Volume LXI No. 1
June 2024

p-ISSN 1655-1516
e-ISSN 2984-8156

The Philippine Review of Economics

ARTICLES IN THIS ISSUE

BOOK REVIEW

A joint publication of the
University of the Philippines
School of Economics
and the **Philippine Economic Society**

The Philippine Review of Economics

A joint publication of the UP School of Economics (UPSE)
and the Philippine Economic Society (PES)

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Publication Information: The PRE (p-ISSN 1655-1516; e-ISSN 2984-8156) is a peer-reviewed journal published every June and December of each year. A searchable database of published articles and their abstracts is available at the PRE website (http://pre.econ.upd.edu.ph).

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Acknowledgements: The PRE gratefully acknowledges the financial support towards its publication provided by the Philippine Center for Economic Development (PCED). The *Review* nonetheless follows an independent editorial policy. The articles published reflect solely the editorial judgement of the editors and the views of their respective authors.

The Philippine Review of Economics

Vol. LXI No. 1
June 2024

p-ISSN 1655-1516
e-ISSN 2984-8156
DOI: 10.37907/ERP4202J

The Philippine Review of Economics
61(1):44-70. DOI:10.37907/3ERP4202J

Nexus between payments digitalization and cash usage in the Philippines

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Innovative contactless payment technologies are transforming retail payments, suggesting a gradual decline in cash use, particularly in advanced economies with an early start on digitalization. In the Philippines, preliminary analysis indicates some substitution from cash to digital payments, albeit not on a large scale yet. While the remarkable inroads in retail payments digitalization and demographics are expected to bring about a behavioral shift in cash usage, the pace and extent of substitution are contingent on policy reforms aimed at widening access to affordable digital payment services, secure digital infrastructure, and privacy protection, among others. More granular data would help inform strategies for equitable and safe payment choices, enabling consumers to securely access and freely choose from diverse and affordable payment options that suit their needs. Thus, it is vital for cash and digital payment infrastructures to adapt and uphold consumer payment choice.

JEL classification: C20, E42, E58, O33
Keywords: central banking, payments digitalization, cash demand, ordinary least squares

1. Introduction

Money, regardless of form, primarily functions as a unit of account, a medium of exchange, and store of value. These fundamental functions of money require a well-functioning, safe, efficient, and inclusive payments and settlements system that is recognized, trusted, and conventionally used by government, businesses, and individuals.

Existing monetary systems are anchored on public money issued by a central bank in the form of banknotes and coins, and central bank reserves, while private

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** The views expressed in this article are those of the authors and do not represent the official position of the Bangko Sentral ng Pilipinas.

money is issued by commercial banks in the form of deposits and by non-bank financial institutions in the form of digital money. Banknotes and coins are the only form of public money available to the general public. Banks, in contrast, also have access to public money in electronic form, via central bank reserves.

As innovative contactless payment technology radically transforms the retail payment markets, cash usage is expected to moderate over time. The COVID-19 pandemic buoyed up e-commerce and concomitantly sped up the uptake of more convenient digital payment platforms. Digital payments can also potentially open new business opportunities, particularly for small businesses [Tanaka 2016] by enhancing transparency and security in transactions and promoting financial inclusion and inclusive growth ["Why digital payments" n.d.].

The usage of digital forms of payment has notably risen over the years, especially in the advanced economies. The steady increase in electronic transactions through various payment platforms suggests that going cash-lite aligns with overall growth in the digital economy. This trend underscores broader changes in consumer preference for more efficient payment solutions [Henry et al. 2024]. Aside from the benefits of convenience and speed, digital payments are traceable, thus adding a layer of security in financial transactions. By facilitating easier, safer, and more accessible financial transactions, digital payments can bring unbanked and underbanked populations into the financial system, potentially reducing poverty, and adding to economic dynamism and opportunities [Resendiz 2017].

In the Philippines, digital payment platforms are gaining an increasing foothold in terms of public acceptance and usage, with exponential growth in the use of PESONet and InstaPay observed during the pandemic. Payment digitalization is a potent force that can help foster a financially inclusive and cash-lite society.

A cash-lite economy is characterized by substantial reduction in the usage and volume of cash in circulation due to massive use of electronic payment channels. Such shift in consumers' payment preference is seen to bring about ancillary efficiency gains in cash cycle management as costs of cash production and transportation are reduced in the process. Recognizably, the digital transformation of money and the substitution of physical cash are processes that evolve gradually over a longer period of time. Boundless growth is improbable given the upper limits imposed by external factors. Nonetheless, a significant growth spurt can be anticipated when a new and major transformative shock sends growth to new heights.

The realization of the vision of a cash-lite economy also depends on a number of factors outside the full control of the central bank. Several factors affect the posited substitution between physical and digital cash such as (i) preferences and habits, (ii) pace of development in digital infrastructure, (iii) fee structure, (iv) cultural factors, (v) demographics, (vi) policy frameworks, including those on privacy safeguards and consumer protection, and (vii) adoption of central bank digital currency (CBDC) at the retail level, among others. Currently, these constitute a large set of unknowns. Hence, it is important to carefully balance

rationalized currency issuance that is reliant on efficient and cost-effective production vis-à-vis the pace of digital retail payments adoption and change in the payment habits of Filipino consumers.

1.1. Significance of the study

Available reports and studies delve into the remarkable inroads in retail payments digitalization. The current measurement model by the Bangko Sentral ng Pilipinas (BSP) measures and analyzes the volume and value of digital payments in the country made to and by the government, businesses, and individuals to facilitate the identification of payments use-cases that may be prioritized for digitalization [Mesina-Romero et al. 2022]. Reproduced below is the 3 x 3 payment grid, which illustrates nine possible payment combinations and 24 payments use-cases among the government, businesses, and individuals.

FIGURE 1. Payment grid with focus use-cases

		PAYEE		
		GOVT	**BUSINESS**	**PERSONS**
PAYER	**GOVT (0.92 percent)**	• Transfers from center to LGUs • Social welfare contributions • Procurements for common use item **0.12 percent**	• Procurement and supplier payments • Utilities **0.13 percent**	• Social welfare contributions • Salaries and payroll **0.85 percent**
	BUSINESS (24.05 percent)	• National taxes and fees • State taxes and fees • Social welfare contributions **0.07 percent**	• Supplier payments • Business lending • Interest payments **27.92 percent**	• Salaries and payroll • Social welfare contributions • Consumer lending **2.35 percent**
	PERSONS (75.03 percent)	• Tax collections • Government fees levied for services • Social welfare contributions **0.07 percent**	• Merchant payments • Utility payments • Interest and loans **60.22 percent**	• Remittances • P2P lending **8.27 percent**

Source: Mesina-Romero et al. [2022].

However, there is no known empirical study that looks into the extent of substitution between cash usage and digital payments in the Philippines; one that considers the possibility that the digital payment chain, particularly at the retail level, is not yet digitalized end-to-end. Measuring the magnitude of substitution would provide important insights on the pace and depth of changes in the cash

demand landscape and their implications on cash cycle management and payment digitalization efforts.

This study fills the gap by providing preliminary baseline empirical analysis of the interplay between retail payment digitalization and cash demand. It utilizes unique monthly data on aggregate bank currency withdrawals from the BSP and payment digitalization from the Electronic Payments and Financial Transactions (EPFS) of Philippine banks. Despite limitations in available payment digitalization data, this study offers some perspectives on the balance between the BSP's exclusive currency issue power and payment digitalization thrust, in support of its vision of a cash-lite and financially inclusive society.

This paper is organized as follows: Section 2 examines the literature on cash usage and digitalization. Section 3 discusses stylized facts on cross-country trends and the Philippine experience. Section 4 describes the data and empirical methodology. Section 5 offers insights into preliminary empirical estimates, and Section 6 concludes.

2. Review of related literature

With the exception of a few jurisdictions, cash remains widely used in both leading and emerging economies around the world despite considerable strides in payment digitalization. However, the future of money is also rapidly changing with sustained advances in technology and adaptation by both issuers and users.

In the 2022 Central Banking benchmarking study by Margulies and Asaju, a majority of the surveyed central banks expected increases of between zero to 20 percent in demand for cash, suggesting that the demise of cash is nowhere imminent. In similar vein, Central Banking [2023] reports that almost two-thirds of the central bank respondents institute access-to-cash policies while nearly half of the respondents maintain minimum cash service levels for commercial banks. The report further notes that the European Commission has drafted regulation that would require Eurozone countries to safeguard sufficient and effective access to cash.

The experience of Sweden, which is considered as a country that will fast transition toward an almost cashless society, provides valuable insights on the payments digitalization drive as well as an admonition on the need for policy balance to ensure that no segment in society is marginalized in access to payment.

In a conversation with Knowledge at Wharton, Associate Professor Jonas Hedman of the Copenhagen Business School emphasized the multifaceted drivers of this trend [Knowledge at Wharton Staff 2018]. Use of payment cards and digitalization of bank accounts began in the 1950s-1960s. Internet infrastructure and internet banking were already set up in the 1990s with strong government support such that by the 2000s, the central bank started to outsource its printing and distribution of cash. He also underscored the legal framework that enshrines precedence of contract laws over banking and payment laws. These factors

provided the fodder for a behavioral shift among the consumers. But even with the sizeable reduction in cash usage, he cautioned about the implications of the payment digitalization trend on anonymity and on the less-technology savvy segments of the population, including elderly people afflicted with dementia. Benedictus [2021] reported that contrary to news brandished in social media platforms, the Swedish government has not made any policy pronouncement on going cashless, and banknotes and coins will continue to be produced.

Immediate and gradual changes in the use of physical cash and digital payments in other jurisdictions have also been observed. In the Euro area, cash is still the most frequently used means of payment at point of sale based on the 2022 Survey on the Payment Attitudes of Consumers in the Euro Area (SPACE).[1] However, there has been a considerable decline from 72 percent in 2019 to 59 percent in 2022. While the reason for this decline is yet to be determined, it may be inferred that the consumption and payment behavior adapted to the pandemic may have been retained post-pandemic.

Even if growing use of electronic means of payment reduces the demand for cash, it is still far from approaching zero at least in the medium term, largely because of consumer preference [Cabezas and Jara 2021]. This is evident in the case of China. On one hand, two leading platforms for payments and digital services, WeChat Pay and Alipay, accounted for 91 percent of digital payments in 2021. The cumulative digital payment value in China is set to reach USD 3.5 trillion, making it a global powerhouse in digital payments. On the other hand, it has been reported that cash on delivery remains the preferred online payment method in China ["Payment methods in China" 2022]. Assurance of quality before payment, and lack of online payment accounts (e.g., senior, rural citizens) explain preference for this method of payment.

The same is true for Japan. In the study by Saito [2021], demand for cash continued to expand in all regions of Japan, except Kinki, with positive net supply of cash by the Bank of Japan despite a long history of payment digitalization. The study highlighted that while cashless payments can be linked to credit and debit cards, a large portion of the financing came from charging by cash, which may reflect consumers' concern with credit card or debit card information as well as precaution against unmonitored expenses. Precautionary holdings of cash were noted to have increased during periods of uncertainty such as COVID-19, natural calamities, power outages, and ATM system malfunction. Zero deposit interest rates may have also made the public indifferent to hold deposits or cash. Naoko [2022] cited results of a survey that showed less than 30 percent of companies are considering implementing the government's plan to implement digital salary payment due to system and increased operational costs.

Increased usage of electronic payment was found to have a small substitution effect on cash demand (Chucherd et al. [2019]; Srouji [2020]). As pointed out by

[1] SPACE is a regularly conducted survey on payment trends.

Trütsch [2020], consumers' decision to use contactless payment is an endogenous choice, thus the overall effect on cash usage may remain unaffected. The varying motivations for using cash in different jurisdictions and cultures underline the persistence of physical cash usage. In Europe, the share of the senior population, the level of digitalization, and the average size of card transactions are among the identified drivers of cash usage [Alonso et al. 2018].

In a study, Flannigan and Staib [2017] found that cash usage continued to rise in Australia along with the size of the economy. Despite the increase in card payments over cash, the value of banknotes in circulation continued to grow with the economy, supporting the transactional demand for cash. In a more recent 2022 report by Mulqueeney and Livermore [2023], however, a significant reduction in in-person transactions was noted, with cash usage dramatically declining from 32 percent to 16 percent since the 2020 pandemic. The decline was pronounced in small value transactions, indicating a strong consumer shift towards digital payment methods for day-to-day expenses, with contactless methods even in traditionally cash-dominant sectors like transportation and small retail purchases partly driving the change. Despite the decline in cash use, cash is still important for certain demographic groups, particularly in non-metropolitan areas, emphasizing the need for balanced financial services that cater to all segments of society.

For Indonesia, Wasiaturrahma et al. [2019] reckoned that in the short term, credit cards and e-money are not significant for real money demand. But in the long run, they found credit cards to have a significant negative effect. Only debit cards have a significant positive effect on cash circulation.

A recent IMF working paper by Khiaonarong and Humphrey [2023] used a panel of 14 advanced and emerging market economies representing half of the world's population. The study found that on one hand, cash is still strongly used for payments in some countries using currency in circulation (CIC) as a ratio to GDP. When measured as the ratio of the value of cash withdrawn from automatic teller machines (ATMs) to GDP, use of cash seems to be falling. The authors attributed the divergence to the fact that CIC includes cash used for payments, hoarding, and even illegal use while ATM cash is focused more on the use of cash payments alone.

The preference for using digital payments, physical cash, or both may also come down to a business decision. The research by Arvidsson et al. [2017] predicted Sweden's rapid transition to a cashless society by 2023 at the earliest. They estimated a threshold of seven percent cash transactions over total payment transactions for Sweden, below which "it becomes more costly to manage cash than the marginal profit on cash sales" [Arvidsson et al. 2017].

Botta et al. [2022], highlighted that even with the continued dominance of cash in Africa, offline channels, especially agent networks, represent an important element of the growing African e-payments infrastructure. These networks have extended beyond cash-in, cash-out (CICO) services and facilitated the expansion

and complexity of electronic payments as a platform for financial services. These include SANEF in Nigeria, Mukuru in Southern Africa, and Fawry in Egypt, which are just a few examples of non-telecom agent networks. For banks, these networks with their lower operating costs have become a critical channel for customer acquisition and servicing, enabling access to a new segment of customers. In Latin America, the overall point of sale [POS] transactions rebounded from the 2020 slump and cash remains the leading payment method [Cash Matters 2022].

For all the benefits of going cashless, policymakers still have to manage an individual's fundamental concerns about privacy, anonymity, and security. Like Sweden, Norway is considered as one of the pioneers in the shift to digital payments, with a plan to eliminate paper money by 2030. Vipps is a dominant mobile payment app deployed by Norwegian banks, with 69 percent of their population using it to pay online. About 53 percent of online transactions are via mobile commerce, reportedly to be more than that of similar advanced economies like France and Germany. But despite the lofty goals set by the government, there remains a strong lobby for the continued use of physical cash, mainly for privacy and security reasons ["Norway strives to get rid of cash" n.d.].

Available empirical estimates show a small impact of digitalization on cash usage, implying more complementarity than complete substitution (Table 1).

TABLE 1. Estimated impact of digitalization on currency in circulation (CIC)

Author	Results of the Study	Estimates of Impact of Digitalization on CIC
Raj et al. [2020]	The change in the value of transactions is found to be statistically insignificant; however, the number of transactions is found to be [marginally] statistically significant and negative (with one period lag).	• ΔLog of value of digital transactions = 0.009 • ΔLog of value of digital transactions (-1) = 0.023 • ΔLog of number of digital transactions = -0.027 • ΔLog of number of digital transactions (-1) = -0.052*
Chucherd et al. [2019]	E-payment usage led to a slight decline in money demand and shows gradual substitution impact. Cash remains as the most preferred payment method.	• Retail e-payment = -0.058** • Card payment = -0.089*** • Internet and mobile banking = -0.054** • e-Money = 0.023
Qin [2017]	Using data of central bank in China during 1999 to 2010, electronic money has a negative impact on M0 (CIC), but a positive impact on M1.	• Relationship between e-Money and M0 = -0.13 • Relationship between e-Money and M1 = 0.74
Kartika and Nugroho [2015]	Analyzing electronic money and the velocity of money in ASEAN, it is found that GDP, M1, and velocity of money had a positive and significant effect on electronic money transactions	• Relationship between e-Money and M1 = 0.1

TABLE 1. Estimated impact of digitalization (continued)

Author	Results of the Study	Estimates of Impact of Digitalization on CIC
Hataiseree and Banchuen [2010]	Given the low degree of debit card usage for making payments and the slow change in the payment behavior, it is unlikely that this development will have noticeable impact on the future use of cash	• Relationship between e-Money and CIC = -0.15

Note: ***, **, * = significance level at 0.01, 0.05, and 0.1, respectively.

3. Stylized facts on currency and payment digitalization trends

3.1. Demand for cash

Data gathered on 19 selected economies show that the ratio of CIC to GDP has generally been rising, except for China, Norway, and Sweden. The ratio of CIC to M1, on the other hand, is on a general downtrend, with Malaysia, South Korea, and India bucking the trend, although a nascent post-pandemic decline is observed for these three economies (See Annex 1 Figure 10).

The trend for the Philippines is consistent with the general experience of other jurisdictions. The ratio of CIC to GDP had been rising until the 2020 pandemic and declined thereafter, a similar trend experienced during the 2008-2009 Global Financial Crisis (GFC). In terms of ratio to different aggregate measures of money, CIC-to-narrow money (M1) was on a steady decline from 2002 until mid-2013. It started to rise thereafter and stabilized at roughly around 30 percent (Figure 2). Consistent with robust economic growth performance, the CIC trend has become steeper since 2016 with marked gyration in the cyclical component in recent years (Figure 3). This may be traced to a number of significant shocks since 2019, which are mirrored in banks' withdrawals from the BSP.

The shocks include the bankruptcy of a major international banknote paper supplier; the pandemic that led to substantial precautionary demand for cash; introduction of the Cash Service Alliance (CSA) that mobilizes and recirculates largely high-denomination fit currencies; retail payment digitalization; and a high inflation environment that affected currency demand dynamics at the denominational level. As such, the recent downtrend cannot be attributed solely to a specific shock. Moreover, it remains to be seen whether the pandemic-induced shocks are (i) transitory and thus, mean-reverting, or (ii) structural in nature and would thus, lead to a new steady state level of CIC (Figures 2 and 3).

FIGURE 2. Ratios of currency to different measures of monetary aggregates

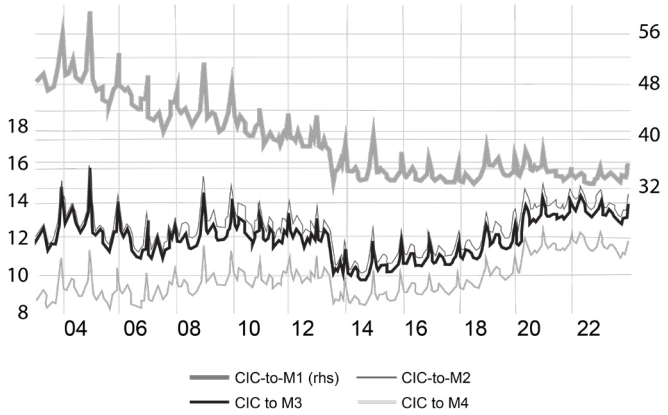
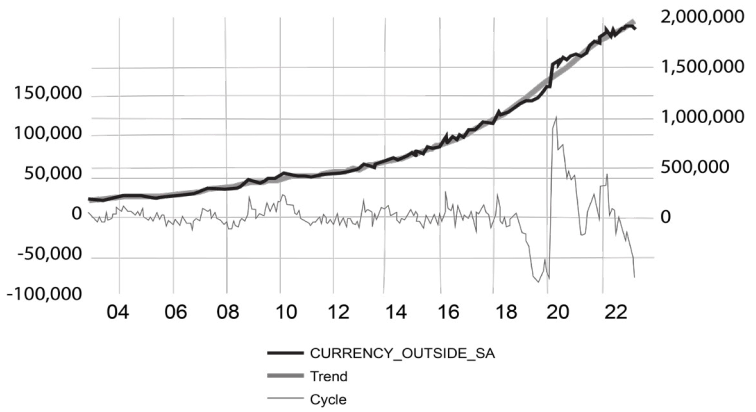


FIGURE 3. Trend and cyclical components of seasonally-adjusted CIC



Note: Authors' estimates.
Source of basic data: BSP Financial System Accounts - Depository Corporations Survey [n.d.].

The dynamics in currency denominational mix make bank withdrawals more nuanced, especially during periods of large shocks. In 2020 when the pandemic struck, the value of bank withdrawals from the BSP surged, largely driven by the two largest denominations i.e., 1000-Piso and 500-Piso for precautionary reasons (Figure 4a). Volume-wise, demand for low denominations is expectedly higher, particularly against the backdrop of a persistently high inflation environment and the greater volume of high denomination fit currencies mobilized and exchanged through the CSA (Figure 4b).

Providentially, the two automated clearing houses (i.e., PESONet and InstaPay) were already fully operating when the pandemic hit. With heightened public concerns on hygiene and mobility restrictions, the availability of digital payment platforms facilitated economic transactions and the distribution of financial aid during the pandemic.

FIGURE 4a. Value of withdrawals from the BSP of high and low denominations (in mPHP)

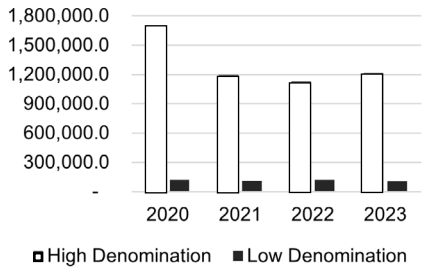
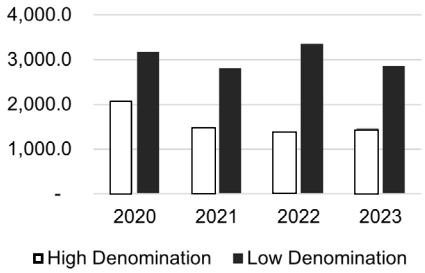


FIGURE 4b. Volume of withdrawals from the BSP of high and low denominations (in mpcs)



Note: Authors' estimates.
Source of basic data: BSP Currency Policy and Integrity Department (CPID) [n.d.]

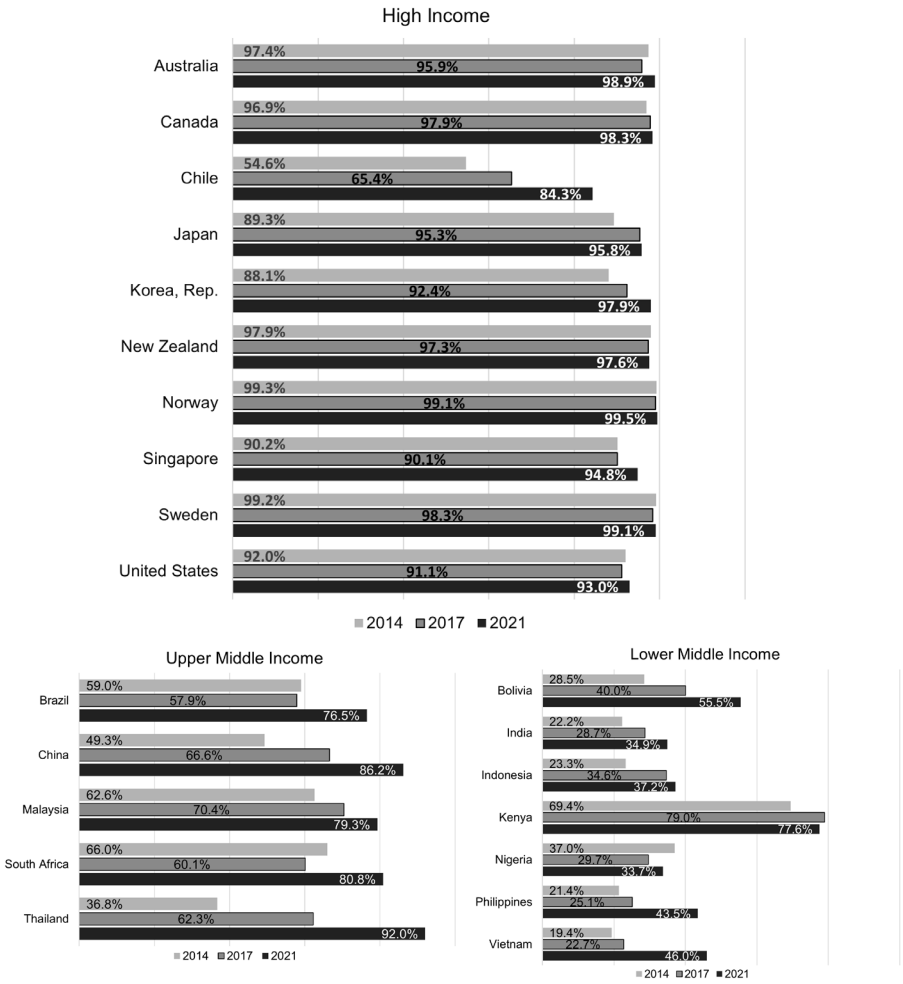
3.2. Retail payments digitalization[2]

Based on the Global Financial Inclusion (Global Findex) database,[3] the share of adults making or receiving digital payments in developing economies grew from 35 percent in 2014 to 57 percent in 2021, while in high-income economies, the figure is nearly universal at 95 percent. Moreover, there is a ten to 20 percent growth in the use of digital financial services in the upper middle and lower middle-income economies from 2017 to 2021. This rise can be attributed to the impact of the COVID-19 pandemic, as payment digitalization initiatives were strongly implemented worldwide amid large-scale community lockdowns (Figure 5).

In the area of mobile money, Sub-Saharan Africa dominates, accounting for 70 percent of the global market. In 2021, the digital transactions were driven by the increase in mobile account ownership, almost 50 percent of which were used for digital transactions. With a wider network of service providers, mobile money has become highly prevalent in so-called under or unbanked areas. They utilize mobile money to send remittances to family and friends within the country. Further, partnerships of mobile money platforms with banks, health care services, and even agricultural sectors have been observed in the past few years, reinforcing mobile money's key position in the financial ecosystem (Global System for Mobile Communications Association, as cited in Onyango [2022]).

[2] Annex 2 synthesizes some notable payment digitalization developments in selected jurisdictions.
[3] Launched by the World Bank in 2011, it provides in-depth data showing how people save, borrow, make payments, and manage risk.

FIGURE 5. Global digital payments trends



Source of basic data: The World Bank, Global Findex Database [2021].

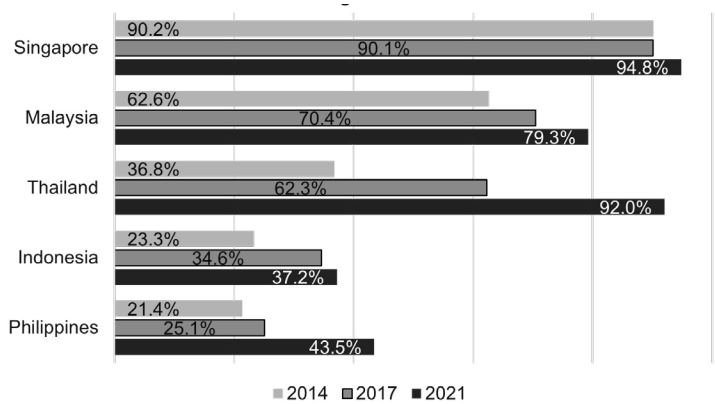
Among the ASEAN-5 economies, digital transactions in Thailand tripled from 2014 to 2021 (Figure 6). Other than the effect of the COVID-19 pandemic, this significant increase in digital payment usage is also attributed to the implementation of the Bank of Thailand's (BOT) Payment Systems Roadmap[4] and the National E-Payment Master Plan,[5] aimed at promoting safe, efficient, and

[4] The BOT set up the Payment Systems Committee (PSC) on August 27, 2001 to formulate policies of promoting safety and efficiency in the national payment systems. The PSC approved three roadmaps for the payment systems, which are the Payment Systems Roadmap 2004, the Payment Systems Roadmap 2010 and the Payment Systems Roadmap 2012-2016.

[5] The National e-Payment Master Plan is a national strategy created by the Ministry of Finance and the BOT, in cooperation with related government and private entities, in 2015 in order to push the development of payment infrastructures and to promote the use of electronic payment services in all sectors.

smooth operations to support a high level of trade and financial transactions. Likewise in Malaysia, the steady growth in digital transactions is reported to be driven by regulatory policy, global developments and active competition, greater use of technology, and consumer behavior.

FIGURE 6. ASEAN-5 digital transactions



Source of basic data: The World Bank, Global Findex Database [2021].

In the Philippines, the increase from 25.1 percent to 43.5 percent in digital transactions from 2017-2021 was buoyed by regulatory reforms that were established by the BSP under the National Retail Payment System (NRPS) Framework[6] to enable Filipino consumers, businesses, and the government to smoothly transition to payments digitalization. The growth of the value and volume of PESONet (Figures 7a and 7b) and InstaPay transactions (Figures 8a and 8b) spiked during the pandemic and decelerated thereafter.

The growth in the digitalization of retail payments also saw a concomitant rise in e-money accounts. Without corresponding bank accounts for cash-in transactions, however, holders of e-money accounts would still require cash to enable digital transactions. Even with bank accounts, income constraints and transaction fees may hinder end-to-end retail digital transactions. Thus, there is no one-to-one mapping between higher digital payment transactions and reduction in cash usage. It can be reasonably inferred that while there may be some substitution, it is far from complete. In contrast, there may still be a high degree of complementarity rather than outright substitution.

[6] The NRPS framework is founded on the principles of interoperability, inclusivity and "coopetition." Interoperability allows customers to transfer funds from their own account to any BSP-regulated transaction account using any device. Inclusivity requires effective participation in the system of all qualified financial service providers, regardless of size and type of transaction accounts offer. "Coopetition", coined from the words "cooperation" and "competition", pertains to cooperation in matters directly impacting shared objectives of system efficiency and resilience.

FIGURE 7a. Value of PESONet transactions

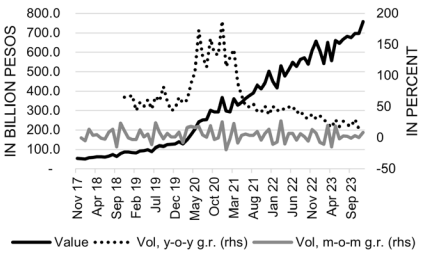
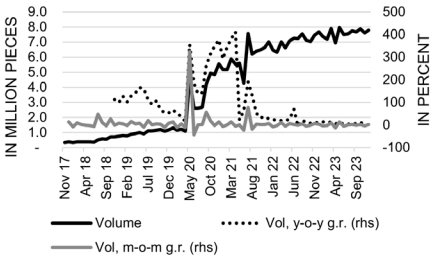


FIGURE 7b. Volume of PESONet transactions



Note: Authors' estimates.
Source of basic data: BSP [n.d.].

FIGURE 8a. Value of InstaPay transactions

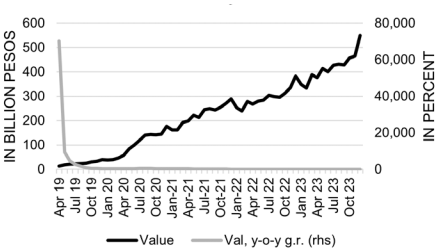
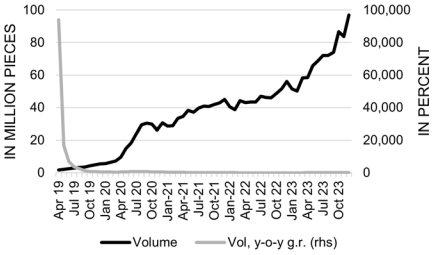


FIGURE 8b. Volume of InstaPay transactions



Note: Authors' estimates.
Source of basic data: BSP Payments and Settlements - National Retail Payment System [n.d.].

As depicted in Figures 9a and 9b, digital payments made through electronic money issuers (EMIs) still entailed substantial cash requirements.

FIGURE 9a. Value of cash-in and cashout transactions of EMIs (in bPHP)

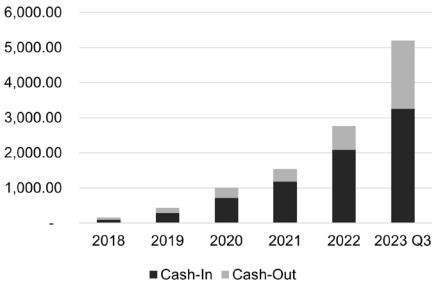
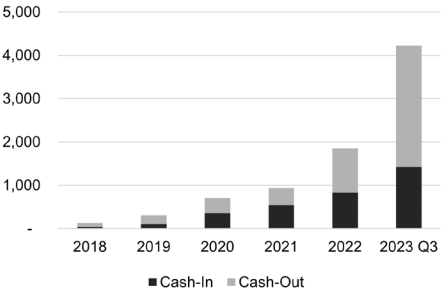


FIGURE 9b. Volume of cash-in and cashout transactions of EMIs (in mPHP)



Note: Authors' estimates. Data capture is incomplete for 2019, 2021, 2022; data for 2023 are up to Q3 2023 only.
Source of basic data: BSP Payments Policy and Development Department [n.d.]

An important consideration is the role of institutional, infrastructural, and cultural factors in determining the degree of substitution between physical and digital cash. In a competitive business environment, ease of market entry and a stronger drive to innovate, including in the financial services sector, can lead to increased availability and adoption of digital payment technologies as businesses seek to streamline operations and improve customer experience, thereby, making digital cash options more attractive than traditional cash. As faster and more convenient digital options become more ubiquitous and dependable, consumers, and businesses, payment habits, and preferences likewise adjust. The shift can be accelerated by factors such as government policies on user-centric use cases and stronger financial literacy programs.

Based on competitiveness indicators, however, the favorable effects of various reform measures have yet to reflect in the Philippines' global ranking. The country ranks lowest among ASEAN-5 economies in terms of ease of doing business score and digital competitiveness index (Tables 2 and 3).

TABLE 2. Ease of doing business scores

	2019	2020
Brunei Darussalam	69.6	70.1
Cambodia	53.8	53.8
China	74.0	77.9
Indonesia	68.2	69.6
Lao PDR	49.8	50.8
Malaysia	81.3	81.5
Myanmar	43.5	46.8
Philippines	60.9	62.8
Singapore	85.8	86.2
South Korea	84.0	84.0
Thailand	79.5	80.1
Vietnam	68.6	69.8

Source: The World Bank [n.d].

TABLE 3. International Institute for Management Development IMD digital competitiveness index, 2023

	Rank	Score
China	19	84.4
Hong Kong	10	93.6
Indonesia	45	60.4
Mongolia	63	43.0
Malaysia	33	75.3
Philippines	59	48.3

TABLE 3. IMD digital competitiveness index, 2023 (continued)

	Rank	Score
Singapore	3	97.4
South Korea	6	94.8
Thailand	35	70.5

Source: IMD World Digital Competitiveness Ranking [2023].

4. Empirical methodology

The empirical estimation was carried out using aggregate bank currency withdrawals (BCW) from the BSP as the dependent variable, which is the micro-level representation of currency demand. Following the work of Khiaonarong and Humphrey [2022], BCW proxies for ATM or over-the-counter withdrawals by the public. This is premised on banks acting as conduits for currency distribution to the public. Given that it is costly to maintain significant cash holdings, banks are presumed to maintain a reasonable level of cash for servicing the public's requirements.

The quantitative impact of digitalization on BCW was estimated on the following specification using simple ordinary least squares. The payment digitalization undercurrent is seen to induce some substitution, hence, expectation of a negative sign.

$$log(BCW_t) = \alpha_0 + \alpha_1 \Delta log(CIC_t) + \alpha_2 \Delta log(Digital_t) + \alpha_3 \Delta log(Demography_t) + \epsilon_t \quad (1)$$

The change in CIC, primarily driven by economic growth and inflation, embodies the impact of macroeconomic developments on currency demand, with an expected positive sign. Further, demographic shifts and their impact on payment preference are represented by birth rates and death rates. The higher inter-generational replacement through higher birth and death rates means that an increase in the proportion of younger population, who are adept and comfortable in using digital transactions, reduces preference for cash.

The general specification in Equation 1did not control for the pandemic because of the shortness of the digitalization series and occurrence of simultaneous shocks that render it difficult to disentangle its distinct effect. However, alternative specifications were attempted wherein a dummy indicator for the period of mobility restrictions due to the pandemic was used. It is important to underscore that the unprecedented nature of the pandemic led to widespread disruptions in economic, social, and healthcare systems, creating a complex web of interconnected variables that can confound statistical relationships. For instance, the sudden shift to remote work, changes in consumer behavior, and government interventions such as lockdowns have introduced new variables that were not present before the pandemic.

Moreover, the temporal nature of the pandemic, with its evolving phases and varying degrees of severity across different regions and time periods, adds an additional layer of complexity to regression analyses. Apart from the brief period of time for the data series that covers the pandemic, there remains the challenge of disentangling the direct effects of digitalization from the indirect effects mediated by the pandemic-related factors.

5. Data and presentation of results

5.1. Data and limitations of the study

The digitalization indicator is given by the value of the extracted digital component of the monthly aggregate data from the EPFS of Philippine banks for the period January 2018 to June 2022. The EPFS data were also cleaned to remove the cash component and avoid double counting of digital transactions. For 2018-2019, however, only annual EPFS data are available. As such, temporal disaggregation technique was employed for these years to generate monthly observations. Otherwise, the sample size would not be ideal for regression analysis. Variables are expressed in logarithms, except for the intervention variable. Hence, estimated coefficients correspond to elasticities.

Currency demand at the micro level is given by the aggregate bank currency withdrawals from the BSP. Demographic factors such as birth rate and death rate are obtained from the Census of Population and Housing by the Philippine Statistics Authority (PSA) (Table 4).

TABLE 4. Summary of regression variables

Variable name	Description	Source of basic data
BCW	Bank currency withdrawals from the BSP, in value	BSP
CIC	Currency in circulation, in value	BSP
Digitalization	Digital payment transactions via PESONet, InstaPay, ATM, Internet, Mobile, and POS transactions, sans cash component, in value	BSP
Birth	Birth rate corresponding to the number of live births per 1,000 people	Philippine Statistics Authority (PSA)
Death	Death rate corresponding to the number of deaths per 1,000 people	PSA

5.2. Estimation results

Different model specifications were tested to gauge the impact of various digitalization indicators on bank withdrawals. Preliminary results show that holding other factors constant, the elasticity of BCW with respect to digitalization is negative, albeit small, indicating some substitution between cash and digital

payments. The results further signify that for the Philippine case, population age structure plays an important role in the interplay between physical cash and digital payments (Table 5).

Proxying for generational payment preference, death rate has a consistent statistically significant negative impact on BCW. Presumably, older people prefer physical cash over digital payments because physical cash is relatively simple to use than the alternative. People from the younger generation are more adaptable and more receptive in exploring alternative means of payment. The negative impact of death rate on BCW may mean that as higher inter-generational replacement occurs, there would be lower preference in using physical cash. Alternative model specifications that include a dummy indicator for months of mobility restrictions due to COVID-19[7] showed statistically insignificant impact on BCW.

TABLE 5. Summary of estimates on the impact of digitalization on bank currency withdrawals from the BSP model

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	11.14 ***	12.68 ***	14.92 ***	12.94 ***	11.05 ***	12.72 ***
Change in CIC	7.17 ***	7.33 ***	7.09 ***	7.02 ***	7.06 ***	6.90 ***
Digitalization	-0.10 *	-0.20 ***	-0.23 ***	-0.12 *	-0.09	-0.11 *
Birth rate	0.38 **	-0.04		0.47 **	0.43 **	0.52 ***
Death rate	-0.46 ***		-0.22 **	-0.51 ***	-0.53 ***	-0.60 ***
Lagged BCW	0.13	0.16 *			0.13	
Covid					0.05	0.06
N	69	69	69	69	69	69
R^2	0.84	0.81	0.81	0.82	0.84	0.83
D.W.	1.91	1.89	1.81	1.79	1.89	1.78

Notes: Authors' estimates, as of April 17, 2024. ***, **, * = significant level at 0.01, 0.05, and 0.1, respectively using Newey West covariance method to account for presence of heteroskedasticity of unknown form. Ramsey Regression Equation Specification Error Test (RESET) test indicates no specification error.
Sources of basic data: BSP CPID; BSP Depository Corporations Survey; BSP PPDD, and Philippine Statistics Authority (PSA).

An important implication of the small estimated substitution effect is that despite milestone payment digitalization reforms, there remains huge scope to expand the reach of digital modes of payment raise the volume of digital transactions and achieve the vision of a cash-lite society. Policy reforms on competitive pricing policy framework, interoperable transit payment systems, credit push payment for person-to-merchant transactions, fee-less micropayments, offline payments, liberalization of access to satellites for internet connectivity, and stronger consumer and merchant protection, among others, would go a long way in expanding and deepening the traction of retail payments digitalization.

[7] Dummy indicator that takes value of one for the period March 2020–December 2021.

Moreover, the complementary upgrading of cash cycle infrastructure and cash management processes provides an essential backstop, particularly when there are shocks and technical malfunctions. An efficient cash management, even at reduced scale, safeguards access to payment, especially for the segment of the population that cannot readily shift to digital modes of payment, due to confluence of ingrained habits, strong preference for autonomy and privacy, and lack of access to affordable payment services. As aptly pointed out by Mulqueeney and Livermore [2023], the ongoing shift requires careful consideration from policymakers to balance the benefits of digital payments with the needs of those who still rely on cash.

6. Conclusion and recommendations

Overall, the literature suggests that digitalization has had some significant impact on cash usage in some jurisdictions, particularly in advanced economies. However, there is no evidence yet of a massive substitution effect of digitalization on cash usage. This is also borne out in the preliminary empirical estimates for the Philippines.

It cannot be denied that a sustained advance in payment digitalization will eventually bring about a significant behavioral shift in cash usage. However, the pace and extent of substitution would be contingent on policy reforms aimed at widening access through affordable services, secure infrastructure, and strong privacy protection, among others. Realistically, there are still a number of fundamental rigidities that need to be addressed. The high costs of electricity and internet are some of the constraints to accessible digital payment services (Tables 6 and 7).

TABLE 6. Electricity rates

	2021 Average Price of 1 Kw/hr (USD)
Japan	0.211
Singapore	0.195
Hong Kong	0.173
Philippines	0.165
Taiwan	0.142
South Korea	0.133
Thailand	0.107
Indonesia	0.101
China	0.084
Vietnam	0.081
Malaysia	0.070

Source: "The price of electricity per KWh in 230 countries" [n.d.].

TABLE 7. Internet costs

	2023 Cost per Mbps (USD)
Indonesia	1.50
Philippines	0.77
Malaysia	0.32
Japan	0.29
Taiwan	0.24
South Korea	0.20
Singapore	0.16
Vietnam	0.15
Hong Kong	0.15
Thailand	0.10
China	0.08

Source: "Analysis: internet speed vs cost by country in 2023" [n.d.].

The market fee structure crucially determines affordability and hence, adoption of digital payment transactions. While the benefits of increased efficiency and convenience from digital modes of payment are indisputable, it is equally important to think and prepare for mitigating the potential downsides such as vulnerability to cyberattacks and the risk of exclusion of individuals who lack the capacity to make an informed and empowered choice about the use of digital payment solutions.

Developing a database on payment attitudes of consumers, like Euro's biannual SPACE, would also provide important insights on how the dynamics between cash usage and retail payment digitalization develop over time. This would also inform strategies to ensure that Filipinos have access to safe and reliable payment systems, including cash. After all, financial inclusion is about empowering Filipinos with safe access to and capacity to choose from a wide array of financial services and payment options that suit their lifestyle and preference. Thus, both cash infrastructure and digital payment infrastructure would need to progressively adapt to changing times to ensure that the freedom of choice in payments is safeguarded.

Interesting areas of research being explored are the development of digitalization indices from diverse data sources, and a more nuanced examination of currency demand based on age, population, and digitalization indices. As society traverses further into the digital age, understanding how different age groups engage with and adopt digital financial tools becomes imperative. Deeper examination could shed light on the preferences, behaviors, and barriers that influence the utilization of cash and digital modes of payment across age cohorts. Additionally, examining how digitalization indices affect the tempo of socio-economic and financial inclusion would provide valuable insights for policymakers, financial institutions, and technology developers on how they can tailor their strategies to the changing needs and preferences of diverse demographic segments in an increasingly digitized global landscape.

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Annex 1. Cross-country roads

To ensure data comparability, the basic data used are sourced from the IMF International Financial Statistics and Federal Reserve Economic Data.

FIGURE 10. Cross-country trends in CIC-to-GDP ratio, 2001-2023 (in percent)

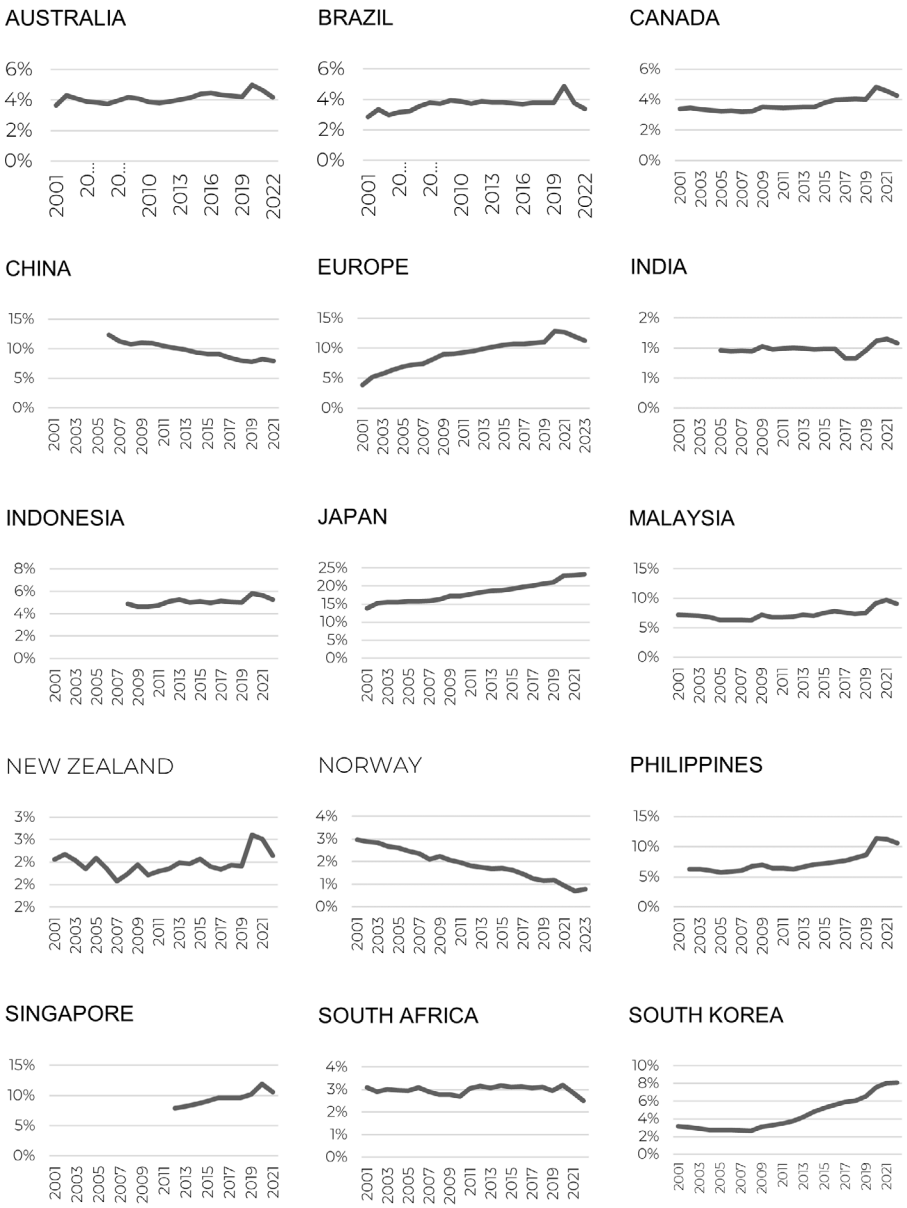


FIGURE 10. Cross-country trends in CIC-to-GDP ratio, 2001-2023 (in percent) (continued)

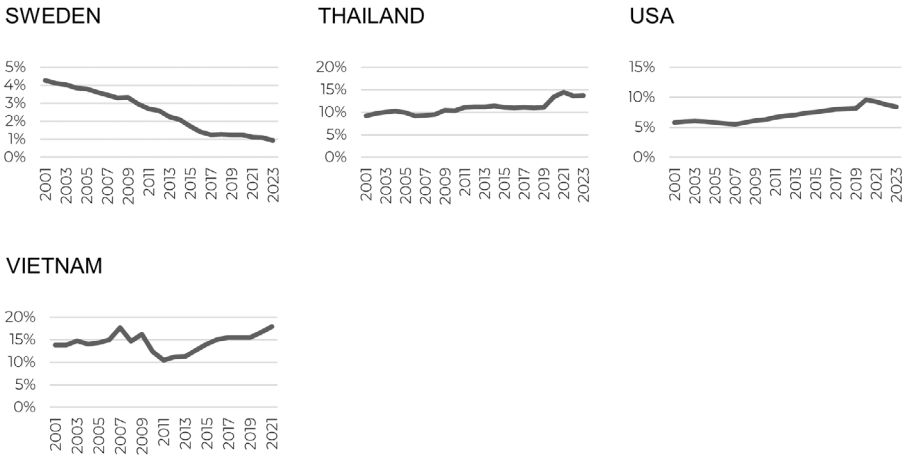


FIGURE 11. Cross-country trends in CIC-to-M1 (in percent)

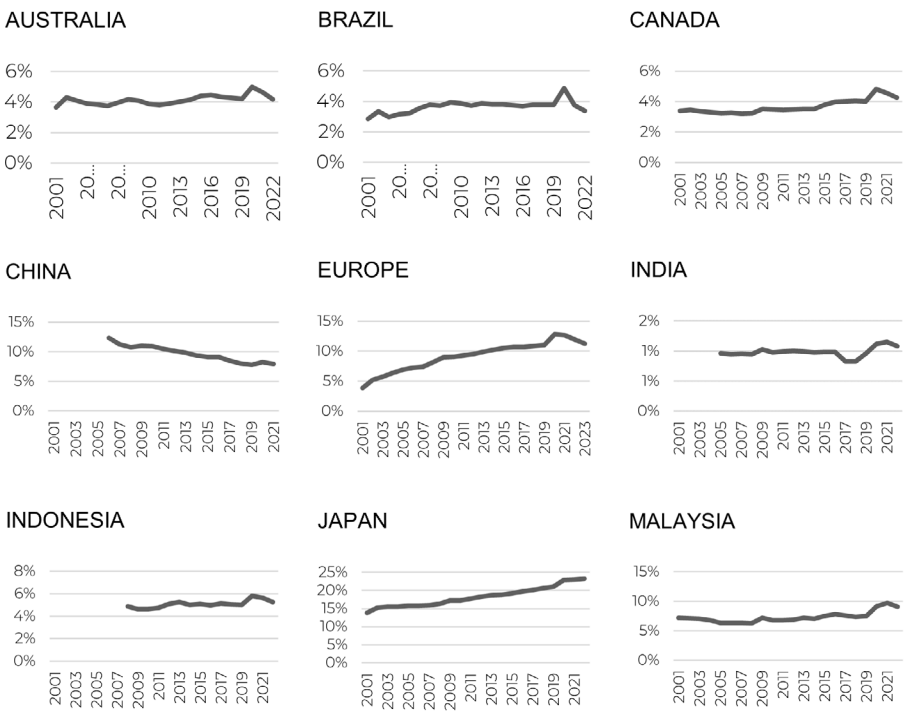
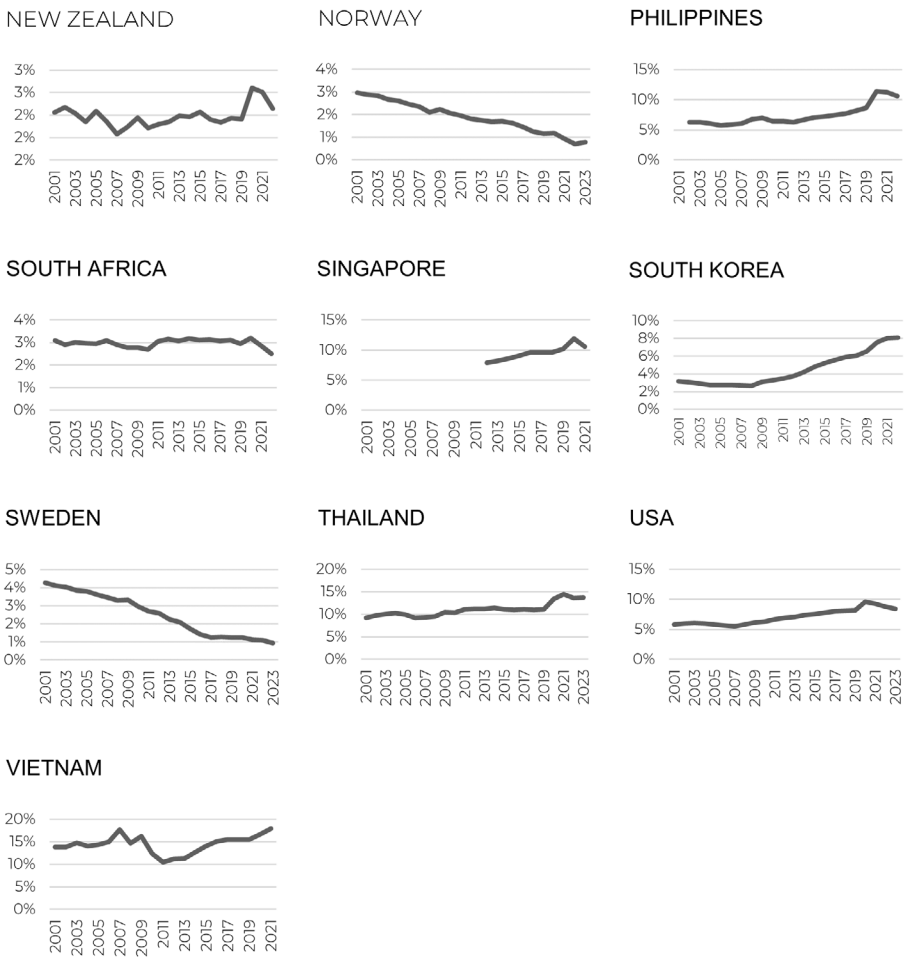


FIGURE 11. Cross-country trends in CIC-to-M1 (in percent) (continued)



Annex 2. Cross-country comparison of payments digitalization journey

This table provides a snapshot of drivers of payments digitalization in notable cases of payments digitalization.

Sweden	As early as 1950s, when central banking in developing countries was at its infancy, payment cards were already widely used in Sweden. Digitalization of bank accounts shortly followed, and internet infrastructure and internet banking were already set up by the 1990s. By the 2000s, the central bank started to outsource its printing and distribution of cash. These factors fostered behavioral shift among the consumers.

Annex 2. Cross-country comparison of payments (continued)

Norway	Norway plans to eliminate paper money by 2030 ["Norway strives to get ride of cash" n.d.]. Norwegian mobile payment app, Vipps, has a reported reach of 69 percent of their population for online payments. Usage rates for online transactions via mobile have exceeded that of similar advanced economies like France and Germany. On the other hand, there is an equally strong push to retain use of cash for privacy and security reasons.
Kenya	Kenya dominates in mobile money payments, which reached a record of KES 7.9 trillion (or USD 5.7 billion) in 2022 due to increased demand for cashless transactions and establishment new money agents [Wakarima 2023]. This is evident in the success of Safaricom's M-Pesa,[8] which has more than 50 million active monthly users across Africa [Armstrong 2022].
Nigeria	Central Bank of Nigeria's cashless policy in 2012 aimed to reduce the amount of physical cash circulating in the economy and to encourage more electronic-based transactions. This paved the way for Nigeria to become Africa's leader in real-time payments and digital payments with 3.7 billion real-time transactions in 2021 ["Nigeria reaps…" 2022]. Nigeria's real-time payments scheme, NIBSS Instant Payments, is driven by its leading payments technology company, Interswitch Group, that has been actively driving payments innovation for 20 years ["Nigeria reaps…" 2022].
South Africa	Unlike Kenya and Nigeria, South Africa has been slower to adapt to digitalization of payments, due in part to a more developed traditional banking infrastructure and a lower mobile phone penetration rate [Wachira 2023]. To address this, the South African Reserve Bank (SARB) launched Payshap in 2021, a low-value, real-time digital payment service that stemmed out of its Rapid Payments Programme (RPP)[9] making South Africa a step closer to a more accessible national payment system that will offer safer and faster payment options for all South Africans.
Brazil	The Brazilian government promotes the digital push through Pix, the instant payments platform powered by the Central Bank of Brazil. Since its introduction in 2020, six out of ten Brazilians use it regularly [PYMNTS 2022]. By January 2022, Pix was already used by 71 percent of the Brazilian population. In its latest Brazilian Central Bank reports, Pix generated a monthly volume of BRL 600 million (more than USD 100 million) of funds transferred.
Venezuela	Venezuela's hyperinflation decimated the country's currency, the bolivar, leading majority of its citizens to live in poverty and lose trust in its currency. Moving to a fully cashless society was deemed favorable to Venezuela as their paper dollars were in too short supply to be useful. Hence, Venezuelans turned to digital payments services to make dollar transactions. However, as Lago [2021] cautioned, Venezuela still needs to have competent management, and develop a reliable, accessible, and pervasive information and communication technology (ICT) infrastructure for the digital economy to be successful.
Chile	The COVID-19 pandemic pushed Chileans to embrace digital payment methods that it has become so entrenched that 62 percent of consumers said they would not patronize a merchant that does not offer some form of digital payment. Bank transfer has also become the most popular digital payment type. These transactions are much less vulnerable to theft and users can easily make payments via banking apps on their smartphones [PYMNTS 2021]. The popularization of digital wallets provides coverage of the industry's means of payment to the digital population in Chile, in addition to providing value-added services to users, such as transfers, savings, and payment of services [The Fintech Times 2022].

[8] M-Pesa is a mobile banking service which was launched in March 2007.
[9] The RPP, which was grounded in the NPS Framework and Strategy: Vision 2025, aims to provide a mobile-friendly instant payments service to assist with financial inclusion and stimulate economic recovery and future growth.

Annex 2. Cross-country comparison of payments (continued)

Bolivia	While internet services remain quite expensive, digital payments and e-commerce transactions keep on growing. The Bolivian government is investing more than BOB 140 million (USD 20.3 million) to build a data center wherein identity information of Bolivians throughout the national territory will be stored. The data center would support the General Personal Identification Service (Segip) around identity cards and driving license. The project is considered by no less than President Luis Arce as pivotal lead to the digitization of the country [Swinhoe 2023].

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