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A Digital Loonie among Many Digital Currencies Prospects and Outlook

Pierre L. Siklos



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About the Author

Pierre L. Siklos is a CIGI senior fellow who specializes in macroeconomics, with an emphasis on the study of inflation, central banks and financial markets. He also conducts research in applied time series analysis. His research has been published in a number of international journals, and he has been a consultant to a variety of institutions and central banks. His work has been widely cited in several macroeconomics and econometrics textbooks. Pierre has also been a visiting lecturer at several universities in Europe and North America as well as in Australia and New Zealand. His research has been funded by domestic and international agencies.

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Acronyms and Abbreviations

AEs	advanced economies
ATM	automated teller machine
BIS	Bank for International Settlements
CBDC	central bank digital currency
CBI	central bank independence
COVID-19	coronavirus disease 2019
EMEs	emerging market economies
EPU	economic policy uncertainty
FDI	foreign direct investment
FSB	Financial Stability Board
G20	Group of Twenty
IMF	International Monetary Fund

Executive Summary

Interest in digital currencies parallels growing interest in digitalization more generally. Digitalization, strongly encouraged by the coronavirus disease 2019 (COVID-19) crisis, has advanced plans made by many central banks to introduce a retail central bank digital currency (CBDC).

This paper sets out to explore two major forces that will dictate the emergence, spread and eventually the success of retail CBDC globally: first, the potential for a foreign retail CBDC to displace existing domestic currencies and, second, the scope for international cooperation in the rollout of retail CBDC. The paper identifies select economic and political factors that may explain the potential for shifts in currency holdings.

For some countries, persistently poorly managed macroeconomic policies might encourage an even stronger shift toward alternative, more stable currencies, especially if they are available in digital form. Additionally, if the promised convenience, lower transactions costs or even the possibility of earning a return on a digital equivalent of cash emerge, then these features may also generate a shift toward the holding of more historically stable and widely used currencies. These are some of the international implications from the introduction of retail CBDC. It also remains to be seen whether, domestically, the composition of means of payment will be redistributed away from existing forms of payments (i.e., cards, mobile, app-based arrangements). While the foregoing considerations may dictate the demand for retail CBDC, each country's ability to successfully create a homegrown retail CBDC will, first and foremost, depend on the quality and sophistication of domestic institutions.

Institutional capacity will largely influence whether launching a digital currency is even feasible. Institutional capacity is meant to reflect resilience in the face of the "shock" that the introduction of a retail CBDC might represent. Because advocates of retail CBDC tout its global benefits, while acknowledging that its existence could constrain the space to carry out domestic economic policy, the possibility exists that a small number of economically and systemically important economies will threaten others. However, there

is scope for groups of smaller countries and diverse groups to serve as counterweights to the actions of more powerful economies. The paper will seek to identify areas where agreement on the deployment of a retail CBDC is most likely, as well as potential sources of conflict.

What do the foregoing developments portend for the prospects of a digital Canadian dollar (or digital "loonie")? The tried and tested rule that a country should keep its economic house in order is likely to prevail. Moreover, the success of any digital loonie will need to be backed up by the ability of the authorities to provide holders with confidence and trust in the digital technology that will be employed. What is far less certain is how technical change, together with uncertain geopolitics, will play out. Policy makers will be challenged to develop new or better macroprudential tools to prevent any potential fallout from the "globalization" of retail CBDC. The precise details are beyond the scope of this paper, although some very broad guiding principles are provided. That said, there is a large shadow looming over the potential and promise of retail CBDC, namely, the global community's ability to reach agreement on the deployment and rules about international movements in digital currencies. Indeed, the prospect of retail CBDCs having a role beyond complementing existing notes and coins — as a tool of monetary policy — is a policy discussion that needs to take place immediately. There are also governance implications to consider for monetary authorities. Declarations by central banks that planned retail CBDCs are not intended to have monetary policy implications are not enough. The time to revisit some aspects of central bank governance and the conduct of monetary policy is now.

Introduction

Digitalization, in response to the COVID-19 crisis, has caused many central banks to further develop their plans to introduce a digital currency. At the outset, it is worth mentioning that observers often downplay the distinction between retail and wholesale forms of digital financial transactions. The latter have evolved considerably over the past several years and, while one element of wholesale digital transactions has been much in the news recently,¹ the future battle is largely about digital currencies to be used by individuals as a complement to existing notes and coins. Indeed, for some time now, analysts have even predicted that conventional forms of cash are likely to disappear (for example, see Barrett 2021). Even if current trends suggest this may eventually happen (see below), reports about the death of cash “are greatly exaggerated,” to paraphrase the famous quote. The following discussion will focus exclusively on digital currencies issued by central banks for retail use, henceforth retail CBDCs.² Moreover, this paper assumes that a retail CBDC is, at most, intended to complement notes and coins in circulation. The author recognizes the possibility that a retail CBDC can earn interest or incur a penalty rate, but these considerations are intended to play different, but potentially important, future roles in the analysis below. Moreover, central banks around the world have made it clear that, at the outset, only the narrowest form of retail CBDC will first be introduced. Other implications follow from the approach

taken in the present paper, and a more complete explanation is provided in the next section.³

Political and economic motives are also critically important, even if technical and legal considerations are some distance from being overcome (for example, see Arner et al. 2020; BIS, SIX Group AG and Swiss National Bank 2020). International cooperation will be essential (for example, see Committee on Payments and Market Infrastructures 2020). Why? A retail CBDC has raised the potential of a reduction in transactions costs and to enhance the public’s ability to hold and trade in multiple currencies (namely, see European Central Bank 2020). Next, and equally germane to this paper, the possibility of currency substitution also dovetails nicely with the Group of Twenty’s (G20’s) continuing aspiration to enhance digitalization as a “tool” to improve economic performance and reduce inequality.⁴

Driving Forces behind Retail CBDC

This paper sets out to explore two major forces that will dictate the emergence, spread and eventually the success of retail CBDC globally: first, the potential for a foreign retail CBDC to displace existing domestic currencies and, second, the scope for international cooperation in the rollout of retail CBDC. That said, a necessary first step is to also ask: What determines the importance of currency held as a proportion of a country’s GDP?

Figure 1 plots the ratio of currency in circulation as a proportion of GDP for 18 countries. The COVID-19 pandemic is represented by the last observation (2020), which is when, at the time of writing, the available data ends. Only 10 countries are explicitly identified to avoid excessive clutter. Nevertheless, at least two important observations can be made based on the results. First, before the pandemic, other than in Sweden and the United States, currency-to-GDP ratios have remained stable or

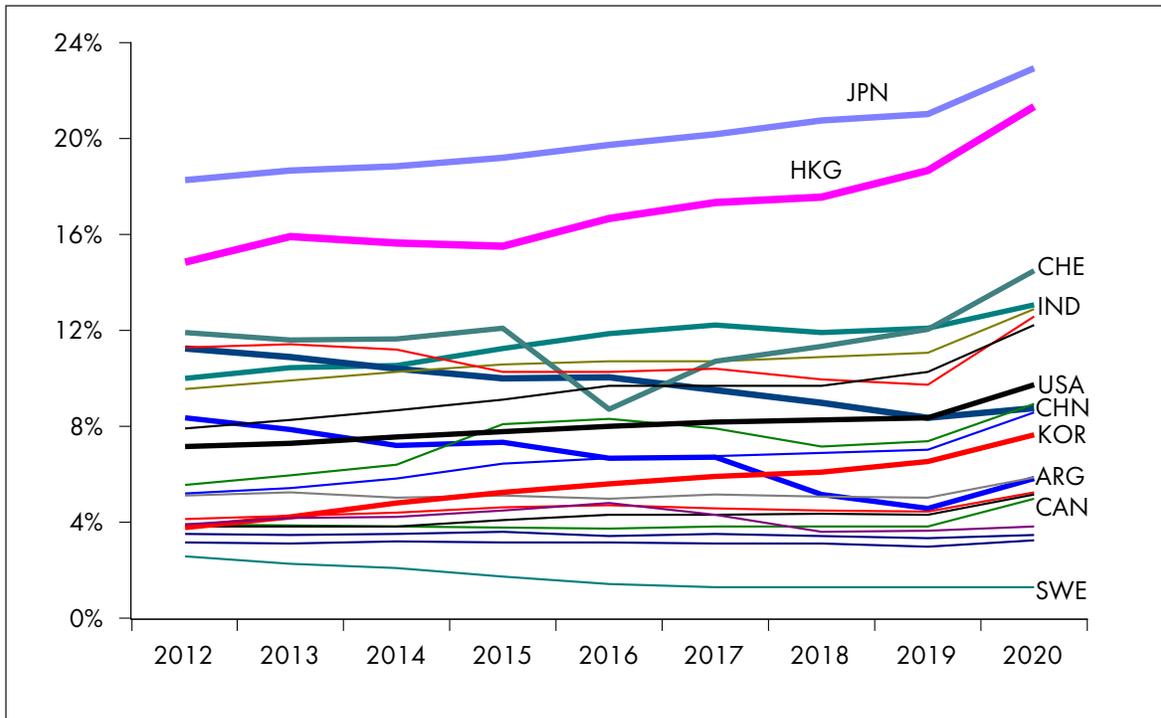
1 Namely, the banning of Russian financial institutions from SWIFT (the Society for Worldwide Interbank Financial Telecommunication) network. For example, see Kowsmann and Talley (2022). The usual thresholds beyond which transactions are labelled as wholesale as opposed to retail can range from \$10,000 to \$100,000 (all dollar figures in US dollars), depending on the country and the financial instrument in question. The Swiss National Bank, among other central banks, is already experimenting with this form of payment (see Bank for International Settlements [BIS], SIX Group AG and Swiss National Bank 2020). Both alternatives have attracted considerable attention from policy makers because there is scope to avoid using central bank-issued money. It also raises the potential to shift business away from the banking sector to non-bank institutions. See Waller (2021) and US Securities and Exchange Commission (2021).

2 Kiffmeister Chronicles (kiffmeister.com) provides regular updates of jurisdictions where retail CBDCs are actively being considered. As of early May 2022, more than 80 central banks are considering the possibility of introducing a retail CBDC.

3 For ease of exposition, it is easiest to first think of retail CBDC as primarily serving as a transaction medium. “Money,” of course, can also serve a “store of value” function. The author returns to this issue below.

4 See www.g20.org/prosperity.html.

Figure 1: Currency in Circulation to GDP (%), 2012–2020



Sources: BIS (www.bis.org/statistics/payment_stats.htm?m=1036) and author's calculations.

Notes: Currency in circulation includes notes and coins. ARG = Argentina; CAN = Canada; CHE = Switzerland; CHN = China; HKG = Hong Kong; IND = India; JPN = Japan; KOR = Korea; SWE = Sweden; USA = United States.

have risen. In some cases (for example, Canada), the pandemic is a proximate explanation. However, elsewhere, notably Japan, Hong Kong, Switzerland, India and even China, a rising share of currency to GDP is observed that predates the pandemic. Second, there is very large diversity in currency holdings, which likely reflects habit combined with cultural factors since, for example, there is no obvious distinction between advanced economies (AEs) and emerging market economies (EMEs).⁵

Turning to the potential fallout of retail CBDC globally, the International Monetary Fund (IMF) (2020) raised the currency substitution question but did not provide any formal empirical evidence. Indeed, it is challenging to do so. Instead, the present study identifies select economic and political factors that may explain the potential for shifts in currency holdings. For some countries,

persistently poorly managed macroeconomic policies might encourage an even stronger shift toward alternative, more stable currencies, especially if they are available in digital form. Additionally, if the promised convenience, lower transactions costs, or even the possibility of earning a return on a digital equivalent of cash emerge, then these features may also generate a shift toward the holding of more historically stable and widely used currencies. For example, in attempting to compete or prevent shifts into different currencies, it is conceivable that countries will attempt to make theirs financially more attractive to hold. A major difficulty is that historical experiences with declines in transactions costs arising from past financial innovations offer limited lessons for the inflation and financial stability implications from the digitalization of money (Chen and Siklos 2022). Another challenge that can limit the shift to a world with fewer currencies, thanks to digitalization, are regulatory constraints imposed in each country to protect its economic sovereignty.

⁵ It may be argued that what matters more is currency holdings in constant purchasing power or real terms. Examination of changes in the holding of notes in real terms suggests stability, for the most part, although there are some exceptions, with large variability in the case of Argentina, Brazil, India, Russia, South Africa and Turkey.

While the foregoing considerations may dictate the demand for retail CBDC, each country's ability to successfully create a homegrown retail CBDC will, first and foremost, depend on the quality and sophistication of domestic institutions. In other words, institutional capacity will largely influence whether launching a digital currency is even feasible. Institutional capacity is meant to reflect resilience in the face of the "shock" that the introduction of a retail CBDC might represent.⁶ Why is resilience important? As noted above, there are many considerations, including economic, political and societal, that stem from the creation of a retail CBDC. A retail CBDC will also impact the financial sector and financial conditions. Why does this matter? As Federal Reserve Chair Jerome Powell stated recently: "Policy works through financial conditions. That's how it reaches the real economy" (Powell 2022, 17). Therefore, to the extent that retail CBDC can influence financial conditions, there is the potential for real economic effects from its introduction.

Clearly, countries that possess the greatest institutional capacity, conditional on their macroeconomic and financial stability, are likely to become the most successful hosts of retail CBDC. This development will also favour currency substitution into those retail CBDCs. However, it is not only access to other digital currencies that will enhance the appeal of retail CBDC, or any potential reduction in transactions costs. Regulatory aspects will also be critical since these will influence the degree to which policy makers will impose non-price impediments in the ability of individuals to digitally hold and transact in several currencies.

Turning to the role of cooperation in the deployment of retail CBDC, it appears that the opportunities to do so have diminished recently due to the ongoing pandemic and the war in Ukraine. More generally, as seen from the data in Dario Caldara and Mario Iacoviello (2022), there has been an upward trend in recent years in global geopolitical risks. Recent events have created new divisions with critical, but largely unknown, implications for the G20 and other international organizations. Nevertheless, at least two important

counter examples exist. First, the creation of the Financial Stability Board (FSB) and, more recently, the international tax agreement (US Department of the Treasury 2021), imply that international consensus is possible even in challenging geopolitical times.⁷ Moreover, and despite the views of some analysts, it is not obvious why a retail CBDC requires a specific number of countries to set rules and standards or, for that matter, a single global standard. Indeed, the concept of the "logic of collective action" (Olson 1965) suggests that the free-rider problem in group settings will rise, the larger and more diverse is the group. Because advocates of retail CBDC tout its global benefits, while acknowledging that its existence could constrain the space to carry out domestic economic policy, the possibility exists that a small number of economically and systemically important economies will threaten others. That said, there is scope for groups of smaller countries and diverse groups to serve as counterweights to the actions of more powerful economies. This paper will seek to identify areas where agreement on the deployment of a retail CBDC is most likely, as well as potential sources of conflict.

What do the foregoing developments portend for the prospects of a digital Canadian dollar (or digital "loonie")? Canada's currency is among the most widely traded in the world.⁸ And there were earlier episodes when policy makers either faced the threat of the wider adoption of the US dollar, or even the recommendation that we consider adopting the US dollar by relinquishing the loonie.⁹ However, the desire to retain economic policy sovereignty (underpinned by the commitment to a floating exchange rate) and the search for (and maintenance of) best practices in macroeconomic policies overcame such threats. Therefore, the tried-and-tested rule that a country should keep its economic house in order is likely to prevail.

6 Although the introduction of retail CBDCs is widely anticipated, the timing, nature and technical platforms used to make them available to the public are still a work in progress. Moreover, we have limited knowledge about how much the wider public is attentive to the implications and uses of digital currencies. Hence, it is not too much of an exaggeration to refer to a shock.

7 At the time of writing, the FSB's membership consisted of 24 countries and several international organizations. One hundred and thirty-seven countries signed the global tax agreement.

8 At least according to the BIS's "Triennial Central Bank Survey of Foreign Exchange and Over-the-Counter (OTC) Derivatives Markets in 2019." See www.bis.org/statistics/rpfx19.htm.

9 The last time there was a surge of interest about the future of the Canadian dollar was in the late 1990s, on the eve of the European Monetary Union and concerns over the relative performance of the Canadian economy vis-à-vis its largest trading partner, the United States. See, for example, Buitier (1999), Courchene (1999) and Harris (1999). The debate over the long-term economic consequences of the North American Free Trade Agreement with Mexico and the United States (1994) also played a role.

What is far less certain is how technical change, together with uncertain geopolitics, will play out.

The study concludes with policy implications. For example, policy makers will be challenged to develop new or better macroprudential tools to prevent any potential fallout from the “globalization” of retail CBDC. It is too early to tell what these might consist of as digital currencies with cross-border features have yet to be introduced. That said, in the first instance, individual countries must ensure proper supervision and control over the issuance of retail CBDC. Next, internationally agreed to rules, preferably negotiated by the FSB, will have to be developed. Since central banks have come to the conclusion that retail CBDC will have to be introduced as a public-private partnership, special care will have to be devoted to prevent financial excesses that have, in the past, produced financial crises small and large. As Kristin J. Forbes (2020) has pointed out, macroprudential tools cannot deal with all potential sources of financial instability. Moreover, there is a large shadow looming over the potential and promise of retail CBDC, namely, the global community’s ability to reach agreement on the deployment and rules about international movements in digital currencies.

The Domestic and International Dimensions of Retail CBDC

The author begins with some definitions and assumptions to fix ideas. The BIS (2021, graphs III.4 and III.5) provides visualizations of the main forms of CBDC being contemplated. None of the main arguments made in the present study are substantially affected by assuming that the retail CBDC being contemplated has the features of existing notes and coins.

Central banks around the world have generally come to a consensus that, initially at least, retail CBDC would complement notes and coins in circulation. Hence, in terms of concepts such as monetary aggregates, the implication is that a narrow monetary aggregate would be affected by such a change. Recall that narrow money

supply measures, often labelled M1, typically are defined to include notes and coins in circulation and bank deposits that earn little or no interest. Precise definitions vary somewhat around the world, although, for example, the IMF publishes series that are comparable across countries. If, eventually, retail CBDCs are created with an interest-earning or penalty component, then there are legal and policy implications as well as governance implications that have been discussed by several authors but are far from being resolved (for example, see Siklos 2022 and references therein). In this case, broader monetary aggregates (for example, M2¹⁰ or M3¹¹) would be impacted.

Most notably, retail CBDCs offer the potential for central banks to use them as an additional instrument of policy either through the payment of interest or by charging a penalty for holding the digital equivalent of notes and coins. How effective such an instrument might be depends, in part, on what fraction of the narrow money supply will be allowed to be in the form of circulating notes and coins, as well as whether it is contemplated that injections of retail CBDC might take place in the form of “helicopter money.”¹² As the pandemic has demonstrated, the old assumption that fiscal policy reacts too slowly to economic shocks has been contradicted. Therefore, “helicopter” drops of digital currencies are no longer the only option in attempts to quickly stimulate economic activity.

The author does not consider the case of cryptocurrencies or stablecoins. Occasionally, there is confusion between CBDCs and stablecoins. The latter are created by the private sector and may be backed by physical assets (for example, gold) or financial assets (for example, dollars), while existing cryptocurrencies can be unbacked. (See BIS [2018, chapter 5] and Barontini and Holden [2019] for additional details.) A good overview of all aspects of CBDCs, whether of the retail or wholesale varieties, is found in Niepelt (2021). Although many have suggested that cryptocurrencies and stablecoins represent threats to the note-issuing monopoly of central banks, this is highly unlikely

10 M2 is a broader measure of the money supply that includes M1 and savings-type deposits.

11 M3 is an even broader measure of the money supply than M2 that would also include certain money market mutual funds and longer-term time deposits.

12 This is a parable that Milton Friedman (1969) first used to refer to the central bank printing money and dropping it on citizens from a helicopter.

(*inter alia*, see Arner et al. 2020 and references therein). Moreover, as Brendan Greeley (2022) notes, private sector attempts cannot escape the human habit of corruption or the breaking of promises. At least in the case of state-sponsored money, there is a greater potential for accountability and restitution in the event of a financial loss. Stated differently, neither of the alternatives can provide the same risk-free guarantees that central banks can provide, nor is it likely that the alternate forms of money will be as widely accepted as notes, whether of the paper or digital varieties. Indeed, regulatory authorities around the world are already on guard to ensure that stablecoins and cryptocurrencies will not be considered perfect substitutes for central bank money.

Motivations among central banks for introducing a retail CBDC are quite heterogeneous (for example, see Bank of Canada et al. 2020). Sweden wishes to improve the convenience and efficiency of day-to-day transactions. Cross-border payments settlement are top of mind for Japanese authorities (Kihara and Wada 2020). Differences in motivations for the introduction of a retail CBDC tend to be underemphasized in many studies that prefer to look for common drivers across countries (for example, Brunnermeier, James and Landau 2019). Clearly, cross-border and settlements systems are a critical ingredient in deploying a retail CBDC. More generally, as Bank of Canada Governor Tiff Macklem recently explained, a made-in-Canada retail CBDC is to be “ready for launch,” prompted by the desire not “to be surprised by some other country” (Sinclair 2020). That said, he also called on the international community to ensure that a retail CBDC is managed in a coordinated manner at the global level (Bank of Canada et al. 2020; Gordon 2020).¹³

While forces that are prompting the imminent introduction of a retail CBDC are powerful, there are also factors that may slow down progress in this direction. For example, in Sweden, policy makers are investigating more fully the consequences of digitalization in the context of an aging population

(for example, see Alderman 2018). This turn of events may well have been motivated by growing empirical evidence that younger adults tend to rely less on notes and coins than older adults (for example, see Khianonarong and Humphrey 2022 and reference therein). Elsewhere, demographic considerations more generally are becoming a dominant theme for policy makers and academics (for example, see Goodhart and Pradhan 2020).

As noted previously, several central banks appear on the verge of launching a retail CBDC. The vast majority of central banks surveyed are exploring or preparing for its introduction (Auer, Cornelli and Frost 2020; Kosse and Mattei 2022). Initially, the race is on to introduce a retail CBDC for domestic purposes, partially as a means of protection against the loss of monetary sovereignty (Chorzempa 2021). Importantly, however, a salient characteristic of a retail CBDC is its appeal beyond conventional borders, that is, to enhance the opportunity to hold multiple currencies for a variety of reasons, including for transactions purposes, hedging or as investment vehicles (Auer, Haene and Holden 2021; Powell 2022).¹⁴

Consequently, the digitalization of money creates the possibility to expand or reduce the role of existing dominant currencies (namely, the US dollar). However, a retail CBDC also enhances the spread of other currencies less widely used at present, especially where macroeconomic management of the country in question is viewed favourably in international markets. Alternatively, geopolitical and technological forces, to name just two other factors, can also explain an apparent modest shift to date toward the holding of “non-traditional” currencies (Arslanalp, Eichengreen and Simpson-Bell 2022).¹⁵

Clearly, since digital currencies require a technical platform to operate under, as well as the legal tender protection that makes notes attractive to hold, there are challenges to be expected if “interoperability” cannot be guaranteed, or if other

13 A reviewer correctly points out that there may be an impact on seigniorage, that is, the profit from the issuance of currency in physical or electronic forms. There are several ways of calculating seigniorage, including the difference between the interest earned from the issuance of different notes less the costs of production and distribution or, more simply, as the change in the real value of the money supply (which combines the inflation tax, if money contributes to rising prices, and changes in real money holdings). As a share of a country’s GDP, the potential size of seigniorage can be large (10 percent or more). Some simple calculations are relegated to the appendix.

14 One indication of the potential demand for cross-border currency holdings might be cash withdrawals inside and outside the country of account holders’ accounts. Unfortunately, the available data is sparse and is dominated by countries in or near the euro area and are, consequently, not very informative.

15 The authors provide an excellent summary of the debate over whether the US dollar’s dominance is coming to an end. So-called non-traditional currencies include the Australian and Canadian dollars, China’s renminbi, the Swiss franc, as well as the currencies of Denmark, Hong Kong, Korea, New Zealand, Norway, Singapore and Sweden.

limitations are placed on the legal contractual obligations when digital currencies are used. Nevertheless, it is unclear that these barriers are significant. For example, credit card issuers appear to have overcome many interoperability problems, although the same is not true for debit or cash card-based transactions, at least at the global level. Legal tender is a device used in individual countries with custom and precedent seemingly an adequate arrangement when currencies other than a domestic one are used elsewhere.¹⁶

The last few decades, however, have generated at least two noticeable trends:

- Improvements in domestic macroeconomic policy diminish the potential for currency substitutability and enhance the ability to implement a sovereign or independent monetary policy. However, this conclusion may not extend to emerging markets where macroeconomic policy is more fragile (for example, see Bordo and Siklos 2021). Equally important, the strength of domestic institutions is also critical to raising domestic capacity to successfully introduce a retail CBDC.
- Crises can be an opportunity for improved international cooperation. However, the more complex the issues, the greater the challenge in arriving at a consensus. Large, systemically important economies can, and should, lead the way. Indeed, the need to ensure the development and maintenance of strong domestic institutions ought to incentivize central banks to find the balance between the desire to improve access and lower the costs of obtaining and holding major currencies while acknowledging the demand for sovereignty in the conduct of domestic monetary policy.

Tanai Khianonarong and David Humphrey (2022) point out that lost in recent discussions about the decline in the usage of conventional notes and coins (also see Ashworth and Goodhart 2020) is that this has taken place in the context of more alternative forms of payments instruments, notably debit and credit cards and mobile and

app-based payments systems.¹⁷ Once account is taken of this development, the introduction of retail CBDC may only redistribute the composition of existing means of payments and need not represent a revolutionary step in the development of the existing international monetary system.¹⁸ They, as do Kento Yoshizawa et al. (2021) and Laura Kim, Raynil Kumar and Shaun O'Brien (2020), also highlight the role of demographic factors in the choice of payments mechanisms.¹⁹ Ultimately, Khianonarong and Humphrey (2022) argue that, other things being equal, it is the net benefits of alternative payments instruments versus credit or debit e-transactions that will dictate the popularity and adoption rate of retail CBDC. While this is undoubtedly a valid decision rule, it ignores that these cards are not costless to maintain (for example, they charge annual and transaction fees), nor are the benefits constant over time.²⁰ Moreover, these instruments are far from being universally acceptable, they do not possess legal tender protection and they do not have the potential as a store of value, nor do they deal with the problem of transacting in multiple currencies. Moreover, improvements in monetary policy and institutional quality that retail CBDCs have the potential to deliver (for example, see Rogoff 2016; Bordo and Levin 2019) are not available from these

¹⁶ Although central banks underestimate the threat to the legal tender provision. Despite warnings and attempts at moral suasion in 2020, as the COVID-19 pandemic was raging, many shops and other businesses began to reject cash for payment. See, for example, Bank of Canada (2020).

¹⁷ Kenya's M-Pesa (it has since spread to several African countries; see www.vodafone.com/about-vodafone/what-we-do/consumer-products-and-services/m-pesa) and Brazil's Pix (see www.bcb.gov.br/en/financialstability/pix_en) are representative examples of account-to-account payments systems. M-Pesa is run by a private company whereas Pix is housed at the central bank.

¹⁸ In the same countries where currency-to-GDP ratios are rising, so is the number of credit, debit and cash cards issued. Only South Africa and Sweden have experienced a decline in total cards held. This suggests that cash and cards of various types are complementary transactions technologies, and that the public prefers choice over one or another form of payment.

¹⁹ If there exists a divide between AEs and EMEs, it is most pronounced in population aging. For the 18 countries considered in Figure 1, age dependency ratios are rising in all AEs but are stable or declining in six EMEs (Brazil, India, Indonesia, Mexico, Saudi Arabia and South Africa).

²⁰ In a survey of automated teller machine (ATM) usage per capita (see www.bis.org/statistics/payment_stats.htm?m=1036) in 24 countries, there is a decline in cards held in 18. All six countries where ATM per capita usage is rising are EMEs.

alternative payments instruments.²¹ Finally, the private sector cannot compete with central banks when it comes to providing some kind of guarantee of security against loss or technical interruptions.

Institutional Capacity, Transactions Costs and Retail CBDC

Even if most central banks are contemplating the introduction of a retail CBDC in some form, and despite the many legal and technical hurdles that remain, as noted earlier, what has not been considered is the institutional capacity in successfully rolling out digital money. As shown in Figure 1, there continues to be considerable heterogeneity in currency holdings behaviour, at least in relation to the size of respective economies. Earlier, it was hypothesized that institutional factors might play an important role. If this is the case, there is no reason to believe that institutional factors will be less important in influencing individuals' holdings of money in digital form.

Table 1 considers whether institutional factors can explain the evolution of the share of currency-to-GDP holdings in the 18 countries previously considered. Given the G20's role in international fora for economic and regulatory cooperation, the countries are all members of the G20. A number of alternative proxies for institutional factors are considered. They are:

- current holdings of alternative forms of payments in the form of cash, debit and credit cards;
- a frequently used measure of contract enforcement known as contract-intensive money (Clague et al. 1999);
- the state of financial globalization, which ought to enhance confidence in holding domestic currencies and, by implication, enhance the possibility of cross-border payments;
- the debt-to-GDP ratio as an indicator of the government's capacity to meet its financial obligations and resistance to rely on money creation to finance its fiscal needs;
- inflation, which is traditionally considered as the primary means to shift out of money into interest-earning assets;
- the institutional resilience of central banks to various economic shocks such that greater resilience translates into a higher preference for cash holdings, other things being equal; and
- the frequency of financial crises measured here in relation to the number of such crises experienced by the United States.

Together, these elements provide guidance about the institutional capacity of the countries considered to introduce and manage some form of retail CBDC.

The estimates shown in Table 1 are based on a panel of data for the full period 2012–2020. The addition of a variable to separate EMEs from AEs in the sample is a straightforward means to control for some fixed effects, that is, other factors not explicitly included in the estimated model.²² The time span is relatively short, owing to data limitations (for example, indicators of the number of alternative forms of payments). Observations for only a selection of the series are available for a longer sample, although this would require additional controls. Hence, the results in Table 1 should only be seen as suggestive. That said, unlike the conventional approach, which asks how, on average, institutional capacity influences the currency-to-GDP ratio, estimates are also shown for the median of currency-to-GDP ratios as well as for those cases where currency

21 A little discussed potential feature of retail CBDC is that currency denominations are no longer, strictly speaking, required. This provides central banks potentially with another tool to fight counterfeiting and a vehicle to reduce, assisted by financial regulation, usage of large denomination notes for illicit activities. Data reveals the continued relative importance of large denomination notes in currency notes outstanding in circulation. Another potential advantage of retail CBDC that goes unmentioned is that, in principle, it could eliminate the need to have denominations of various sizes. The removal of old notes is more common than one might think. A simple search online reveals that the following countries have removed notes of various denomination sizes for a variety of reasons (policy, security, changes in the representations on notes and conversion from paper to polymer, to name a few): Canada, Costa Rica, Denmark, the euro area, Hungary, Iceland, India, Indonesia, Korea, Maldives, Mexico, Myanmar, Norway, Qatar, Singapore, Switzerland, Sweden and the United Kingdom.

22 Some experimentation with conventional fixed effects did not alter the conclusions.

Table 1: Economic and Institutional Determinants of the Demand for Notes in Circulation

Dependent Variable: Notes-to-GDP Ratio				
Variable	Mean	Median	Right Tail	Left Tail
Per capita cards	0.71 (0.22)*	0.83 (0.17)*	0.70 (0.11)*	0.61 (0.07)*
Contract intensive	-28.74 (10.85)**	-29.11 (6.85)*	-40.39 (12.15)*	-21.74 (3.71)*
Financial globalization	-0.06 (0.05)	-0.08 (0.03)**	-0.06 (0.03)*	-0.06 (0.04)
Debt-to-GDP ratio	0.03 (0.01)*	0.04 (0.01)*	0.03 (0.01)*	0.04 (0.02)**
Inflation	-0.25 (0.09)*	-0.18 (0.05)*	-0.09 (0.24)	-0.26 (0.14)**
Central bank resilience	-2.95 (1.00)*	-2.58 (0.51)*	-5.16 (0.70)*	-1.75 (0.75)**
Excess number of crises	-1.34 (0.51)**	-1.72 (0.68)*	-3.28 (1.53)**	-1.02 (1.06)
EMEs	1.94 (1.45)	1.42 (0.97)	2.22 (1.60)	2.14 (0.72)**
Constant	37.67 (12.30)	37.52 (8.30)	53.88 (12.00)*	26.95 (3.39)*
Cross-sections	18	18	18	18
Observations	121	121	121	121
\bar{R}^2	0.75	0.51	0.58	0.51
F/p-value	46.38 (0.00)	213.39 (0.00)	173.41 (0.00)	137.27 (0.00)
Fixed effects	No	No	No	No

Sources: Data on per capita cards from BIS Red Book (see www.bis.org/statistics/payment_stats.htm), contract intensive is based on Clague et al. (1999), financial globalization is based on the KOF's index (see <https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html>), inflation is annual rate of change in consumer prices from the BIS (see www.bis.org/statistics/cp.htm?m=2678), and central bank resilience and excess number of crises are from indicators constructed by Hartwell and Siklos (2022).

Notes: Pooled least squares estimates. *, ** indicate statistical significance at the one percent and five percent levels, respectively. Standard errors in parentheses. \bar{R}^2 is the adjusted coefficient of determination. F/p-value is the test statistic for the joint statistical significance of the right-hand-side variables in the estimated specification. P-value is the statistical significance level of the test statistic.

held is relatively high (right tail) or low (left tail). This permits us, for example, to investigate whether the role of institutional capacity is sensitive according to whether there is a built-in bias toward greater or lesser currency holdings.

Overall, the results suggest that institutional factors go a long way to explaining aggregate currency holdings over the period considered. More importantly, perhaps, is the finding that almost all institutional factors matter across the G20 economies. In particular, if contract enforcement mechanisms are strong, that is, greater property rights protection exists, this raises the currency-to-GDP ratio. Notice also that response is much stronger in the right tail than in the left tail — a strong indication that a

critical element in explaining money holdings are property rights. Financial globalization and the debt-to-GDP ratio also influence currency-holding behaviour, although the economic magnitudes of the estimated coefficients are relatively small. Nevertheless, it is interesting that more financial globalization reduces the demand for currency only at the median and in the right tail of the distribution of currency-to-GDP ratios. Hence, any shift away from holding currency may well be linked to enhancements of global rules to the extent that the globalization proxy is able to capture such influences. Perhaps surprisingly, inflation has little impact on currency holdings, although

it is important to point out that the sample covers a period of relatively low and stable inflation.²³

Next to contract intensity, the most important other determinant of cash holdings, as measured by coefficient size, is central bank resilience. This variable unambiguously suggests that more resilient central banks translate into greater cash holdings in relation to GDP. Although the coefficients are broadly comparable across the distribution of cash-to-GDP ratios in the 18 countries considered, clearly countries where relatively more cash is held are associated with the most resilient central banks. This finding, if it holds for a larger set of countries and over a longer sample, supports the important role that the reputation of the monetary authority plays in cash-holding behaviour. There is no reason to suggest that this relationship would become less important in a world with retail CBDC. Finally, and unsurprisingly, countries that experience an excessive number of financial crises are also where currency holdings are relatively smaller, although the effect is not significant where cash holdings are small (i.e., in the left tail), suggesting that individuals in these economies have already adjusted their cash-holding behaviour in the face of financial instability.

Arguably, the finding that institutional capacity matters will play a role in the introduction and evolution of retail CBDC, but this result is somewhat silent about the potential for digital currencies to be used in cross-border transactions.²⁴ Therefore, Table 2 considers the data on remittances, an important source of cross-border transactions.²⁵ In particular, the table considers which private institutions intermediate transactions involving remittances. Next, since the promise of retail CBDC is that it has the potential to reduce transactions costs, as well as complete transfers in real time, the author presents some data about the evolution of the fees paid by individuals over

time. As usual, there are data limitations. That said, a reasonably clear picture begins to emerge.

First, other than in the Philippines, the number of transactions completed using firms that transfer funds essentially in real time rose between 2016 and 2021. The increase is most noticeable for India and Jamaica. Equally impressive, however, is the reduction in the proportion of banks as intermediaries in these kinds of transactions.

Next, average fees and the standard deviation across various intermediaries of all types, are shown for the 2016–2021 period for the same countries as before but with the global average added as a benchmark.²⁶ The data source subdivides fees according to transactions of two sizes, namely, \$200 and \$500 per remittance transferred. First, consider small transactions. In all the countries shown, as well as at the global level, fees have declined. However, much of the decline is a one-time drop in fees. This takes place mainly in 2017 in three of the four countries considered, with Jamaica lagging behind but showing a substantial drop in fees by 2020. In contrast, fees for the relatively larger remittances (i.e., \$500) have been more stable. Nevertheless, some actually increased slightly between 2016 and 2020, such as in the Philippines. Also notable is the relatively small standard deviation in remittance fees for the four countries shown, especially when compared to global values. Therefore, while one may wonder how much scope there is to reduce the fees for small and large transactions of the kind shown in Table 2, there seems to be much greater scope for doing so at the global level. This suggests that, globally, a retail CBDC can enhance market contestability in cross-border transfers, such as remittances.

However, there still are additional unanswered questions from the data shown in Table 2. The data is not informative about the extent to which individuals simply shifted from making small to larger remittances to reduce transactions costs. The same issue would, presumably, arise with retail CBDC unless there is some agreed upon protocol by central banks and governments that cooperate in a cross-border scheme of some kind. Next, the developments in the four countries, which explain not only transactions costs but the resort to fast

23 A plot of inflation rates in the 18 countries considered makes this quite clear.

24 Included, but outside the scope of this paper, are the important and still unresolved questions surrounding privacy and the use of private information for commercial or other reasons. See, for example, Siklos (2022a) and references therein.

25 For an analysis specific to Canada that uses the same data referred to below, see Dimbuene and Turcotte (2019). Note that the authors only examine funds sent from Canada to other countries and focus on the record in 2017.

26 According to the data source, data before 2016 may not be, strictly speaking, comparable.

Table 2: Select Summary Statistics on Remittances

Date	Global	China		India		Jamaica		Philippines	
		Banks (%)	Fast (%)	Banks (%)	Fast (%)	Banks (%)	Fast (%)	Banks (%)	Fast (%)
	ND	How remittances are made: institutions used							
2016 Q2		50	37.5	47.4	31.6	28.6	23.5	23.8	52.4
2021 Q3		21.4	42.9	37.9	48.3	17.6	52.9	16.7	40
Date	Global	China		India		Jamaica		Philippines	
Average fee in US dollars (standard deviation) in making remittances									
2016	7 (5)	9 (0)	7.33 (0.58)		9.44 (0.58)		6 (0)		
	5 (3)	5.67 (0.58)	5.67 (2.08)		6 (1)		4 (0)		
2017	7 (5)	6.75 (1.71)	6 (0)		9.75 (0.50)		4.75 (0.50)		
	5 (3)	3.75 (1.71)	4.50 (2.38)		6.75 (0.50)		2.50 (0.58)		
2018	6.96 (5.07)	6 (0)	5.45 (0.53)		9.70 (0.87)		3.25 (0.50)		
	4.50 (3.34)	3.25 (0.50)	3.38 (0.48)		6.73 (0.91)		2.50 (0.58)		
2019	6.83 (5.21)	6.93 (1.51)	5.50 (0.62)		9.63 (1.76)		5.38 (0.85)		
	4.47 (3.46)	5.38 (0.85)	4.53 (1.44)		7.23 (1.74)		2.82 (0.84)		
2020	6.66 (5.40)	6.58 (0.97)	4.84 (0.26)		6.89 (0.94)		4.60 (0.57)		
	4.39 (3.46)	4.60 (0.57)	2.63 (0.15)		4.63 (0.87)		2.73 (0.35)		
2021	6.31 (5.45)	6.77 (0.25)	5.06 (0.13)		6.93 (0.65)		4.43 (0.55)		
	4.20 (3.44)	4.70 (0.17)	3.10 (0.10)		5.23 (0.40)		2.67 (0.15)		

Source: As calculated by the author from data found at World Bank, Remittance Prices Worldwide, <http://remittanceprices.worldbank.org>.

Notes: Data for 2016 begins with 2016 Q2; for 2021, the data ends with 2021 Q3. Banks = number of banks as a percent of all funds transfer providers; fast = number of providers offering funds transfers in less than an hour as a percent of all providers; global = fee based on data for all countries in the data set. ND means data was unavailable.

versus bank-based remittances, do not explain the extent to which domestic regulations, or even cellphone or internet accessibility, may have driven down fees over time. Finally, and relatedly, there are geopolitical considerations to think about that likely also impact not only the choice of currency in cross-border transactions but also the choice of intermediary to carry them out.

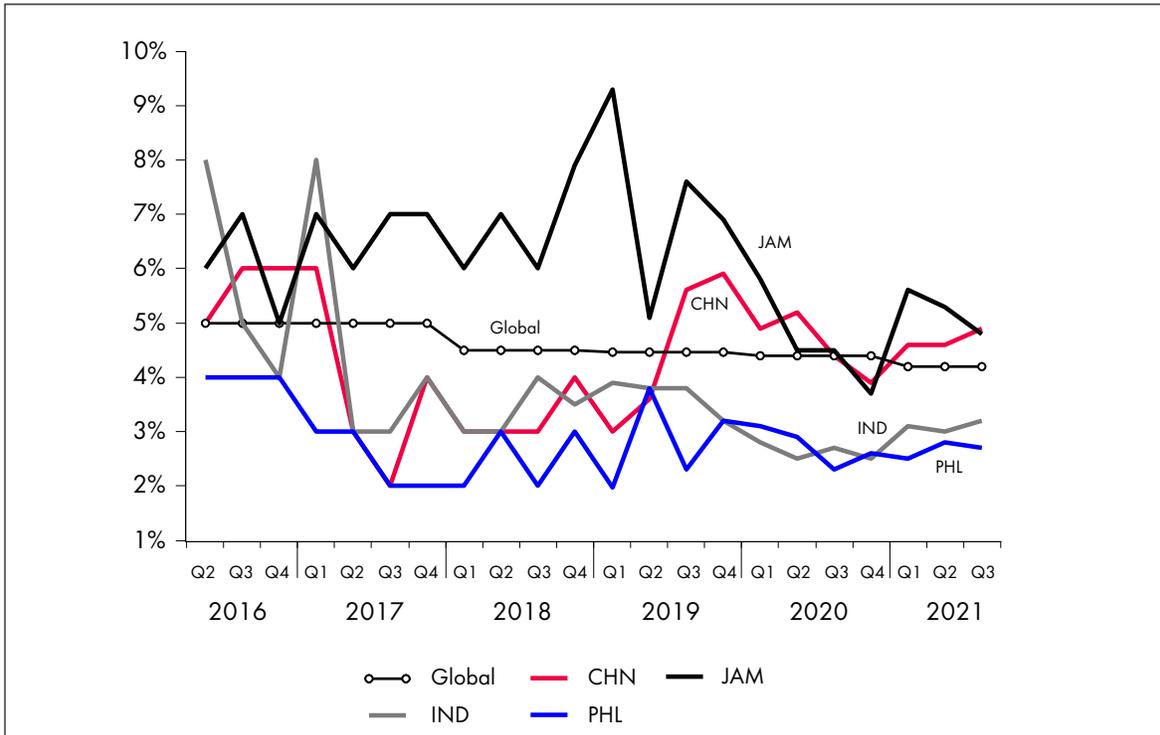
Figures 2 to 4 provide a few more insights into the potential for retail CBDC to become a game changer in facilitating cross-border payments. Figure 2 indicates that, as a percent of the size of the remittance, there is considerable cross-country

heterogeneity with relative stability at the global level.²⁷ Moreover, it is not the case that banks in the larger EMEs necessarily charge smaller fees; there is also considerable variation over time in remittance fees. Indeed, if the stability at the global level is thought to represent a minimum of sorts that cannot easily be breached, then we have some clear indications about an objective that retail CBDC can aim for if the promise of lower transactions costs is to be realized.

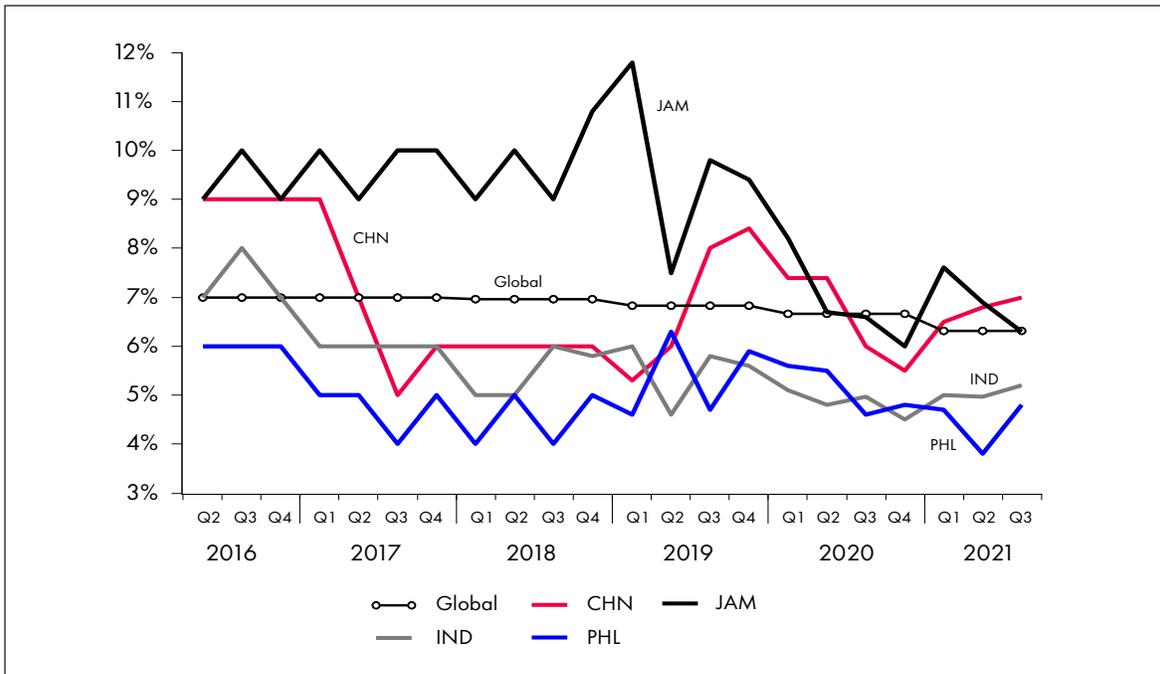
²⁷ As noted above, however, the variance of global fees is considerably larger than for the individual countries shown.

Figure 2: The Size of Remittance Fees

Remittance Fees as a Percent of \$500 Transfer



Remittance Fees as a Percent of \$200 Transfer

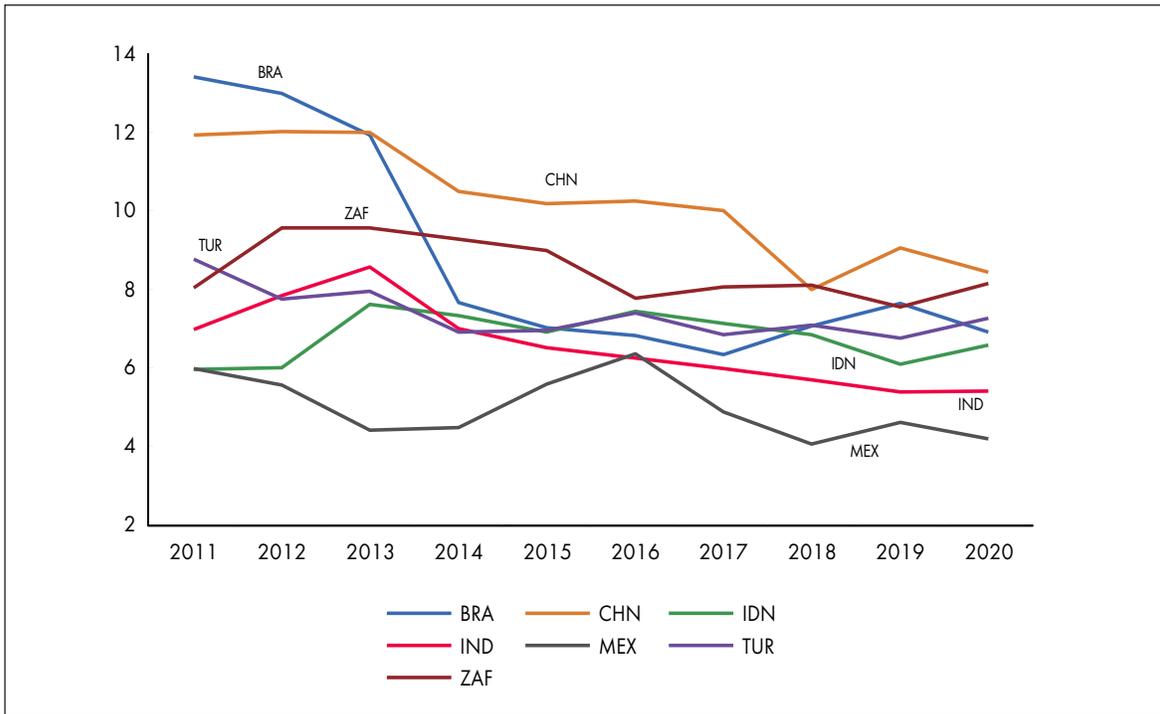


Source: <http://remittanceprices.worldbank.org>.

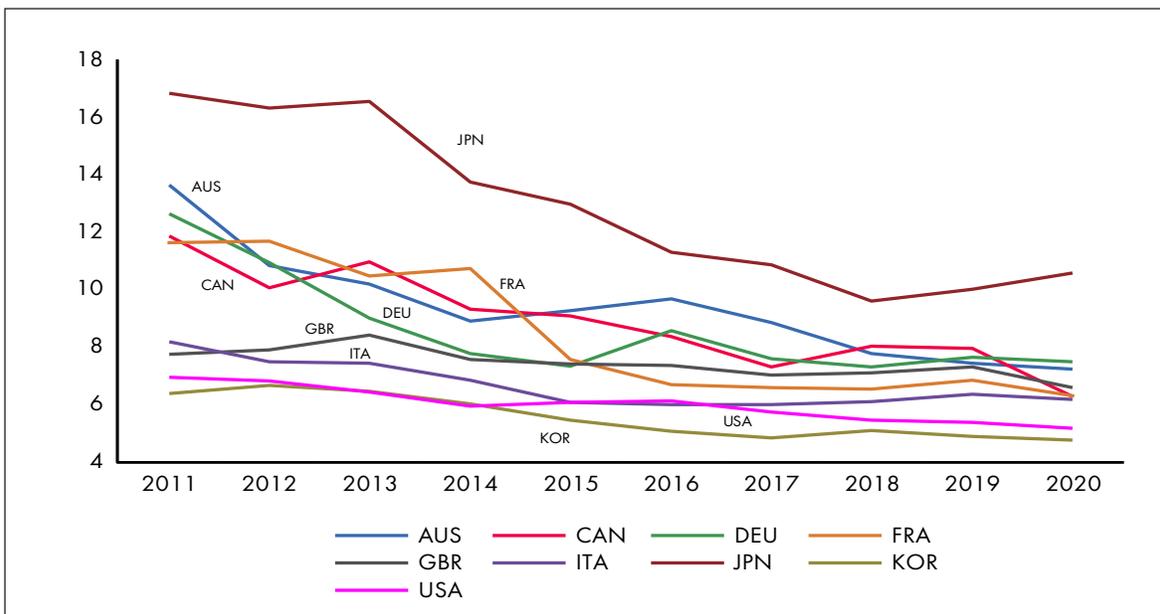
Notes: CHN = China; IND = India; JAM = Jamaica; PHL = Philippines.

Figure 3: Remittance Costs in Selected Recipient and Sender Countries

Remittance Costs to EMEs



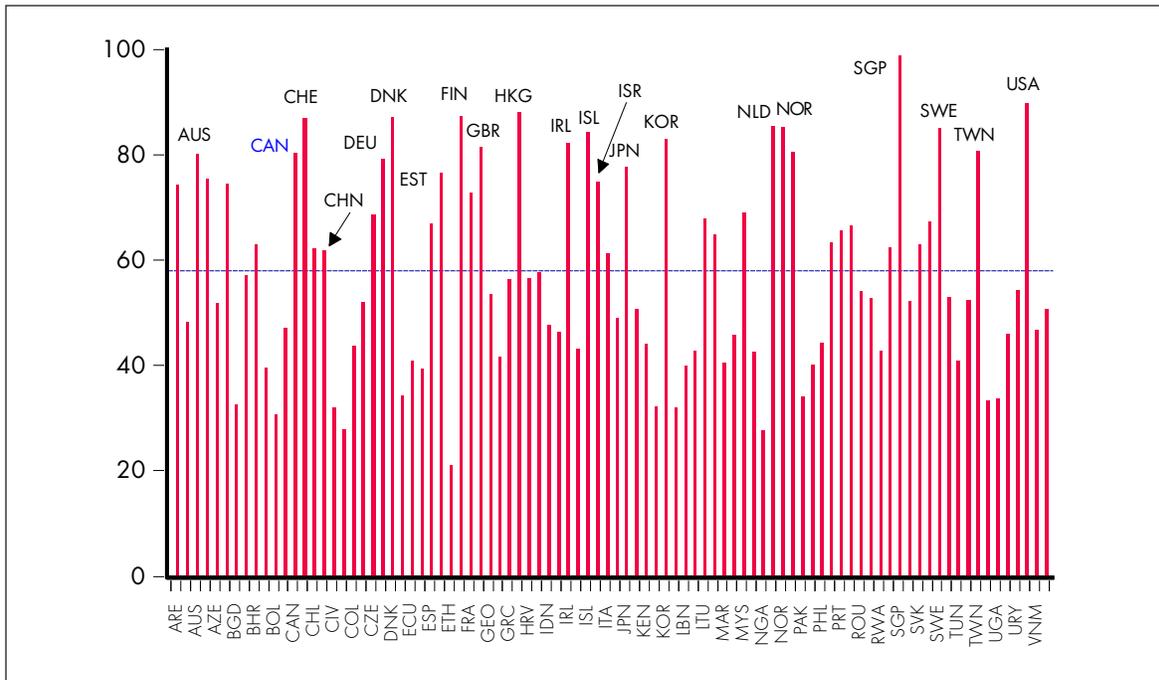
Remittance Costs from AEs



Source: <http://remittanceprices.worldbank.org>.

Notes: Costs are a percent of the size of the transaction. AUS = Australia; BRA = Brazil; CAN = Canada; CHN = China; DEU = Germany; FRA = France; GBR = Great Britain; IDN = Indonesia; IND = India; ITA = Italy; JPN = Japan; KOR = Korea; MEX = Mexico; TUR = Turkey; USA = United States; ZAF = South Africa.

Figure 4: Digital Evolution around the World in 2019



Sources: Data constructed from Chakravorti et al. (2020, figure 11). Also see The Fletcher School at Tufts University, Digital Intelligence Index, <https://digitalintelligence.fletcher.tufts.edu/trajectory>.

Notes: Horizontal dashed line represents the mean across all countries. ARE = United Arab Emirates; AUS = Australia; AZE = Azerbaijan; BGD = Bangladesh; BHR = Bahrain; BOL = Bolivia; CAN = Canada; CHE = Switzerland; CHL = Chile; CHN = China; CIV = Côte d'Ivoire; COL = Colombia; CZE = Czech Republic; DEU = Germany; DNK = Denmark; ECU = Ecuador; ESP = Spain; EST = Estonia; ETH = Ethiopia; FIN = Finland; FRA = France; GBR = Great Britain; GEO = Georgia; GRC = Greece; HKG = Hong Kong; HRV = Croatia; IDN = Indonesia; IRL = Ireland; ISL = Iceland; ISR = Israel; ITA = Italy; JPN = Japan; KEN = Kenya; KOR = Korea; LBN = Lebanon; LTU = Lithuania; MAR = Morocco; MYS = Malaysia; NGA = Nigeria; NLD = Netherlands; NOR = Norway; PAK = Pakistan; PHL = Philippines; PRT = Portugal; ROU = Romania; RWA = Rwanda; SGP = Singapore; SVK = Slovakia; SWE = Sweden; TUN = Tunisia; TWN = Taiwan; UGA = Uganda; URY = Uruguay; USA = United States; VNM = Vietnam.

Figure 3 examines large EMEs and AEs to assess the changes in remittance costs for sender countries, typically AE, and receiver, generally EME, countries over a longer period (2011–2020). Although there is a trend of sorts toward lower fees for both sender and receiver countries, and the spread in costs between the countries shown has declined, fees remain substantial. Finally, Figure 4 provides an indication of the digital evolution across many countries, based on a survey for the year 2019. Digital evolution consists of combining different characteristics related to the availability and development of digital technologies in

different countries.²⁸ Two features of the figure stand out. First, other than China, no EME is in the above-average group of countries. If central bank digital money facilitates improvements in cross-border transactions, this might be expected to generate some convergence between fees charged in AEs versus EMEs. Of course, this is critically dependent on international cooperation to prevent unnecessary impediments to the flow

28 See the notes to the figure. Essentially, the metric is an aggregation of factors that describe the environment, experience, attitudes and behaviour of digital technology users. Environment refers to accountability, privacy and security considerations; experience measures access, the state of digital infrastructure and interaction with digital technology; attitudes refer to the users' sentiment toward and confidence in digital technology; and behaviour seeks to capture the intensity with which users engage with the digital world.

of retail funds between countries.²⁹ This is an input into the quest for successfully introducing a retail CBDC, and the figure ought to make clear that both AEs and EMEs have an incentive to cooperate if this is the vehicle used to enhance cross-border payments. Second, as is true for the other elements essential for the widespread introduction of retail CBDC, the gap between the levels of digital evolution for the countries shown is quite wide. Regardless of what form a retail CBDC will take, this will hamper its rollout globally.

So far, the author has explored areas where there is the potential for retail CBDC to make its impact felt. Alongside these opportunities are threats. Just as in the case of the determinants of currency holdings, the threats emerge from the political economy realm. Table 3 provides a selection of indicators associated with globalization. If globalization can facilitate cross-border relations, or at least reflect the reduction in barriers to enhance cooperative behaviour, this will reduce the difficulties encountered that might prevent the global use of retail CBDCs.

Eight indicators of factors in the adoption of retail CBDC for the G20 are displayed in Table 3. While *de jure* indicators of central bank independence (CBI) have been criticized, they provide some indication of the extent to which the economies in question view the role of central banks that will be directly implicated in the rollout and management of retail CBDC. And since more central banks adopted inflation control strategies during the 1990s, combined with greater autonomy, the global rise in CBI reflects a common global development in the management of monetary policy. The range between highest and lowest on the 0–1 scale is fairly wide. Japan is lowest on the scale and the European Central Bank (i.e., France, Germany and Italy) is highest. Unless one believes that only the narrowest form of retail CBDC will ever be introduced, that is, as a pure complement to existing notes and coins, the digitalization of money does potentially raise, as pointed out above (also see Siklos 2022a), several issues that blur the distinction between monetary and fiscal policy. Once retail CBDCs are introduced, there will be a strong temptation to expand their role if conditions warrant (for

example, a crisis). A solution is for central banks to ensure that a directive, or memorandum of understanding, between the political and monetary authorities is negotiated to ensure rules of the game, including privacy and property rights, to give two examples, concerning the type and scope of retail CBDC are clearly laid out.

Trade openness is another factor that ought to influence the adoption of retail CBDC. As seen from Table 3, it is high, although it lags considerably in major economies (for example, Brazil, Japan, India and the United States), and this may reduce the urgency of policy makers to deal with global rules once retail CBDCs are deployed. Since an aim of digitalization is to facilitate cross-border flows at the retail level, thereby reducing transactions costs, it is not unreasonable to expect that it might spur some forms of foreign direct investment (FDI). Once again, the gap between the highest and lowest estimates is not trivial, and the substantial variation over the years, as proxied by the standard deviation of the estimates shown, is also considerable. Hence, it is not immediately apparent that FDI rates are informative about the scope for cooperative behaviour in the global spread of retail CBDC. FDI rates are, of course, also partially governed by regulations in place and the openness with which the recipient country welcomes foreign investment. It is, therefore, interesting that Japan scores lowest among the G20, since an apparent aim of a retail CBDC for that country is to improve cross-border payments. A complementary indicator is net portfolio investments. While there are substantial cross-country differences, only five out of 19 countries, including Japan, are net sellers of equities and securities while the remaining countries generate net outflows. This further suggests additional cross-country financial interdependence, which should facilitate the global spread of retail CBDC as well as provide an incentive for policy makers to develop global rules for cross-border transactions for CBDC at both retail and wholesale levels.

Next, the author considers the KOF's *de facto* measure of informational globalization, which combines a country's internet bandwidth capacity, the number of patents applied for and exports of high-level research and development products. This is presumed to provide some signal of a country's ability to handle the substantial technical demands of a retail CBDC, including the ability to participate in a global network to facilitate

29 Unfortunately, we are a long way from realizing the potential for reduced fees. For example, Beck, Janfils and Kpodar (2022) and the Committee on Payments and Market Infrastructures (2020), who discuss the challenges with cross-border wholesale CBDC transactions, point out that the challenges are multiplied in the case of retail CBDC.

Table 3: Factors in the Adoption of rCBDC, 1990–2019

Country	CBI (2000–2017)	FDI (2000– 2019) % GDP	Open % GDP	NPI Bill USD	Informational Globalization (1990–2019)	Age Dependency Ratio (1996– 2019)	Rule of Law (2002– 2019)	EPU (2000–2022)	Debt-to-GDP Ratio (2012–2020)
Argentina	0.67	2.00 (0.77)	28.2	-3.65	1.90 (2.71)	58.7 (2.7)	-0.61 (0.18)	ND	63.12 (22.93)
Australia	0.36	3.45 (1.96)	40	-1.59	0.58 (1.21)	49.8 (1.8)	1.78 (0.06)	105.86 (59.39)	39.66 (8.90)
Brazil	0.35	3.27 (0.91)	23.2	-1.31	1.93 (2.65)	49.1 (5.0)	1.78 (0.06)	105.56 (91.75)	76.83 (13.47)
Canada	0.54	3.25 (0.91)	66.6	-2.25	0.70 (2.65)	46.2 (1.8)	-0.20 (0.14)	179.82 (116.27)	91.33 (10.07)
China	0.67	3.25 (2.21)	42.4	-1.30	5.17 (6.11)	40.7 (4.3)	-0.44 (0.12)	195.14 (167.48)	47.79 (10.48)
France	0.91	2.12 (1.05)	53.1	-1.92	1.32 (2.49)	55.8 (2.9)	1.43 (0.06)	189.65 (102.08)	97.93 (6.92)
Germany	0.91	2.54 (2.61)	67.1	3.85	0.93 (7.94)	50.5 (2.5)	1.66 (0.07)	155.53 (89.95)	70.24 (7.52)
India	0.45	1.62 (0.72)	35.3	-8.93	2.99 (5.75)	58.1 (5.9)	0.02 (0.08)	91.50 (46.88)	78.62 (7.05)
Indonesia	0.84	1.27 (1.51)	54.1	-6.29	2.99 (5.74)	52.2 (3.3)	-0.58 (0.19)	ND	28.27 (4.11)
Italy	0.91	1.22 (0.84)	49	6.76	1.81 (4.35)	51.9 (5.9)	0.46 (0.13)	112.71 (41.36)	135.92 (7.95)
Japan	0.32	0.28 (0.24)	25.2	3.58	1.75 (3.58)	54.5 (7.9)	1.38 (0.13)	107.31 (32.78)	233.74 (8.15)
Korea	0.62	0.96 (0.39)	70.8	-5.52	1.58 (2.39)	37.8 (1.2)	1.01 (0.11)	141.39 (68.43)	40.50 (3.47)
Mexico	0.57	2.80 (0.63)	54.9	-1.18	2.18 (3.29)	58.4 (5.9)	-0.50 (0.11)	83.46 (61.28)	52.10 (5.56)
Russia	0.48	2.21 (1.18)	54	3.58	1.68 (5.01)	43.3 (3.5)	-0.83 (0.08)	162.61 (125.87)	14.42 (2.26)
Saudi Arabia	0.50	2.22 (2.80)	73.1	5.44	3.38 (6.13)	54.9 (13.0)	0.10 (0.08)	ND	13.01 (10.78)
South Africa	0.46	1.42 (1.22)	53.6	-5.27	2.36 (3.50)	56.5 (5.6)	0.10 (0.09)	ND	48.10 (9.60)
Turkey	0.83	1.59 (0.85)	47	-5.11	2.23 (8.23)	53.9 (3.7)	-0.01 (0.16)	ND	30.90 (3.87)
United Kingdom	0.35	4.36 (3.53)	54.1	-8.18	1.39 (4.76)	54.5 (1.7)	1.71 (0.08)	210.73 (154.27)	87.83 (6.43)
United States	0.63	1.79 (0.65)	25.1	-2.66	0.50 (1.51)	51.0 (1.2)	1.58 (0.06)	137.18 (66.12)	108.80 (9.57)

Sources: Central bank independence is from Romelli (2022); FDI to % GDP, age dependency ratio, rule of law and debt-to-GDP ratio are from the World Bank Development Indicators (<https://databank.worldbank.org/source/world-development-indicators>); informational globalization is from KOF (<https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html>); EPU is from www.policyuncertainty.com/. All data is annual.

Notes: Standard deviation over the period covered in parentheses. FDI = foreign direct investment; NPI = net portfolio investments; EPU = economic policy uncertainty; ND = no data; USD = US dollar.

cross-border transactions. Both the gap, and the variability over time, between the most and least informationally globalized country is large (the range is 0.50–5.17). Over the 1996–2019 period, China was far ahead of any other G20 economy.

The potential role of an aging population has already been noted, but differences in mean values shown for the 1996–2019 period are also substantial. Canada is in the middle of the group at 46.2 years. To the extent that these differences translate into differences in priorities over the speed and nature of the progress of the digitalization of currencies, the age dependency ratio may provide clues about which groups of countries are likely to be part of the first wave of those introducing a retail CBDC. If there is a first-mover advantage, this can impact the international usage and access of some digital currencies.

Property rights were seen earlier to have an impact on the desirability of holding cash. A related indicator is the World Bank’s rule of law index, with negative values indicating a deterioration in this proxy, while positive values signal improvements in this metric. On this score, 12 of the G20 countries display positive values even though there are noticeable gaps in the score. That said, since a critical element of any retail CBDC is the legal environment in which it exists, the record over the 2002–2019 period not only suggests that common legal ground can be found, but also which countries are likely to be able to create the required coalition to facilitate cross-border digital money transactions. Unfortunately, Canada is the only AE where the rule of law has deteriorated over the period considered.

Finally, a country’s views about the net benefits of a retail CBDC from a global perspective may well be influenced by how much economic policy uncertainty (EPU) is present. Sadly, three out of the five countries where EPU is highest, including Canada (fourth), are AEs. EPU may limit the speed with which a retail CBDC is introduced, persuade policy makers to narrow its access for cross-border transactions and limit the ability of policy makers across the G20 to agree on common standards.³⁰

30 While Table 3 provides average scores over the 2000–2022 period, Siklos (2022a) also reports that the trends in EPU have been largely positive over the past decade. This adds to the challenges of deploying retail CBDCs as a means of facilitating cross-border transactions.

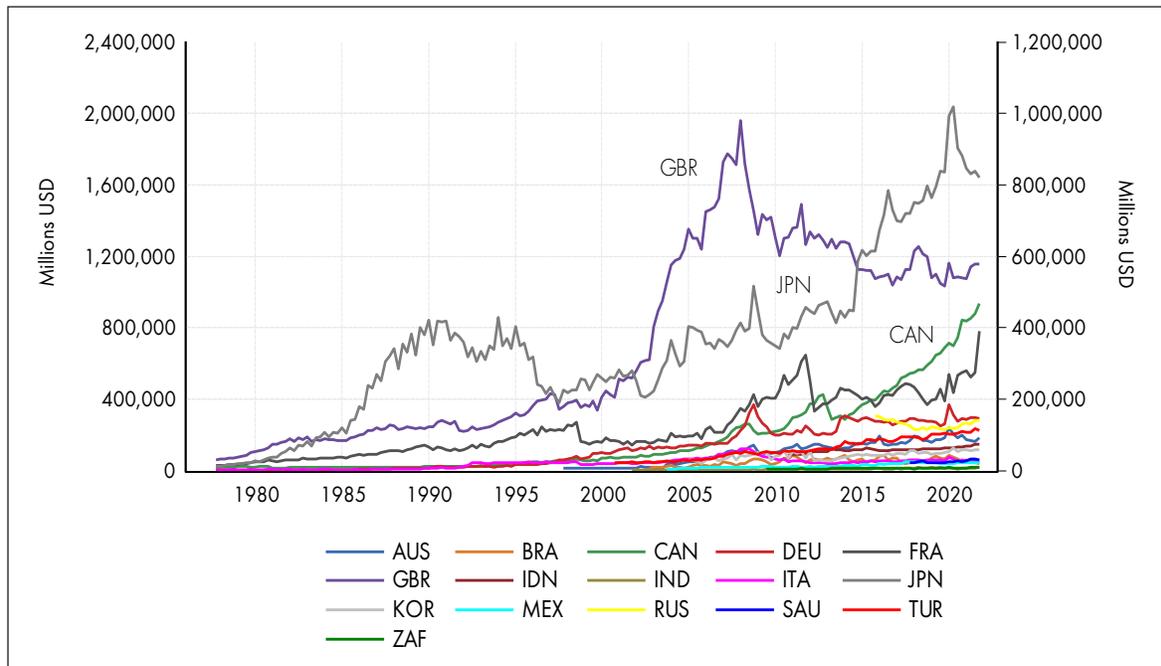
Currency Substitutability: A Threat to the Loonie?

Alberto Giovannini and Bart Turtelboom (1992) provide the last notable survey about currency substitution (also see Calvo and Végh Gramont 1992; Cohen 1998). Only a handful of empirical studies have been published in recent years using data from currencies in small developing or emerging countries. Critically, the relevant empirical studies often omit an explicit role for institutional considerations, even if this is clearly essential in evaluating the desirability of holding any currency. We have already seen that institutional considerations loom large, not only in explaining currency holdings but also in the prospects for retail CBDCs to have a meaningful global impact. Indeed, the last time a substantive public debate was held about the role and value of the Canadian dollar was during the 1990s when even its existence was put into question (also see footnote 9 above).

While it is outside the scope of the present study to explore the potential for substitution away from the Canadian dollar in the presence of some, as yet non-existent, retail CBDC and the absence of global rules and regulations governing access and usage beyond borders, it is possible to comment on the potential for dollar digitalization to enhance its place among the most globally important currencies. Keeping in mind that the distinction between wholesale and retail is not always clear from the available data, Figure 5 shows, for a selection of G20 economies, the relative importance of foreign currency liabilities, as a percent of GDP, at banks. These are, by far, denominated in US dollars.³¹ By the mid-2000s, Canada was a close third behind Britain and Japan. The share of foreign currency liabilities has risen substantially; over time, the same trend is much less apparent in the other countries shown, except France. While the close trading relationship between the United States and Canada is an obvious reason for the size and the changes over time in foreign currency liabilities, it cannot be the entire story. The rise, no doubt, also reflects the relative importance of the US dollar in price setting, for example, for commodities. However, what is equally notable is

31 More details are available from BIS, Consolidated banking statistics, www.bis.org/statistics/consstats.htm?m=2070.

Figure 5: Banks' Foreign Currency Liabilities in US Dollars



Source: BIS, Consolidated banking statistics, www.bis.org/statistics/consstats.htm?m=2070; author's calculations.

Notes: AUS = Australia; BRA = Brazil; CAN = Canada; DEU = Germany; FRA = France; GBR = Great Britain; IDN = Indonesia; IND = India; ITA = Italy; JPN = Japan; KOR = Korea; MEX = Mexico; RUS = Russia; SAU = Saudi Arabia; TUR = Turkey.

that, except possibly for the British pound, there is a negative relationship between changes in the shares for Canada, Japan and the euro area, and changes in the nominal exchange rate.³² Therefore, it is not unreasonable to expect that, if retail CBDCs are introduced by large AEs in the near future, and the regulatory roadblocks previously discussed preventing ease of use for cross-border transactions can be avoided, how foreign exchange markets view the Canadian dollar will be critical in the long-term success of a digital loonie. Assuming these markets are influenced by the quality of macroeconomic management, there is no reason to expect the Canadian dollar's role in digital money to be threatened. Of course, as others will point out, the success of any digital loonie will need to be backed up by the ability of the authorities to provide holders with confidence and, therefore, trust in the digital technology being employed. Here the evidence is less clear. One survey

(Chakravorti et al. 2020) ranks Canada well below the international average of 42 countries surveyed.³³

Conclusions and Policy Implications

Interest in digital currencies parallels growing interest in digitalization more generally. Central banks have long stressed, at the retail level, that a retail CBDC is intended to complement and not replace existing notes and coins in circulation. Of course, this has not prevented observers from predicting the end of paper money and coins, although this seems highly unlikely in the short to medium term. Simple examination of the large

32 The correlations (with significance or p-values given in parentheses) are: GBR 0.12 (0.10), JPN -0.65 (0.00), CAN -0.14 (0.06) and EUR -0.57 (0.00). The estimate for GBR is barely statistically significant at conventional significance levels.

33 A bar chart with the results of the survey is available in the Appendix. The collection of data is available from The Fletcher School at Tufts University, Digital Intelligence Index, <https://digitalintelligence.fletcher.tufts.edu/trajectory>.

and substantial gaps in technical capacity, not to mention a host of legal questions around the status of digital money, let alone their use in cross-border transactions, should convince observers that we are far away from a digital-only monetary system.

Nevertheless, it is worth taking a step back to ask what explains the size of currency holdings in a variety of AEs and EMEs. In so doing, the present study brings attention to the role of institutional factors. These factors can explain, in large part, the demand for cash in the G20 economies. This implies, given the technical and legal issues outstanding in the deployment of retail CBDCs, institutional factors especially will be critical to the success of any digital currency, whether it is intended for domestic or international use.

A frequently stated promise of digital currencies is that these will not only facilitate the growth of cross-border transactions but also reduce transactions costs. Based on an analysis of remittances, the evidence on this score is mixed, and considerable uncertainty remains since the rules of the game about the contestability of retail CBDCs in the market for cross-border transactions is unclear. At the core, the issues are political in nature, and there is a risk that central banks will be called upon to play a role they are not suited to play.

The final ingredient in assessing the promise for digitalization in cross-border payments that the G20 has emphasized is the scope for international cooperation on the legal, technical and operational issues. The prospects are mixed, and ongoing geopolitical risks will increase the challenges. Nevertheless, relying on a set of well-known principles, outlined decades ago, it may be preferable for certain groups of countries, not necessarily economically large in the global sense, to take the lead and not wait for other groups, such as the G20, to provide direction. The recently announced Digital Economic Partnership Agreement offers a model. Moreover, it should be emphasized that the rules, regulation and broader characteristics of digitalization are a political responsibility. Hence, digital currencies should be included as a part of the global drive toward digitalization and not seen as a separate tool to speed up or achieve a particular level of digitalization. Indeed, as argued by Siddharth Tiwari et al. (2022), good practice in data governance ought to be achieved first.

Indeed, the prospect of retail CBDCs having a role beyond complementing existing notes and coins — as a tool of monetary policy — is a policy discussion that needs to take place immediately. Because there exists the potential for digital currencies to have implications for the conduct of monetary policy and financial stability (Chen and Siklos 2022), there are also governance implications for central banks (Siklos 2022b). Declarations by central banks that planned retail CBDCs are not intended to have monetary policy implications are not enough. The time to revisit some aspects of central bank governance is now.

For decades, some observers feared the economic implications of the dominant role of the US dollar as the world's premier reserve currency. Indeed, the existence of smaller currencies, including the Canadian dollar, felt threatened and the introduction of the euro, the common European currency, appeared initially to exacerbate the survival of the loonie. The global financial crisis of 2007–2008, followed by the European sovereign debt crisis, has largely banished that threat, but the potential for easy cross-border transactions in safe currencies has once again raised the same questions that were posed decades ago. The US dollar continues to be likely to retain its supremacy as a global reserve currency. Serkan Arslanalp, Barry J. Eichengreen and Chima Simpson-Bell (2022) point out that it is “non-traditional” reserve currencies, including the Canadian dollar, that have benefited. Emphasis on retaining the country's ability to implement best practices in economic policy can only help cement the loonie's ability to meet any threats that loom from progress toward greater digitalization. The Canadian dollar will likely always be threatened by more domestic policy decisions than by the forces of digitalization. Digitalization itself is not the problem, but the potential fallout from global digitalization, if not properly considered, is a bigger threat.

Finally, it needs to be stressed that the prospect and challenges outlined above, when thinking about the deployment of retail CBDCs worldwide, are ones that apply to all countries, not just Canada. Nevertheless, there are additional threats that await emerging and developing economies as they seek to improve domestic economic conditions, since they are considered to be relatively more fragile. It would not be surprising if these economies felt an even greater need for clear rules of the game if digital currencies of various denominations become

widely available and easily held by individuals on a global scale. Whether the largest and most systemically important economies see any benefits remains to be seen, but the risks that accompany the rise of digitalization are broadly the same for all. Hopefully, this is enough of an incentive for an attempt at serious international cooperation.

Author's Note

Some results referred to in the main body of the paper are relegated to a separate appendix. Comments from two anonymous reviewers helped improve the paper.

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