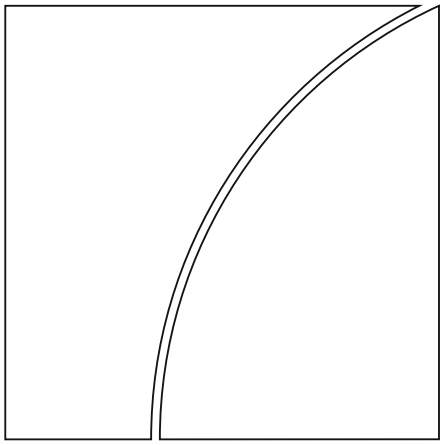

BIS Papers

No 128

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by Enrique Alberola and Ilaria Mattei

Monetary and Economic Department

November 2022

JEL classification: D47, E42, E58, F33, G21, H41, O32, O38, L86.

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The views expressed are those of the authors and not necessarily the views of the BIS.

This publication is available on the BIS website (www.bis.org).

ISSN 1682-7651 (online)
ISBN 978-92-9259-610-1 (online)

Central bank digital currencies in Africa

Enrique Alberola and Ilaria Mattei[1]

Abstract

This paper, based on a survey to central banks, analyses the development, motivations and concerns of central bank digital currencies (CBDCs) in Africa relative to other emerging and developing regions. The interest of African central banks in CBDCs has shot up in recent times. While all of those surveyed are analysing CBDCs, only few have projects at advanced stages (pilot or live). Some countries, in particular in East and West Africa, stand out as promoting fast payment systems through mobile money, but half of the surveyed central banks think that CBDCs can provide a superior solution. Like their peers, a key motivation for African central banks is achieving greater payment system efficiency. In addition, a higher proportion than in other regions see potential benefits for monetary policy, an important consideration for a region where the transmission mechanism is weak. Central banks in Africa also place more emphasis on financial inclusion. These factors could foster CBDC issuance and favour adoption. At the same time, they are more worried than other regions about cyber security risks and cross-border spillovers and are also concerned about high operational burdens. These factors and others, such as the high degree of informality that may hinder adoption, favour a cautious approach. All in all, differences in motivations, concerns and other country-specific factors determine how central banks are approaching CBDCs.

Keywords: money, digital currencies, central banks, CBDCs, payments, financial inclusion, cybersecurity, African economies.

JEL classification: D47, E42, E58, F33, G21, H41, O32, O38, L86.

[1] This paper was prepared for the Roundtable of Governors from African central banks organised by the BIS and held on 26 September 2022. We thank Claudio Borio, Agustín Carstens, Stijn Claessens, Tirupam Goel, Benoît Mojon and Hyun Song Shin for their comments. Both authors worked at the BIS at the time the paper was written. The views expressed in this document are those of the authors and do not necessarily reflect those of the Bank for International Settlements or Bank of Spain, to which the first author is now affiliated.

Introduction

A central bank digital currency (CBDC) is digital money denominated in the national unit of account and a liability of the central bank (BIS (2021)). Initially, central banks across the world took a cautious approach towards CBDCs, but their interest has increased in recent years. According to a recent BIS survey (Kosse and Mattei (2022)), 90% of central banks surveyed were engaged in CBDC analysis or projects in 2021, compared with two thirds in 2017, and the share running pilot projects had doubled, reaching 26%.

As analysed in this year's BIS Annual Economic Report (BIS (2022a), monetary systems are evolving in step with technological advances. Digital technology in finance and new private forms of digital money have the potential to enhance the monetary system. But structural flaws make cryptocurrencies unsuitable as the basis for the monetary system. In this context, central banks have adopted a more proactive stance toward CBDCs (Auer et al (2021)): CBDCs are envisioned as bolstering the public good nature of the monetary system with the central bank at the core, supporting safe, low-cost and inclusive payments, while promoting innovation.

African central banks are no exception to the global trend. All 19 participants in the survey underlying this note (Annex Table A1) report that they are active on CBDCs. But most are still in the initial stage of research and analysis. Only Nigeria has issued a retail CBDC, the eNaira (Box 1), and Ghana and South Africa are running pilot projects (retail and wholesale, respectively). South Africa has also participated in the Dunbar multi-currency (mCBDC) project coordinated by the BIS Innovation Hub.

This paper starts by discussing the main motivations of African central banks for CBDC engagement. A second section reviews their main concerns. The third section analyses the design choices for CBDCs. The fourth section discusses the implications of cross-border use of CBDCs. The paper concludes with high-level takeaways. Throughout, the note draws on the comparison between Africa and other emerging market economies (EMEs), as analysed in a recent report (BIS (2022b)) that used the same survey structure.

Box 1

The eNaira[1]

The eNaira is the Nigerian retail CBDC issued by the Central Bank of Nigeria (CBN). It was launched as the world's second CBDC on 25 October 2021. The CBN lists several domestic policy goals for CBDC, including ensuring financial inclusion, improving the availability of and access to central bank money, and making payment systems more efficient and resilient. But the eNaira is also intended to improve cross-border payments and make remittances to Nigeria cheaper.

Legally, the CBN is empowered to issue CBDC based on its mandate under the Central Bank of Nigeria Act and other financial institution acts. The eNaira engages the CBN, financial institutions (FIs), end users and government ministries, departments and agencies that receive and make payments to citizens.

The eNaira uses a two-tier CBDC distribution model. The CBN administers the eNaira through the Digital Currency Management System (DCMS) to issue and mint the CBDC and financial institutions maintain an eNaira Treasury Wallet for holding and managing eNaira on the DCMS. The eNaira platform hosts the eNaira wallets for the participants. At the highest level, the Stock Wallet, owned and managed by the CBN, serves as the warehouse for all minted eNaira. Financial institutions administer their Treasury Wallets through the FI Suite application, which enables them to manage currency holdings, requests and redemptions with the CBN; an FI can create Branch (sub-)Wallets for its branches, funded by its Treasury Wallet. The Merchant Speed Wallets are used solely for receiving and making eNaira payments for goods and services, while the basic Speed Wallets are available for end users, typically households, to transact on the eNaira platform.

Technologically, the eNaira relies on permissioned distributed ledger technology (DLT), in which the intermediaries make up nodes in the network. The financial institutions also carry out onboarding of customers and AML/CFT controls. Users of eNaira are subject to a tiered structure of KYC requirements based on transaction and balance limits.

Universal access to eNaira is a key goal of the CBN, and new forms of digital identification are being issued to the unbanked to help with access. The individual and merchant wallets of the eNaira have different caps on daily transaction limits and the amount of eNaira that can be held in them, depending on their customer due diligence tier. The wallets with lower caps can be held by individuals who do not have a bank account, but a bank account is necessary to hold a wallet with higher caps. According to the BCN, the caps are intended to ensure that the eNaira is primarily used for smaller retail payments and that competition between eNaira and bank deposits is limited. Similarly, the CBDC has been designed with a 0% interest rate, which is also intended to avoid competition with bank deposits. When it comes to anonymity, the CBN has opted to not allow anonymity even for lower-tier wallets. At present, a bank verification number is required to open a retail customer wallet; going forward, anyone whose identity can be verified at least with a phone number will be able to open lower-tier wallets.

The CBN also reports that the design of eNaira is able to support international interoperability. The eNaira, could thus lead to cheaper remittances to Nigeria, and also improve cross-border payments in general, which could facilitate trade.

[1] Adapted from BIS (2022c). See also Central Bank of Nigeria (2021).

Motivations for CBDC issuance

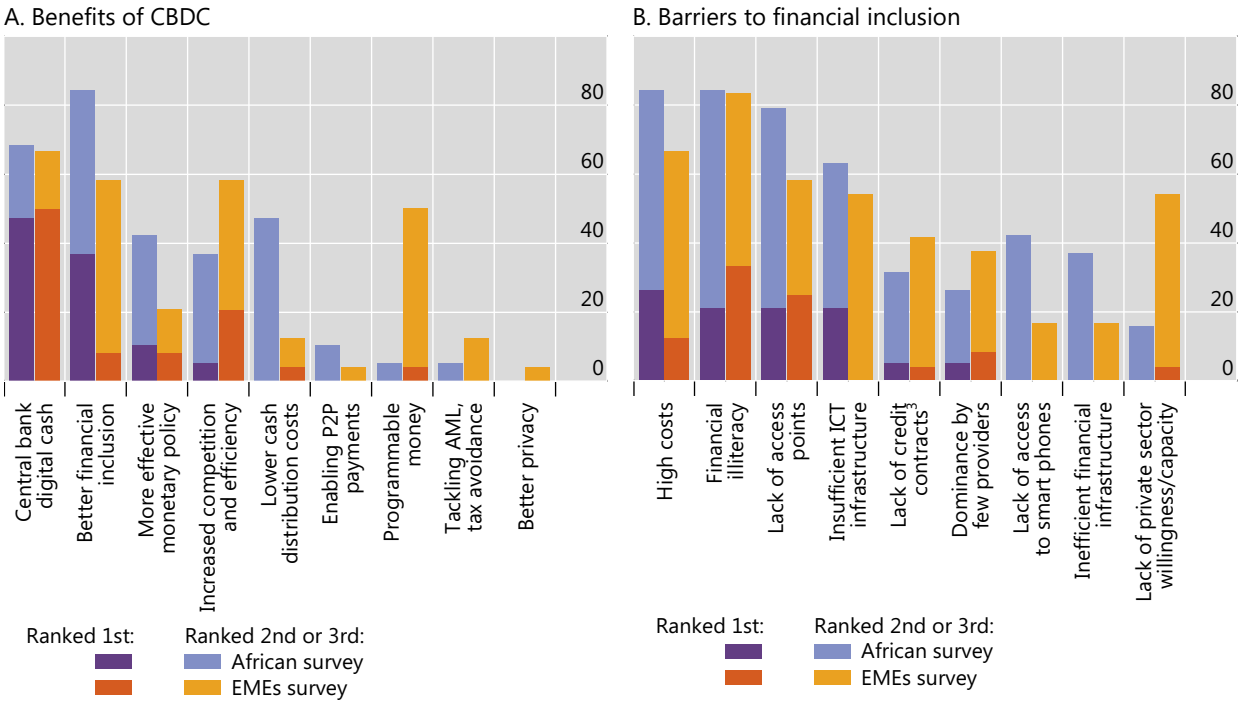
The top motivations for CBDC issuance in Africa are the provision of cash in digital form and the promotion of financial inclusion (Graph 1.A). Other key considerations include improving the effectiveness of monetary policy, increasing competition and reducing distribution costs of money. These motivations are not mutually exclusive.

Compared with other EMEs, financial inclusion ranks above digital cash among the top three motivations; the reduction of cash distribution costs and monetary

policy improvements are more relevant; and encouraging competition and the programmability of money are deemed as less important.

Fostering financial inclusion is one of the main motivations for CBDCs in Africa[1]

Percentage of participating central banks[2] Graph 1



[1] Each bar indicates the percentage of central banks that choose a given motivation as one of their top three benefits of CBDC/barrier to financial inclusion. [2] Unless otherwise stated, the percentage is computed over all the central banks that participated in the surveys (19 and 24 central banks in the African and EME survey, respectively), including those that did not answer the specific question. [3] Lack of credit contracts and procedures suitable for individuals and/or firms with erratic and/or undocumented cash flows.

Sources: BIS African and EMEs 2022 surveys on central bank digital currencies.

Provide cash in digital form

The provision of cash in digital form as an alternative means of payment is the top consideration for more than half of the surveyed African central banks, similar to other EMEs.

The digital revolution has been changing the payment landscape in Africa, eroding the dominance of commercial banks and the use of physical cash. Mobile money – ie digital payments through a mobile phone not requiring a bank account – started the transformation at the turn of the century, with African countries such as Kenya at the forefront. Sub-Saharan Africa now accounts for two thirds of the mobile money transactions volume and more than half of active users in the world (GSMA (2022)). Later, banks and then big techs and fintech firms have moved in with new means of payment; likewise, digital assets, such as cryptocurrencies and stablecoins, have emerged.

Against this backdrop, a CBDC could serve as a prime form of trusted money, just as cash does today (BIS (2021)). Relatedly, CBDCs could reinforce central banks'

roles as the issuer of the unit of account and as the anchor of the monetary system. Another possible motivation for issuing a CBDC is the cost savings from less cash in circulation. Cost reductions relate to the printing, transportation and storage of banknotes and coins. The potential for savings is greater in economies where cash circulation remains high, as in Africa. For African central banks, reducing cash distribution costs is indeed a much more important motivation (48% of responses) than for other EMEs.

Enhance financial inclusion

Central banks in general perceive that CBDC is an important and complementary tool for promoting financial inclusion (Auer et al (2022)). Financial inclusion, broadly defined, means that individuals and businesses can access and use financial services at low cost. Inclusion in Africa has improved over time but is still low, with half of African adults having no bank account in 2021, a greater proportion than in any other region (World Bank (2022a)). Indeed, fostering financial inclusion is one of three main considerations for all African central banks surveyed and the top one for more than a third.

Financial market features and broader structural factors explain financial exclusion (Graph 1.B). Market features seen as most important in Africa include high costs, lack of access points and inadequate ICT infrastructure. Private sector reluctance is not judged as a relevant constraint, in contrast to assessments in other EMEs. Financial or digital illiteracy – especially prevalent in low-income countries – is the main structural factor impeding inclusion. Lack of access or differences in users' preference for digital products also cause related "digital divides" across income, education and age groups, Africa's young population facilitates digital services penetration, but the informal sector – where most employment is in the continent (ILO (2022)) – favours the anonymity of cash. This is an obstacle to financial inclusion and eventually to the wide adoption of CBDCs (Oh and Zhang (2020)).

CBDCs can mitigate some of the market imperfections inhibiting inclusion. For instance, CBDC issuance can provide an open infrastructure that sets the rules of the game for payment service providers (PSPs). In turn, this could enhance interoperability and promote effective competition, thereby delivering benefits to consumers. Private players could also develop services with greater added value on the basis of CBDCs. Finally, CBDCs could help cut the cost of payment services by lowering or eliminating fees.

Improved efficiency of domestic payments

The potential of CBDCs to increase the competition and efficiency in digital payment services is an important motivation for a number of African central banks. That said, it is rarely a top one and is ranked lower than in other EMEs.

Payment service markets are often oligopolistic, as a few PSPs can gain and maintain large market shares due to network effects (Gowrisankaran and Stavins (2004)). Concentrated market power has several undesirable implications. One is the high cost of services; even if costs are low initially to gain market share, oligopolists PSPs may subsequently seek rents. Another concern is informational rents in an increasingly digitalised world, where only a few players have access to detailed user transaction data.

The introduction of a CBDC as an alternative means of payment can affect the competitive structure of the payment system, by providing a level playing field through open standards. Depending on design, it can improve competition and reduce costs, and can also help prevent informational rents. CBDC issuance could also support new digital technologies and their integration with the broader economy such as the distribution of fiscal transfers and tax collection, thereby also fostering the formalisation of economic activity.

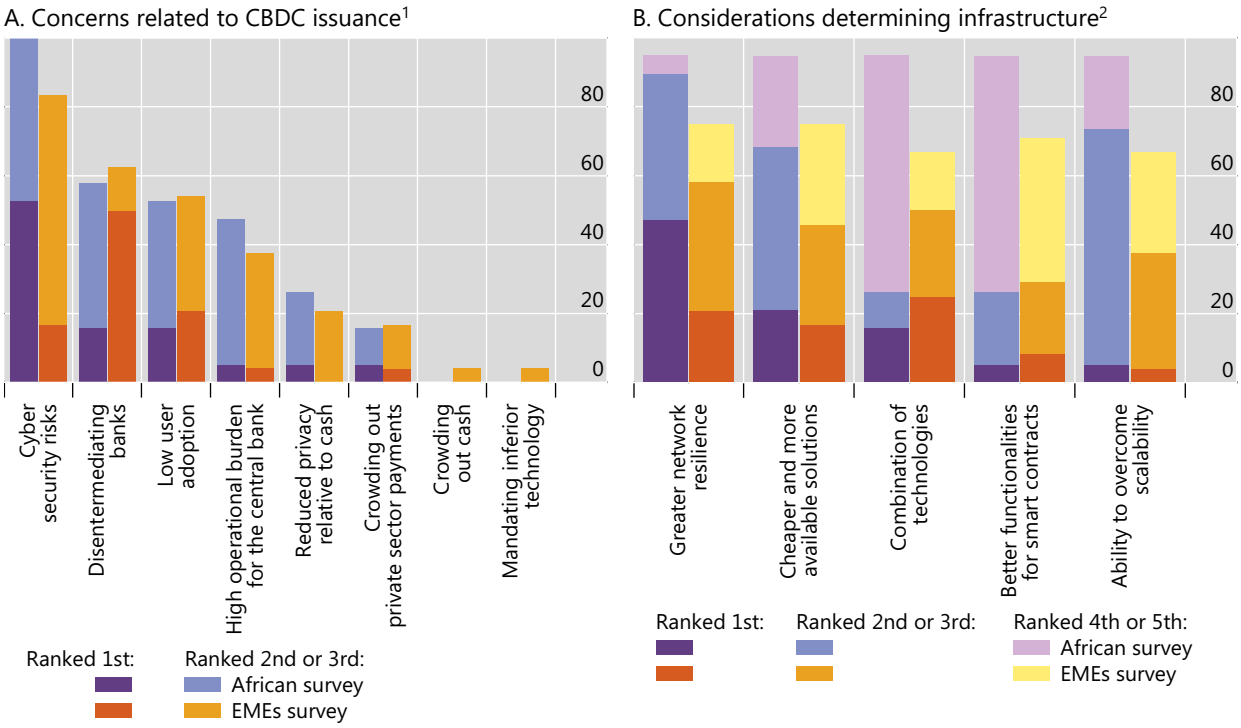
Concerns related to CBDC issuance

The main concerns related to CBDCs (Graph 2.A) are operational. These include cyber security and the burden for central banks of maintaining the system and its resilience and stability. African central banks are also concerned by low user adoption and bank disintermediation, albeit to a lesser extent than other EMEs. These latter concerns could be mutually exclusive, as low adoption could decrease disintermediation risk.

How the CBDC is designed can mitigate some of these concerns. In particular, a key decision is on the type of architecture: a two-tier CBDC, with the central bank at the core, but private agents (banks and PSPs) interacting with users; or a direct system where the central bank also takes care of user-facing activities.

Main concerns related to CBDCs centre on cyber security, while resilience scores highest on infrastructure considerations

Percentage of participating central banks — Graph 2



[1] Each bar indicates the percentage of central banks that choose a given downside as one of their top three concerns. [2] Each bar indicates the percentage of central banks that choose a given motivation as one of their top five considerations regarding infrastructure.

Sources: BIS African and EMEs 2022 surveys on central bank digital currencies.

Operational concerns

CBDC systems must be safe, stable, robust and able to recover from operational disruptions. Such disruptions could also have reputational costs. These risks are common to any payment system, including fast payment systems (FPS).

The main operational challenge noted is cyber risk, even more in Africa than elsewhere: it is among the top three concerns for all African central banks and the top one for over half of them. A successful cyber attack on CBDCs could cause widespread and serious damage and erode the reputation of central banks. Attacks such as hacks into credit card systems, databases containing consumer credit profiles and central banks (as in the case of Bangladesh in 2016), offer a glimpse of the threats involved. Defending against such attacks is difficult given the multiplicity of linkages with the broader financial and digital ecosystem.

Another important challenge is the operational burden of maintaining a CBDC. Here African central banks highlight aspects very similar to other EMEs (Graph 2.B): network resilience, the cost, availability and combinability of technologies, and their scalability and functionalities. The operational cost of such a complex system is high. A two-tier architecture would reduce the burden for the central bank (BIS (2021)).

Low user adoption

Low CBDC adoption, which would hinder the policy objectives central banks hope to achieve, is the second largest concern for African central banks. This concern is particularly widespread in North Africa, where digital payment penetration is relatively limited.

Success in the adoption of a currency is driven by its usefulness to private agents. In particular, CBDCs would need to satisfy unmet user needs for broad adoption; this would depend on country-specific conditions (Group of Central Banks (2021a)). In contrast to physical cash, where central banks have a monopoly, CBDCs face competition from private FPS that could undermine their adoption. Around half of African central banks perceive significant advantages of CBDCs over FPS in terms of boosting financial inclusion, somewhat more than other EMEs (Graph A1.A in the Annex). Successful implementation of new payment services and broad adoption can result from less frictions and incentives tailored to the targeted users. Kenya's mobile money (M-Pesa), for example, has provided the unbanked population with access to basic banking-like facilities via SMS services and has become universal in the country.

For merchants and banks affected by disintermediation, which could be reluctant to adopt, the gains from CBDCs could come from more efficient payments domestically. And a CBDC could lay the foundation for an international system of CBDCs, where am mCBDC bridge could further help broaden the reach of banks and merchants.

Bank disintermediation

Over half of African survey respondents indicated concerns about bank disintermediation. Its importance in the African survey is somewhat lower than in the EMEs survey, where it came top for half of the central banks.

Design choices, such as remuneration of CBDCs and possibly safety, could drive bank disintermediation. An account at the central bank might be attractive as being safer. The perceived main channels through which credit provision could be affected in Africa include a smaller volume of deposits, more volatile and higher loan rates and lower bank lending (Graph A1.B). Even with limits on individual CBDC holdings, some reduction in commercial bank deposits could ensue. An interest-bearing CBDC would reinforce such effects (eg Fernández-Villaverde et al (2021), Agur et al (2022)).

However, banks could benefit from CBDCs if they foster financial inclusion, as intended: an increase in users of digital payment of financial services would eventually allow the banking sector to expand its financial services, as the experience of Brazil's Pix suggests (Duarte et al (2022)).

Deposit disintermediation could induce affected banks to rely on more expensive and less stable funding sources, such as wholesale or money markets. This, in turn, could reduce credit provision and raise loan rates. Not surprisingly, two thirds of the African survey respondents expected an impact on credit provision (Graph A1.C).

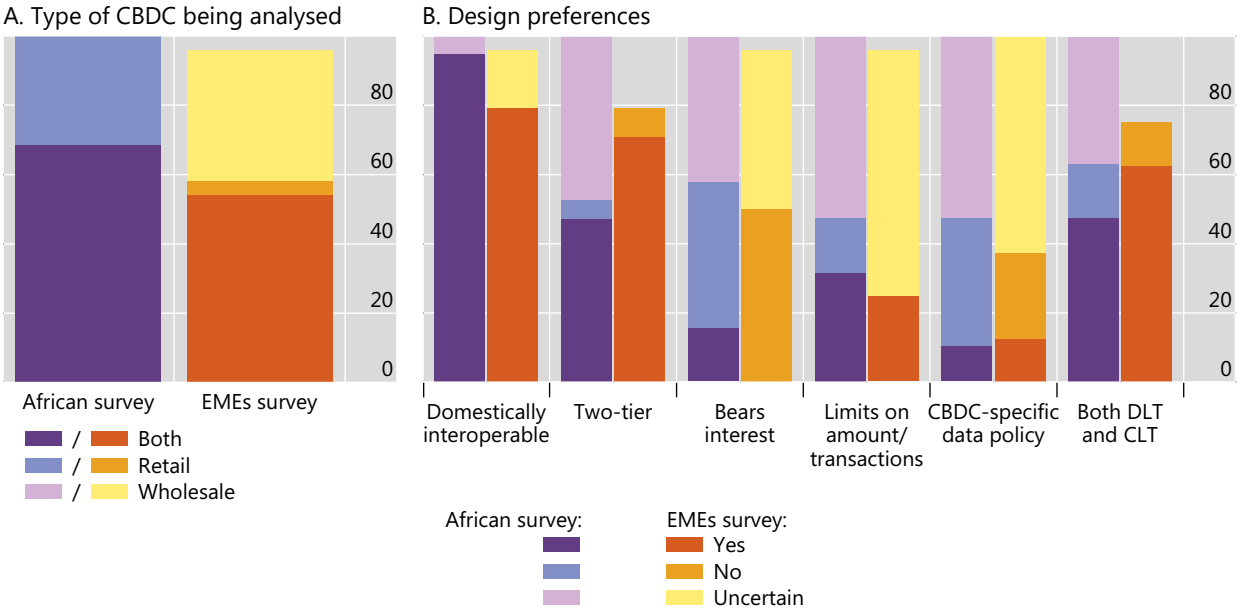
Any disintermediation is likely to be more marked and abrupt in a crisis, given a CBDC's status as a safe asset. Specifically, CBDCs could exacerbate runs on weak private banks, especially in countries where banking sectors are less developed or have low reputation. The conditions – tranquil or crisis times – under which CBDCs might disintermediate banks present difficult policy trade-offs for a central bank. A CBDC could hasten disintermediation in a crisis, amplifying the liquidity stress on weaker banks. However, not allowing for CBDCs' convertibility to control volatile flows runs counter to the goal of providing a safe means of payment precisely when that safety is valued most.

Bank disintermediation, if sufficiently large and broad-based, could complicate monetary policy. Deposit flights to CBDCs can expand central bank balance sheets, raising the question of how resources should flow back to the real economy – directly from the central bank, or via public or private banks.

Yet most African central banks expect CBDCs to improve monetary policy implementation, much more than in other EMEs (Graph A1.C). This may reflect the greater financial inclusion that Africans expect from CBDCs, since a more widespread use of financial services would strengthen the transmission of monetary policy. The monetary policy implications would be greater if the central bank were to pay and vary interest on the CBDC.

Central banks envision both wholesale and retail CBDCs and interoperability

Percentage of participating central banks Graph 3



Sources: BIS African and EMEs 2022 surveys on central bank digital currencies.

Considerations on CBDC design

A first choice concerns the type of CBDC. Graph A2 shows the two main types. A retail or general purpose CBDC is universally accessible to the general public (like cash) and can be made anonymous. A wholesale CBDC is available only to select financial institutions (similar to bank reserves). With reserves being digital for a long time, the wholesale CBDC only differs in the form that it is available (for instance, as a token on a distributed ledger platform). As such, it may be accessible to a wider set of counterparties, be interoperable with foreign systems, or feature "smart contracts" (eg allowing instantaneous settlement of securities on a delivery-versus-payment basis – so-called atomic settlement). Most African central banks are investigating both retail and wholesale CBDCs (Graph 3.A), while about a third are focusing only on the retail version, proportions similar to other EMEs.

The design of a retail or wholesale CBDC can help alleviate trade-offs. The experience with the eNaira is one example (Box 1). Central bank survey responses, summarised in Graph 3.B, shed light on six main design features. In Table A2, the responses are shown as a score, also considering motivations and concerns.

(1) Domestic interoperability. Interoperability is a broad term, which generally denotes the ease with which funds can flow between CBDC and other payment systems, domestic or cross-border (BIS (2021a)). An interoperable CBDC would be one where transfers between CBDC and private solutions are possible directly, instead of going via a bank account.

There is almost unanimous support for a domestically interoperable CBDC. Greater interoperability would foster an open and dynamic system, contributing

to the diversity of payment options and enhancing competition. It could also serve as a backup for the broader payment system. On the downside, greater interoperability could be technically more complex.

(2) Degree of central bank involvement. The key design feature for a retail CBDC is whether the system is direct or two-tier, as defined above. African central banks are less decided than other EMEs on the choice: just over 40% favour a two-tier architecture.

As the second column of Table A2 shows, the preference for a two-tier model is strongest among central banks for which financial disintermediation is a top concern. Bringing banks – and other PSPs – on board would encourage them to accept CBDCs. A two-tier model would facilitate collaboration and potentially draw on synergies with the private sector. It would also hugely reduce the operating costs for central banks (eg performing KYC/AML functions).

(3) Remuneration. Only a small share of African central banks foresee offering interest on CBDCs, although the proportion is higher than in other EMEs. A non-interest-bearing CBDC is consistent with the objectives of providing a cash-like digital means of payment. At the same time, it can limit adverse effects on credit intermediation and monetary policy. Notwithstanding this, central banks which believe that CBDCs can make monetary policy more effective are relatively less in favour of remuneration (Table A2, third column).

(4) Limits. Most African central banks are uncertain about imposing limits on CBDC access, balances or transaction amounts. Among those that have a view, a majority favour some form of limits, an opinion that is most strongly held among those worried about disintermediation (Table A2, fourth column). Imposing them, however, may not be straightforward. Limits on holdings may require changes to existing legal frameworks or be at odds with the general public's expectations from a CBDC. Limits on cash payments are sometimes justified on security and fraud grounds (Group of Central Banks (2021b)). More generally, imposing limits on a means of payment constrains users' choices, raising broader public policy considerations.

(5) Data governance. A majority of central banks are uncertain or do not see the need for a specific data governance policy. Those concerned with low user adoption favour more specific arrangements. The high degree of uncertainty probably reflects the absence of a globally accepted standard on data governance, including for digital currencies.

(6) Technology: distributed ledger (DLT) vs central ledger (CLT). Each option is seen as having advantages and disadvantages, with neither model (in its current incarnation) dominating the other (Auer et al (2021a)). For instance, in terms of resilience, the key vulnerability of a CLT system is the failure of the central entry point, while that of a DLT system, which is based on the consensus mechanism, is a denial-of-service attack. In terms of functionality, a DLT may offer more programmable or smart contract features. While most surveyed central banks are currently considering both arrangements, half are undecided.

Beyond the six main design choices, the survey responses underscore other characteristics that could help promote financial access in particular (Graph A3). The feature deemed most useful in Africa, and also more than for other EMEs, is offline availability. Other characteristics noted are low cost or free access, interoperability with credit cards, mobile money and other FPS and eKYC. At the same time,

anonymity and the separation between transaction and personal data are seen as less relevant.

Innovative solutions are needed for CBDC to make inroads among the digitally lagging or illiterate. Offline functionality, combined with CBDC access via feature phones, could rely on near field communication (NFC) technology, Bluetooth or SMS. This could help users without a smartphone or less familiar with digital products (eg a payment app). Relatedly, interoperability with cash-in/cash-out networks (eg agents who can load prepaid CBDC cards upon receipt of physical cash) could be attractive for heavy cash users. In addition, an eKYC-enabled CBDC that is integrated with the national ID schemes could greatly ease financial onboarding. Another means is using mobile phone numbers as an initial CBDC account identifier for users without a bank account.

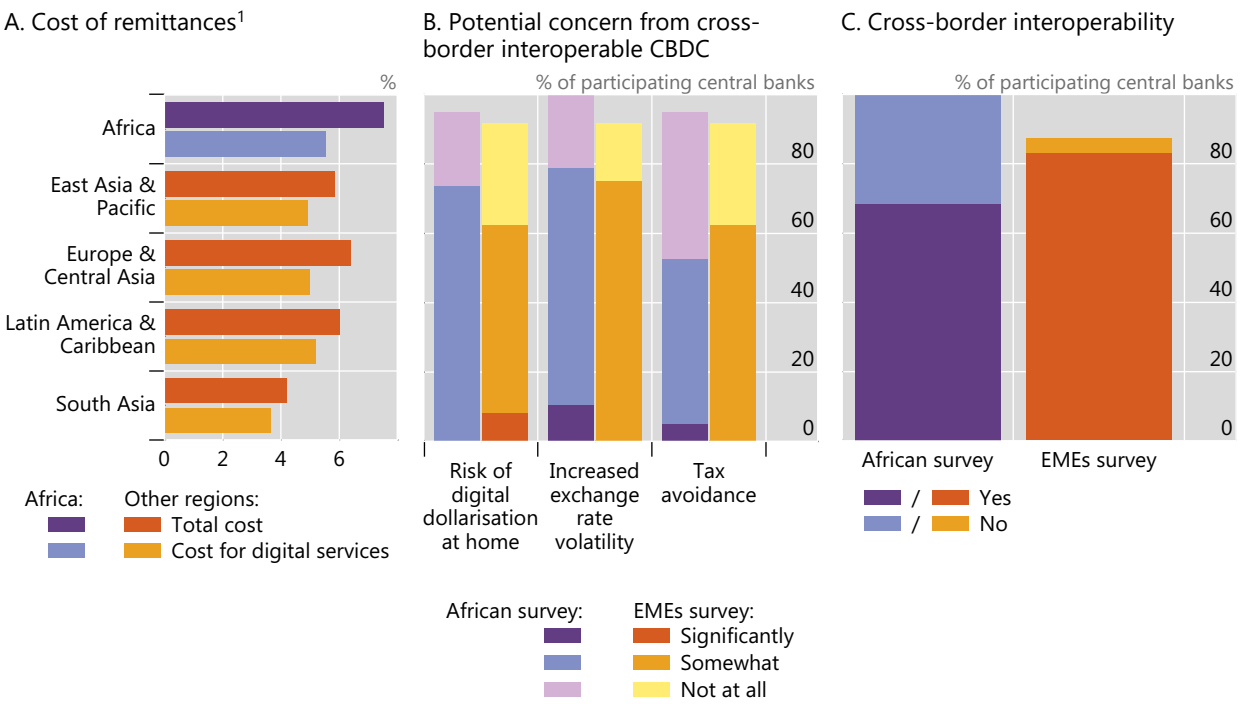
Finally, an interoperable and open CBDC system could help to keep payment costs low. A CBDC with a minimal or highly competitive fee could help further reduce transaction costs. These features could be particularly attractive for those who find existing solutions too costly.

Cross-border CBDC: design considerations

CBDCs that can be used across borders or are interoperable with foreign CBDCs – ie cross-border CBDCs – bring benefits as well as challenges.

Cross-border CBDCs can help improve international payments. International payments such as remittances remain costly, with those for Africa as the most expensive (Graph 4.A): making a $200 payment to or from Africa costs $15 (7.5%), that is, $3 (1.5%) more than the global average (World Bank (2022b)). Digital remittances cost somewhat less, but the cost is still highest in Africa. Cross-border CBDCs could streamline intermediation and thus reduce transaction costs and time. All African central banks surveyed expect lower cost with CBDCs, with over half expecting significant savings. Trade payments and trade finance would also benefit. CBDCs would also enable better monitoring of capital flows to the extent that such flows are channelled through cross-border CBDCs.

Cross-border CBDCs reduce remittances costs, but also entail risks Graph 4



[1] Average cost of sending $200 to the receiving region.

Sources: BIS African and EMEs 2022 surveys on central bank digital currencies; World Bank (2022).

Regarding the risks, more than half of the central banks, both in Africa and EMEs, believe that cross-border CBDCs could spur currency substitution, exchange rate volatility and tax avoidance (Graph 4.B). The risk of currency substitution is higher for economies that face high inflation, balance of payments problems or domestic economic instability. In any case, this type of risk would probably be higher if foreign cryptocurrencies and stablecoins were widely used.

Managing spillovers via design

On net, African central banks, favour cross-border interoperable CBDCs (Graph 4.C), albeit to a lesser extent than in other EMEs. Potential risks could be manageable via design features such as limits on access and usage. For example, central banks could impose such restrictions on non-residents or foreign visitors based on digital IDs established as a part of mutual recognition of national ID schemes (BIS (2021)).

Three types of CBDC arrangement for cross-border interoperability are gaining traction (Boar et al (2021), Carstens (2021)). The first model promotes greater compatibility between different retail CBDC systems via harmonised regulatory frameworks, market practices and messaging formats that make it easier for systems to interoperate. The second takes integration further by linking two domestic systems through technical interfaces that allow them to interoperate. The third, and most ambitious, establishes a single and jointly operated wholesale multi-CBDC system (eg the Dunbar project, in which the South African Reserve Bank participated with three other central banks; BIS (2022d)). In all models, users would be able to hold CBDCs from various jurisdictions in their CBDC "wallet", subject to some limits.

Cross-border coordination and cooperation are crucial. In particular, the choices made by large economy central banks could constrain the options available to smaller countries. Efforts include common governance arrangements, which can be challenging (Auer et al (2021)). In addition, consistent technical standards, oversight framework and adequate liquidity would be necessary for several currencies.

Key takeaways

As in other regions, in Africa central bank engagement with CBDCs has increased. Overall, however, Africa has not proceeded as far as the rest, with fewer projects at advanced stages (pilot or live). Some countries, in particular in East and West Africa, stand out as promoting FPS through mobile money, but half of the central banks think that CBDCs would provide a superior solution.

Differences in motivations, concerns and other country-specific factors matter for how central banks are approaching CBDC engagements. Like their peers in advanced economies (AEs) and other EMEs (Boar et al (2021)), a key motivation for African central banks is achieving greater payment system efficiency. In addition, a higher proportion than in other EMEs see potential benefits for monetary policy, an important consideration for a region where the transmission mechanism is weak (Adam et al (2021)). Central banks in Africa also place more emphasis on financial inclusion. These factors could foster CBDC issuance and favour adoption. At the same time, they are more worried than AEs about cyber security risks and cross-border spillovers and are also concerned about high operational burdens. These factors and others, such as the high degree of informality that may hinder adoption, favour a cautious approach.

CBDC design matters for the trade-offs involved. For instance, mitigating bank disintermediation and promoting adoption affects the choices regarding limits and remuneration of CBDCs and favour the onboarding of the banking sector. More generally, the starting point regarding digital infrastructure, FPS penetration, financial literacy or competition in the payment system shape the objectives of CBDC issuance, determine their value added and affect design choices.

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Annex: Graphs and tables

BIS 2022 surveys on central bank digital currencies — Table A1

African survey: 19 participating central banks

Bank Al-Maghrib (Morocco)	Bank of Namibia	Central Bank of West African States
Bank of Algeria	Bank of Tanzania	National Bank of Rwanda
Bank of Botswana	Bank of Uganda	Reserve Bank of Malawi
Bank of Central African States	Central Bank of Egypt	Reserve Bank of Zimbabwe
Bank of Ghana	Central Bank of Kenya	South African Reserve Bank
Bank of Mauritius	Central Bank of Madagascar	
Bank of Mozambique	Central Bank of Nigeria	

EMEs survey: 24 participating central banks

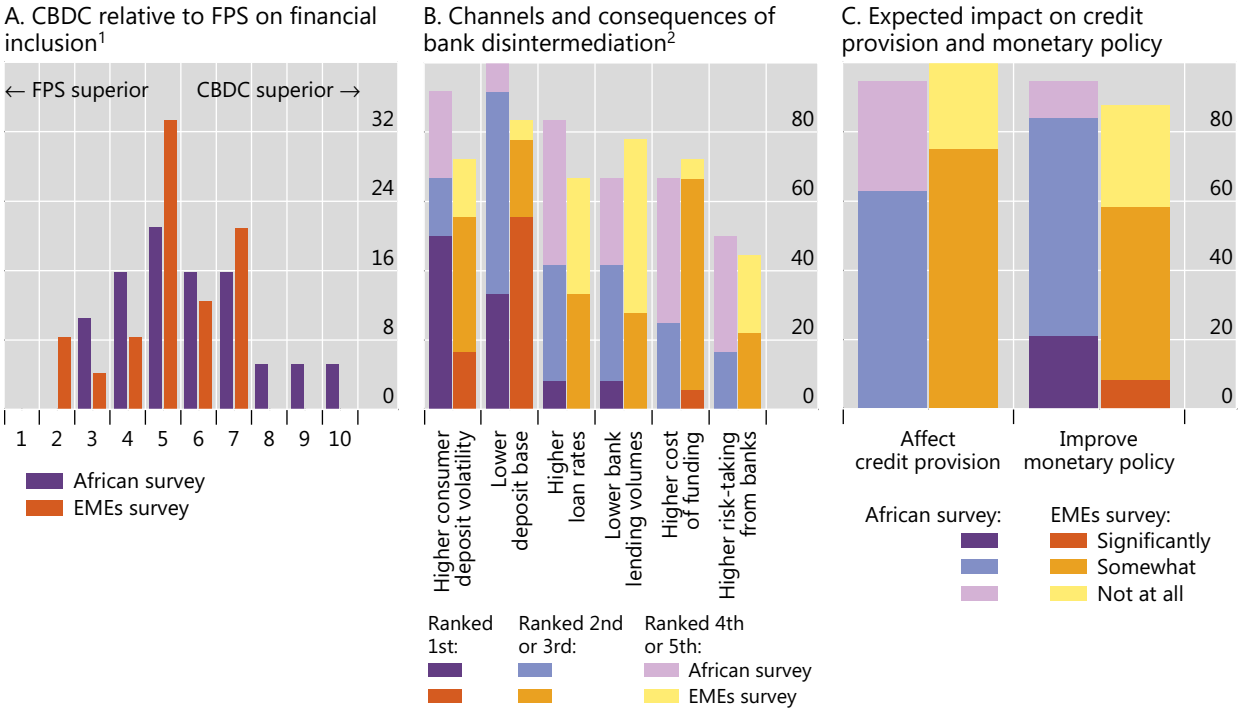
Bangko Sentral ng Pilipinas	Central Bank of Chile	Hong Kong Monetary Authority
Bank Indonesia	Central Bank of Colombia	Magyar Nemzeti Bank
Bank of Israel	Central Bank of Malaysia	Monetary Authority of Singapore
Bank of Korea	Central Bank of the Republic of Türkiye	Narodowy Bank Polski
Bank of Mexico	Central Bank of the Russian Federation	People's Bank of China
Bank of Thailand	Central Bank of the United Arab Emirates	Reserve Bank of India
Central Bank of Argentina	Central Reserve Bank of Peru	Saudi Central Bank
Central Bank of Brazil	Czech National Bank	State Bank of Vietnam

[1] The African central bank survey was distributed to 27 African central banks and closed in June 2022. The EMEs survey closed in November 2021. Two African central banks participated in the latter (Algeria and South Africa) and they have been excluded from the EMEs group in this note. For Algeria, its results in the EMEs survey have been used.

Sources: BIS African and EMEs 2022 surveys on central bank digital currencies.

CBDCs can be more inclusive than FPS, but affect banks' business and credit

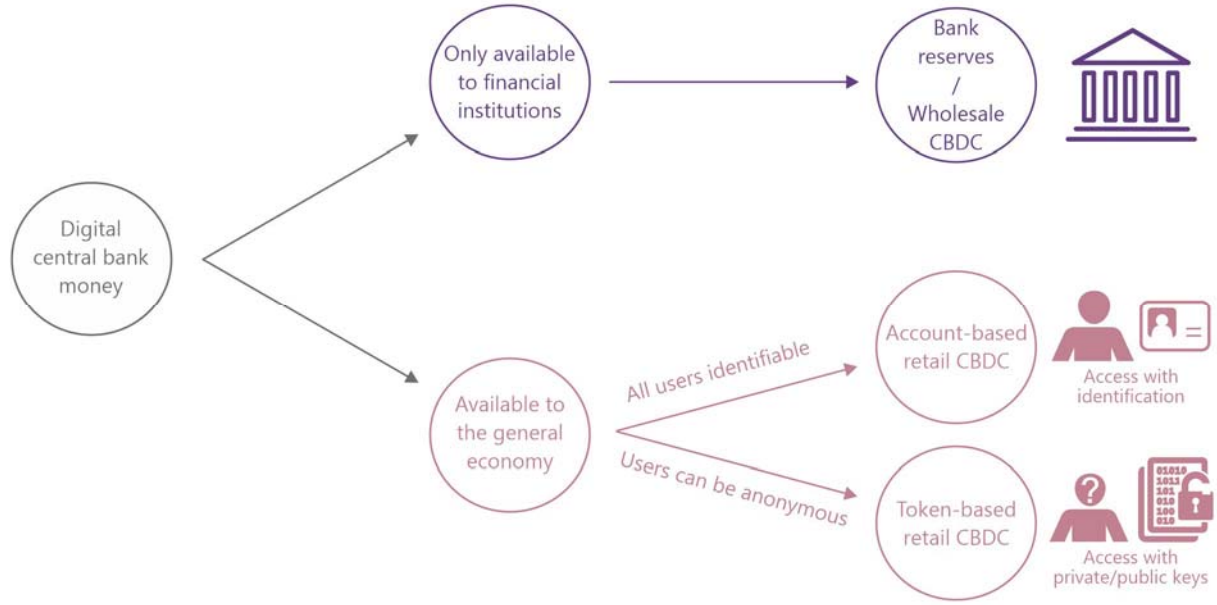
Percentage of participating central banks — Graph A1



[1] The scale ranges from 1 (other solutions are vastly superior) to 10 (CBDC is vastly superior), with 5 meaning that they are equal. [2] The question only applies to those central banks that expect CBDC to affect bank credit provision (12 and 18 central banks in the African and EMEs survey, respectively); the values are calculated as a percentage of this subset of respondents. Each bar indicates the percentage of central banks that choose a given item as one of its top five likely channels and implications of potential bank disintermediation.

Sources: BIS African and EMEs 2022 surveys on central bank digital currencies.

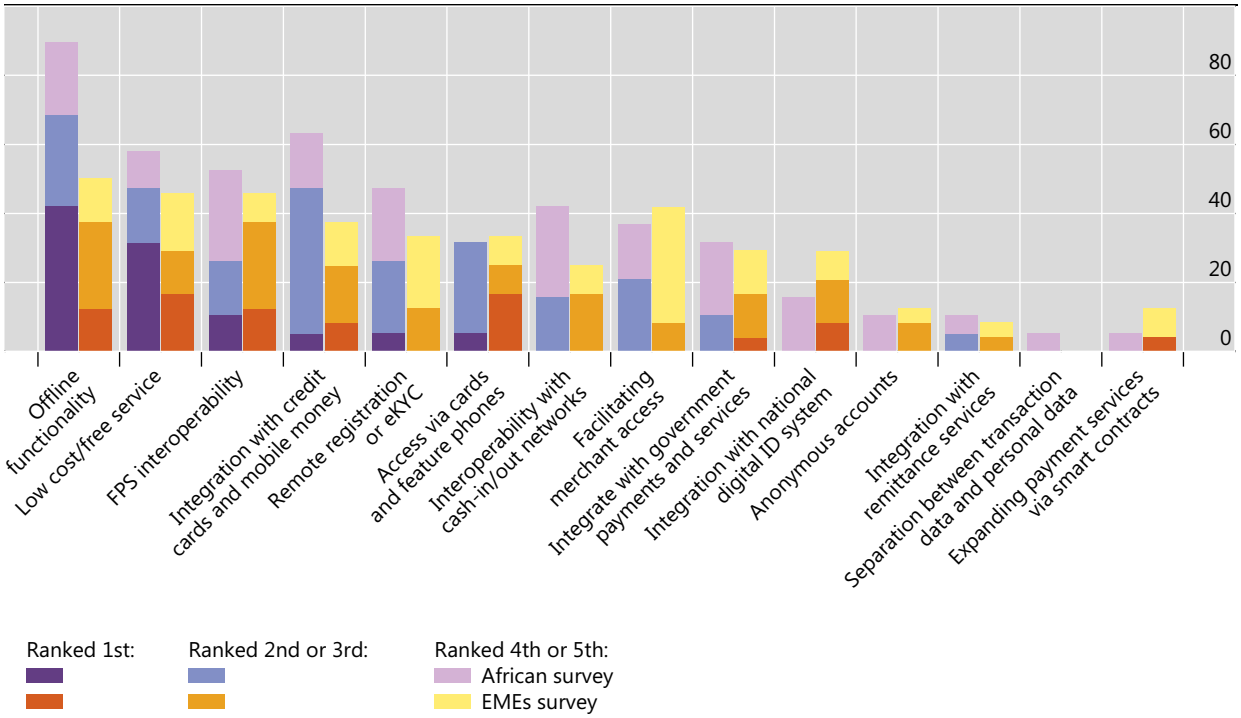
Types of digital central bank money Graph A2



Source: BIS, *Annual Economic Report 2021*, Chapter III.

Financial inclusion hurdles and CBDC design[1]

Percentage of participating central banks — Graph A3



[1] Each bar indicates the percentage of central banks that choose a given design as one of top five features that can help improve inclusion.

Sources: BIS African and EMEs 2022 surveys on central bank digital currencies.

Design preferences depend on the perceived benefits and concerns[1]

Scores for whole sample and difference in scores for specific motivations and concern — Table A2

	% of central banks[2]	(1) Domestically interoperable	(2) Two-tier	(3) Bears interest	(4) Limits on amount/ transactions	(5) CBDC-specific data policy	(6) Both DLT and CLT
African survey							
	%	Score					
Whole sample	100	97.37	71.05	36.84	57.89	36.84	65.79
	%	Difference in score					
Main motivation							
Central bank digital cash	47.4	2.63	–4.39	2.05	–7.89	–3.51	–10.23
Financial inclusion	36.8	–4.51	–6.77	–1.13	6.39	–1.13	12.78
Competition and efficiency	5.3	2.63	28.95	13.16	42.11	–36.84	34.21
Effective monetary policy	10.5	2.63	28.95	–11.84	–7.89	38.16	–15.79
Main concern							
Bank disintermediation	15.8	2.63	28.95	–3.51	42.11	–3.51	0.88
Operational burden	5.3	2.63	–21.05	13.16	–7.89	–36.84	–15.79
Low user adoption	15.8	2.63	–37.72	29.82	–7.89	29.82	0.88
Cyber security risks	52.6	–2.37	3.95	–1.84	–2.89	3.16	–0.79
EMEs survey							
	%	Score					
Whole sample	100	89.58	81.25	25.00	62.50	43.75	75.00
	%	Difference in score					
Main motivation							
Central bank digital cash	63.2	–2.08	14.58	–4.17	0.00	2.08	–4.17
Financial inclusion	10.5	10.42	–31.25	–25.00	37.50	–18.75	–25.00
Competition and efficiency	26.3	10.42	–1.25	–15.00	–2.50	6.25	15.00
Effective monetary policy	10.5	–14.58	–6.25	0.00	–12.50	6.25	0.00
Main concern							
Bank disintermediation	63.2	–6.25	2.08	0.00	–4.17	2.08	0.00
Operational burden	5.3	10.42	18.75	25.00	–12.50	6.25	25.00
Low user adoption	26.3	10.42	–11.25	–5.00	17.50	6.25	–25.00
Cyber security risks	21.1	10.42	18.75	–12.50	0.00	–18.75	25.00

[1] For each central bank and design feature, a "yes" is set to 100, a "no" is set to 0, and "uncertain" or "no answer" is set to 50. The score of a design is then calculated as the average score across central banks that ranked the selected motivation/concern as first. The numbers shown in the table for each motivation/concern are calculated as the difference in score with the whole sample (first row). The score is labelled with different colours: red (green) means the motivation/concern impacted negatively (positively) on the assessment of a design feature with respect to the whole sample average. [2] Percentage of central banks which rank first each motivation/concern.

Sources: BIS African and EMEs 2022 surveys on central bank digital currencies; BIS calculations.

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