, although the patterns are not uniform in either of these groups of economies. In this section, I examine the relative importance of cash, as well as changes in indicators of that importance, in different regions of the world.

2.1 Changes in Currency Stocks Relative to Monetary and Real Indicators

Table 1 examines the ratio of currency to M2, an indicator of the relative importance of cash in an economy's total money supply, as measured by a broad money aggregate.² In most Asian economies this ratio declined from 2004 to 2020. The exceptions are, interestingly enough, three high-income economies—Japan; the Republic of Korea; and Taipei, China—where this ratio actually went up over this period, along with one low-income economy, Bangladesh. In Japan, for instance, this is partly a reflection of the rapid expansion of the central bank's balance sheet through unconventional monetary policy operations, which included printing money to buy government bonds and other financial assets. In the People's Republic of China (PRC), the ratio fell from 8.5% to 3.9%, making it the country with the lowest ratio in the group. The ratio is close to 10% in both Indonesia and Thailand, and about 15% in India.

The ratio of currency to nominal GDP, another indicator of the importance of cash in an economy, is shown for 2004 and 2019 in the second block of Table 1. The pattern is similar to that in the first block, with the ratio rising for Japan; the Republic of Korea; and Taipei, China, as well as a few other economies. The ratio is below 8% for Bangladesh, the PRC, Indonesia, and the Republic of Korea, and over 21% for Japan. In short, cash remains important in much of Asia, although, at least based on these crude indicators, its importance has declined in most emerging markets while rising in advanced economies.

² The regional averages referred to in this section are unweighted, cross-sectional averages.

Table 1: Some Financial Statistics for Selected Asian Economies

| | Currency to M2 (%) | | Currency to GDP (%) | | Size of Informal Economy (% of GDP) | |
|---------------|-----------------------|-------|------------------------|-------|---|-------|
| | 2004 | 2020 | 2004 | 2019 | 2004 | 2015 |
| Bangladesh | 13.25 | 13.62 | 4.72 | 6.67 | 36.50 | 27.60 |
| Cambodia | 38.00 | 11.11 | 5.40 | 11.91 | 46.74 | 33.85 |
| PRC | 8.45 | 3.85 | 13.27 | 7.71 | 14.31 | 12.11 |
| India | 18.64 | 15.38 | 13.27 | 11.77 | 23.87 | 17.89 |
| Indonesia | 12.51 | 10.59 | 5.42 | 5.04 | 25.18 | 21.76 |
| Japan | 8.02 | 8.40 | 16.49 | 21.23 | 11.09 | 8.19 |
| Rep. of Korea | 2.57 | 4.58 | 2.99 | 6.50 | 26.23 | 19.83 |
| Taipei, China | 2.89 | 4.64 | 5.99 | 11.40 | 32.04 | 28.97 |
| Thailand | 9.47 | 9.11 | 10.55 | 11.33 | 49.45 | 43.12 |
| Viet Nam | 22.05 | 12.07 | 14.00 | 19.81 | 18.40 | 14.78 |
| Average | 13.58 | 9.33 | 9.21 | 11.34 | 28.38 | 22.81 |

Notes: Data provided by central banks and compiled by CEIC data. Estimates of the size of the informal economy are from Medina and Schneider (2018). Currency and M2 data are based on the amount in December of that year or the latest available month for the 2020 data. For India, M3 is used instead of M2. The averages shown in the last row are unweighted cross-sectional averages.

The final block of Table 1 shows measures of the size of the informal economy, which often tends to be positively correlated with the usage of cash. Estimates of the size of the informal economy, based on work by Medina and Schneider (2018), show that the relative size of the informal economy as a ratio to GDP fell in all Asian economies over this period. In 2015, the range of estimates of this ratio was from 8% in Japan to 43% in Thailand. In every Asian economy examined here, the relative size of the informal economy declined over the period 2004–2015.

Table 2 shows similar data for a selected set of African countries. Relative to Asia, the share of currency in M2 is much higher in Africa, although it has declined sharply in a number of countries in the region. For instance, in Kenya, where mobile payment technologies have become widely prevalent in recent years, the ratio fell from 15.9% in 2004 to 8.4% in 2020. The sharpest fall in this ratio is in Nigeria, which is now the largest economy in Africa—from 24.1% in 2004 to 7.3% in 2020. On average, the currency to M2 ratio has fallen in Africa but the ratio of currency to GDP has risen slightly. Virtually every African economy is estimated to have a large informal economy, with only modest progress in reducing the relative size of the informal economy over the period 2004–2015. Interestingly, Nigeria has one of the lowest ratios of currency to M2 in the group, the lowest ratio of currency to GDP, but also the highest ratio of the estimated size of its informal economy to measured GDP.

Table 3 provides similar data for a group of Latin American economies. On average, the share of currency in M2 for the countries in the region was 21.8% in 2020, which is higher than the average for Asia and Africa. A number of economies, such as Argentina, Bolivia, and Paraguay, reported ratios above 25%. The average ratio of currency to nominal GDP in the region rose from 5% in 2001 to 7% in 2019.

Table 2: Some Financial Statistics for Selected African Countries

| | Currency to M2 (%) | | Currency to GDP (%) | | Size of Informal Economy (% of GDP) | |
|--------------|-----------------------|-------|------------------------|-------|---|-------|
| | 2004 | 2020 | 2004 | 2019 | 2004 | 2015 |
| Algeria | 23.59 | 34.14 | 14.23 | 26.90 | 27.76 | 23.98 |
| Egypt | 13.37 | 13.23 | 12.95 | 11.18 | 33.92 | 33.32 |
| Ghana | 36.64 | 20.52 | 9.56 | 4.39 | 42.90 | 39.97 |
| Kenya | 15.91 | 8.38 | 5.53 | 2.75 | 34.64 | 33.43 |
| Morocco | 22.89 | 25.11 | 16.90 | 21.73 | 33.92 | 27.13 |
| Nigeria | 24.11 | 7.28 | 3.06 | 1.86 | 56.72 | 52.49 |
| South Africa | 5.88 | 5.01 | 3.73 | 3.27 | 26.58 | 21.99 |
| Zambia | 15.41 | 12.21 | 2.84 | 3.37 | 47.60 | 32.99 |
| Average | 19.72 | 15.73 | 8.60 | 9.43 | 38.01 | 33.16 |

Notes: Data provided by central banks and compiled by CEIC data. Estimates of the size of the informal economy are from Medina and Schneider (2018). Currency and M2 data are based on the amount in December of that year or the latest available month for the 2020 data. The averages shown in the last row are unweighted cross-sectional averages.

Table 3: Some Financial Statistics for Selected Latin American Countries

| | Currency to M2 (%) | | Currency to GDP (%) | | Size of Informal Economy (% of GDP) | |
|------------|-----------------------|-------|------------------------|-------|---|-------|
| | 2004 | 2020 | 2004 | 2019 | 2004 | 2015 |
| Argentina | 36.80 | 31.10 | 6.89 | 4.29 | 24.30 | 24.99 |
| Bolivia | 59.00 | 43.41 | 5.34 | 17.40 | 66.70 | 62.30 |
| Brazil | 8.90 | 9.37 | 2.48 | 3.64 | 37.30 | 37.60 |
| Chile | 5.20 | 9.00 | 2.50 | 4.94 | 16.90 | 16.70 |
| Colombia | 16.00 | 19.33 | 5.05 | 8.39 | 35.30 | 37.60 |
| Costa Rica | 11.00 | - | 2.62 | - | 24.00 | 16.70 |
| Mexico | 13.60 | 16.51 | 4.66 | 7.12 | 29.80 | 24.50 |
| Paraguay | 38.00 | 27.98 | 3.98 | 6.07 | 36.30 | 33.60 |
| Peru | 7.80 | 17.87 | 1.78 | 8.07 | 53.50 | 31.70 |
| Uruguay | 53.74 | 21.31 | 5.16 | 3.90 | 40.70 | 34.50 |
| Venezuela | 12.00 | - | 2.57 | - | 36.20 | 52.40 |
| Average | 23.82 | 21.76 | 4.95 | 7.09 | 36.45 | 33.87 |

Notes: Data provided by central banks and compiled by CEIC data. Estimates of the size of the informal economy are from Medina and Schneider (2018). Currency and M2 data are based on the amount in December of that year or the latest available month for the 2020 data. The averages shown in the last row are unweighted cross-sectional averages.

A case study for Colombia reinforces the point about the importance of cash in Latin America (see Arango-Arango, Suárez-Ariza, and Garrido-Mejía 2017). A survey of the general public and small traders in the country's five main cities was conducted by the Banco de la República. The survey indicated that even urban consumers who have a high degree of access to electronic payment instruments still make 97% of their payments in cash, mainly due to the limited acceptance of such instruments in their daily transactions. The reluctance of small businesses to accept electronic payments is attributed to their perceptions of the cost involved and the prospect of higher tax burdens. Electronic payments account for barely one-third of higher-value transactions (roughly above \$470) and about 12% of the total value of all transactions.

2.2 Measures of Financial Inclusion and Digitization of Payments

The statistics reported in Tables 1–3 are buttressed by a review of the levels of financial inclusion in different regions. In Table 4, drawing on the World Bank’s Findex Database, I present some data on basic aspects of financial inclusion and also some measures of access specifically related to digital payment and banking technologies. The table shows data for 2017 for selected Asian economies. Based on a broad measure of financial inclusion—having an account at a financial institution—on average 68% of adults in Asian economies have direct access to the formal financial system. This measure ranges from 22% in Cambodia to 80% in the PRC and India, and to over 90% in Japan; the Republic of Korea; and Taipei,China.

Table 4: Measures of Financial Inclusion and Digital Access in Asia
(% of the adult population)

| | Account at Financial Institution | Used Mobile Phone or Internet to Access A/c | Debit Card | Credit Card | Made Digital Payments in Past Year | Mobile Money Account |
|---------------|--|---|------------|-------------|--|----------------------------|
| Bangladesh | 50 | 13 | 6 | 0 | 30 | 21 |
| Cambodia | 22 | 6 | 7 | 1 | 12 | 6 |
| PRC | 80 | 50 | 67 | 21 | 61 | – |
| India | 80 | 6 | 33 | 3 | 20 | 2 |
| Indonesia | 49 | 14 | 31 | 2 | 27 | 3 |
| Japan | 98 | 34 | 87 | 68 | 89 | – |
| Rep. of Korea | 95 | 71 | 75 | 64 | 91 | – |
| Taipei,China | 94 | 35 | 74 | 53 | 69 | – |
| Thailand | 82 | 20 | 60 | 10 | 43 | 8 |
| Viet Nam | 31 | 25 | 27 | 4 | 16 | 3 |
| Average | 68 | 27 | 47 | 23 | 46 | 7 |

Notes: Data were obtained from the World Bank’s Global Findex Database. Data shown in the table are for 2017. Adult population refers to individuals aged 15 years or older. The second column indicates what proportion of households *with* accounts used mobile phones or the internet to access their accounts. Debit and Credit Card columns represent the share of the population that have them. The averages shown in the last row are unweighted cross-sectional averages.

The average shares of adults with a debit card and a credit card are 47% and 23%, respectively, suggesting that electronic means of payment are still not used by large swaths of the populations in these economies. There is again a wide discrepancy among regional economies. For instance, the proportion of adults with a credit card is 10% or lower in Bangladesh, Cambodia, India, Indonesia, Thailand, and Viet Nam, while it is over 50% in Japan; the Republic of Korea; and Taipei,China. Credit and debit cards seem to be pervasive in these advanced economies and play key roles in facilitating digital payments. In the PRC, 61% of the adult population report having made digital payments in the previous year, indicating how other digital payment systems have proliferated and reduced the need for debit and credit cards to make noncash payments. Mobile money accounts are not widely prevalent in a majority of the Asian economies for which data are available (Bangladesh being a notable exception).

In Africa, financial inclusion is much lower than in Asia (Table 5). The one exception is Kenya, where the share of adults with an account at a financial institution is 82%. In Kenya, the mobile payment system M-Pesa has served as a conduit to a bank account. Reflecting the low-income levels in these countries and other factors that have limited the penetration of financial institutions, especially in rural areas, access to debit and credit cards is quite limited across the entire region. Kenya also stands out as a country with much higher digital payment usage than in the rest of Africa, with three quarters of the adult population having made a digital payment over the past year.

Table 5: Measures of Financial Inclusion and Digital Access in Africa
(% of the adult population)

| | Account at Financial Institution | Used Mobile Phone or Internet to Access A/c | Debit Card | Credit Card | Made Digital Payments in Past Year | Mobile Money Account |
|--------------|--|---|------------|-------------|--|----------------------------|
| Algeria | 43 | 5 | 20 | 3 | 16 | – |
| Egypt | 33 | 4 | 25 | 3 | 6 | 2 |
| Ghana | 58 | 28 | 19 | 6 | 43 | 39 |
| Kenya | 82 | 57 | 38 | 6 | 76 | 73 |
| Morocco | 29 | 4 | 21 | 0 | 9 | 1 |
| Nigeria | 40 | 18 | 32 | 3 | 24 | 6 |
| South Africa | 69 | 25 | 34 | 9 | 43 | 19 |
| Zambia | 46 | 35 | 20 | 4 | 33 | 28 |
| Average | 50 | 22 | 26 | 4 | 31 | 24 |

Notes: Data were obtained from the World Bank's Global Findex Database. Data shown in the table are for 2017. Adult population refers to individuals aged 15 years or older. The second column indicates what proportion of households *with* accounts used mobile phones or the internet to access their accounts. Debit and Credit Card columns represent the share of the population that have them. The averages shown in the last row are unweighted cross-sectional averages.

Finally, I examine the same measures of financial inclusion for Latin America. This region has an average financial inclusion ratio that is between the averages for Africa and Asia (Table 6). The ratio is below 50% in Argentina, Colombia, Mexico, and Peru, while it is 70% or higher in Brazil, Chile, and Venezuela. Even among adults who have such an account, only a small proportion use the internet or mobile phones to conduct financial transactions through that account.

The average shares of adults with a debit card and a credit card are 43% and 20%, respectively, suggesting that electronic means of payment are still not used by large swaths of the populations in these countries. There is again a wide discrepancy among regional economies. For instance, the proportion of adults with a credit card is 10% or lower in Bolivia, Ecuador, and Mexico, while it is 30% or higher in Chile and Uruguay. On average, only about 39% of adults in Latin American countries report having used any form of digital payment over the past year. The share is higher than 50% in only three economies—Chile, Uruguay, and Venezuela.

The share of adults with a mobile money account is in single digits for most countries. In general, there have been only modest increases in the indicators shown here over the last few years (the Findex database has data for 2011 and 2014, in addition to 2017). Thus, both in terms of financial inclusion and digitization of payments, there is considerable room for progress in Latin American economies.

Table 6: Measures of Financial Inclusion and Digital Access in Latin America
(% of the adult population)

| | Account at Financial Institution | Used Mobile Phone or Internet to Access A/c | Debit Card | Credit Card | Made Digital Payments in Past Year | Mobile Money Account |
|------------|--|---|------------|-------------|--|----------------------------|
| Argentina | 49 | 21 | 41 | 24 | 32 | 2 |
| Bolivia | 54 | 12 | 28 | 7 | 33 | 7 |
| Brazil | 70 | 18 | 59 | 27 | 46 | 5 |
| Chile | 74 | 34 | 60 | 30 | 56 | 19 |
| Colombia | 46 | 16 | 26 | 14 | 29 | 5 |
| Costa Rica | 68 | 26 | 52 | 14 | 46 | – |
| Ecuador | 51 | 9 | 28 | 9 | 22 | 3 |
| Mexico | 37 | 15 | 25 | 10 | 23 | 6 |
| Peru | 43 | 10 | 28 | 12 | 25 | 3 |
| Uruguay | 64 | 25 | 56 | 41 | 53 | – |
| Venezuela | 73 | 40 | 66 | 29 | 65 | 11 |
| Average | 57 | 21 | 43 | 20 | 39 | 7 |

Notes: Data were obtained from the World Bank's Global Findex Database. Data shown in the table are for 2017. Adult population refers to individuals aged 15 years or older. The second column indicates what proportion of households *with* accounts used mobile phones or the internet to access their accounts. Debit and Credit Card columns represent the share of the population that have them. The averages shown in the last row are unweighted cross-sectional averages.

2.3 Implications

Tables 1–6 show the challenges across various regions of the world in providing access to the formal financial system, the continued prevalence of cash, and also the low level of digitization of payments in many economies. At the same time, in many middle-income economies such as the PRC and Kenya, there have been significant improvements in the extent of digitization of payments.

One intriguing question that arises from reviewing the data discussed above is what the relationship and direction of causality are between the usage of cash, the level of financial inclusion, and the degree of informality of economic activity in a country. There is some suggestive evidence of a positive (unconditional) cross-sectional relationship between the usage of cash and the degree of informality, although there are some notable exceptions such as Japan and Nigeria. That is, in general, economies that use more cash seem to have more informality. There is also a weak negative relationship between the level of financial inclusion and the degree of informality. In other words, economies with higher levels of financial inclusion generate more economic activity in their formal than in their informal sectors.

Even if these relationships were to hold up in more formal statistical analysis, the issue of causality would be difficult to disentangle since there could in fact be alternative factors that account for these relationships. Indeed, it is likely that these phenomena, as well as that of dollarization, have common origins. For instance, a high tax burden creates incentives for shifting economic activity into the informal sector, shrinking the tax base and often leading governments to resort to monetary financing of public deficits. This can result in high and variable inflation, which in turn affects the stability of the value of the official medium of exchange, and can in turn lead to dollarization. Thus,

macroeconomic policies ultimately are key determinants of the multiple phenomena discussed here.

Nevertheless, these data suggest that if digitization of retail payments accomplishes the twin objectives of greater financial inclusivity and reduced reliance on cash, then an added benefit could be a reduction in the informality of economic activity. By bringing more economic activity out of the shadows, a developing country could broaden its tax base without raising tax rates. It could also help formalize employment and bring more of a country's population into the ambit of the social safety net. Digitization, by reducing reliance on cash, could also help in controlling public corruption and reducing leakage in government benefit transfers to households.

This raises an important question: Given the many potential benefits of greater digitization, what role should the government play in order to foster private sector innovation but also provide a basic technological infrastructure that provides a neutral and level playing field for private sector innovators? How best can this be done without creating undue financial system risks and while ensuring adequate consumer protection? It turns out that India has forged a path that other countries—including ones that have relatively low per capita incomes and where the extent of digital connectivity is limited—might be able to use as a template.

3. INDIA'S APPROACH TO FINANCIAL INCLUSION THROUGH DIGITAL TECHNOLOGIES

India's approach has a number of useful lessons for other developing (as well as developed) economies about how the government can play a supporting but not intrusive role. India's government has taken a more comprehensive approach than most countries to improving its citizens' access to digital payments as well as financial inclusion more broadly. This approach has also had implications for SMEs, many of which are of very small scale and have had little access to the formal financial system.

3.1 Elements of the India Stack

India has developed a version of the technology stack that has come to be known as the "India Stack."³ With the goal of creating a central platform rather than undertaking multiple technological projects, India has built one of the world's most comprehensive public goods—a digital system that allows both public and private sector participants to gain access to the digital economy, while protecting their privacy. The creation of this digital infrastructure has provided the foundation for a system that is capable of allowing millions of people working in the informal sector, or otherwise excluded from the formal financial system, to become a part of the digital economy by providing them with a tool that takes care of their identity and payments.

In 2009, India launched the world's first initiative to provide biometric identities for a country's entire population. The program, called "Aadhaar" (which means "foundation"), created an "identity rail" that provides unique digital identifiers for each citizen. This made it possible for everyone to get a bank account easily.

The government then helped create a public digital infrastructure with open access that provides easy entry for payment providers, thus encouraging innovation and fostering competition. This "payment rail," the Unified Payments Interface (UPI), is interoperable,

³ For more details, see D'Silva et al. (2019) and <https://www.digfinngroup.com/what-is-india-stack/>.

which means that it allows transactions to be conducted seamlessly across various payment providers and financial institutions. This approach differs from the stand-alone private payment providers such as Alipay and WeChat Pay that now dominate retail payments in countries such as the PRC.

UPI can be described as an addressing system built on top of a regulated payment system that enables people to obtain aliases or addresses (such as a mobile number or a nickname) linked to a bank account or a card. This addressing system operates compulsorily on every single bank account in the country, thus enabling a person to use a payment app provided by a regulated service provider to make and receive payments at the click of a button. UPI is the first national addressing system for payments that operates as an open system and as a public good.

The third element is a “data sharing rail” managed by authorized account aggregators that allows individuals to control their digital data trails and use the information to obtain access to financial services and products such as loans.

These three elements, taken together, have given even low-income and rural households easy access to a broad range of financial products and services. Private technological innovations can be plugged into various parts of this publicly provided digital infrastructure that has come to be known as the “India Stack” on account of its modular nature. Biometric identification of account holders, official certification of participants in UPI, and licensing of account aggregators help maintain regulatory oversight. To address concerns about privacy, the government has mandated that customers’ data can be shared only with their knowledge and consent, building confidence in what might otherwise be seen as just an intrusive government program. Thus, India has shown how the government can play a constructive role in creating a technical and regulatory infrastructure that allows private sector-led innovations to flourish on a level playing field for big and small innovators.

The India Stack can be thought of, alternatively, as just a set of standards or application programming interfaces (APIs) that facilitates interoperability and sharing among all the participants in the ecosystem that adopt these APIs. This serves both the financial services providers and customers, including households and businesses.

The way the three rails or pillars connect with each other could be illustrated like this: the first step to financial inclusion is a bank account, and Aadhaar (along with related government initiatives) made it possible for everyone to get a bank account easily. But most of these accounts were dormant. So the next step was to facilitate payments directly from the bank accounts, and this is what UPI did. Now that there were banking transactions, the final step was to empower people to use their banking transaction data to access other financial services like credit, and this is what the Account Aggregator hopes to do.

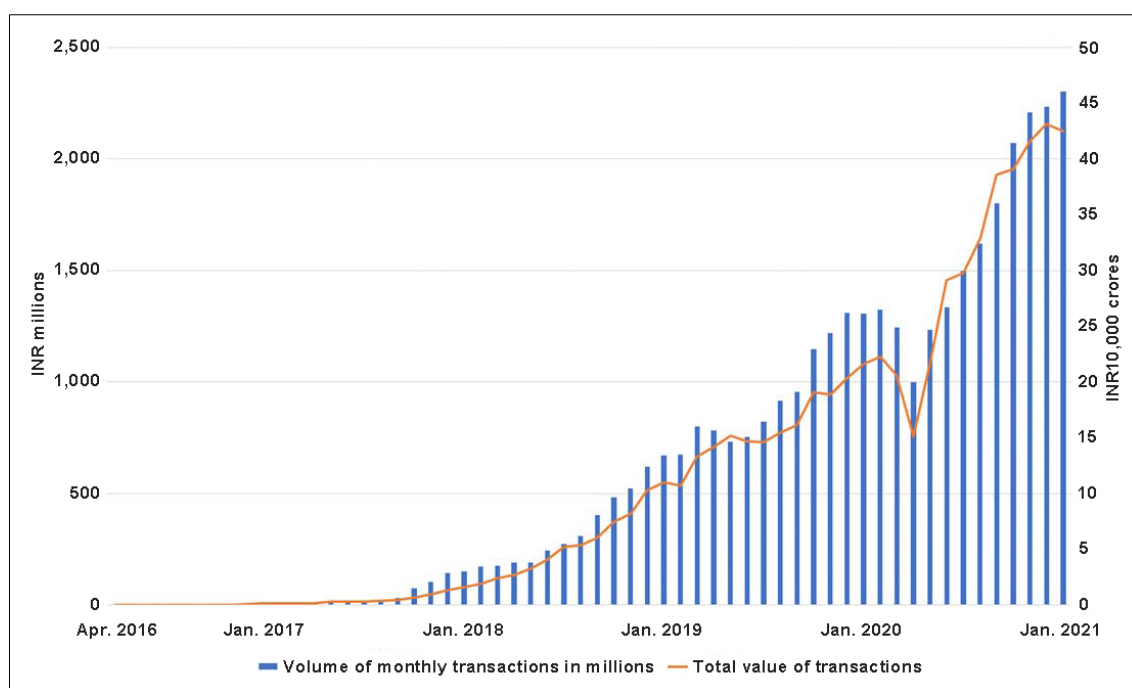
The emphasis on bank-led financial inclusion is an important characteristic of India’s approach. In many other countries, payments have served as the route through which digital technology enhances financial inclusion. Some low- and middle-income countries, such as Kenya and Tanzania, have allowed a mobile money system to develop and serve as an entry point that provides access to basic financial services. However, in many such cases, the mobile money system acts as an alternative to bank accounts and escrow accounts provide only a loose link to the banking system, implying that access to a broader range of financial products, such as those for saving and credit, is not provided by this system. By contrast, India has emphasized bank-led inclusion, an approach that, as discussed below, has provided a range of other benefits as well.

3.2 What Has the India Stack Accomplished?

Some outcomes of the India stack are quite remarkable. About 95% of India's population (amounting to more than 1.2 billion people) is now registered with Aadhaar. This broad coverage is especially impressive given the shares of India's rural population and low-income households.

Another measure of the success of the India Stack is the rapid proliferation of the UPI network—the digital system that powers multiple bank accounts into a single mobile application—in India's domestic commerce. In 2016, the system got off the ground with barely 20 banks in the network. Five years later, as of February 2021, UPI had partnerships with more than 201 banks. In that month, the network recorded 2.3 billion transactions, which had a total value of roughly INR4.2 trillion (\$58 billion at the March 2021 exchange rate).⁴ This implies that the average transaction size amounted to less than INR2,000 (\$27), which includes business-to-business transactions as well as transactions between customers and businesses. Figure 1 shows how rapidly the value and volume of monthly transactions in the UPI network have surged over the past few years, showing the strong latent demand that existed in India for digital payment services.

Figure 1: India's Unified Payments Interface: Volume and Value of Transactions (monthly)

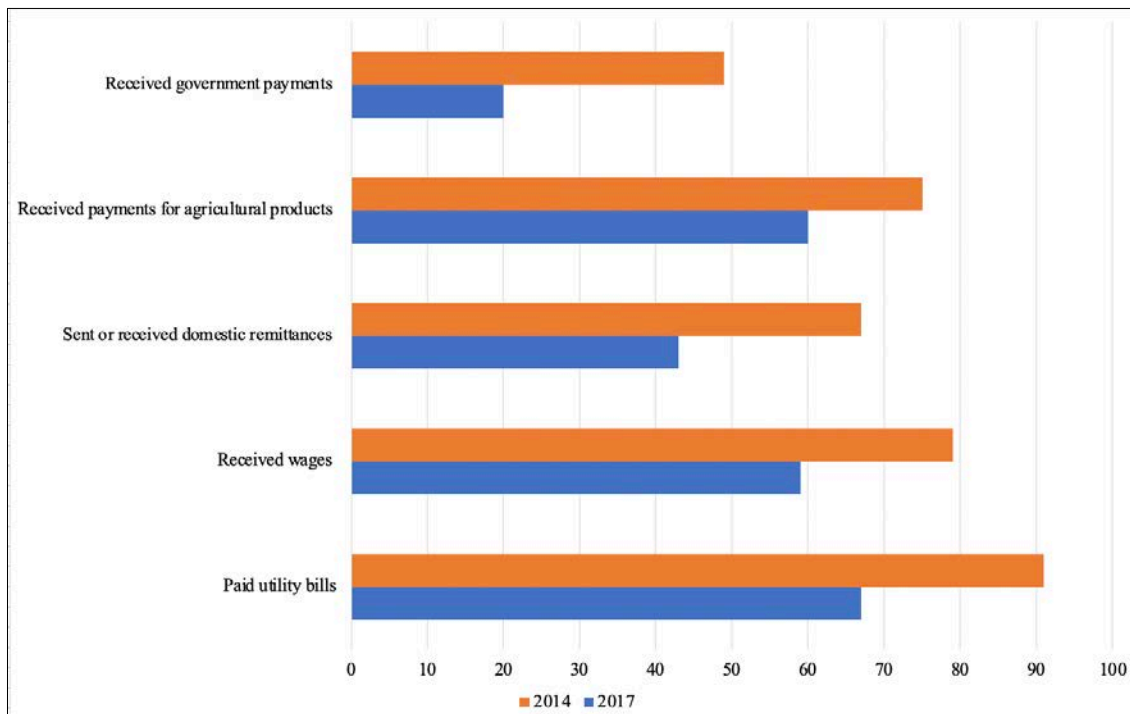


Notes: INR stands for Indian rupees. The source for the data is <https://www.npci.org.in/what-we-do/upi/product-statistics>.

⁴ The statistics and data discussed in this section are taken from https://uidai.gov.in/aadhaar_dashboard/ and <https://www.npci.org.in/what-we-do/upi/product-statistics>.

One question is whether the India Stack has had a material effect on the use of cash for quotidian transactions. There is evidence that, even in the early stages of its rollout, the effects had already become important. Figure 2, which is based on World Bank data, shows that the use of cash has been reduced for transactions that encompass payments of utility bills, private sector wages, payments for agricultural products, domestic remittances, and government payments.⁵

Figure 2: India: Transactions for Different Purposes Using Cash (%)



Notes: This chart shows the proportion of cash-based transactions. The source of the data shown in this figure is the World Bank Global Findex Database.

In fact, one of the most striking changes has been the shift to direct benefit transfers (DBTs) from the government. The DBT scheme was initiated in early 2013.⁶ World Bank data show that, just from 2014 to 2017, the share of government benefits paid by cash rather than electronically fell from 50% to 20%. The primary components of the DBT scheme include a beneficiary account validation system and a reconciliation platform integrated with the Reserve Bank of India, the National Payments Corporation of India, and various public and private sector banks, including regional rural banks and cooperative banks. The Aadhaar Payment Bridge system uses the Aadhaar number as a central key for digitally transferring the government benefits to the Aadhaar Enabled Bank Accounts of the intended beneficiaries.

⁵ The latest available data are for 2017. It is highly likely that the trend of shifting away from the use of cash has picked up pace since then, particularly in view of the COVID pandemic and the desire on the part of both customers and businesses for contactless digital payments.

⁶ For more on the DBT scheme, see <https://www.nic.in/blogs/direct-benefit-transfer-a-blessing-during-the-time-of-pandemic/>.

DBTs allow the government to transfer cash benefits as well as various kinds of subsidies to individuals directly through their Aadhaar-linked bank accounts rather than in the form of cash. This has had a number of benefits, including reducing leakages and delays, and improving the efficiency of the process. Over the past nine years, government institutions have been able to electronically transfer more than \$100 billion to beneficiaries. The DBT scheme has proved particularly valuable during the COVID pandemic, when it has been used by the government to quickly ramp up benefits to help buffer the adverse effects of the lockdown on the economically vulnerable segments of the population.

The India Stack has also created a base for other innovations. One service that uses the India Stack and the PayTM application is FASTag—a recently launched system of contactless payment at toll booths on Indian highways. The system facilitates automatic digital payments when special sensors at toll booths are used to automatically detect a special tag on vehicles, deducting the toll amount from the digital wallets of the passengers. This innovation, too, has proven especially helpful during the COVID pandemic by enabling contactless payments for interstate travel and commerce.

The India Stack has also had important benefits for small and medium enterprises (SMEs), which play an important role in growth and development. They are also important for employment and account for a significant proportion of India's exports. However, a large number of SMEs, including microenterprises, lack access to credit. Some estimates of India's business credit gap suggest that more than 50 million SMEs lack access to credit or have to rely on informal sources to get financing. The reasons for this include the lack of credit information and the high cost and high risk of, and low profits from, providing financial services to SMEs. Furthermore, even when it is available, access to financing from formal institutions requires collateral and involves complex documentation, strict repayment terms, and high interest rates. SMEs are also burdened by a lack of technology, including operation technology, accounting systems, and digital financing applications.⁷

The India Stack has made it easier for SMEs to obtain access to credit by digitizing various aspects of loan application, processing, and servicing. In particular, the Open Credit Enablement Network (OCEN) is putting in place a set of frameworks and protocols that can enable democratization of credit for segments that need it the most. OCEN is creating an infrastructure protocol that enables consent-based access to verified information from multiple public and private data sources and connects borrowers with lenders through an ecosystem that offers access to affordable credit. The system will leverage the innovations of the India Stack, including Aadhaar-based eKYC, eSign, UPI, and the Account Aggregator framework.

3.3 The Government's Role

Finally, it is worth reviewing the role of the government in the innovations described in this section. The driving philosophy behind the data sharing rail in India is different from that in other countries and regions. Take, for instance, the "open banking" concept in Europe. While open banking is focused on competition and leveling the playing field,

⁷ A discussion on the constraints faced by SMEs can be found at <http://iibf.org.in/documents/research-report/Report-30.pdf> and <https://www.tatacapital.com/blog/business-loan/top-challenges-faced-by-sme-msme-financing-in-india/>. For a discussion on the roles of the India Stack and OCEN in lending to SMEs, see <https://lendfoundry.com/role-of-india-stack-in-lending-sector/> and <https://www.financialexpress.com/money/what-does-ocen-mean-for-small-businesses/2071398/>.

data sharing in India is motivated by empowering the consumer with his or her data, especially how these data can be used to gain access to other services.

The “open access” aspect of the network comes with a caveat that the National Payments Corporation of India (NPCI) still needs to certify UPI participants. Any third-party apps such as Google Pay or WhatsApp need to partner with a bank. Thus, there are two levels of regulatory checks. The government has not yet mandated that consent is needed to share customers’ data, although there is clearly an intention to pass relevant legislation—the Personal Data Protection bill is making its way through the legislative process. For now, the RBI Account Aggregator guidelines specify that the Account Aggregator operates as a consent manager.

The framework also includes various consumer protection measures. For instance, nonbank finance companies (NBFCs) play an important role in the network. But they are not allowed to hold customer cash and, instead, have to maintain ties with banks and store the money in escrow accounts. This is in contrast to the situation in the PRC where, for instance, until recently some payment providers such as Alipay were allowed to use the “float” on payments, from the time when the platform received the customer payment to when it is transmitted to the merchant, to provide consumer credit. In India, technology companies offering payment products have to tie up with banks and there are guidelines limiting the liability of consumers on account of unauthorized transactions.

Moreover, the digital infrastructure, including the structure for payments, is seen as a public good that provides a level playing field for all private sector participants. This is different, for instance, from the M-Pesa system in Kenya that is owned and operated by a private telecommunications company. UPI and Account Aggregator are not directly government-owned or government-managed initiatives, though they are public in nature. UPI is actually built by the NPCI on top of the National Financial Switch (which was handed over to the NPCI by the RBI). Account Aggregators are entities licensed by the RBI. Thus, the government has played a critical role in catalyzing and overseeing the system but does not have direct involvement or ownership.

4. THE INTERNATIONAL DIMENSION

New forms of money and new channels for moving funds both within and between economies could have implications for international capital flows, exchange rates, and the structure of the international monetary system. The proliferation of channels for cross-border capital flows will make it increasingly difficult for national authorities to control these flows. Emerging market economies will face particular challenges in managing the volatility of capital flows and exchange rates, and could be subject to greater monetary policy spillovers and contagion effects.

Set against these considerations are the considerable benefits that could be realized from advances in payment systems. International payments present particular challenges since they involve financial institutions in different countries, money passing through different national payment systems, and various regulatory requirements affecting cross-border financial flows. Consequently, such payments tend to be costly, slow, and inefficient. Another layer of complications results from cross-border payments involving exchange rates between currencies. Exchanging small amounts of money from one currency to another can result in disproportionately high fees. Moreover, slow transactions that take hours or, in some cases, days to be settled raise issues about whether the exchange rate that should be used for a particular payment is the one employed when the transaction is initiated or completed. Different countries

have varying regulations about such matters and reconciling them can be a challenge. Thus, compared to domestic payments, fintech has even greater potential to resolve such shortcomings and change the landscape of international payments.

4.1 Remittances

Traditional cross-border transfers are expensive for both individuals and businesses. Remittances, which are funds sent by international migrants to their home countries, account for the bulk of such transfers by individuals. The World Bank estimates the global average cost of sending remittances to low- and middle-income countries at 7% of the transfer value. Intraregional remittance costs are even higher among the low-income economies of sub-Saharan Africa, averaging 9%. Poorer countries, which rely more on remittances, often seem to face higher costs. In 2019, Haiti received \$3.2 billion in remittances, amounting to about one third of its GDP. Haitian workers laboring in nearby countries such as the Dominican Republic and in faraway countries such as France face fees of 8%–9% on money sent back to their families.⁸

There is clearly a big opportunity for improvement in the area of cross-border transfers, especially in the context of remittances. The World Bank estimates that annual remittance flows to low- and middle-income countries reached \$554 billion in 2019. Adding in money sent to high-income countries raises that figure to \$714 billion.

A number of companies have tapped into this opportunity. TransferWise, a UK-based online money transfer service founded in January 2011, handles 49 currencies.⁹ As of March 2020, the company had more than seven million customers and was processing transactions amounting to four billion British pounds (roughly \$5 billion) each month. The company charges an average fee of about 0.7% on each transaction, with fees as low as 0.4% for transactions involving just the major currencies. According to the company, a quarter of the transactions are completed within 20 seconds, which is remarkable as it means that money leaves a user's bank and arrives in the recipient's bank account, in a different country and in a different currency, practically instantaneously. The average speed of transactions is also impressive—41% of transactions take less than an hour and 72% take less than 24 hours. TransferWise also makes it possible for transacting parties to get more competitive exchange rate quotes than those typically offered by commercial banks.

Another online money transfer service, WorldRemit, enables senders in 56 countries to send money in 90 currencies to 150 countries across the world.¹⁰ Depending on the country combination, customers can send money to bank accounts as cash to local cash pickup agent locations or for door-to-door delivery, to mobile wallets, or as airtime top-ups (a popular option for migrants to stay connected with their friends and family back home). In fact, a third of money transfers using the service are apparently received on mobile phones, leading the company to claim that it is now the leading sender of remittances to mobile wallets worldwide. The company has over four million customers and states that over 90% of the transfers on its platform are authorized within minutes. WorldRemit charges a flat fee, usually between \$4 and \$25, depending

⁸ Remittance prices are reported at: https://remittanceprices.worldbank.org/sites/default/files/rpw_report_march_2020.pdf. The reported average prices are for a typical remittance transaction of about \$200. Estimates of remittance flows and remittance fees in 2019 are found at: <https://www.knomad.org/sites/default/files/2020-05/Migration%20and%20Development%20Brief%2032.pdf>.

⁹ For details about TransferWise and statistics about the company, see <https://transferwise.com/gb/blog/annualreport2019> and <https://transferwise.com/gb/blog/mission-update-q1-20>.

¹⁰ Information about WorldRemit can be found at <https://www.worldremit.com/en/about-us> and <https://www.monito.com/en/send-money-with/worldremit>.

on the amounts and currencies involved, although there are indications that its exchange rate quotes are less favorable to customers than TransferWise.

Both WorldRemit and TransferWise have formed partnerships with the PRC's Alipay, giving Alipay users access to these platforms for cross-border payments.¹¹ For now, this arrangement is just for payments originating abroad and going into the PRC, but it shows the potential for linking up domestic and cross-border digital payment systems. These examples show how financial technologies now make it possible to meet specific needs for payments and other services, bringing improvements in both cost and efficiency that are particularly valuable to lower-income households, small businesses, and developing economies.

4.2 Portfolio Diversification

There are significant changes in store for retail investors as well. Fintech firms might eventually make it possible for retail investors to invest directly in stock markets around the world at a low cost. In a country such as the United States, for instance, one can already do this simply by buying shares in a mutual fund that invests abroad. Such funds typically charge higher fees than funds that might invest in US stocks and bonds. New investment platforms are likely to lead to lower costs, forcing even existing investment management firms to reduce their fees.

Fintech firms are reducing the costs both of getting information about foreign markets and of investing in those markets. Moreover, new investment opportunities are also being opened up by technologies that allow for more efficient pooling of small savings amounts of individual households into larger pools that can be deployed more effectively.

These opportunities make sense from the perspective of individual investors. Finance theory indicates that, in order to improve returns while reducing risk through diversification, investors should hold a "world portfolio," essentially a portfolio of holdings in stock indexes of all major stock markets around the world, with the proportion of holdings in each stock index depending on the total dollar value of all the stocks traded on that index. This would mean, for instance, that an investor would hold about 39% of their portfolio in an investment that tracked major US stock market indexes, 9% in an investment that tracked the Chinese market, 7% in Japan, and about 5% each in India and the United Kingdom. This proposition is independent of which country the investor lives in, although the tax laws in their country regarding domestic and foreign investments could influence the structure of this desirable portfolio. It is, of course, not trivial to diversify in this way but should become easier as stock markets around the world open up to foreign investors and as the costs of transacting across national boundaries fall.¹²

¹¹ The partnerships with Alipay are described here: <https://www.worldremmit.com/en/news/worldremmit-partnership-alipay>; <https://transferwise.com/us/blog/new-send-cny-instantly-to-alipay-users>.

¹² According to the World Federation of Exchanges, global stock market capitalization was about \$94 trillion at the end of 2019, measured at end-of-year market exchange rates. The share of the United States is based on the total market capitalization of the NASDAQ and the New York Stock Exchange; for the PRC: Shanghai and Shenzhen exchanges; for India: the Bombay Stock Exchange and National Stock Exchange; for the United Kingdom: the London Stock Exchange. The data are available here: <https://www.world-exchanges.org/our-work/articles/2019-annual-statistics-guide>. The figures on estimated home bias in stock holdings are from this report: <https://personal.vanguard.com/pdf/ISGGAA.pdf>.

Actual investment patterns look nothing like this hypothetical desirable portfolio. In 2014, US investors allocated nearly 80% of their stock portfolio to domestic stocks. In Japan, the share was 55%. In most countries, the share has been declining gradually but remains well above 50%. Investors thus exhibit extensive “home bias”—they tend to heavily favor investments in their domestic stock markets rather than diversifying their portfolios. In principle, they could do far better in terms of improving the risk-return tradeoff of their portfolios through international diversification.

Home bias might not be as extensive as might appear just by looking at investors’ holdings of different stocks. A large and increasing portion of Apple’s revenue and profits now comes from outside the United States. So investing in Apple is now not just a bet on the company’s performance in the United States but in markets around the world. Taking account of investments in multinational companies and in companies that are based abroad but list their stocks on US stock exchanges does put a dent in the evidence for home bias, but the extent of the puzzle still remains large.

One of the next frontiers in the fintech evolution is likely to be the intermediation of capital flows at the retail level, enabling less wealthy households and smaller firms in both rich and poor economies to more easily gain access to global financial markets. Fintech firms that help overcome information barriers, reduce costs and other frictions in international capital movements, and create new saving and financial products are likely to experience significant demand for their services. Of course, as with any financial innovations, there will be risks in this process and financial regulators will face the usual tradeoffs between facilitating innovations and managing those risks. In fact, the capital flows themselves pose risks not just to individual investors but also at the country level.

4.3 Monetary Policy Spillovers

Greater financial integration has a large number of benefits. But these potential benefits come at a price, especially for smaller and less developed economies. This group is particularly vulnerable to whiplash effects from volatile capital flows, with this volatility being caused in part by monetary policy actions of the major advanced economies. When the Fed lowers interest rates, money looking for better returns tends to flow into EMEs. These economies tend to have higher interest rates on their government and corporate bonds than comparable bonds in advanced economies. These higher returns are in part because emerging market governments and corporations are seen as riskier investments, but investors are sometimes willing to accept such risks when the alternative is to earn close to a zero rate of return on government bonds in “safe” countries such as the United States (or, for that matter, Germany and Japan, which in recent years have had even lower interest rates).¹³

Some of these EMEs are smaller and have underdeveloped financial markets. A relatively modest amount of money (by global standards) streaming into Thai stock markets in 2006 was enough to lead to roaring stock prices, which further enticed investors eager to ride the boom. This led to the Thai baht appreciating sharply and quickly, hurting Thai exporters. The government tried to clamp down on inflows into the stock market, before setting off a sharp selloff and a big currency depreciation. A repeat of this cycle of events occurred in 2010. Such large swings in exchange rates

¹³ Rey (2018) makes the case for a global financial cycle in capital flows, asset prices, and credit growth, and the constraints this imposes on the monetary policy independence of EMEs. Thailand’s imposition of capital controls in December 2006, including the reasons for the controls and the fallout from their imposition, is reported in: <https://www.nytimes.com/2006/12/19/business/worldbusiness/19iht-baht.3954800.html>.

can cause complications for exporters and importers, and also for firms that have foreign currency-denominated loans.

Money flowing into emerging markets tends to be volatile. When the Fed lowers rates, investors are willing to take on more risk to get a better yield. When the Fed hikes rates, money tends to flow out of emerging markets as investors opt for a decent rate of return in a safe investment rather than a higher return but riskier investment. Such “risk-on” and “risk-off” investor behavior leads to volatile swings in capital flows to emerging markets. To the exasperation of policymakers in these countries, they end up being subject to such volatility even when their policies are disciplined and their economies are doing perfectly well. In other words, they end up becoming collateral damage when a central bank such as the Fed uses monetary policy levers to achieve its own ends, with little regard for the effects of those policies on other economies.

New and relatively friction-free channels for cross-border financial flows could exacerbate these “spillover” effects across economies. These new channels could not only amplify financial market volatility but also transmit it more rapidly across countries. This is a particular concern for EMEs that are already subject to whiplash effects on account of conventional and unconventional monetary policy actions of the Fed and other major advanced economy central banks. In other words, the availability of more efficient conduits for cross-border capital flows could intensify global financial cycles and all the domestic policy complications that result from them.

4.4 Currency Competition

The demand for Bitcoin as a store of value rather than as a medium of exchange has stoked discussion about whether such cryptocurrencies could challenge that role of traditional reserve currencies. It is more likely that, as the underlying technologies become more stable and as more efficient verification mechanisms are developed, such decentralized nonofficial cryptocurrencies will start playing a bigger role as mediums of exchange. Even that proposition is a tenuous one given the high levels of price volatility experienced by such currencies recently. Nevertheless, this shift could occur over time as the utilitarian functions of cryptocurrencies and the underlying payment verification and transfer systems take precedence over the speculative interest in them.

The decline in transaction costs and easier settlement of transactions across currency pairs could have a more direct and immediate impact—a decline in the role of vehicle currencies such as the US dollar that are used to intermediate transactions across pairs of other currencies. The dominance of the dollar as a vehicle currency, followed by the euro, is related to the depth and liquidity of most currency pairs with the dollar (and the euro), which reduces the associated transaction costs. This dominance is unlikely to persist and could even result in an erosion of the dollar’s role as a unit of account. For instance, the denomination of all oil contracts in dollars could easily give away to denomination and settlement of contracts for oil and other commodities in other currencies, perhaps even emerging market currencies such as the renminbi.

Notwithstanding any such changes, the role of reserve currencies as stores of value is not likely to be affected.¹⁴ Safe financial assets—assets that are perceived as maintaining most of their principal value even in times of extreme national or global financial stress—have many attributes that cannot be matched by nonofficial cryptocurrencies.

The key technical attributes include liquidity and depth of the relevant financial instruments denominated in these currencies, such as US Treasuries. More importantly, both domestic and foreign investors tend to place their trust in such currencies during times of financial crisis since they are backed by a powerful institutional framework. The elements of such a framework include an institutionalized system of checks and balances, the rule of law, and a trusted central bank. These elements provide a security blanket to investors that the value of those investments will be largely protected and that investors, both domestic and foreign, will be treated fairly.

While reserve currencies might not be challenged as stores of value, digital versions of extant reserve currencies and improved cross-border transaction channels could intensify competition among reserve currencies themselves. In short, the finance-related technological developments that are on the horizon portend important changes to domestic and international financial markets but not a fundamental ordering of the international monetary system.

5. CONCLUDING REMARKS

Given the extensive demand for more efficient payment services at the retail, wholesale, and cross-border levels, private sector-led financial innovations could lead to significant welfare gains for households and corporations. In this respect, the key challenge for central banks and financial regulators is how to balance financial innovation with risk management. A passive approach to these developments could risk limiting financial innovation, with the potential risk of the payment systems shifting outside national borders and therefore outside domestic regulatory jurisdictions.

A related question faced by emerging market central banks is whether to issue digital versions of their fiat currencies. The potential benefits of CBDC include lower transaction costs, easier verification and settlement of payments through sophisticated financial technology, reduced information asymmetries, and elimination of the nominal zero lower bound on policy interest rates. In addition, well-designed retail CBDC can also broaden financial inclusion, a particular priority for developing economies, and serve as a backstop to the infrastructure of privately managed payment systems.

However, the issuance of CBDC will not in any way mask underlying weaknesses in central bank credibility or other issues such as fiscal dominance that affect the value of cash. In other words, digital central bank money is only as strong and credible as the central bank that issues it. In considering a shift to digital forms of retail central bank money, it is important to keep in mind that the transitional risks could be higher in the absence of stable macroeconomic and structural policies, including sound regulatory

¹⁴ Gopinath and Stein (2018) offer a different perspective, arguing that the dollar's dominance is largely the *result* of its prominence as a medium of exchange. This suggests that the two roles are tied together and that a decline in the dollar's medium of exchange function in international transactions could weaken its dominant reserve currency status. By contrast, Prasad (2014, 2016) makes the case for continued dollar dominance as the reserve currency even if its importance as a unit of account or medium of exchange in international finance should decline, particularly with the advent of the Chinese renminbi and given some of the factors discussed in this paper that would reduce the need for a vehicle currency in international trade transactions.

frameworks that are agile enough to be able to recognize and deal with financial risks created by new types of financial intermediaries.

It should also be recognized, notwithstanding the potential benefits, that there are many unanswered questions about how the new financial technologies could affect the structure of financial institutions and markets. Questions also abound about whether retail CBDC will in any significant way affect monetary policy implementation and transmission. These uncertainties suggest a cautious approach to embracing the concept of CBDC but not shunning it altogether.

One interesting point to note is that small advanced economies—such as Canada, Singapore, and Sweden—along with developing economies such as the PRC seem to be taking the lead in pushing forward with exploration and development of digital versions of their fiat currencies. Even the issuers of the major reserve currencies—the Bank of Japan, the European Central Bank, and the Federal Reserve—have recently shown more openness to the concept of a CBDC. Developing countries, particularly those that suffer from a high degree of dollarization, might find such developments particularly challenging as they could further erode the demand for money, either physical or digital, issued by their national central banks.

In fact, such challenges to domestic fiat currencies might be more imminent than previously thought, now that major multinational social and commercial platforms such as Amazon and Facebook are developing their own digital tokens. Given the easy access that developing country households have to these platforms and the enormous financial and commercial clout that such corporations have, such stable coins could further reduce the domestic demand for fiat currencies, both as mediums of exchange and stores of value.

Developing-country central banks and governments may be left with little choice but to proactively develop a strategy that helps harness the benefits of the developments in financial technologies discussed in this paper. Some caution is certainly warranted in light of economic and political constraints in these economies. Still, an active approach could help improve the benefit-risk tradeoffs of new financial technologies, while a passive approach increases longer-term risks and delays the potential benefits that economies in the region stand to gain.

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