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Could Uncapped and Unremunerated Retail CBDC Accounts Disintermediate Banks?

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Abstract

One of the challenges of issuing a central bank digital currency (CBDC) is its potential to disintermediate banks through deposit substitution. To avoid this outcome, much of the research on CBDC is focused on whether and what limits to set on CBDC holdings, and if CBDC accounts should be paid interest. But the issuance of CBDC can also generate significant fiscal revenue through central bank balance sheet expansion if they are funded by unremunerated CBDC liabilities. This can lead to a criticism of central bank policies and can potentially compromise its independence. Taking the view that a significant share of unremunerated bank demand deposits can migrate to retail CBDC account if there are no restrictions on the holding amounts, this paper raises and provides some indicative answers to a number of policy questions that arise in this setup. These include the following: Will the commercial bank's money creation process get disrupted? How will it impact the efficient transmission of monetary policy? What role can central banks play to ensure that the demand for credit in the economy is met at reasonable price terms? Will non-bank actors be able to offer better terms and conditions for loans than banks in the changed intermediation landscape brought about by CBDC? What levers will central banks have to control non-bank actors so that they do not amplify procyclical lending behaviour? Will the remit of central banks need to broaden in scope and reach? We will explore the options and alternatives that might emerge while highlighting what the challenges might be.

Keywords: Central banks, digital currency, financial stability, monetary policy, bank intermediation, non-banks, collateral.

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1. Introduction

Transforming savings and demand deposits into illiquid, risky and long-term loans to support a variety of investment and entrepreneurial activities to create jobs and spur economic growth is the main function of banks. To help banks fulfil this role, central banks provide liquidity support against good collateral and require banks by law to participate in a collective deposit insurance scheme to which the government provides liquidity backstop. Banks are also subject to stringent oversight and regulation to build trust and reassure the public that their deposit claims on banks are safe. The safety feature is fundamental in ensuring that banks will be the preferred intermediaries to receive our wages through electronic transfers into our individual bank accounts.

The electronic money that sits in bank accounts is referred to as commercial bank money. That is because the claim to our money remains in the custody of banks, and it is their liability. Receiving our wages in commercial bank money has become the accepted practice. But this practice is a recent phenomenon. I recall that when I took up my first paid employment in India four decades back, I received my wages in central bank money. That is the company I worked for handed out to me an envelope with cash for the services I rendered. Little did I or any of my colleagues know that we were being paid in central bank money rather than in commercial bank money. That is likely to be the case even today as the awareness of this distinction is known only to a few in the society who by choice or accident chose to study economics. I can well imagine that if I continue to remain in employment during the next decade, I may again receive my wages in central bank money. But this time instead of an envelope filled with cash, my central bank digital currency (CBDC) account held at a commercial bank might get directly credited.

The distinction between the two forms of money has come under greater focus now. It is being debated among economists and is discussed in the mainstream media. But the debate tends to be more focused around the decline of cash and the emergence of a new form of central bank money – the central bank digital currency. Just as cash is a direct claim on the central bank, a CBDC is also a direct claim on the central bank. It is natural to ask the question why this debate is important. That is if central banks have been issuing forms of money in the past that is a direct claim on them, what changes would occur if physical cash is replaced by digital cash? One obvious answer to that question is that instead of carrying one or several briefcases of cash to buy a car or an apartment, we only need to carry with us a plastic card or our mobile phone to conduct this transaction. As all of us know, it is both inconvenient and risky to do the transaction using cash whereas the digital means of settling the transaction is convenient, has less risk of theft and more efficient.

If we go by the above reasoning, introducing an instrument that is a digital claim on a central bank instead of physical cash sounds as a no brainer for a good innovation. So, what are the central banks waiting for? That could be, for example, deciding on both the appropriate design features of a CBDC as well as on the agent who will be responsible for managing them. But it could be also that central banks must assess the implications of a shift in public preference to settle their claims in central bank money rather than commercial bank money, which would require them to hold a greater portion of their savings in the former. And what those shifts would mean for a bank's role as an agent that performs liquidity and maturity transformation of demand deposits into loans for long-term investment projects to support economic growth. Finally, assessing if these changes might create challenges for safeguarding monetary and financial stability is also important. These key policy questions are raised and discussed in this paper.

The rest of this paper is structured as follows. Section 2 provides a brief discussion of the use cases for CBDCs with a focus on retail rather than wholesale CBDCs. Building on the existing two-tier structure of account-based financial system, Section 3 discusses why and by how much commercial banks' deposit liabilities could potentially shrink with the introduction of uncapped retail CBDC. That can bring about a profound change in the bank intermediated credit creation we are accustomed to, which central banks oversee and control through regulation and banking supervision. If bank credit becomes expensive and non-banks step in to offer competitive credit terms, commercial banks could well get disintermediated. These issues are discussed in Section 4. In Section 5, the implications of this change for the implementation of monetary policy and safeguarding financial stability are explored. The final section concludes.

2. The use cases for CBDCs

There are none. That is the conclusion Chris Waller, a member of the Board of Governors at the Federal Reserve System, came to after examining the merits of various arguments that have been circulating to justify the introduction of a CBDC (Waller, 2021). In a crisp summary, he states that the CBDC is a solution in search of a problem. A similar reservation was also raised in a report published by the UK House of Lords (House of Lords, 2022). Chris Waller's underpinning argument is that the congressionally mandated division of functions between the Federal Reserve and commercial banks is based on the understanding that the government should compete with the private sector only to address market failures. There are no specific market failures that have been identified that a CBDC is meant to address. If we take this argument at the face value of it, there is no use case for CBDCs.

But why then are central banks around the world spending considerable time and effort on the design features and operational arrangements for introducing retail CBDCs? Indeed, a CBDC survey conducted by the BIS covering 86 central banks in 2022 suggests that 9 out of 10 central banks are now exploring the introduction of CBDC with nearly half of them developing or running concrete experiments (Kosse and Mattei, 2023). In a recent Staff Report, the IMF has noted that the growing interest in CBDC is truly global (IMF, 2023). A persuasive argument in policy circles for introducing CBDC appear to be to reinforce the trust in the account-based monetary system at a time when technological changes are opening the door for a shift away from this. The defining moment came in 2019 when the Libra stablecoin project was revealed by Facebook, now Meta, backed by a basket of fiat currencies. Central banks worried that Libra had the potential to reshape cross-border remittances and international commerce undermining the monetary architecture that central banks had carefully built and safeguarded.

It could well be that this is the problem that central banks have identified, and CBDC is seen as a solution to this problem. But the solution does not have to be complex as complexity introduces its own sets of problems. A simple solution to the identified problem would be to agree on a globally coordinated legislation to prohibit the use of stablecoins or cryptocurrencies in cross-border payments and in e-commerce transactions. Domestic regulation on top of this can further mitigate any residual risks to the financial system from a proliferation of payment instruments. But central banks do not want to be seen as the showstopper to financial innovation where millennials tend to shape the narrative on social media.

As newer forms of instruments to settle payments are being contemplated and manufactured by the private sector, central banks worry that their monetary sovereignty can be undermined, and with that, their ability to control the macroeconomic outcomes. Equally important are financial stability concerns because actors that introduce private sector alternatives to sovereign fiat currency are not accountable for promoting stability of the financial system. As the use of mobile apps and digital payments become more entrenched in the daily lives of

citizens, central banks feel compelled to enter this race to offer a digital version of the cash in circulation. To do this, central banks must convince their governments and the public they serve of the intended use cases and justification for the introduction of CBDC. The use cases that are commonly cited and communicated by central banks are discussed below.

The money we hold in the accounts at a commercial bank is electronic money. The promise that this electronic money can be converted into cash denominated in the domestic currency pegs commercial bank money to central bank money. As we move closer towards a cashless society, one argument put forth is that a CBDC will be a credible way to reassure the public that the ability to convert from commercial bank money to central bank money has not been disrupted. In the absence of this conversion mechanism, one school of thought is that other forms of money that compete with a central bank's unit of account will appear.

A second argument often cited for the use case of CBDC is its ability to foster financial inclusion by enabling the unbanked population to access financial services (G7, 2021). Because financial inclusion is the gateway to increased prosperity, associating CBDC to financial inclusion is often a good selling point (Rummel, 2022). Yet, if a retail CBDC design relies on the traditional account-based monetary system, the CBDC cannot be accessed by the unbanked population. For them, the lack of a verifiable personal identification is a major hurdle to open a bank account. Moreover, financial literacy is usually a precondition for financial inclusion, and a CBDC cannot directly address the former. Also, for a CBDC to increase financial inclusion, it must address the causes of exclusion, which vary by jurisdiction and are often complex. The use case of CBDC as an enabler of financial inclusion can therefore be contested.

A third argument is that a retail CBDC will help create the infrastructure needed to facilitate a shift towards the use of wholesale CBDCs for settling large value payments including those involving cross-border transactions.[2] However, making that connection can restrict the design choices for a retail CBDC. For example, the wholesale CBDC could be designed using token-based technology paying no interest whereas the retail CBDC might use an account-based design paying interest on the holdings. If retail and wholesale CBDCs have to be fungible, both will have to share the same design features. If this is not the case, two different forms of money that are direct claims on the central bank will have to be introduced requiring different settlement protocols.

Finally, another use case cited is that a retail CBDC can improve the efficiency and reduce the cost of cross-border remittances. To the extent that a large share of remittances come from advanced economies, the benefit of this use case is dependent on many of these countries agreeing to introduce a retail CBDC. Moreover, the 2020 G20 initiative has a focused mandate on improving the efficiency and lowering the costs of cross-border payments in fiat currencies (FSB, 2023). Reflecting this need, building infrastructure for cross-border connectivity for payments in the ASEAN region is now a key priority (Bank Negara Malaysia, 2023). But this project is not reliant on having retail CBDCs to achieve its objectives.

The use cases identified above do not persuasively argue for the need to introduce a retail CBDC. But the central bank may want to reassure the public that as use of physical cash for daily transactions is on the decline, there will be a digital version of it for those who want to hold it. It is also to ensure that there will be a competing and trustworthy form of a digital money to other forms of private money that the public will have access to. This is the use case central

[2] Wholesale CBDC, unlike retail CBDC, are only used in transactions between financial institutions. Such wholesale operations of the monetary system are today highly efficient and are settled through the real-time gross settlement system.

banks can sell to the elected representatives of the government to get the mandate to introduce a retail CBDC.

3. Changes to commercial bank deposit funding

The introduction of a CBDC requires careful design choices across multiple dimensions. They include, among others, the following: level of anonymity of CBDC transactions; architecture for administering CBDCs; ensuring interoperability in the existing retail payment ecosystem; applicable interest rate on CBDC holdings; and caps if any on the holdings. These choices can have profound influence on the broader acceptance of CBDC among households and businesses, and consequently, on how this might affect the deposit base of commercial banks. By making some assumptions on what these choices could be, its implications for potential changes to commercial bank deposit liabilities are discussed below.

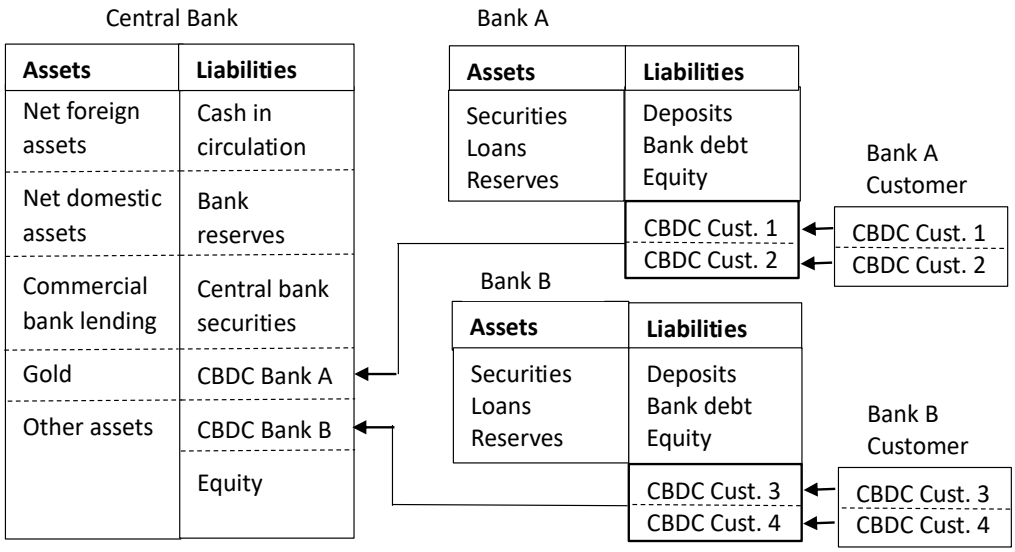
Ensuring the CBDC shares the same level of anonymity as cash when making payments is often a preferred design feature in several advanced economies.[3] That is because most central bank CBDC projects are marketed to their constituencies as complementing cash rather than replacing it, and they envisage a strong role for intermediaries. Taking this feature into consideration is likely to restrict CBDC to be designed using the token-based system employing a distributed ledger. A general feature of the token-based design is that it relies on the identification of the object being transferred as a means of payment rather than relying on identification of the individual whose account is being debited. Since transferring CBDC in the form of electronic tokens between two parties requires third-party involvement, this can result in high costs and slow speed of transactions relative to cash (Khan et al., 2018). Central banks, therefore, tend to favour a two-tier account based CBDC administration where an intermediary holds accounts for retail customers, which then is reflected as a consolidated claim on the central bank. This architecture is referred to as the intermediated CBDC design, the claim structure for which is shown in Figure 1 (Auer et al., 2022). In this paper we will assume that this is the preferred architecture for retail CBDCs that central banks will adopt.

It is important to emphasise here that an intermediated CBDC design does not ensure complete anonymity of transactions. This is because the central bank will have to maintain for each bank a register of individual CBDC accounts and the outstanding amounts in them because these accounts will have to be ported to another bank if the first one fails or is being resolved. But this could be done through a third-party service provider. Anti-money laundering and countering financing of terrorism (AML/CFT) compliance requirements will also require some form of tracing of the CBDC transfers and payments. Any e-money payment can never fully replicate the anonymity of cash transactions.

Advancements in payments technology and the adoption of ISO 20022 standards in many countries have ensured that interoperability across different forms of money and its acceptance across different payment interfaces will not pose any technical challenges. Furthermore, payment service providers are well equipped to handle transactions involving the traditional two-tiered account-based system that an intermediated CBDC design will offer. Ensuring interoperability of retail CBDCs across payment platforms is, therefore, the least of the concerns for a central bank.

[3] The obsession on ensuring anonymity of transactions involving digital cash is largely a western phobia. If we take the view that cash transactions are on the decline and the public is accepting this shift (at least among the younger population), every payment we make is not anonymous. In an era where the social media rules our daily lives and there is great desire to tell the world what we are doing every minute, the emphasis on anonymity of payments using retail CBDC is an oxymoron.

Figure 1
Intermediated CBDC architecture



The decisions as to whether CBDC holdings should receive an interest income as well as the applicable caps on the holdings if any, are the most important ones a central bank must take (Burlon et al., 2022). These choices will determine if there is a broader acceptance among households and businesses to adopt retail CBDC as a medium of exchange for their daily transactions. Because depositor insurance transforms, in principle, commercial bank money to central bank money for guaranteed bank deposits, the incentive to shift money in bank deposits to retail CBDC accounts will arise only if both accounts offer comparable level of interest rates. If retail CBDC accounts pay no interest, households may have less incentive to switch out of money held in commercial bank accounts. Small business enterprises (SMEs) and non-financial corporates (NFCs), on the other hand, will have a greater incentive to switch as they tend to maintain large balances in current (checking) account bank deposits that pay little or no interest. Moreover, these deposits will not fall under eligible bank liabilities that receive depositor protection.

The shift of SME and NFC commercial bank deposits to CBDC accounts, however, is possible only if there are no caps on the retail CBDC holdings for both household and business customers. If this is not the case, retail CBDC will remain a sandbox experiment with little or no appetite for customers to shift from commercial bank to central bank money. Implicitly, this means that enforcing a cap on CBDC holdings will ensure that large shifts out of bank deposits to central bank money cannot happen even in crisis times. Consequently, it will reduce the scope for systemic risks to materialise through flight of bank deposits to CBDC accounts.

Yet, imposing a ceiling on individual holdings of CBDC can limit the number or size of payments, as the recipients' holdings of CBDC would have to be known in order to finalise the payment (Panetta, 2018). The risk that payments would be rejected for a reason not known to the payer in advance would imply a major friction undermining the efficiency of payments. Imposing a cap on CBDC holdings will essentially relegate retail CBDC accounts to that of a pre-paid debit card function that is used for small value payments. Even this use case will have few takers as this functionality will be disintermediated by debit and credit card issuers by

offering rewards to customers for using private money for payments. A central bank cannot offer rewards for spending from CBDC accounts. To avoid this outcome of remaining in the sandbox, we will assume that there will be no caps on CBDC holdings, but CBDC accounts pay no interest income.

Theoretical models discussed in the literature to assess how interest on CBDC accounts could affect the size of bank deposits tend to treat both forms of money as substitutes (Andolfatto, 2021; Chui et al., 2019; Garratt and Zhu, 2021). Without factoring in investor preferences and deposit insurance, such models will lead to the result that the account which offers lower interest rate will receive zero inflows. In practice, bank balance sheet composition (asset and liability side) is quite complex with multiple funding instruments and asset holdings, which banks manage actively. When bank regulation and deposit insurance claims are factored in, it will be hard to predict how much of bank liabilities will shift to CBDC accounts even in equilibrium.

In a different setup using a model of monetary economy with a wide range of monetary and other frictions, Brunnermeier and Niepelt (2019) ask a related question: “Would a substitution of CBDC for bank deposits change the equilibrium allocations?”. Assuming that CBDC has the same liquidity properties as deposits, they find that an appropriate open-market operation and a corresponding central bank pass-through policy would not change the equilibrium allocation. This leads them to conclude that substitution of deposit funding with central bank funding will not trigger financial stability risks. Yet, the Silicon Valley Bank failure showed that a run on bank deposits can arise when depositors worry about the valuation of assets held on amortised cost basis. This in turn, can create large funding gaps and financial stability risks due to lack of adequate collateral to borrow from the central bank on a market value basis. Theoretical model results, therefore, need to be treated with caution.

Stepping into real world outcomes, the premise of this paper is that even if CBDC accounts pay no interest, not enforcing a cap on the CBDC holdings can still lead to significant shifts from commercial bank to central bank money by SMEs and NFCs. This is more so the case when businesses have the option to pay for salaries and other services in the form of central bank money. It is useful to note here that shifting money from commercial bank deposits to retail CBDC accounts will be operationally similar to moving funds from current to savings accounts. But the consequences of the shift in the former case will have material implications for bank funding and credit allocation. This will be discussed in the next section.

A critical question for policy is how big the shift from commercial to central bank money can be if uncapped and zero interest paying retail CBDC is introduced. To provide an indicative answer to that question, we need some statistics on unremunerated checking or current account deposits in the banking system. In the euro system, as of March 2023 the share of overnight and unremunerated deposits of households were about 60 percent whereas for non-financial corporates it was about 80 percent (see Box 4 in ECB, 2023). The deposits from households and non-financial corporations account for around 71 percent of the total deposits and 54 percent of the total liabilities of euro area banks. If these figures are also representative of the share of unremunerated deposits of other customers, it is quite conceivable that about 30 percent of commercial bank total deposit liabilities can shift to CBDC accounts.[4] The

[4] This estimate is much higher than the figure of 65 percent of quarterly euro area GDP predicted by Burlon et al. (2022) for uncapped and unremunerated CBDC design based on a theoretical model, which is about 13 percent of commercial bank deposits liabilities. But set against the backdrop of cash in circulation, which few hold but is still about 8 percent of commercial bank deposit liabilities, the estimate of 30 percent of commercial bank deposit liabilities shifting to digital cash holdings (CBDC) seems not large.

justification for this estimate comes from the prediction (52 percent) for household demand for CBDC with deposit-like features paying no interest (Li, 2021). This empirical estimate is based on a logit demand model for allocation between cash and demand deposits of households employing survey data.

For developing economies (DEs) the figure could be somewhat lower as DE households tend to rely more on interest income from bank deposits as a source of revenue. But it is difficult to find detailed breakdown of various types of deposits at the aggregate level, with information on whether they are interest bearing or not, in many jurisdictions. One exception is the data published by the National Bank of Moldova, which gives a detailed breakdown of unremunerated deposits in the banking system of the Republic of Moldova. This rich data set provides some insight on the relative share of various deposits in a small country context, which also include foreign currency deposits (Table 1). These figures shows that about 40 percent of total bank deposit liabilities are unremunerated. If one-half of these liabilities shift to CBDC, CBDC accounts will attract about 20 percent of current commercial bank deposit funding.

Table 1

The structure of deposits of the banking sector, September 2023

Indicators	**Breakdown of total deposits of banks at end of reporting month, in**	
	in local currency	in foreign
Non-interest bearing sight	**19,454,001,589**	**18,982,127,695**
Deposits of individuals	6,548,730,908	9,203,636,196
Deposits of legal entities and	12,905,270,681	9,778,491,499
Deposits of banks	16,373,677	83,150,673
Interest bearing sight deposits	**17,724,779,644**	**4,321,811,641**
Deposits of individuals	9,629,935,668	1,231,736,990
Deposits of legal entities and	8,094,843,976	3,090,074,650
Deposits of banks	2,358,451	0
Non-interest bearing – term	**101,382,038**	**277,155,377**
Deposits of individuals	24,280,235	86,011,145
Deposits of legal entities and	77,101,803	191,144,232
Deposits of banks	0	0
Interest bearing term deposits	**29,093,352,295**	**16,017,723,415**
Deposits of individuals	25,262,175,812	12,444,332,213
Deposits of legal entities and	3,831,176,484	3,573,391,202
Deposits of banks	0	187,424,000
Total deposits	**66,373,515,566**	**39,598,818,128**
Deposits of individuals	41,465,122,622	22,965,716,544
Deposits of legal entities and	24,908,392,944	16,633,101,583
Deposits of banks	18,732,128	270,574,673

Source: National Bank of Moldova.

Over time, however, network effects can lead to a further fall in the share of commercial bank deposits if households and businesses get used to the concept of CBDC accounts, and more payment services options to settle in central bank money become widely available. The point to emphasise here is that even unremunerated CBDC has the potential to shift a significant share of commercial bank deposits into these accounts.

4. Who will supply credit?

Maturity transformation is the building block of market economies. That is because output from real production happens at longer horizons than what savers want to commit their resources to. Banks step in as intermediaries to offer redeemable deposits that are used to fund long-term investment projects. In doing so, banks manufacture private money that is considered safe by making them information insensitive (Gorton, 2017). That is done by providing a safety net through government mandated deposit insurance for a certain portion of bank deposits. The uninsured short-term debt of banks is made information insensitive by backing them implicitly with long-term loans that are often hard to value. To reduce the uncertainty on the market value of long-term loans, which are mostly held at amortised cost, banks back them with own funds or equity. This model of banks acting as intermediaries between savers preferring to hold liquid assets and entrepreneurs requiring long-term loans has served the market economies well over many decades – a model whose resilience is further reinforced through government mandated banking regulation and supervision.

A natural question that arises is to what extent this trusted and supervised model of supplying bank intermediated credit for long-term investment projects could be disrupted by the introduction of an uncapped and unremunerated retail CBDC. In particular, if around 20 percent of total bank liabilities migrate to CBDC accounts resulting in a commensurate fall in bank assets, can banks raise other forms of funding to ensure that their balance sheet size will not shrink? Or will it be more cost efficient for other actors in the economy to fill the gap in credit supply? We will explore below the options and alternatives that might emerge while highlighting what the challenges might be.

Let us start with some basics. Commercial banks hold only a fraction of customer deposits as reserves at the central bank and use the rest of the deposits to award loans to borrowers. When a bank issues new loans in the form of deposits to the borrower's account (in commercial bank money) in exchange for a promissory note, it creates new money which in turn increases money supply. This is the fractional reserve banking that we are familiar with today. It is an important channel for money creation and monetary policy transmission. The only binding constraint banks face in this money creation process is the availability of adequate regulatory capital. The increase in demand for loans can be met in this framework if banks can raise the necessary capital at reasonable costs to fund the balance sheet expansion.

Set against this backdrop, several policy questions arise when retail CBDC is introduced. Will the banks' money creation process get disrupted? How will it impact the efficient transmission of monetary policy? What role will central banks play to ensure that the demand for credit in the economy is met at reasonable price terms? Will non-bank actors be able to offer better terms and conditions for loans than banks in the changed intermediation landscape brought about by CBDC? What levers can central banks use to control non-bank actors so that they do not amplify procyclical lending behaviour? Will the remit of central banks need to be broadened in scope and reach? Some of these questions will be taken up in the next section, but here we will discuss the implications of retail CBDC accounts on banks' lending and what incentives this may create for other actors to compete with banks.

We will start with the premise that over time about 20 percent of current total bank liabilities will migrate to CBDC accounts. If banks reduce their asset holdings also by 20 percent, they will have excess capital. That is not a bad thing as it will increase the soundness of banks. But there will be pressure to raise dividends and reduce excess capital. Banks may also choose not to reduce their balance sheet size. They will have two options to pursue. One would be to issue debt in capital markets to offset the reduction in deposits resulting from the migration to CBDC accounts. The other option would be to borrow from the central bank against eligible

collateral assets. Let us examine each of these to understand the relative merits and the challenges they may bring.

Raising bank debt in capital markets is not always an option for banks in DEs as these markets lack depth. Issuing short-term papers like certificates of deposit (CD) can be an option, but these markets are unlikely to provide the funding needed to cover the shortfall. A more fundamental challenge is that when about 20 percent of commercial bank liabilities have been transformed into central bank liabilities, there might not be much domestic market funding remaining to tap. Banks will also be wary of raising such amounts of market funding as most of the deposits that migrated would have been those that paid no interest. Bank debt that is funded in capital markets would be priced above central bank policy rates. These costs will have to be passed on to borrowers to ensure that banks remain profitable. A counterargument to the challenges identified here might be to suggest that banks will ensure that the shift to retail CBDC accounts will not happen. For example, they might pay interest on current account deposits at a level close to the policy rate. However, that strategy has the same effect as issuing CDs at market rates to close the funding gap.

The second option that banks could pursue is to raise collateralised funding from central banks. This is a time-tested funding arrangement between commercial banks and central banks. Following the euro area crisis in 2010-11, the ECB offered banks targeted long-term refinancing operations (TLTRO) at a rate that was 50 basis points below the deposit facility rate. The collateralised lending to banks at this rate was specifically targeted towards certain sectors of the economy to stimulate investments and support job growth. But central banks could simply lend at the deposit facility rate against eligible collateral. Note that any collateral can be made eligible by transforming them into a safe asset by applying deep haircuts on its market value.

Turning to central banks' balance sheets, the introduction of intermediated retail CBDC will make them look operationally similar to traditional banks. That is because they will be seen as raising debt at zero interest rates (by issuing retail CBDC liabilities) and then lending them to commercial banks against safe assets as collateral, and in the process, generating a significant net interest margin. Central banks can quickly come under criticism as market participants will see them as running a large carry trade to the detriment of the private sector and to the benefit of the government. Moreover, if the CBDC liabilities are also used to fund government bond purchases, central banks will be seen as implicitly subsidising government financing. These central bank operations will have political economy implications as it will occur at the expense of the private sector and taxpayers.

One can raise objections to this line of thought as the financing of government bonds can also happen with cash in circulation which pays no interest and is recorded as a central bank liability. While this is true to some extent, there are costs involved in administration, printing of new bank notes and in recycling the old notes. These costs must be absorbed by the central bank. For CBDC, these costs do not arise, and therefore, there is much greater seigniorage income for a central bank when CBDC liabilities are issued. Cash in circulation will be smaller – in the euro area it is about 6 percent of total bank liabilities. The introduction of retail CBDC will not materially reduce the amount of cash in circulation as the arguments put forth here only relate to the shift of current account deposits in banks to CBDC accounts.

Returning to the question on credit supply, the capacity and willingness of banks to offset the funding shortfall through collateralised borrowing from the central bank may simply not be there. To see why, central bank internal policies generally favour collateral that is backed by property or other assets. If unsecured loans are posted as collateral to a central bank, the haircuts on these assets will have to be large to ensure that they meet the safety requirements

for central bank lending. Pledging a large share of good quality collateral with deeper haircuts will result in a significant share of bank assets being excluded under resolution or bankruptcy proceedings. To comply with resolution regimes, banks would be required to raise either additional capital or issue more subordinated debt that are eligible for bail-in. If banks substitute funding from current account deposits through collateralised borrowing from the central bank, and consequently, are also required to issue more subordinate debt, their funding costs will increase significantly. Unless these funding costs can be passed on to credit worthy borrowers, banks will not see it viable to borrow from the central bank to maintain their balance sheet size when customer deposits migrate to CBDC accounts.

Coming back to the central question that is being raised in this section, namely who will supply credit to the economy, there are no clear answers. We can rule out the option that the central bank may want to provide direct credit to the economy. This leaves non-bank financial institutions (NBFIs) as a potential candidate to fill the gap in credit supply left by banks. Yet, when one examines the liability structure of NBFIs, they rely to a significant extent on funding from banks. This is particularly true in DEs where capital markets are less developed. In India, for example, NBFIs source about 40 percent of their funding from banks (see Chart 4.2 in CAFRAL, 2023). Mutual funds and institutional investors are the other main providers of NBFI funding. It is quite possible that banks may cut back on their lending to NBFIs so that they have more balance sheet capacity to originate loans themselves and generate higher net interest margins. It is difficult to argue convincingly that NBFIs will be able to source the funding needed at reasonable costs to fill a gap in credit supply amounting to nearly 20 percent of current bank liabilities. With an asset size about 6.5 times lower than those of banks in the Indian context, this would require the NBFIs' asset size to grow 130 percent from current levels.

To the extent that the demand for credit does not fall with the introduction of retail CBDC, the ones with the capacity to provide large quantities of credit will be the e-commerce players. Because they connect buyers and sellers on their platforms, they are likely to hold the information needed to make credit allocation decisions. Those loans could comprise largely of consumer and business credit. The same is the case with big technology companies (BigTech) that hold lots of data on consumer spending habits through their search engines or e-payment services. The question in many people's minds will be where they get their funding from. The funding for these loans is likely to be sourced from capital markets in international centres by issuing bonds in different currencies. Because central banks themselves will need to acquire domestic currency assets as their CBDC liabilities grow, they could turn out to be major investors in the bonds issued by BigTech and e-commerce giants. Credit for long-term infrastructure projects to support the transition to sustainable development goals could come from multilateral development banks including ADB, AIIB and NDB. By issuing bonds in the domestic currencies of Asian countries, they can tap into the demand from central banks for investible assets for their CBDC liabilities. The scenarios outlined here are likely outcomes if the credit supply gap left by banks from the issuance of retail CBDC has to be filled.

5. Implications for monetary policy and financial stability

Section 4 provided arguments as to why banks will find it unattractive to seek alternative funding sources if a large share of their unremunerated deposit liabilities migrate to CBDC accounts. BigTech and large e-commerce firms that have been waiting for many years to enter the lending business will find it attractive to exploit this credit intermediation gap left by the introduction of retail CBDC. Set against this backdrop, the key policy question confronting central banks would be how effective their existing tools for conducting monetary policy will be in delivering on their mandate of safeguarding financial stability while ensuring their inflation

targets and growth objectives are met. Whether banks will be disintermediated, though an important question, becomes secondary to the broader objectives.

Central banks employ a variety of tools to influence the terms and conditions for the supply of credit to the economy. Among others, they include the reserve ratio requirement for banks, changing targets for various macroprudential measures that banks must comply with, altering the risk weights on bank assets used to compute the capital ratios, and raising or lowering the central bank policy rate. All the prudential measures to influence credit creation are directed at banks, and in some countries, it may also include non-banks if they come under the purview of bank regulation.

Conventional monetary policy instruments rely on the ability of central banks' policy rate to impact the amount of credit supplied by banks to the economy, and through this, the overall growth (Mishkin, 1996). A material decline in the share of bank credit to the economy will reduce the effectiveness of the bank lending channel to the monetary policy transmission process. Consequently, if banks get disintermediated in the credit creation process, the credit and interest channels in the monetary policy transmission mechanism will be weakened. A recent IMF working paper also voices the view that the risks posed by the introduction of CBDC for monetary policy implementation and transmission can be material and will require policy consideration (Lukonga, 2023).

Turning to the operational part, the expansion and contraction of credit supply to the economy is carried out through open market operations (OMOs), which flow through bank balance sheets. It is an important tool for monetary policy implementation to encourage or discourage banks from lending. In practice, bank capital constraints can act as a bottleneck for credit expansion.

Expansionary monetary policy is generally associated with lower central bank policy rates as headwinds to growth mount. As a central bank increases commercial bank reserves through OMOs, the macroeconomic backdrop may provide incentives for a shift of money from commercial bank deposits to CBDC. This would result in an increase in CBDC liabilities of the central bank and a fall in bank reserves. If we follow this line of argument, central banks may be constrained in their ability to implement expansionary monetary policy by trying to control money supply if uncapped retail CBDC is introduced. In this framework, the expansion of the central bank balance sheet will have to flow through BigTech by encouraging them to issue more local currency debt that the central bank can buy in capital markets as its CBDC liabilities rise. But there will be significant time lags for this transmission channel unless BigTech firms have direct access to central bank balance sheets like commercial banks. But providing that access will raise many questions including whether BigTech will have to fall under the remit of central bank oversight and regulation.

The entry of BigTech into the lending market can make the balance sheet channel for monetary policy transmission important if the credit supply through the bank lending channel falls. BigTechs hold large amounts of data on consumers collected through their internet search engines and social media platforms. Consequently, they are well-placed to leverage this information to address the asymmetric information problems in credit markets to provide competitive loans. Moreover, being well equipped with AI and Machine Learning tools, BigTech will be able to make quicker and better-informed decisions than banks in assessing the net worth of borrowers. But since the net worth of borrowers tends to be procyclical, the credit allocation decisions of BigTech can be more procyclical than those of banks. This can have adverse consequences for financial stability, and by implication, complicate monetary policy conduct. Currently, central banks have no tools to address this source of vulnerability to the financial system. Mitigating this will require a broader mandate for central banks.

Challenges to monetary policy implementation in turn is likely to have detrimental consequences for safeguarding financial stability. One source of risk to financial stability can flow directly from the central bank balance sheet. To avoid the political economy questions highlighted earlier, central banks may end up investing a sizeable share of their CBDC liabilities in non-government securities. This will result in their balance sheets being more exposed to credit risk than what they are used to. Less liquid and more risky central bank balance sheets will raise credibility questions on their role as lenders of last resort function. This will diminish their ability to mitigate financial stability risk in times of stress. That in turn can compromise their independence.

In situations where there is a material outflow from CBDC accounts resulting from the perception of reduced systemwide risks and attractive bank deposit rates, the central bank will be forced to reduce some of its less liquid asset holdings. Such outcomes where central banks are required to manage their balance sheets more actively can be a source for risk propagation. To avoid this outcome, the central bank may be forced to raise bank reserve requirements to minimise asset sale. While a reduction in CBDC holdings will raise bank deposits and therefore require higher bank reserves, CBDC liabilities on the central bank balance sheet is associated with narrow banking whereas bank deposits are subject to fractional reserve banking (Broadbent, 2016). Consequently, raising bank reserve ratio requirements for commercial banks will result in a contractionary monetary policy stance. This may not be the outcome the central bank wants. But it is also possible that the central bank may be only left with the option to reduce its asset holdings if banks hold excess reserves so that the reserve ratio is not binding.

Finally, financial stability risks can be amplified if problems in some banks, as the recent failure of Silicon Valley Bank showed, lead to large depositor withdrawals from several banks. So far, such runs have shifted money from one bank to another bank, but the money remained mostly within the banking system. Uncapped retail CBDC will change this as the flight of deposits will result in money leaving the banking system. The ease with which such shifts can happen in a digital economy will make the need for central banks' provision of emergency liquidity assistance more frequent. Safeguarding financial stability would become much more challenging for central banks when retail customers and businesses have access to CBDC accounts. As a central bank becomes everyone's deposit taker, it will also become everybody's lender and crowd out private intermediaries (Carstens, 2019).

6. Conclusions and summary

Much research is now focused on exploring the use case for CBDC and its potential design choices. In the absence of empirical evidence, the research relies mostly on theoretical models to assess the impact CBDC can have on bank lending, monetary policy conduct and financial stability. But these models largely miss the financial frictions arising from bank incentive structures, collateral constraints, the need for adequate unencumbered loss absorbing liabilities to meet bank resolution rules, network effects arising from payment options available to settle transactions in CBDC, and competition from BigTech if they enter the lending business. The findings of these models should, therefore, be treated with caution.

Taking a more practical viewpoint, this paper provides some motivation as to why even an unremunerated CBDC account will attract significant deposits from the banking system even if these deposits are paid no interest. Central banks will face significant challenges to keep their balance sheets liquid as they will not want to be seen as financing a large share of government debt, which would amount to diverting revenue from the public to the government. The paper argues that providing funding to commercial banks that are compatible with central bank lending policies will make bank credit uncompetitive and expensive. Growth can suffer

as a result of this. Moreover, an uncapped retail CBDC will also raise significant challenges to safeguard financial stability. If the stability of the financial system comes under threat, existing central bank tools will be inadequate to mitigate them if non-banks and BigTech disintermediate bank lending.

Enforcing a cap on CBDC holdings, which seems to be the consensus now, will dampen these risk propagation mechanisms and avoid bank disintermediation. Under this scenario, the retail CBDC will remain in the sandbox and its use case will be diminished. If retail customers hold CBDC accounts, they will mainly serve the same functionality of e-wallets that many FinTech companies today provide. As the needs of retail customers are being met today in an evolving efficient and interoperable payment ecosystem, central banks do not have to spend much time and effort on CBDC research to introduce another form of e-wallet. That takes us to the conclusion of Chris Waller (2021) where he sees no use cases for CBDC.

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