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Central Bank Digital Currencies: The Motivation

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CENTRAL BANK DIGITAL CURRENCIES (PART I): THE MOTIVATION

Executive Summary

A growing number of central banks are considering the issuance of central bank digital currencies (CBDCs). Upon their introduction and depending on their exact design, CBDCs may have considerable consequences for deposit insurers as well. In the first of a set of papers, this Fintech Brief sets out four of the main motivations for issuing CBDCs. Acknowledging considerable divergences across jurisdictions, we find:

- CBDCs for the general public ("retail CBDCs") would constitute a central bank liability and a form of digital cash. To the public, they would be an alternative to central bank issued cash and private money, such as bank deposits.
- A large and growing share of central banks are experimenting with retail CBDCs. Some 20% of central banks indicate that they are likely to issue a retail CBDC by 2026, 40% indicate this is "possible".
- Short-term monetary policy considerations are unlikely to play a significant role in central banks' motivation for CBDCs.
- Whereas central banks in emerging markets and developing economies note that CBDCs may contribute to promoting financial inclusion, in advanced economies, CBDCs are not the most straightforward instrument in doing so.
- The evolution of payments plays a pivotal role in developing CBDCs. Given the declining role of cash in some jurisdictions, CBDCs as a new form of central bank money may contribute to safeguarding trust in the public currency. However, the available CBDC amounts necessary for that purpose may cause conflicts with likely and financial-stability-related limits on the volume of CBDCs that individuals may hold.
- As CBDCs would offer an alternative payment solution, they would contribute to resilience in future payment markets that may be privately dominated. However, given their digital nature, CBDCs may well be subject to similar cybersecurity and other digital risks that apply to private payment systems.
- CBDCs may contribute to competition and efficiency in an otherwise oligopolistic market for payment services, dominated by BigTechs. While potentially challenging to implement, a regulatory or competition-law-based response may be possible and would be less intrusive than introducing a CBDC.
- Central banks face the risk of large-scale use by the public of private or public (i.e. CBDC) digital currencies, not denominated in the domestic currency. These currencies may play a decisive role in the economy, and if foreign-based, largely out of reach of domestic legislation. CBDCs and/or private payment solutions in the domestic currency may assist in mitigating this risk, given sufficient demand for these.

1 Definition and Introduction

Central bank digital currencies (CBDCs) are a central bank liability offered in a digital form and in the national unit of account.[1] If introduced, they would form a new, third form of central bank money, in addition to (i) cash, which is available to the general public and (ii) overnight deposits by (mainly) banks at the central bank. CBDCs can be designed to be available to the general public ("general purpose" or "retail" CBDCs) or to the financial sector only ("wholesale CBDCs"), see Figure 1.

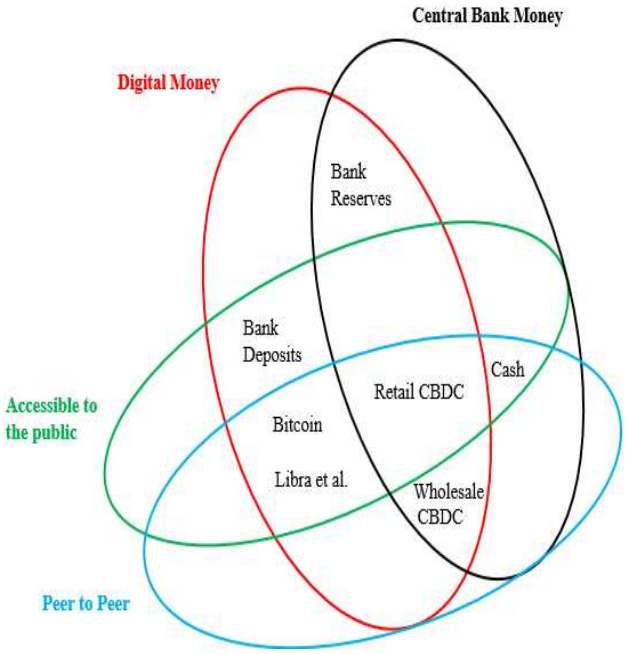

Figure 1: Forms of money
Based on: Bech & Garratt (2017)

In addition to central bank money, private money as well is made available to the general public. This may take the form of commercial bank money, e.g. in the form of bank deposits. Although commercial bank money may be convertible into central bank money through the exchange into cash, it is not issued by the central bank and is hence a liability of the commercial bank, not of the central bank. From the perspective of deposit insurers, the risks associated with commercial bank money and central bank money are distinct. Whether deposit insurers have a role to play in the future of CBDCs, and if so, to what extent, will be analysed in an upcoming Fintech Brief. Other forms of private money include cryptocurrencies such as Bitcoin or stablecoins such as Tether or Diem.[2] In a way that is similar to cash, certain models of CBDCs, cryptocurrencies and stablecoins allow for peer-to-peer use, i.e. the exchange of these forms of money can be direct between users and may not require intermediaries.[3]

In the past four years, the share of central banks engaging in CBDC research has grown by a third and reaches 86% as of 2020 (see Figure 2). A relative majority of central banks is focussing on both retail and wholesale CBDCs, but interest in retail CBDCs has grown over the years. The share of central banks that are already in an advanced stage of CBDC research is growing, with 60% of central banks conducting experiments and 15% being even further invested via pilot projects.[4]

Despite the increased interest, only 10% of central banks think they are "likely" to start issuing retail CBDCs within the next three years (wholesale: even less). This number raises to 20% (for retail) and 15% (for wholesale) when looking up to six years ahead.[5] However, whereas the majority of central banks (56%) holds it "unlikely" to issue wholesale CBDCs within six years, only 40% thinks so for retail CBDCs.[6]

[1] Group of central banks (2020), Bindseil (2020) and BIS (2021).
[2] The figure distinguishes between "permissionless" Bitcoin and "permissioned" stablecoins. Permissionless cryptocurrencies allow for any user ("miner") with sufficient computer capacity to contribute to the validation of transactions on the blockchain. In general, stablecoins do not give the general public access to this infrastructure.
[3] Depending on the exact design and distribution channels of the CBDC, private payment intermediaries may play a more or less important role (see upcoming Fintech Brief).
[4] Boar C. and Wehrli A. (2021)
[5] These figures are approximated and based on Graph 7 in Boar & Wehrli (2021).
[6] Ibid, remainders find it «possible» to issue such CBDCs.

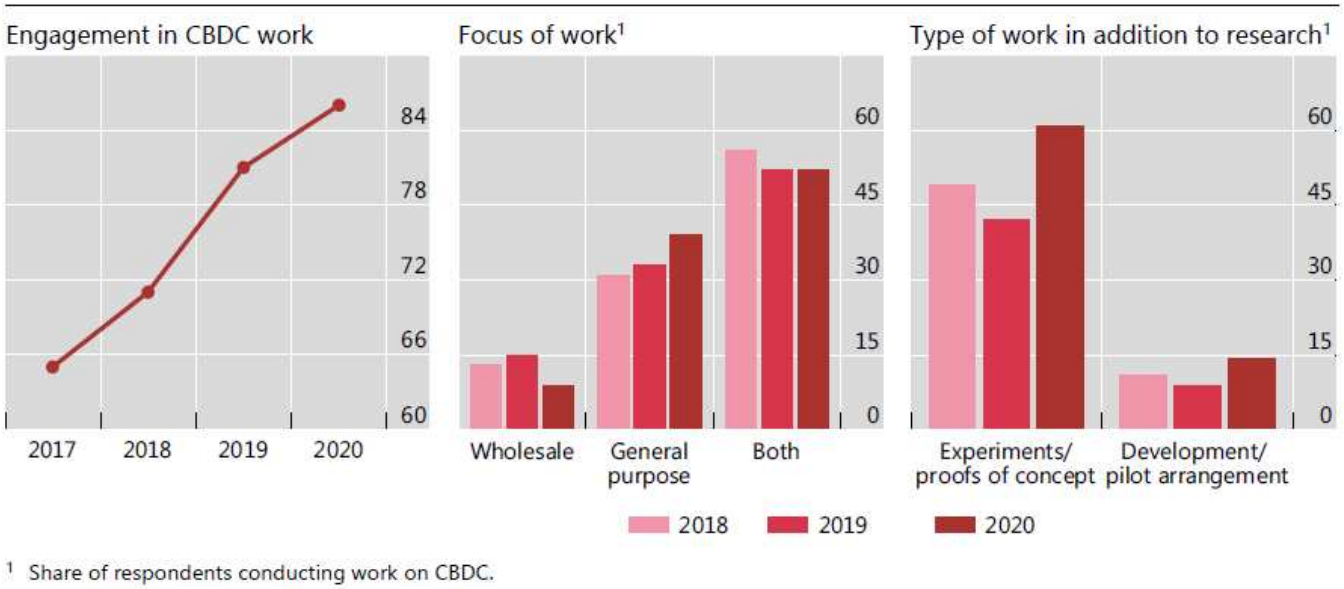

Figure 2: Central Banks' interest in CBDCs
Source: Boar and Wehrli (2021)

This Fintech Brief focusses on central banks' motivations for considering the issuance of CBDCs and offers a number of case studies. In part, this is grounded in recent research conducted by IADI suggesting that fintech initiatives and cross-borders issues, both highly relevant to CBDC policy discussions, should be regarded as priority areas for the international deposit insurance community.[7] Upcoming Briefs will assess issues such as the design of CBDCs and potential implications for deposit insurers.

2 Motivation for CBDCs

Motivating reasons for central banks' interest in CBDCs are many and diverse. In the following, we give an overview of the often-cited factors before dealing with them in more detail. Given the relevance for deposit insurers, we focus on retail CBDCs.

2.1 General Overview

In a high-level stock-taking, the BIS has been surveying central banks around the world for three consecutive years now to understand what motivates them in considering issuing CBDCs. As **financial inclusion** is an important element upon considering CBDCs in emerging markets and developing economies, on average, central banks in emerging markets and developing economies demonstrate a stronger motivation to issue CBDCs than their counterparts in advanced economies. An overwhelming majority of central banks indicates efficiency and safety of **domestic payments** as a reason for considering CBDCs**. "**Other" motivations of high relevance include **monetary sovereignty** in face of the expectations regarding the further decline in cash-use and the use of private digital currencies. As opposed to their counterparts in other parts of the world, central bankers in advanced economies rate the relevance of **financial stability** and **monetary policy** as reasons for CBDCs as rather low and declining.[8]

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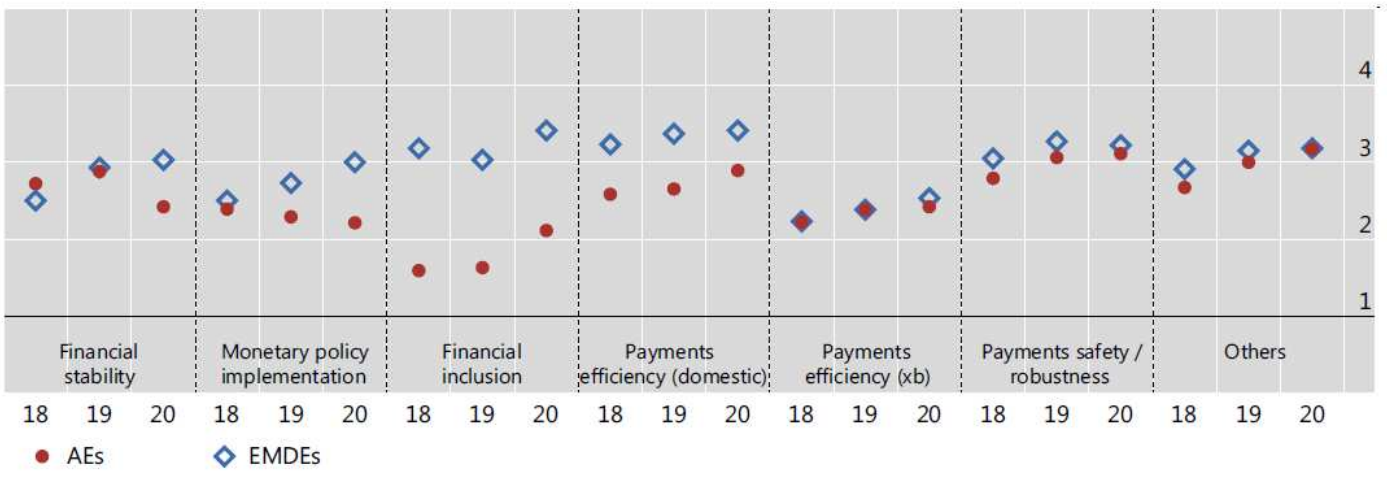
[7] The five priority areas identified by Van Roosebeke & Defina (2021) include climate change, fintech developments, COVID-19 policy responses, deposit insurers' role in resolution, and cross-border considerations.

[8] Motivation for issuing wholesale CBDCs is on average lower than for retail CBDCs. Only the efficiency of cross-border payments scores higher as for retail CBDCs. While not a focus area in this paper, it is acknowledged that efficiencies realised from CBDC introduction on cross-border payment outcomes are likely to be non-negligible. Some CBDC design options (multiple CBDC or mCBDC systems) seek to prioritise cross-border considerations through the interoperability of payment platforms among jurisdictions. A relevant example is the mCBDC Bridge being prototyped by the BIS Innovation Hub Hong Kong Centre, the Hong Kong Monetary Authority, the Bank of Thailand, the Digital Currency Institute of the People's Bank of China and the Central Bank of the United Arab Emirates – see https://www.bis.org/about/bisih/topics/cbdc/mcbdc_bridge.htm. Another example saw the Reserve Bank of Australia, Bank Negara Malaysia, Monetary Authority of Singapore, and South African Reserve Bank, together with the BIS Innovation Hub, announcing an initiative to make cross-border payments faster, cheaper and safer using a multi-CBDC common settlement platform. Dubbed 'Project Dunbar', the joint effort will explore development of technical prototypes using distributed ledger technologies to overcome the key challenges of governance, access, as well as regulations and jurisdictional boundaries. A report of this project, including details of the technical design and implementation, is expected to be



(1) = "Not so important"; (2) = "Somewhat important"; (3) = "Important"; (4) = "Very important".

Figure 3: Average importance in the motivation of central banks to issue retail CBDCs
Source: Boar and Wehrli (2021)

2.2 Motivation in detail

In the following, we identify four key motivations for the consideration by central banks of CBDCs. The remainder gives a short insight.

2.2.1 Monetary policy

Retail CBDCs may be a future instrument of monetary policy for central banks by offering an additional channel for the transmission of monetary policy. The setting of interest rates on CBDCs by central banks may exert a direct influence on money demand by the public. Also, in societies with minimal cash usage or where cash would be forbidden[9], negative retail CBDC interest rates may be an additional instrument of extremely accommodative monetary policy. In such cases, cash would not be available as a form of holding money at non-negative interest rates. This may ease central banks' limitations in setting negative short-term lending rates (zero-level bound). Finally, CBDCs may facilitate the use by central banks of "helicopter money"[10].

However, acceptance of these arguments is limited. For CBDCs to have an impact as a monetary policy tool, banknotes must be largely discontinued to avoid users fleeing into zero-rated cash.[11] Positive effects by CBDC on monetary policy effectiveness will also be conditional upon a significant uptake of CBDC and/or very high volume of CBDC in circulation, which may cause financial stability risks via encouraging bank-runs. All in all, there seems to be consensus, at least in advanced economies, that "monetary policy will not be the primary motivation for issuing CBDC".[12]

It is important to note that this discussion starts from the premise that the general environment remains unchanged and only CBDC were introduced. In that *ceteris paribus* environment, the added value of CBDC for monetary policy effectiveness seems rather small. A distinctly different discussion is the one of monetary policy effectiveness in an environment subject to considerable changes in the use of payment methods and currencies (see section 2.2.4 below: Monetary and economic sovereignty).

2.2.2 Financial inclusion

In jurisdictions with a low share of access by households to the commercial banking system, or with underdeveloped banking systems, in a way similar to the provision of e-money[13], CBDCs may offer an alternative access to (central

published in March 2022 – see https://www.bis.org/about/bisih/topics/cbdc/wcbdc.htm. Further exploration of such initiatives will be made available in future IADI Briefs.
[9] Rogoff (2014)
[10] See Bernanke (2016) for a discussion of the relative merits of helicopter money as a central bank policy tool to stimulate aggregate demand.
[11] Bindseil (2020), ECB (2020)
[12] Group of central banks (2020), p. 8
[13] Defina, Van Roosebeke and Manga (2021) explore in further detail the case of Kenya whereby the predominant e-money service provider (M-Pesa) has had a profound impact on the overall level of financial inclusion. Tarazi & Breloff (2010) note that within its first three years, M-Pesa

bank) money and associated payment services and thus promote financial inclusion. As figure 3 illustrates, in more advanced economies, financial inclusion seems to play a less relevant role when discussing CBDCs. Some central banks mention scenarios where CBDCs may offer an alternative to those users which are technically unable or reluctant (e.g. for privacy reasons) to use highly digitalised private payment services upon continuing decline in the use of cash.[14]

However, the reasons for gaps in financial inclusion may be very diverse and encompass a lack of trust by consumers in financial institutions, high travel or monetary costs associated with accessing financial services, deficiencies in financial literacy, a lack of sufficient documentation of identity, or a prospective lack of profitability for financial institutions in doing business with customers. CBDCs may not be able to provide a solution for all these factors[15] and financial inclusion considerations may be more effectively addressed through embedding in a wider agenda.[16] Also, CBDCs may prove counterproductive to financial inclusion were they to crowd out private initiatives which serve the purpose of financial inclusion better. Overall, CBDCs are "not likely to be the first or most straightforward choice" for expanding financial inclusion.[17]

2.2.3 Payment services

Payments plays a pivotal role in central bank motivation as to whether they consider CBDC issuance. Most arguments concentrate on the following elements:

- **Cash is on the decline**. Cash is the only form of central bank money currently available to the public. At the same time, the overall use of cash is steadily declining, although regional differences are significant.[18] The COVID-19 pandemic has led to a further decline in cash usage, but it remains to be seen whether this will have lasting effects. The more the use of cash continues to decline, the higher the costs related to logistics and upholding cash infrastructure would weigh on a declining number of remaining users. Public money (cash) may then come under increasing pressure of being substituted by private forms of money. Central banks may find this concerning as the public's trust in the currency would then be fully dependent upon the trust placed by the public in issuers of private money. These may be well-regulated and supervised banks, but may also be non-bank issuers of crypto-currencies and stablecoins. The latter are – at least as of now – less regulated, which may increase trust-related risks.[19] Subsidising the costs of cash-handling, or intervening with public policy (e.g. mandating banks to maintain a certain number of ATMs) may slow down the decline of cash or safeguard its availability to a limited degree. Nevertheless, it is unlikely that such intervention can, or should, materially influence users' payment preferences.

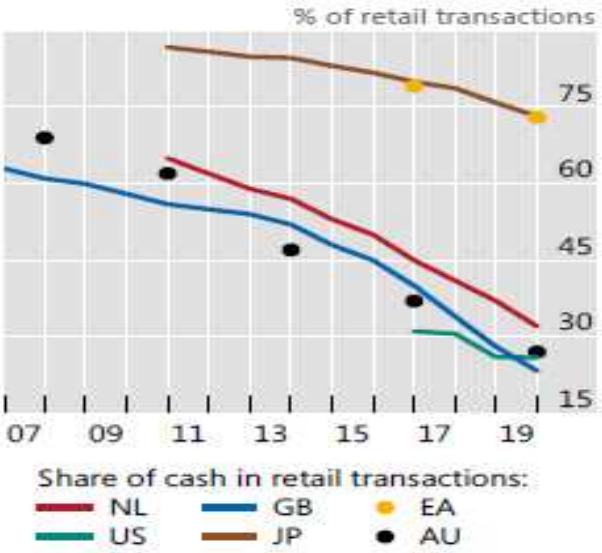


Figure 4: Cash in retail transactions
Source: BIS(2021)

  Absent sufficient cash, in times of stress, a conversion of commercial bank money into risk-free central bank money (such as banknotes) would no longer be possible.[20] Making CBDCs available to the public, as a digital cash-like form of central bank money, may be helpful in safeguarding confidence in the currency[21]. However, CBDCs do run into limits: for financial stability reasons, the potential volume of CBDCs that individuals may hold is likely to be

attracted over 9.5 million customers. To offer some sense of scale, Kenya only had 8.4 million active bank accounts within the domestic system at this time.

[14] Bank of England (2021), Group of central banks (2020), ECB (2020). Note however, that some user may avoid using CBDC for privacy reasons as well, as they may fear central bank knowledge of transactions [see: BIS(2021a)].

[15] Bull et al. (2021) doubt CBDCs offer gains to financial inclusion in terms of access to financial services, efficiency of payments and lower cost.

[16] Group of central banks (2020).

[17] Committee on Payments and Market Infrastructures and World Bank Group (2020)

[18] As an example, almost 75% of point-of-sale transactions in the Eurozone take place in cash, amounting to almost 50% of transaction values. In France, only 60% of transactions take place in cash, for a total value of 25% only. See ECB(2020a) for details.

[19] Bank of England (2021)

[20] Sveriges Riksbank (2018)

[21] Bindseil (2020) and Sveriges Riksbank (2017)

limited. Whether this limited holding of CBDCs can be sufficient to anchor trust in the sovereign currency remains to be seen.

- **Resilience of payment markets.**

  Resilience of payment markets may be weakened upon a declining role of cash because remaining payment systems (1) are private in nature, as opposed to public cash; (2) are subject to network effects, hence concentration is likely to lead to a small number of operators which may achieve market dominance; and (3) may be foreign-based, introducing exposure to political risks and risks to the ability of enforcing local law and policy. Private payment suppliers may not have sufficient incentives to prepare for contingencies, suggesting that non-negligible regulatory intervention may be necessary to mitigate broader financial stability concerns. At the same time, legislators and supervisors may struggle in subjecting monopolistic, foreign-based providers to local regulations which aim at preparing for such contingencies.[22]

  Currently, cash is an important alternative to private electronic payment products, at least for offline point-of-sale transactions. Upon further decline in its use, cash may however lose its potential as a contingency solution as only electronic payments may remain available as a means of payment. This may negatively impact the resilience of the payment sector. As a public alternative, retail CBDCs may offer the contingency option that cash has so far assumed. The digital nature of CBDCs enable them to be a contingency in e-commerce as well (a role cash cannot play today). Upon the possibility to use CBDC in an offline modus, it could to a certain extent also be used upon large scale electricity and IT outages at points-of-sale.[23]

  However, due to their digital nature, CBDCs themselves may also be subject to cybersecurity and other digital risks that equally apply to private payment systems.[24] Upon materialising, these risks may negatively impact the availability of and trust in public money, the safeguarding of which is one of the reasons of issuing a CBDC.[25] It remains to be seen whether CBDCs can be built with sufficient safeguards to minimise these risks. As to private payment systems, even though these are subject to concentration tendencies, these may encompass payment systems through banking systems, non-banks or stablecoins. Depending upon design choices, it may well be that upon unavailability of one of these, other private schemes remain available. However, given the possible lack of interoperability between those, this is likely to result in a limited availability of services.

- **Efficiency and competition in payment markets.** Network effects in private payment markets are likely to lead to significant consolidation, with a small number of providers prevailing. Such an environment may foster various adverse outcomes for the payments sector including constraints on future productivity growth and innovation, reduced choice for consumers, and potentially inflated transaction costs in the medium-long term. There is a significant risk that these providers may reach market dominance and that this dominance is not-contestable.[26] The reasons therefore include lock-in effects and high barriers to enter the market, given first-movers profit from a large user base and may control access to essential infrastructure. Data may also play an important role in cementing market dominance, as data generated through the use of such services offers essential insights on how best to optimise essential workflows, hence shoring up the competitive advantage experienced by early and successful movers.[27] New entrants have access to neither this data nor to the user base. Also, data may be a means to transfer market power from adjacent markets such as social networks or selling platforms to payment markets.[28] In the absence of cash as an disciplining factor, an oligopolistic organisation of payment markets may lead to suboptimal welfare effects through high prices and reduced innovation.[29] Market abuse may also take the form of inappropriate use of users'

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[22] Lagarde (2020) and Sveriges Riksbank (2017)
[23] Bank of England (2020)
[24] G7 Working Group on stablecoins (2019)
[25] Group of central banks (2020) points to potentially higher cyber risk for CBDCs as the number of endpoints will be significantly larger than in current wholesale central bank systems.
[26] Lagarde (2020) and Kiff (2020)
[27] The recent expansion in uptake of machine learning and artificial intelligence methodologies has further exacerbated this phenomenon, as these approaches are well-equipped to process and utilise data of this nature. Defina (2021a) presents an overview of these methods and relevant applications from the perspective of the deposit insurer.
[28] This phenomenon is not constrained to payment markets, but common to many digital and data-driven branches of the economy. For an introduction, see Van Roosebeke et al. (2016).
[29] Sveriges Riksbank (2017) and (2018)

data. CBDCs may offer a public alternative to these oligopolies by creating an open and level-playing field-like platform for payment services. [30] Unlike analogue cash, digital CBDC could offer this advantage also in the digital sphere.

However likely oligopolistic tendencies in payment markets may be, CBDCs may not be the only answer. Instead, there is a complex policy question as to how to react to this challenge. In advanced economies, the classical answer to these problems is one of competition law, antitrust law and regulation.[31] These public interventions ideally aim at safeguarding the process of competition in private markets. Issuing a CBDC sidesteps these possibilities by public sector action beyond competition: no private actor can offer a risk-free asset in the way the central bank can. Intervening through such direct public activity and justifying this with competition issues may be counterproductive if arguments against less intrusive action are not brought forward. Usher et al. (2021) refer to a number of problems in applying traditional competition law concepts to network-like problems. In conclusion, they claim a retail CBDC "could be a simpler competition policy tool because it would provide an alternative low-cost payment instrument". This is not entirely convincing for at least three reasons.

- First, it is true that competition law has been struggling, especially with finding market dominance in complex two-sided markets. However, recent changes in modern competition law may help accommodating this stand-still.[32] Also, the decisive role of data is increasingly picked up in competition law as a means of transferring market power, be it through existing (essential facility doctrine) or new approaches.[33] Competition-law based access to data or data portability rights for users are increasingly realistic.
- Secondly, regulation of presumably market-dominant players remains a possibility. This may encompass price regulation (e.g. the multilateral interchange fees regulation in the EU[34]) or access-rights related behaviour regulation (e.g. the proposed Digital Market Act in the EU entailing a set of rules on non-discriminatory behaviour by core platform service providers with a gatekeeper function[35]).
- Thirdly, from a competition point of view, CBDCs may well "provide an alternative low-cost payment instrument"[36], but this is likely to come at another cost. In each intervention, competition law typically aims at safeguarding innovation incentives by respecting intellectual property and the efforts of dominant actors. For this reason, intervention typically takes place upon abuse of market dominance only. Whether or not such abuse of market dominance will take place in payment markets is unknown today. Issuing CBDCs irrespective of the presence of abusive behaviour, risks curtailing innovation, which does come at a cost. Hence, from a competition point of view, upon intervening, CBDCs should be designed such that they respect the intellectual achievements of payment service suppliers as much as possible. This is easier said than done, as CBDCs are not just another supplier. They own the monopoly of direct and final settlement in central bank money. Any pricing of CBDC-based payment services enabled by the central bank should consider this decisive advantage in order to minimise distortions in competition.

2.2.4 Monetary and economic sovereignty

Given the previously mentioned oligopolistic tendencies in payment markets, and cash playing a less significant role, many jurisdictions risk being systemically dependent on foreign-based, dominant payment providers in the future. As such, the enforcement of sound regulation, oversight and operational resilience measures may not always be effective. As a policy answer to safeguard resilient and efficient payment markets, jurisdictions may support the establishment of

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[30] BIS (2021)

[31] Soursourian & Plaitakis (2019) offer insights on potential policy measures to strengthen effective and potential competition in the digital payments sector, focussing on market entry, a level playing field and transparency.

[32] See European Commission (2021) or the 2021 changes to the German Competition Act (GWB) introducing – in addition to dominant undertakings – a new concept of "undertakings of paramount significance for competition across markets" against which competition authorities may act.

[33] Van Roosebeke (2020), Schweitzer & Welker (2020) and European Commission (2021)

[34] Regulation (EU) 2015/751 of the European Parliament and of the Council of 29 April 2015 on interchange fees for card-based payment transactions

[35] See the Proposal for a Regulation of the European Parliament and of the Council on contestable and fair markets in the digital sector (Digital Markets Act); COM/2020/842 final, 15 December 2020

[36] Usher et al (2021)

private payment products based within their jurisdiction to dissuade the public from using alternative payment services[37]; and/or may consider issuing CBDCs as a public alternative.[38]

The prospect of a significant share of the public using payment products which are not denominated in the sovereign currency or show only weak links to this currency is the most convincing reason for the development of a CBDC.[39] This risk of "digital dollarisation" may be especially large for small and open economies, even though their currencies may be stable.[40] This may concern private payment products, whose issuers would compete with the monetary sovereignty as issuers; managers of a globally accepted private currency[41] (which may be backed by one or by a basket of sovereign currencies); and non-domestic public currencies (e.g. a CBDC issued by a third country). Note that the latter in its turn may have formed a jurisdiction's response to the dominant role of a private payment supplier.[42]

Wide-spread use by the public of other currencies and/or payment products therein threatens monetary sovereignty and central banks' ability to safeguard financial stability and price stability for a number of reasons.

- The central bank has no or little power to influence the value of the digital private or non-domestic public currencies which are used by a large share of the population and which influence purchasing power;
- Monetary policy tools (e.g. overnight interest rates) refer to the sovereign currency only and may thus lose relevance for a significant share of the economy;
- Central bank activities as lender of last resort (e.g. in bail-ins) must take place in the sovereign currency, as the central bank is the monopolist issuer of that currency. Yet, the relevance of that currency to the actors subject to this action may have diminished.

In the end, digitalisation and the decline of cash increase the risk that a currency other than the one issued by the central bank will play a decisive role in a jurisdiction's economy. This may relate to a privately issued currency (e.g. a stablecoin profiting from enormous network effects, as it is globally trusted and used); but also to a retail CBDC issued by a foreign central bank. In these cases of "digital dollarisation", a central bank loses demand for its own currency and is at risk of no longer being able to steer price stability nor financial stability. By introducing a CBDC, the central bank may offer a public alternative in domestic currency that is easily usable. Sufficient domestic demand for this CBDC is however key to its success; but this not guaranteed as consumers may find the use of private currencies more attractive.

[37] Group of central banks (2020)
[38] The European Union is a good example of this dual strategy. Besides work on a CBDC, public support is vocal for the European Payment Initiative, a bank-based pan-European ease-to-use fast payment initiative.
[39] Lagarde (2020)
[40] Brunnermeier et al (2019)
[41] Villeroy de Galhau (2020)
[42] Bank of Canada (2020)

3 Case studies

The exploration of CBDCs globally is occurring at different speeds. While some jurisdictions have demonstrated significant activities, others seem less convinced about future CBDC prospects. The Appendix offers informative context through a non-exhaustive overview of activities among some of the best-publicised initiatives, although it is noted that the area is highly transient at this time.

The Bahamas

The Central Bank of The Bahamas was first to officially launch a CBDC (the "Sand Dollar"), in October 2020, making it available to the general public. This involved implementation of a new digital payments system infrastructure. The motivation was largely oriented around financial inclusion and reducing transaction costs: "To advance more inclusive access to regulated payments and other financial services for under-serviced communities and socio-economic groups; as well as to reduce service delivery costs and increase transactional efficiency for financial services across The Bahamas."[43]

Nigeria

On 25 October 2021, Nigeria launched the eNaira. This CDBD is available to general public and is based on the blockchain technology. Its main policy aim is to facility and lower the costs of payments and promote financial inclusion. Use of the eNaira requires the use of an app or alternatively the use of USSD-codes and requires users to run through an identification process. eNaira can also be utilised by users without commercial bank account. Depending on whether a bank account is available and on the degree of identification, different limits regarding daily transactions or cumulative holdings may apply. The highest limits for retail users amount to approx. 1.200 USD (daily transactions) and 12.000 USD (in holdings).[44]

Eurozone

On 14 July 2021, the European Central Bank (ECB) launched the investigation phase for the digital Euro project. A formal decision on the issuance of a CBDC has not yet been taken. In a two-year phase, design and distribution issues will be investigated to ensure ease of use but at the same time avoid negative implications for financial stability and monetary policy. The ECB will define a "business model for supervised intermediaries within the digital euro ecosystem" and will incorporate views of the private payment industry. No decision has been taken regarding the use of blockchain or fast payment systems (TIPS, Target Instant Payment Settlement) within a potential digital Euro.[45]

People's Republic of China

The People's Bank of China (PBC) has been exploring the use of digital currencies for a number of years now. This commenced in 2014 with research into a "Digital Currency/Electronic Payment". In April 2020, a pilot program on the electronic Chinese yuan (e-CNY) was launched in four cities. As of November 2020, Shanghai as well as five other major cities and regions joined in the pilot. As of June 2021, more than 24 million wallets have been opened, and more than 70 million transactions were executed, of a total value of RMB 34.5 billion (roughly USD 5.3 billion). The PBC has adopted a "two-tier operational system", with the PBC issuing e-CNY to authorised commercial banks. These and "other commercial institutions exchange and circulate e-CNY to the public". [46] The PBC will continue its pilot, though a timetable for the final launch of the e-CNY is not yet available.

The PBC stresses three main reasons for developing its CBDC:

- Ensuring public access to central bank money – given the decline of cash – and supporting financial inclusion,
- Supporting fair competition, efficiency and safety of retail payment services; where the e-CNY is seen to complement existing electronic payment services,

[43] https://www.sanddollar.bs/faqs/why-does-the-central-bank-of-the-bahamas-think-we-need-this
[44] Information as of 24 November 2021, as made available by the Bank of Nigeria at https://www.enaira.gov.ng/about/faq and https://www.cbn.gov.ng/Out/2021/CCD/eNaira%20Launch%20Press%20release%20%20231021.pdf.
[45] ECB (2021)
[46] People's Bank of China (2021)

- Echoing international initiatives and improving cross-border payments through pilot cross-border payment programs that are "preconditioned on mutual respect to monetary sovereignty and compliance".[47]

Russian Federation

The Bank of Russia conducted a public consultation in 2020 for potential development of a digital ruble.[48] A selection of key considerations included:

- The Russian payments system must remain seamless, with all forms of ruble able to be easily converted into one another.
- A requirement to create additional payment infrastructure, which will foster the further development of the Russian payment system and increase its stability.
- An assessment of various models and technologies concerning their capability to provide all the necessary features of a digital ruble for households and businesses, as well as from an information security standpoint.
- Assessing the potential impact introducing a digital ruble will have on Bank of Russia price and financial stability considerations.

After the consultation period ended, in April 2021, the Bank of Russia presented a design concept. This was based on feedback received from respondents and market participants to the consultation paper. The chosen retail CBDC model consists of two-tiers, with the Bank of Russia opening wallets for financial institutions and the latter doing so for retail users.[49] Next steps include development of a prototype digital ruble platform by December 2021, followed by the launch of prototype test in Q1 2022.

Sweden

Driven by a significant decline in the use of cash that mainly has been substituted by the use of private payment systems (esp. Swish), Sveriges Riksbank initiated its work on a retail CBDC (the "eKrona") in 2017. The Riksbank has published two public reports on the eKrona. It set out in detail why it is considering issuing a CBDC, how that may be designed and which role in the payment markets the central bank may play. In 2020, the Riksbank ran a pilot-test with an eKrona designed as token-based in a distributed network based on blockchain technology and in a two-tier environment, with the Riksbank issuing eKrona to financial institutions and these further distribution to users.[50] In 2021, the Riksbank continued technical and design testing and will "start the work of preparing for a possible procurement of an issuable e-krona".[51] No formal decision to issue an eKrona has been taken yet.

United States of America

The Federal Reserve (FED) has a mandate to promote monetary and financial stability and the safety and efficiency of the nation's payment system. The Fed's approach to CBDCs is summarised by the following public statement.

To date, no decision has been made on whether to issue a CBDC in the U.S. payment system. However, given the dollar's important role globally, it is essential that the Federal Reserve remains fully engaged in CBDC research and policy development. The Federal Reserve System is focused on better understanding the underlying technologies and their potentials, as well as policy issues associated with a CBDC. In addition to projects underway at the Board and the Federal Reserve Bank of Boston, the Federal Reserve is collaborating internationally in groups such as the Bank for International Settlements' CBDC coalition.[52]

Governor Christopher Waller indicated that the Federal Reserve would publish[53] a discussion paper on the benefits and costs of creating a CBDC. In his opinion, he is "not convinced as of yet that a CBDC would solve any existing problem that is not being addressed more promptly and efficiently by other initiatives", and stated that CBDCs are "a solution in search of a problem".[54]

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[47] Ibid.
[48] This consultation period was run throughout Q4 2020. See Bank of Russia (2020) for the full public consultation paper.
[49] Bank of Russia (2021)
[50] Sveriges Riksbank (2020)
[51] https://www.riksbank.se/en-gb/payments--cash/e-krona/
[52] Powell (2021)
[53] Precise timing of this paper release is not publicly known.
[54] Waller (2021)

Uruguay

The Central Bank of Uruguay flagged financial inclusion objectives as playing a key role in motivating its 2017 e-Peso pilot programme.[55] Individual users and businesses, via electronic wallets, could hold a maximum of 30,000 e-Pesos (roughly USD 1,000) and 200,000 ePesos respectively. Total issuance was capped at 20 million e-Pesos. Transfers took place instantly and peer-to-peer, via mobile phones using either text messages or the e-Peso app. The 6-month pilot programme facilitated instantaneous settlement (not requiring an internet connection, just a mobile phone line), anonymity in transactions (while remaining traceable to enable oversight), effective encryption of use data, backups that ensured funds in a phone would not get lost[56] and security features to mitigate against risks of fraudulent activities and falsification.[57] This CBDC initiative was deemed a success and may lay the foundation for broader-based adoption of a similar model in the future.

[55] Barontini & Holden (2019)
[56] e-Pesos were secured and encrypted via the Global E-note Manager (GEM) platform which mitigated against the risk of a user losing their phone or forgetting the password of their digital wallet.
[57] See Licandro (2018) for further details. Sarmiento (2021) also offers an updated set of perspectives on lessons learnt.

Appendix: Jurisdictions Where Retail CBDC Are Being Explored

TABLE: Jurisdictions Where Retail CBDC Are Being Explored[58]	
Where central banks are in the advanced stages of retail CBDC exploration	
Bahamas	Sweden (proof of concept started)
Nigeria	Ukraine (pilot completed)
China (pilot launched)	Uruguay (pilot completed)
Eastern Caribbean (pilot launched)	Jamaica (pilot launched)
Where central banks have explored or are exploring issuing retail CBDC	
Australia	Japan
Brazil	Korea (proof of concept started)
Canada	Mauritius
Chile	Mexico
Chinese Taipei	Morocco
Curaçao en Sint Maarten	New Zealand
Denmark	Norway
Ecuador (completed pilot and project discontinued)	Russia
Euro area	Singapore
Finland	Switzerland
Ghana	Trinidad and Tobago
Hong Kong SAR	Tunisia
Iceland	Turkey
India	United Kingdom
Indonesia	United States
Israel	
Where central banks have explored or are exploring issuing retail CBDC (unconfirmed)	
Bahrain	*Pakistan*
Egypt	*Palestine*
Haiti	*Peru*
Iran	*Philippines*
Kazakhstan	*Rwanda*
Lebanon	
Sources: Central banks or various news sources. *Italicised* entries are sourced from news articles. Information has not been verified through official channels.	

[58] Information is sourced from Kiff et. al. (2020) which is nominally dated as of 27 May 2020. The table has been extended with some more recent additions by this paper's authors.

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