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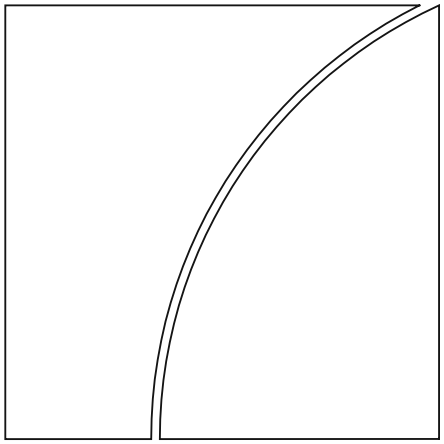

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by Raphael Auer, Codruta Boar, Giulio Cornelli, Jon Frost, Henry Holden and Andreas Wehrli

Monetary and Economic Department

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CBDCs beyond borders: results from a survey of central banks

Raphael Auer, Codruta Boar, Giulio Cornelli, Jon Frost, Henry Holden and Andreas Wehrli[1]

Abstract

Central bank digital currencies (CBDCs) could ease current frictions in cross-border payments – and particularly so if central banks factor an international dimension into CBDC design from the outset. Based on a survey of 50 central banks in the first quarter of 2021, this paper explores initial thinking on the cross-border use of CBDCs. While most central banks have yet to take a firm decision on issuing a CBDC, the survey responses show a tentative inclination towards allowing use of a future CBDC by tourists and other non-residents domestically. They have a cautious approach to allowing use of a CBDC beyond their own jurisdiction. Concerns about the economic and monetary implications of cross-border CBDC use and about private sector global stablecoins are taken seriously. At the wholesale level, 28% of surveyed central banks are considering options to make CBDCs interoperable by forming multi-CBDC arrangements. This involves arrangements that enhance compatibility, interlink or even integrate multiple CBDCs into a single payments system. Finally, almost 14% of respondents are considering an active role for the central bank in FX conversion.

Keywords: central bank digital currency, CBDC, multi-CBDC arrangements, mCBDC, mCBDC Bridge, cross-border payments, payment systems, central banking, digital currency, stablecoins, remittances.

JEL classification: E42, E51, E58, F31, G21, G28, L50, O32.

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Introduction

Central banks around the world are exploring the design and implications of central bank digital currencies (CBDCs). Research on CBDCs is addressing a wide range of economic and policy issues – including their potential to enhance cross-border payments (Boar and Wehrli (2021); Carstens (2021a,b)). While the focus of most CBDC research and development projects has been domestic to date (Auer and Boehme (2020); Auer, Cornelli and Frost (2020)), attention to cross-border aspects has increased. Cross-border use is explicitly considered or targeted by several projects, such as the mCBDC Bridge (BIS (2021a)), Project Dunbar (BIS (2021b)), Project Jura (BIS, Banque de France and SNB (2021)), Project Stella (ECB and Bank of Japan (2019)), Project Aber (SAMA and UAECB (2020)) and others (eg Bank of Canada, Bank of England and MAS (2018); Bank of Canada and MAS (2019)).

In October 2020, the G20 endorsed a roadmap to address current frictions affecting cross-border payments (CPMI (2020); FSB (2020)). While many of the efforts aim at enhancing the current payment ecosystem, the roadmap also features initiatives to harness the potential of emerging payment infrastructures and arrangements. CBDCs could incorporate improvements to international payment arrangements from the outset, by factoring an international dimension into CBDC design. As part of the actions envisaged by the roadmap, an initial stocktake of provisional CBDC designs and experimentation was requested. This aims to inform further work by the Committee for Payments and Markets Infrastructure (CPMI) and the BIS Innovation Hub, in consultation with the IMF and World Bank. The stocktake should consider the extent to which CBDCs could be used for cross-border payments, followed by an analysis of the macro-financial implications of cross-border CBDC use. Further actions will focus on the practical and technological aspects of implementing cross-border CBDCs.

This paper contributes to this work with a survey of central banks' initial thinking on cross-border use of CBDCs. The survey includes responses by 50 central banks to questions on the potential role of a CBDC in cross-border payments, the use of retail CBDC payments within other currency areas, interoperability features and cross-border risks. This data set allows us to identify common trends and differences among central banks from around the world, with their wide range of policy approaches towards CBDCs.

We present several key findings. First, we show that a number of central banks are open to allowing tourists and other non-residents to use CBDCs within their own jurisdiction (in addition to residents). Fewer central banks are open to allowing usage of their CBDC by non-residents abroad, given the risks this may entail for the issuing and recipient economies. Second, we show that central banks take concerns about currency substitution by a foreign CBDC very seriously; they consider risks from facilitation of tax avoidance and loss of oversight by domestic authorities due to the use of foreign CBDCs to be especially relevant. They are actively considering the tools that are available to limit the risks that the domestic currency might be displaced by a global stablecoin or foreign CBDC.[2] Some central banks may reconsider their approach to exchange restrictions if use of a foreign CBDC, stablecoin or

[2] See Libra Association (2019, 2020) for a global stablecoin proposal and Adrian (2019), Carney (2019), Brunnermeier, James and Landau (2019) and Arner, Auer and Frost (2020) for evaluations.

cryptocurrency were to become widespread.[3] Third, we show that central banks are considering a variety of multi-CBDC ("mCBDC") arrangements, with some even contemplating multiple CBDCs run on a single system. Some central banks are exploring novel operational roles in foreign exchange (FX) conversion. Overall, the responses show an active consideration of cross-border issues and a strong interest in international peer learning.

Survey design and implementation

The survey was carried out in the first quarter of 2021. Fifty central banks replied, with 18 respondents in advanced economies (AEs) and 32 in emerging market and developing economies (EMDEs).[4] About two thirds are conducting CBDC experiments or pilots, and over half see cross-border payments efficiency as a key motivation for a CBDC. The survey investigated how central banks around the globe are taking into account the potential for CBDCs to interoperate across borders. The questions relate to both the front-end/retail use of CBDC and the back-end/wholesale level. Also included were questions on concerns regarding the implications of cross-border use of CBDC. The survey questions are set out in the Annex.

It should be noted that these answers reflect preliminary thinking and should not be interpreted as an indication that central banks have decided to issue a CBDC. To date, only two CBDCs have gone live (the Sand Dollar in The Bahamas and DCash in the Eastern Caribbean).[5] Most central banks have not taken firm design and policy decisions related to the potential issuance of a CBDC in their jurisdiction.

In principle, cross-border payments with CBDCs may occur in two different ways.

In a first scenario, the retail CBDC of a given jurisdiction could be available to non-residents visiting the relevant jurisdiction, or to non-residents abroad. In this case, the role of CBDCs in cross-border payments resembles that of cash. In contrast to cash however, various restrictions on cross-border use could be imposed via the technological and regulatory design of the CBDC. In theory, commercial entities or individuals could hold CBDCs from various jurisdictions and use them to pay in different currencies, potentially via multi-currency "wallets". This type of international use of CBDCs is further described as the front-end and retail use of CBDCs.

A second, very distinct scenario consists in mCBDC arrangements – design frameworks, including technological, market structure and legal features that facilitate the use of CBDCs by users in other currency areas (Auer, Haene, and Holden (2021)) by interlinking CBDCs from two or more jurisdictions. This is typically done at the wholesale level, and is described in the section on back-end/wholesale role of CBDCs.

[3] For a discussion of regulatory issues, see G7 Working Group on Stablecoins (2019), FSB (2012b), IOSCO (2020) and Adachi, Cominetta, Kaufmann and van der Kraaij (2020). Frost, Shin and Wierts (2020) discuss the historical context, while BIS (2018) and ECB (2020) examine the technological underpinnings of cryptocurrencies and stablecoins.

[4] The questionnaire was sent to 61 central banks. Of these, 11 central banks either did not respond or indicated that they were not able to provide answers at this time.

[5] See Central Bank of The Bahamas (2020) and Eastern Caribbean Central Bank (2021).

These two scenarios are not mutually exclusive and their interplay can influence the economic and monetary implications of CBDC use.

Opportunities for front-end/retail use of CBDC

At the retail level, the potential of CBDCs to enhance cross-border payments is closely linked to its domestic configuration in terms of access, ie who can use a given CBDC and where it can be used.[6]

Today, the only central bank money widely available to the public is cash. Token-based and non-digital, it is openly accessible by design. It is convenient for foreign visitors – to which the ranks of ATMs and exchange services in airport arrival halls stand testament. Conversely, in some parts of the world, foreign banknotes are an integral part of the payment system. Recent research suggests that 60% of US bills are held outside the United States – a proportion that has been growing since the 1980s (Judson (2017)). A CBDC could function as a means of payment for tourists to a currency zone or even entire countries outside it.[7]

A CBDC, being digital, could be designed so that it faces no constraints on where and by whom it is used. If a CBDC design allows for anonymous digital tokens, it would by default be accessible to foreign residents. Also, there would be no sure way of restricting its use abroad. In practice, relatively few central banks are considering purely token-based systems (Auer, Cornelli and Frost (2020)). In that case, a CBDC would by design be distinct from today's account-based payment system, where most cross-border transactions are inseparably linked to a foreign exchange transaction.[8]

If the national access framework is account-based, ie linked to some form of identification of users, use by non-residents becomes a policy choice and the international circulation could be limited by design. For example, the domestic agency can decide to grant access to CBDC-based wallets to residents only. Alternatively, it can set conditions under which non-residents can access it. If the technology also allows the use of CBDC to be tied to a specific location, one option is to allow the use of CBDC by non-residents as long as they are physically located within the issuing jurisdiction. This approach is being considered by the People's Bank of China (PBC) for its electronic Chinese yuan (e-CNY) project (see Auer, Cornelli and Frost (2020)).

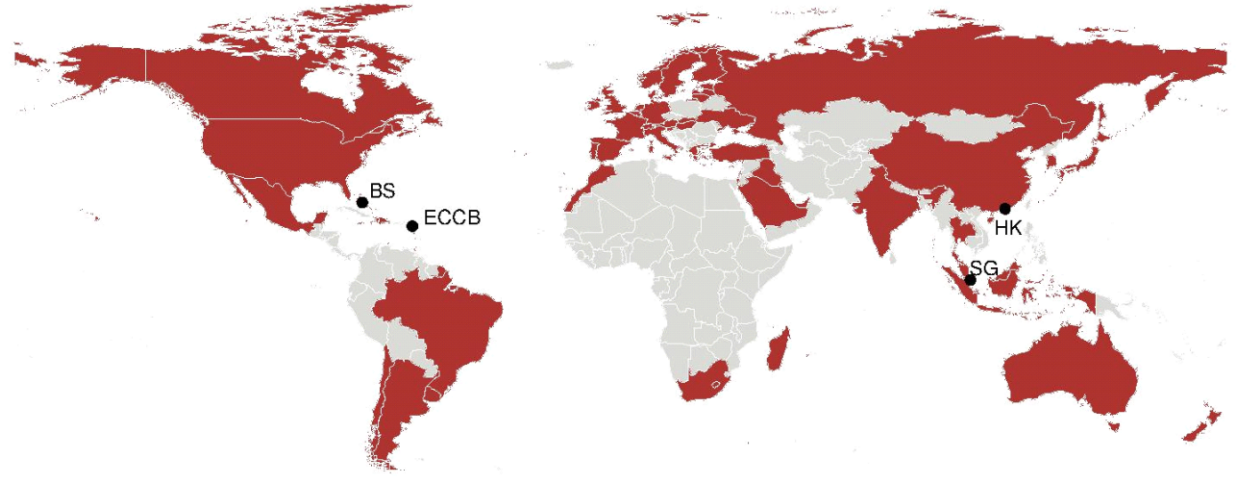
[6] See Auer and Böhme (2020a) and Kahn and Roberds (2009). Throughout this paper, token-based (also sometimes called value-based) refers to a system based on assessing the validity of the item exchanged or a private key ("I know, therefore I own"), while account-based refers to a system based on identification of an individual ("I am, therefore I own").

[7] If consumers were given the option of buying foreign currency in advance, before spending it abroad or making payments across borders, just as they can with cash, this would separate the payment from the foreign exchange transaction. In turn, this would open up the possibility of interfacing retail wallets directly with competitive foreign exchange market).

[8] Exceptions are transactions between countries in a currency union, or transactions with economies that are heavily dollarised/euroised, ie where a foreign currency makes up a substantial share of bank deposits, credit contracts and daily transactions.

Respondents to the survey

Graph 1



BS = The Bahamas; ECCB = Eastern Caribbean central bank; HK = Hong Kong SAR; SG = Singapore.

The use of this map does not constitute, and should not be construed as constituting, an expression of a position by the BIS regarding the legal status of, or sovereignty of any territory or its authorities, to the delimitation of international frontiers and boundaries and/or to the name and designation of any territory, city or area.

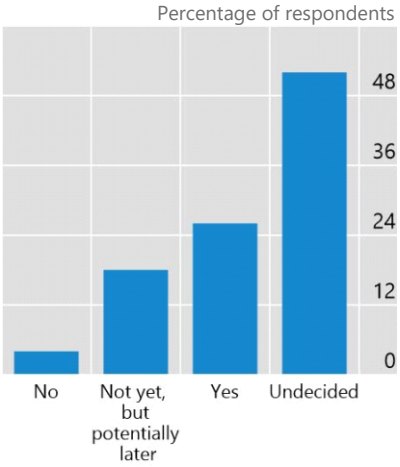
Source: Authors' elaboration.

The first two questions central banks were asked thus covered these aspects: (i) would a retail CBDC be open to use by foreign visitors and; (ii) would its use be allowed outside the jurisdiction's borders? The survey results suggest that most central banks have not yet taken a firm position on either issue, as evidenced by the high share of "undecided" responses. Where central banks have indicated their initial thinking, there is a positive inclination for use by non-residents domestically, and somewhat more reluctance to allow use abroad. Specifically, more than 25% of central banks are considering whether to allow CBDC use by non-residents, and nearly 20% say that they are not yet considering this, but may do so in the future (Graph 2, left-hand panel). Only two central banks categorically ruled out allowing such usage. On the other hand, only 8% of respondents are initially considering the use of a domestically issued CBDC in other jurisdictions; about a third may do so in the future (centre panel).

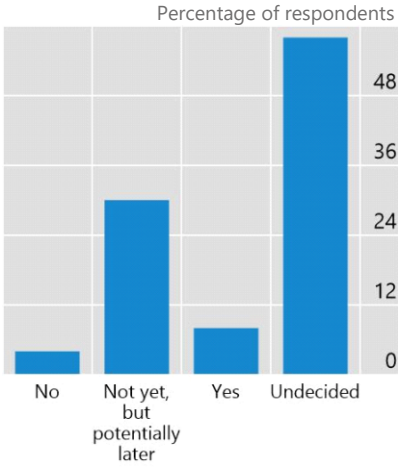
Notably, there is a strong correlation between the options of (potentially) allowing CBDC use by non-residents and (potentially) allowing use beyond domestic borders (Graph 2, right-hand panel). Those central banks considering use by tourists and visitors in their own jurisdiction are more likely to see at least a possible role for foreign use of a domestic CBDC in the future.

Most central banks have not yet decided on use by non-residents or abroad Graph 2

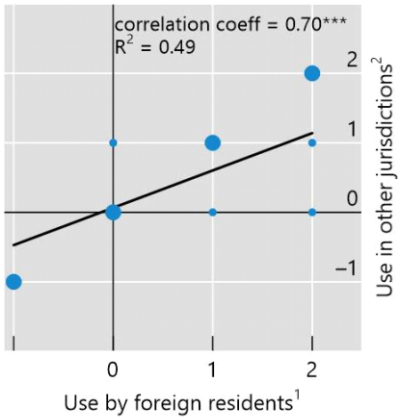
Use by foreign residents?[1]



Use in other jurisdictions?[2]



Allowing use by non-residents and beyond domestic borders[3]



[1] The survey question read "Do you envisage the design of a CBDC allowing foreign residents to use the CBDC inside your jurisdiction (eg tourists)?". [2] The survey question read "Should your jurisdiction decide to issue a retail CBDC, do you envisage allowing use of the CBDC beyond the borders of your jurisdiction in some form?". [3] 2=Yes; 1=Not yet, but potentially later; 0=Undecided; −1=No. Larger dots indicate more than one respondent.

Source: Authors' calculations.

Concerns related to the international use of CBDC

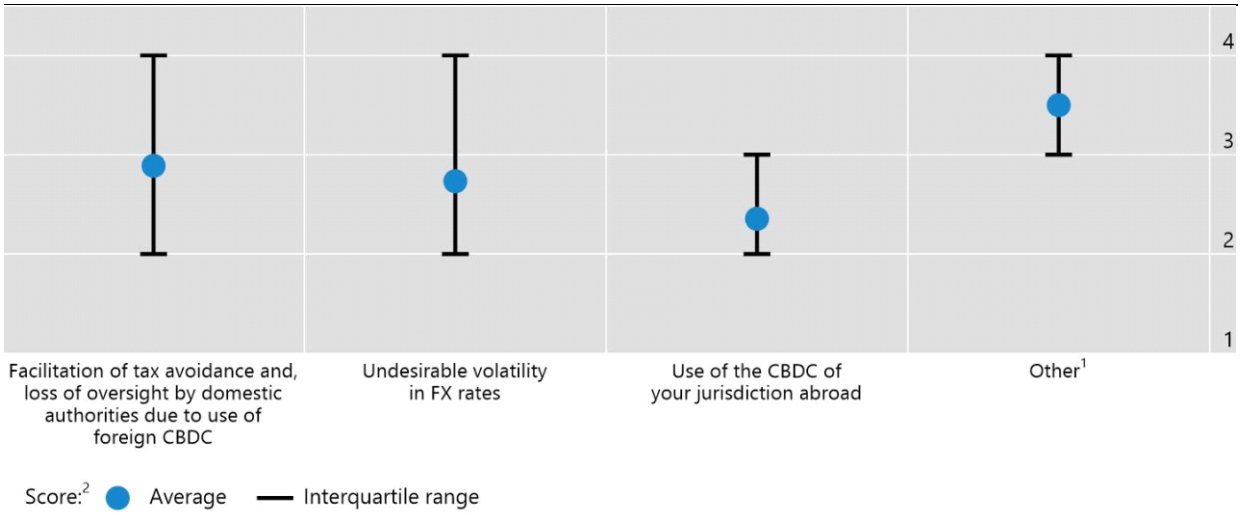
International use of CBDCs could have important monetary policy, macroeconomic and other public policy implications, for both the issuing country and the one in which the foreign CBDC is used. In particular, CBDCs could increase international spillovers of shocks – although certain design features might serve to dampen them (Ferrari, Mehl and Stracca (2020)). A primary concern, particularly in EMDEs, is "digital dollarisation", or the risk that use of a foreign currency CBDC may become widespread in a recipient economy, displacing the domestic currency in payments and financial transactions. For currency substitution, CBDCs can be both a poison and a medicine (IMF (2020)). Specifically, households facing domestic economic instability or high inflation in their home currencies may look to a global stablecoin or foreign CBDC as a convenient means of payment and a safe store of value. Yet this trend may have destabilising effects on the economy as a whole, and might be difficult to reverse (Berg and Borensztein (2000)).[9] This could be a particularly pressing issue for token-based CBDCs.

[9] With cash, the need for physical transport across borders allows for policies to curb the inflow of foreign currency. Further, the wear and tear of banknotes means that foreign cash can be used only a limited number of times in payments before it needs to be replaced. In contrast, from a technological perspective, electronic money knows no borders, nor does it show wear and tear. The widespread use of US-based digital payment apps in Venezuela exemplifies the threat of dollarisation in digital payment systems. Thus, policy designs may need to play a role in countering digital dollarisation.

Another concern is that CBDCs could facilitate tax avoidance or a loss of domestic oversight capabilities. This could occur if domestic authorities had only a limited overview of holdings or transactions by residents in a foreign CBDC. A further potential concern is undesired volatility in exchange rates, for instance if flows between domestic currency and a foreign CBDC were to be disorderly. Finally, there could be complications in macroeconomic management, and in foreign economic cooperation, from the perspective of the issuing central bank.

How important are the following risks?

Relative score, 1–4 Graph 3



[1] Includes AML/CFT, cyber-risk, ease of settlement, emergence of a foreign CBDC as a dominant vehicle in the domestic market, imbalance of capital outflows, monetary control and financial stability, significant non-domestic use due to lack of control, redundancy of payment systems, remittances, security and USD parity. [2] 4=Very important; 3=Important; 2=Somewhat important; 1=Not so important.

Source: Authors' calculations.

An additional set of questions thus covers the perceived importance of specific risks from cross-border use of CBDCs. Central banks ranked the relative importance of cross-border risks to their domestic CBDC motivations on a four-point scale from "not so important" to "very important".

Answers show that facilitation of tax avoidance and loss of oversight emerge as key concerns (Graph 3). Central banks also rated undesirable volatility in exchange rates as an important worry. Outside the predefined choices, central banks indicated other important risks such as ease of settlement, AML/CFT, cyber risk and emergence of a foreign CBDC or a global stablecoin as a dominant vehicle in the domestic market. Several of these concerns are closely related to digital dollarisation.[10]

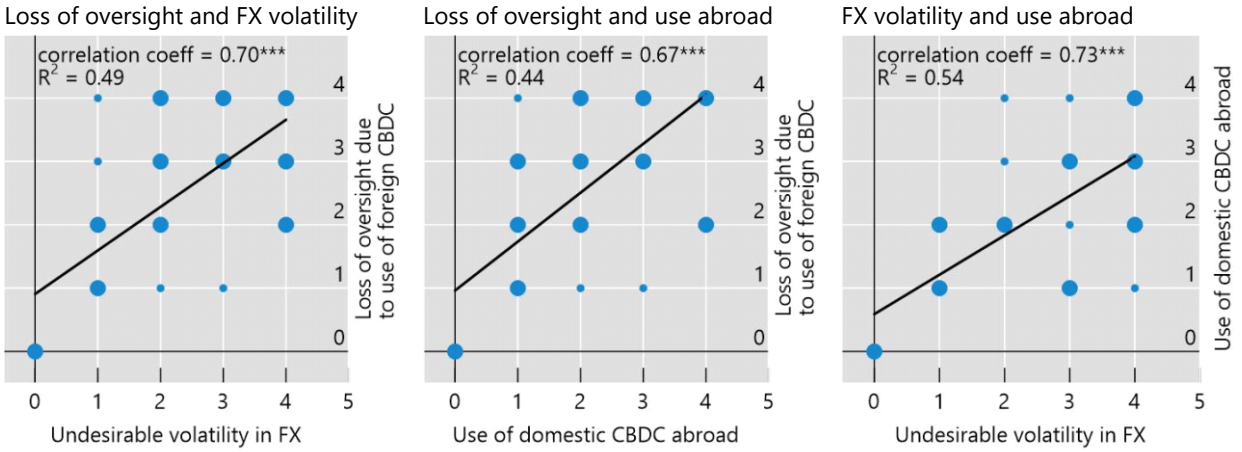
Interestingly, these concerns by central banks appear to be correlated (Graph 4). The greater the concern about tax avoidance and loss of oversight, the greater the concern about undesired FX volatility (left-hand panel). Similarly, concerns about loss of oversight, and of FX volatility, are each associated with greater concern about the

[10] Again, see IMF (2020) for a review of macroeconomic implications and Ferrari, Mehl and Stracca (2020) for an examination of international spillovers.

use of the domestic CBDC abroad (centre and right-hand panels). Thus, central banks concerned about each of these aspects are also concerned about the other aspects.

Concerns about cross-border risks are correlated with one another

Graph 4



4=Very important; 3=Important; 2=Somewhat important; 1=Not so important; 0 = Undecided. *** indicates statistical significance at the 1% level. Larger dots indicate more than one respondent.

Source: Authors' calculations.

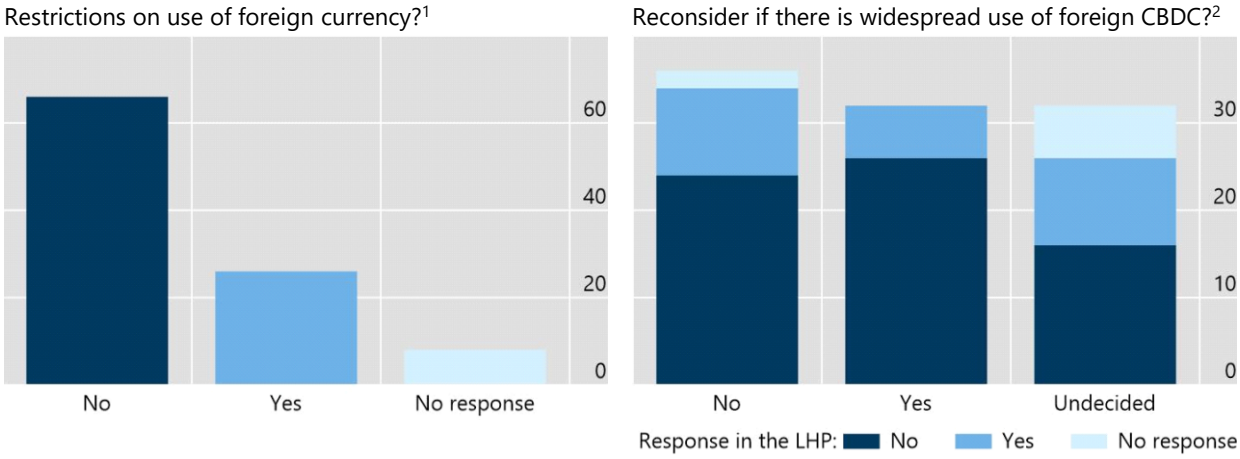
One avenue to counter currency substitution is additional monitoring and controls – but these must be carefully weighed against other design objectives such as convenience and flexibility. At a technical level, CBDCs can be designed to curtail their use beyond the home jurisdiction (Carstens (2020a,b).[11]

Survey responses show that most jurisdictions currently have no restrictions on the use of foreign currency for transactions in their domestic jurisdiction. Only 26% of respondents noted having such restrictions, with a further 8% opting not to answer (Graph 5, left-hand panel). Notably, almost a third of responding central banks may reconsider their FX restrictions if there were widespread use of a foreign CBDC in their jurisdiction; most of these respondents do not currently have controls (Graph 5, right-hand panel). A further third did not give a yes or no response on whether they would reconsider.

[11] Any framework that addresses currency substitution will also inevitably be influenced by other domestic choices on the operational role of the central bank, the infrastructure used and how access is controlled (ie all dimensions of the "CBDC pyramid" in Auer and Boehme (2020)).

Most jurisdictions do not have FX restrictions, but may reconsider

Percentage of respondents Graph 5



[1] The survey question read "Does your jurisdiction restrict the use of foreign currency inside your jurisdiction?". [2] The survey question read "Would widespread use of a foreign CBDC, stablecoin or cryptocurrency lead to a reconsideration? Relatedly, is this potential route for "digital dollarisation" a bigger concern in the future than it is today?"

Source: Authors' compilation.

CBDC design can protect monetary sovereignty by making legitimate cross-border and cross-currency payments easier, thereby obviating the need to hold other currencies and helping a central bank to monitor transactions. For account-based CBDCs, tied to identity, central banks would retain greater control and oversight of cross-border use. Seamless integration of CBDCs could help make currency substitution less pervasive, in both AEs and EMDEs, by facilitating convenient cross-border and cross-currency payments. Smoothly functioning mCBDC arrangements (see next section) could allow cheap and fast conversion to reduce the need to hold foreign currency (Diez de los Rios and Zhu (2020)). Even if foreign CBDCs were used to hold funds to avoid economic instability or high inflation in a jurisdiction, a local CBDC with seamless conversion could allow the local economy to maintain its own unit of account for domestic goods and services. This brings us to the second dimension of using CBDC for cross-border at the back-end/wholesale level.

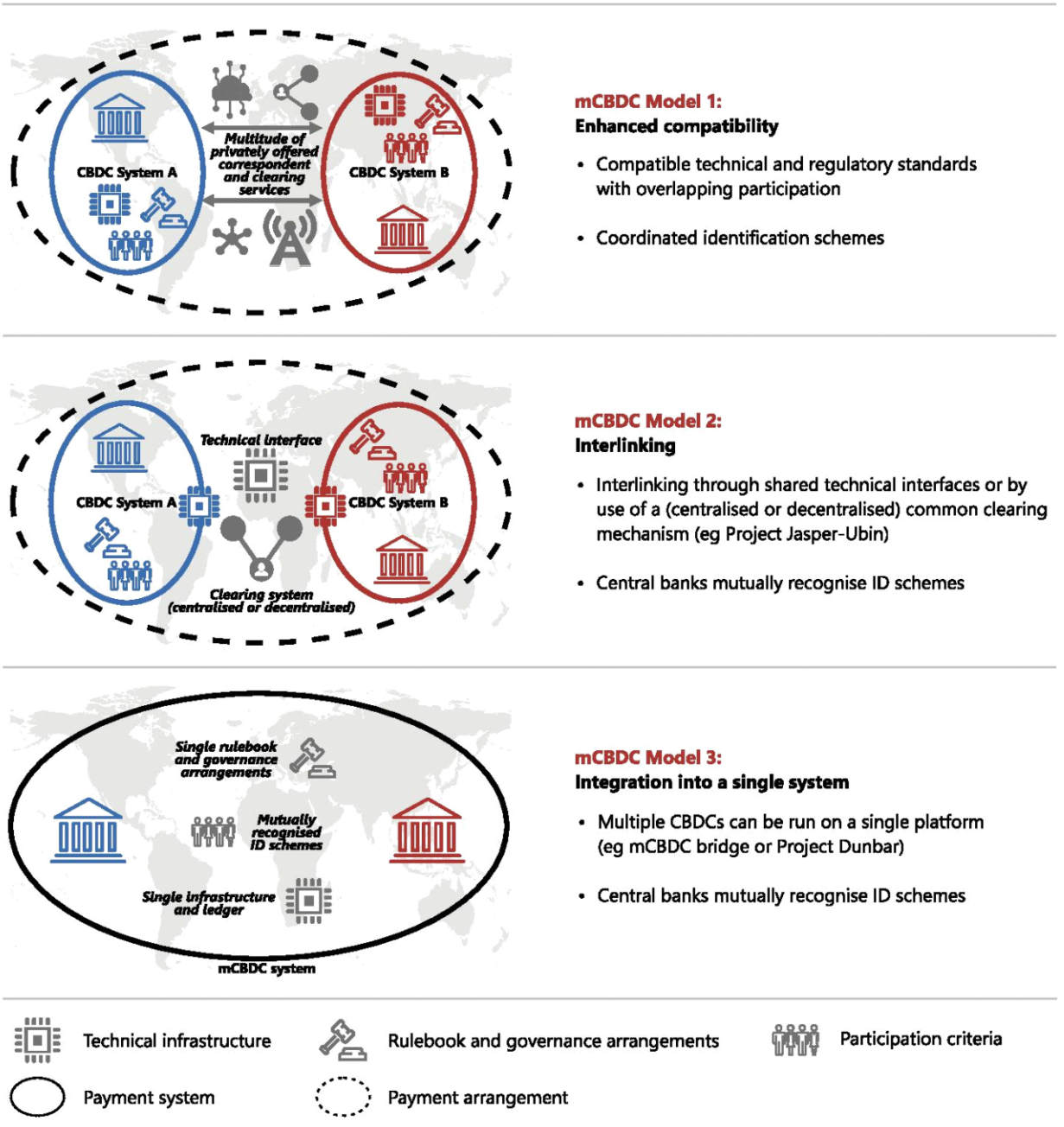
Harnessing the potential of mCBDC arrangements

A promising means of integrating cross-border aspects in CBDC design are mCBDC arrangements, which establish interoperability between national CBDCs (CPMI (2020), Carstens (2021a,b); Auer, Haene and Holden (2021)). The approach for mCBDC arrangements builds on current efforts to interoperate traditional wholesale payment systems,[12] but adapted to the technology underlying CBDC. There are broadly three models: (i) enhanced compatibility; (ii) interlinking CBDC systems; and (iii) integration

[12] The different models are CBDC variants of the "multi-currency cross-border" payment systems and arrangements as defined in the taxonomy of Bech, Faruqui and Shirakami (2020). In the G20 cross-border payments roadmap (CPMI (2020), FSB (2020)), these aspects are addressed in building blocks 13 and 17.

into a single system (see Graph 6). These show successively greater integration and thus greater need for policy coordination, particularly on identification schemes.

Interoperability can be enabled via "multi-CBDC arrangements" Graph 6



Model 1 enhances compatibility for CBDCs via similar regulatory frameworks, market practices, messaging formats and data requirements. Model 2 involves interlinked CBDC systems. This could build on enhanced compatibility but offer additional safety, via PvP settlement. Further, common clearing mechanisms – potentially operated by central banks acting as super-correspondents in cross-currency settings – could enhance efficiency, especially when they are linked with FX trading. Model 3 involves a jointly operated mCBDC payment system hosting multiple CBDCs. All FX settlements would be PvP by default, rather than requiring routeing or settlement instructions through a specific entity acting as an interface. Trading venues could also be integrated into an mCBDC system, to reduce complexity, fragmentation and concentration.

Source: Auer, Haene, and Holden (2021).

Notably, mCBDC arrangements could help to mitigate cross-border and cross-currency risks and frictions. As argued by Carstens (2021a,b), such arrangements could be preferable to alternative proposals for new global currencies, such as private sector global stablecoins (ie Libra Association (2019, 2020)).[13] Rather than creating a new unit of account that competes with domestic currencies, mCBDC arrangements focus squarely on designing national CBDCs with access frameworks and interlinkage options to facilitate efficient cross-currency payments. This could support the broader global efforts to improve cross-border payments (CPMI (2020); FSB (2020); Carstens (2020a)), of which such arrangements would form one part.

Some central banks are already collaborating with one another on projects and studies on the use of CBDCs to facilitate cross-border payments.[14] These projects and studies are focused on developing a cross-border corridor network prototype.

One example for mCBDC model 3 is the mCBDC Bridge project, which addresses the potential of distributed ledger technology (DLT) to enhance financial infrastructure for cross-border payments.[15] The initiative builds on the experience of the Inthanon-LionRock project of the Bank of Thailand and the Hong Kong Monetary Authority (HKMA) with the aim of developing a proof-of-concept prototype to support real-time cross-border foreign exchange payments using DLT. The mCBDC Bridge is a multicurrency CBDC platform on which participating central banks from several jurisdictions can analyse business use cases such as international trade settlement and capital market transactions. Graph 7 gives a schematic overview of the participants in the system.

Meanwhile, Project Dunbar[16] explores different governance and connectivity models that would be required for central banks to issue wholesale CBDC on a shared multi-CBDC platform.[17] The initiative builds on work by the Monetary Authority of Singapore (MAS) and the financial industry on Project Ubin. It aims to develop platform prototypes that enable the purchase, exchange, transfer and redemption of these different CBDCs in a shared test environment. The project will explore new use cases made possible through smart contracts and multi-CBDC use, such as mechanisms and algorithms that enable more efficient matching and settlement of foreign exchange transactions.

Project Jura, conducted by the Banque de France, the Swiss National Bank and the BIS Innovation Hub, together with a private sector consortium, is exploring cross-border settlement with two wholesale CBDCs and a digital security on a DLT platform. It will involve the exchange of a French digital security and euro wholesale CBDC through a delivery versus payment (DvP) settlement mechanism and the exchange of

[13] Such attempts to create a novel global unit of account cannot do away with risks underlying the currency conversion in cross-border payments: they just shift the risk elsewhere – specifically, to the recipient of the new currency unit. This shift could further encourage currency substitution if domestic use of the new currency were to become widespread.

[14] See ECB and Bank of Japan (2019)), SAMA and UAECB (2020), Bank of Canada, Bank of England and MAS (2018), Bank of Canada and MAS (2019) and Bank of Thailand and HKMA (2020).

[15] The mCBDC Bridge is an initiative run by the BIS Innovation Hub in collaboration with the HKMA, Bank of Thailand, People's Bank of China and Central Bank of the United Arab Emirates. For further, up-to-date information, see www.bis.org/about/bisih/topics/cbdc/mcbdc_bridge.htm.

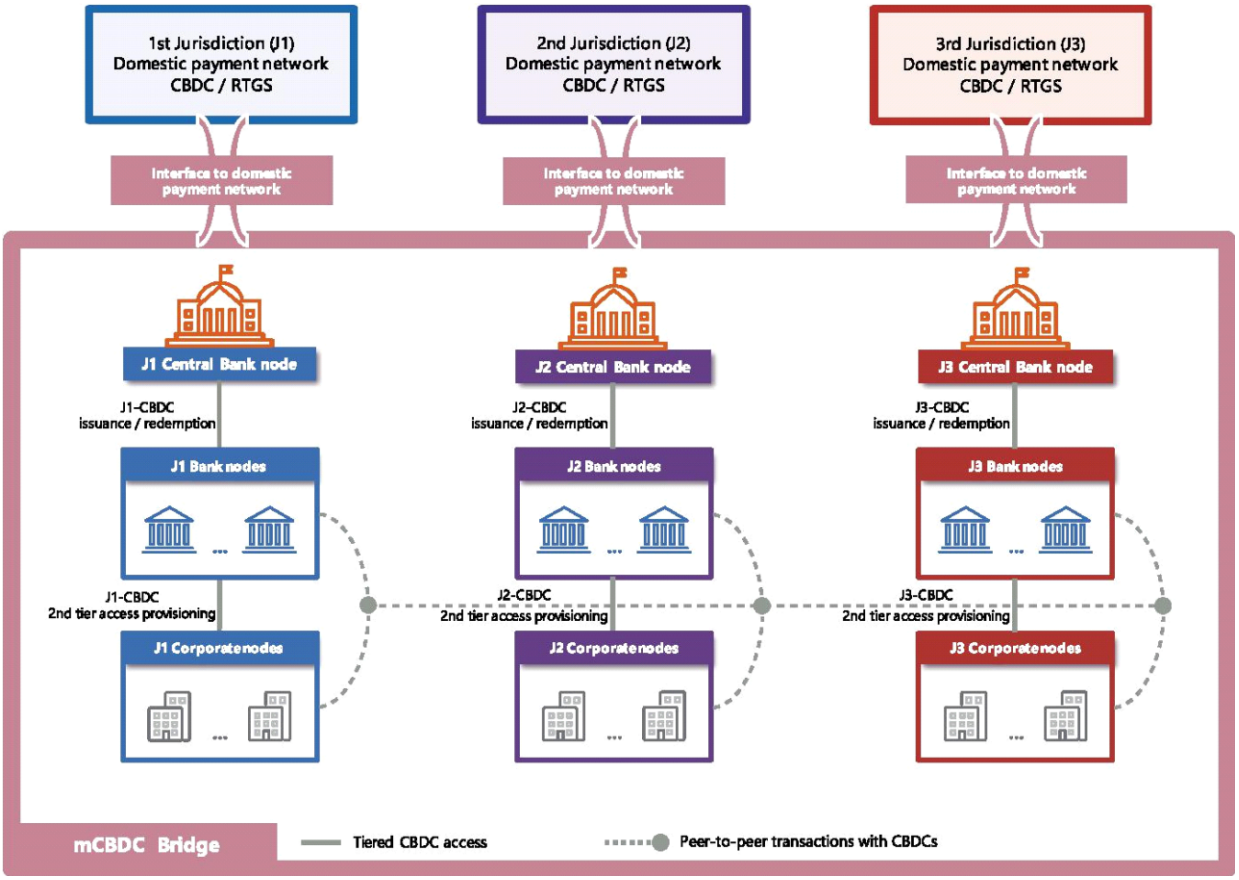
[16] For further, up-to-date information, see www.bis.org/about/bisih/topics/cbdc/wcbdc.htm.

[17] Project Dunbar is an initiative run by the BIS Innovation Hub and MAS.

euro wholesale CBDC against Swiss franc wholesale CBDC through a payment versus payment (PvP) settlement mechanism.

Multiple CBDC (mCBDC) Bridge

Graph 7



The mCBDC Bridge is designed as a corridor network providing connectivity to financial market participants across jurisdictions, including central banks, commercial banks and non-financial corporations. It interfaces to domestic payment networks such as domestic CBDC networks or real-time gross settlement (RTGS) systems. The central bank of each jurisdiction has the sole authority on the issuance and redemption of its currency CBDC in the Bridge. Commercial banks can purchase CBDC tokens from their central bank and use the token on the Bridge. A corporate participant can access a CBDC through its commercial bank by purchasing CBDC token and have the token transferred to its CBDC wallet. Peer-to-peer transactions between participants across jurisdictions can be achieved with CBDCs.

Source: BIS.

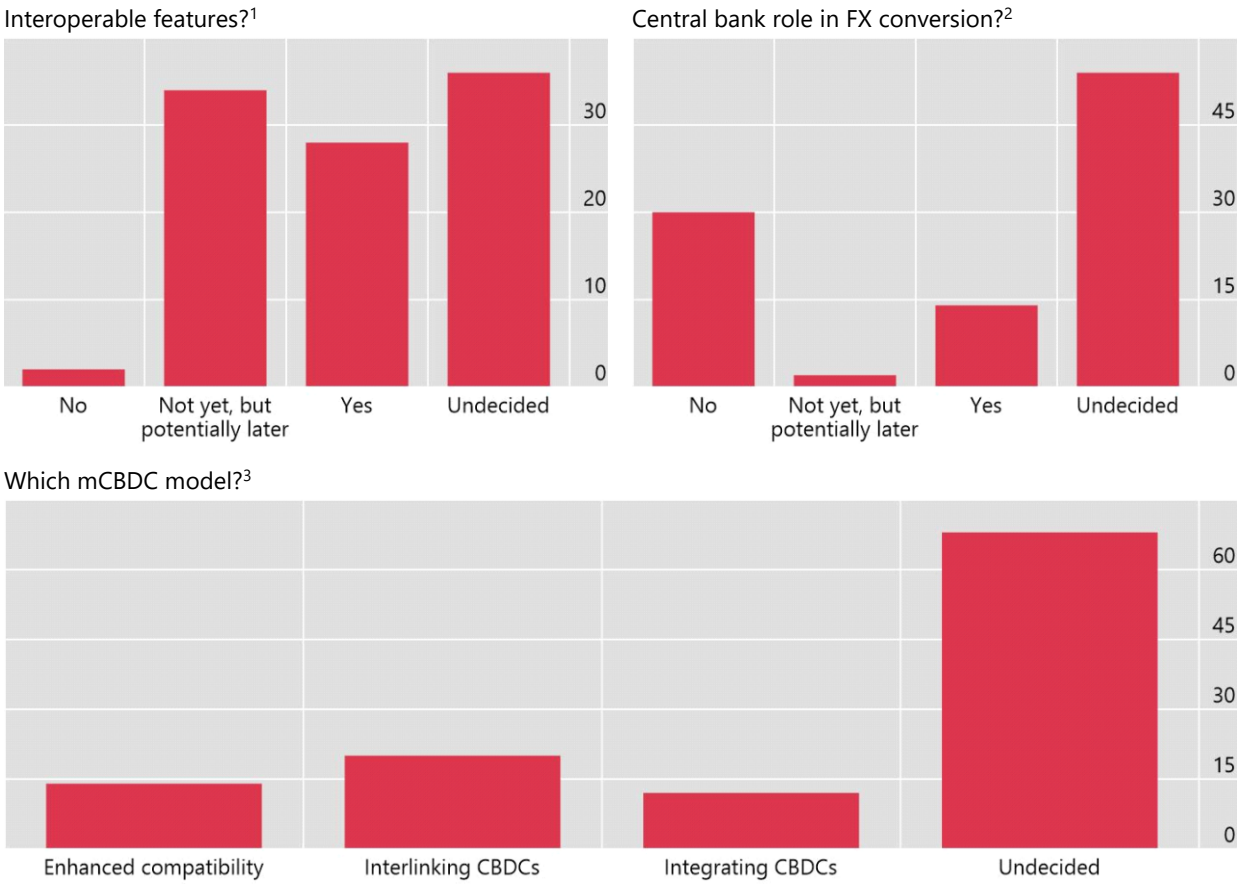
While most of the ongoing experiments are based on DLT, it is unclear whether the same technology would be used for full-scale implementations. The analysis of Auer, Monnet and Shin (2021) suggests that deploying a scaled-up system based on this technology rather than a centralised ledger may have economic potential only wherever it is difficult for the involved jurisdictions to agree on a common governance arrangement.

Beyond these examples, the survey responses reveal that more than a quarter of central banks are considering the incorporation of interoperable features to reduce frictions in cross-border and cross-currency settlement in designing their CBDC (Graph 8, top left-hand panel). Of the central banks that are considering this option, over half are undecided on the model. The remaining central banks are examining all possible mCBDC models (bottom panel). The answers suggest that the most preferred

choice is the mCBDC arrangement of interlinking the domestic CBDC system with a foreign system.

A range of approaches to interoperability, mCBDCs and FX conversion

Percentage of respondents — Graph 8



[1] The survey question read "are you considering incorporating interoperable features to reduce frictions in cross-border and cross-currency settlement?". [2] The survey question read "would the central bank take on a novel role in the FX conversion process?". [3] The survey question read "Which features are you considering?". A : mCBDC arrangement 1: Enhancing compatibility with international standards; B : mCBDC arrangement 2: Interlinking your CBDC system with a foreign system; C : mCBDC arrangement 3: Integrating your CBDC into a single mCBDC system. More than one answer possible. For further details see Auer, Haene and Holden (2021).

Source: Authors' compilation.

Some central banks are also considering taking on operational roles, most notably in FX conversion (Graph 8, top right-hand panel).[18] The degree of involvement could potentially be very heterogeneous, ranging from direct liquidity provision to monitoring and facilitation of FX conversions. Examples mentioned by respondents included the central bank regulating the FX market, or assuming a supervisory role in the CBDC FX conversion process. Respondents also noted that the central bank could provide local currency CBDC liquidity or facilitate and monitor the smooth operation of FX conversion.

[18] See CPMI (2018) and Bech and Holden (2019) for a discussion of how settlement in different currencies adds to risks and costs in today's systems.

Conclusion

CBDCs offer an opportunity to rethink some key features of cross-border payments. Central banks could ease current frictions by factoring an international dimension into their CBDC designs from the outset.

For front-end retail uses, CBDCs could allow for use by non-residents in a jurisdiction, or abroad, if central banks permit this option and the transacting parties agree on using the CBDC as means of payment. Some CBDC designs could allow for transfers that are as frictionless as digital messages. Account-based CBDCs that link balances to identification could bring efficiency while mitigating any key risks that digital cash may otherwise entail (Carstens (2021a)).

An alternative option is for various mCBDC arrangements, which are generally focused on wholesale uses. At least three models exist in principle to facilitate cross-border payments in this way, involving successively greater integration and policy coordination.

Our survey finds that central banks are actively considering these cross-border issues around CBDCs. While a slight majority of central banks have not yet come to any firm conclusion on whether non-residents would have access to a (future) domestic CBDC, slightly more than a quarter of respondents say that they would allow such access, and almost 20% would consider this at a later stage. Fewer central banks would allow for use abroad by non-residents. Central banks are aware of the risks entailed by such cross-border usage of their own CBDC, or usage in their jurisdiction of foreign CBDCs. Tax avoidance, loss of oversight and a range of concerns associated with "digital dollarisation" were mentioned prominently in the survey responses. While most central banks do not currently report restrictions on the use of foreign currencies for transactions in their jurisdiction, about a third may reconsider such restrictions if a foreign CBDC (or stablecoin or cryptocurrency) were to become widely used. Nonetheless, where a central bank is considering only retail or only wholesale CBDC, they frequently responded that aspects covering the other area are undecided.

On the wholesale front, the survey results show that central banks are considering a variety of mCBDC arrangements. Some central banks are even contemplating multiple CBDCs run on a single system. Meanwhile, some central banks are considering novel operational roles for the central bank in FX conversion. Overall, the responses show active consideration of cross-border issues and a strong interest in international peer learning.

This brief overview has laid out a number of open issues for both policy and economic research. In particular, the discussion of both retail and wholesale use underscores the importance of early policy coordination on CBDC design, so as to promote coherence and to reduce future policy spillovers. From a research perspective, there is a clear need to better understand how CBDCs compare with other potential policy interventions, such as retail fast payment systems, and what the longer-term implications of issuance for the international monetary system may be. Beyond currency substitution, the broader macroeconomic implications of CBDCs also need to be understood, not least for monetary policy transmission and cross-border capital flows. Further research on CBDC design could help to inform efforts to reduce the risk of international spillovers. All these are relevant areas where research and policy can fruitfully enrich one another.

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Annex: survey questions

Four questions on cross-border retail use of CBDCs

1. Do you envisage the design of a CBDC allowing foreign residents to use the CBDC inside your jurisdiction (eg tourists)?
1a Yes/No/Not yet, but potentially later/Undecided
1b If yes, how might this work (eg limit on the amount, prepaid CBDC cards)?

2. Should your jurisdiction decide to issue a retail CBDC, do you envisage allowing use of the CBDC beyond the borders of your jurisdiction in some form?
2a Yes/No/Not yet, but potentially later/Undecided
2b Depending on your answer, what would be the allowable use cases and how would foreign use be curbed (eg do you envisage monitoring tools to detect foreign use or other controls to restrict issuance and redemption)?

3. For context, does your jurisdiction restrict the use of foreign currency (ie foreign physical banknotes, foreign currency-denominated transfers) inside your jurisdiction?
3a Yes/No
Would widespread use of a foreign CBDC, stablecoin or cryptocurrency lead to a reconsideration? Relatedly, is this potential route for "digital dollarisation" a bigger concern in the future than it is today?
3b Yes/No

4. How important are the following cross-border risks to your domestic CBDC motivations? For each topic, put a score: 4=Very important / 3=Important / 2=Somewhat important / 1=Not so important
4a undesirable volatility in foreign exchange rates – Your score:
4b use of the CBDC of your jurisdiction abroad – Your score:
4c facilitation of tax avoidance and loss of oversight by domestic authorities due to use of foreign CBDC – Your score:
4d other (please specify:) – Your score:

Three questions on cross-border wholesale linkages of CBDCs

5. In designing a CBDC, are you considering incorporating interoperable features to reduce frictions in cross-border and cross-currency settlement?
5a Yes/No/Not yet, but potentially later/Undecided

6. If yes, which features are you considering (a, b and/or c)? (see the attached paper: "Multi-CBDC arrangements and the future of cross-border payments", 2021)?
6a mCBDC arrangement 1: Enhancing compatibility with international standards
6b mCBDC arrangement 2: Interlinking your CBDC system with a foreign system
6c mCBDC arrangement 3: Integrating your CBDC into a single mCBDC system
Depending on your answer, can you provide details or a link to published technical reports?

7. How would CBDC to CBDC FX conversions happen, and what is the role of the central bank? Would the central bank take on a novel role in the FX conversion process?
7a Yes/No/Not yet, but potentially later/Undecided
7b If yes, can you be more specific on the role the central bank could perform or link to relevant reports?

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