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Retail Central Bank Digital Currency: A Review and Assessment



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Abstract

In the interests of constructive debate about the possible introduction of a retail Central Bank Digital Currency (CBDC), this review offers a critical analysis of the potential benefits, costs and risks associated with retail CBDC at three levels: (1) the methodology of the debate, (2) the possible benefits of retail CBDC, and (3) the potential costs and risks associated with retail CBDC. Many specific advantages have been proposed in several papers and reports issued by central banks and others, it is though not clear that the problems it is designed to solve, or benefits that would accrue, would be more effectively and efficiently addressed through the creation of a retail CBDC rather than a combination of alternative private market innovations and/or regulation. There is also doubt about the potential user demand for such a new digital currency given the wide range of available alternative transactions media including existing digital options.

Retail CBDC could struggle to become a significant payments mechanism with the necessary critical mass unless it can offer additional or better payments mechanisms than are already available with commercial bank money and the wide range of other payment mechanisms. Dependent in part on the particular design features embedded in the currency, its issue could have a significant impact on the banking system and the role of banks. However, central banks would always have the option of offsetting any impact on bank reserves, bank lending and deposits by their own market operations. Although concerns have been raised about recent trends in the payments system having the potential to undermine the role of central banks in the conduct of monetary policy, as commercial banks would continue to hold reserves at the central bank, they would still have the power to influence short-term interest rates in the normal way. Before any sensible decision can be made about such a major project, a full assessment of the costs and benefits needs to be made compared with alternative routes for securing any such benefits.

Introduction and Perspective

"...the vast majority of payments we make using deposit money are initiated via payment cards, online-banking, websites or smartphone applications. Banks and payment card providers use state-of the-art secure data transmission technologies and sophisticated cryptographic techniques to ensure the legitimacy of all transactions. Modern deposit money thus truly is digital money". Pichler and Summer, (2018)

In a recent SUERF Policy Note Philip Lane (Chief Economist at the European Central Bank) presents a detailed analysis regarding the introduction of a retail Euro digital currency (Lane, 2025). The paper sets out clearly the case for introducing a euro digital currency in the context of recent trends in payments systems, notably digitisation, the increasing use of technology in payments, the decline in the use of cash, and the emergence of stable crypto currencies and stable coins.

He argues that the Digital Euro, providing continued public access to central bank money, is needed as "a robust response that ensures the resilience of our monetary system". His analysis is set in a broad framework including the distinction between outside money (created by the central bank) and inside money (created by banks). His argument is that the identified trends might undermine the delicate balance between the two tiers of money and in the process disrupt monetary policy transmission, central bank sovereignty and the singleness of money.

Although the Lane paper cited was written in a personal capacity, members of the ECB Governing Council (Cipollone, 2024, and Panetta 2023) also make the case that the introduction of a digital Euro is an imperative. The Lane paper offers an admirably clear summary of the case for a central bank digital currency (CBDC) which draws on the substantial recent literature on CBDCs and contains many appropriate references. It will be of undoubted value to scholars working in this area.

The purpose of our SPN is twofold: to offer a critique of some of the arguments used by Lane and others in favour of creating a retail CBDC, and to consider several additional issues which were not covered in the Lane paper but which might question the efficacy of introducing a retail CBDC. Our focus is on retail CBDCs in general and not just for the euro. We also restrict our analysis exclusively to retail CBDC. The case for a wholesale CBDC is stronger: e.g. expansion of the access to the central bank to a wider range of large financial institutions, and more efficient international payments.

Some analysts and central banks have argued that, with the evolution of payments technology and digitalisation, the next logical stage would be the creation of retail CBDCs as an alternative to cash and other existing payment options. Assenmacher and Smets (2024) argue that one reason for the ECB to issue a digital euro is "to ensure that the monetary system keeps pace with digital advances." A survey and overview of the potential role of CBDCs is found in Gnan and Masciandaro (2018).

Others, on the other hand, argue that retail CBDCs are not needed and that adding them to the existing wide range of electronic payments options would create little value-added within an already crowded payments sphere. In particular, the question arises whether there is a viable user demand for retail CBDC, and whether the introduction of retail CBDC would satisfy the requirements of a cost-benefit analysis as compared with alternative options that could be available to address the concerns that advocates believe support the case for introducing CBDC. Considerable scepticism was outlined by the UK's House of Lords Economic Affairs Committee which in its 2023 report on retail CBDC suggested that it was a "solution in search of a problem".

Surveys of central banks undertaken by the Bank for International Settlements (BIS, 2022 and 2023) found that 93 percent of central banks have been engaged in some form of CBDC assessment, and around 80 percent of central banks see potential value in its adoption. Five countries are already experimenting with a retail CBDC (Bahamas, Eastern Caribbean, Jamaica, Nigeria and Anguilla) but no advanced economy has so far introduced it, though 18 percent of

central banks indicated that they could issue a CBDC in the near term. Sweden has come closest to a cashless society and is known to be considering an eKrona. The BIS has suggested that by 2030, 15 such currencies will have been created. The Economic Affairs Committee of the UK's House of Lords reports that both China and South Korea are at a pilot stage and preparing for the possible creation of their own CBDCs (House of Lords, (2023).

In a recent study, Kevin Dowd examines the experience of five countries that have experimented with the introduction of a retail CBDC, (Dowd, 2024). He observes that in two countries (Finland and Ecuador) the experiment has been abandoned. In those countries (in the Caribbean, China and Nigeria) that have established a digital currency, consumer demand has been extremely low due mainly to the existence of efficient alternatives.

Nature of Retail CBDC

Households would hold CBDCs in digital wallets either with the central bank or, more likely, with Payment Interface Providers (PIPs). Although different retail CBDC models can have distinctive features, the key characteristics are that they are a liability of the central bank for use by individuals and small businesses for retail payments. Being a liability of the central bank they would be complementary to cash and deposits by banks at central banks which are held as reserves (ECB, 2020). Central banks could always exchange reserves, bank notes, and CBDC deposits at par with financial institutions, PIPs that have accounts at the central bank, or other financial institutions that have a central bank account. They would be legal tender and fully convertible into cash. We assume here that the proposals do not include the issue of token currency, and that notes and coins for general circulation would continue to be issued by the central bank, as and when needed for transactors who prefer to use them for some transactions, or should digitisation become unavailable owing to operational breakdowns.

Consumer access to the accounts would be non-exclusive as CBDCs would be created according to demand.

Two Design Features

Various models of retail CBDC with different design features are possible. As noted by Martinez-Resano (2025) "the diversity of CBDC models is broad and their mix of benefits and challenges cannot be generalized". The impact of the introduction of different retail CBDCs would depend *inter alia* upon their precise design features. Trade-offs may emerge in that some characteristics may be necessary for some objectives while being inimical to others. We assume that it would not be the sole form of money with the central bank being the sole creator of money: although the case for CBDCs being the exclusive source of money is made by Drees and Sharma, (2023).

We also assume that no interest would be paid on CBDC accounts. The contrary case for the central bank paying interest on such balances has been made by Haldane (2023) on the grounds that the issue of currency creates a seigniorial advantage to the government, and that the non-payment of interest is a form of concealed taxation.

Two particular design features are considered: (1) whether the transactors' digital accounts would be administered by the central bank, and (2) whether limits would be placed on individual holdings of retail CBDC accounts:

1) Role of Payment Interface Providers

A key issue is whether transactions in retail CBDCs would be undertaken directly with the central bank, or indirectly via PIPs. In the direct case, CBDC accounts would be held at the central bank which would conduct all the administration. It is unlikely that this model would be applied as central banks would not want to incur the substantial costs and administrative burdens of managing the accounts.

The alternative, and in practice more realistic, model is for Payment Interface Providers to become a central part of the transactions. While CBDC accounts would be a liability of the central bank, the accounts would not be held at the

central bank but with PIPs which might, though not necessarily, be commercial banks. Transactors and investors would not have direct access to the central bank but would purchase CBDCs from a PIP (most likely from the transactor's existing bank account) or by cash. PIPs would necessarily have accounts with the central bank which would be used to purchase CBDCs on behalf of their retail customers. The role of the central bank in this model would be to hold a central ledger recording CBDC transactions.

The PIPs would be responsible for managing all aspects of the consumer interface. This would include onboarding customers, creating digital wallets, managing the administration and registration of the digital wallets, and managing the customer interface including, for instance, adhering to regulation such as Know-Your-Customer, etc. In this role the PIP would not be a financial intermediary in the conventional sense of the term but purely an administrator and incurring the costs of such business. We consider below whether a PIP would be prepared to incur the administration costs of such a role.

2) Imposed limits

Some of the potential negative impacts of retail CBDC could be mitigated, if not removed entirely, by imposing limits on the maximum size of individual accounts or even imposing limits on how the accounts could be used and for what purposes.¹

It is likely that central banks would impose a maximum size limit on individual accounts. For instance, while in neither case has any firm decision been made, the ECB is known to be considering a limit of between \leq 3,000 and \leq 4,000 (Meller and Soons (2023) and the Bank of England of between £10,000 and £20,000 (Cunliffe, 2023). Such an imposed ceiling would limit the impact on commercial bank accounts and financial fragility associated with potential flows between CBDC and commercial bank accounts. It would also limit the rise in the size of central banks' balance sheets (liabilities) with a possible accompanying problem of a shortage of suitable assets for the central bank to hold on the other side of the balance sheet. Another rationale for a size limit would be to limit the extent of banks seeking loans from the central bank, which in turn could face a problem of a shortage of suitable collateral to offer the central bank.

Impact of the Banking System

The impact of switches from bank accounts to retail CBDC accounts would have implications for the role of banks and the extent of disintermediation, and also potentially on financial stability. The impact on the financial system would depend *inter alia* on the extent of the take-up of the accounts, whether limits are imposed on their size and use, whether interest is paid on the accounts, the responses of banks following movements of funds between bank deposits and CBDC accounts, and the response of the central bank to such flows. The ECB offers a comprehensive analysis based on a range of scenarios (ECB, 2022):

"A digital euro would prompt changes in the demand for bank deposits in turn affecting financial stability and monetary policy transactions. Specifically reduced demand for bank deposits could have consequences for banking sector credit provision, risk taking, profitability and resilience".

Switches from bank to CBDC accounts would cause an immediate decline in bank deposits, bank reserves with the central bank, and in the banks' reserve ratios. This in turn could induce lower bank lending and income and profits from such lending, marginally higher interest rates on bank credit as banks lose interest-free transactions accounts, asset sales by banks, and banks becoming more dependent on wholesale funding sources which on average are more costly and potentially more volatile. To the extent that deposit volatility is raised, banks might also choose to hold

¹ It has been suggested (by for instance, Eswar Prasad, 2023) that a programmed CBDC could be envisaged. He quotes a Monetary Authority of Singapore White Paper describing how such "purpose-bound money" could be designed to be "utilised for its intended purposes". Imposing expiry dates could also enhance consumer spending at certain times. Limits could also be applied to what transactions can be made with CBDC. Leaving aside the practicality of such a system, there would be the problem that the central bank could be seen as an arm of government, and an adjunct to the government's fiscal policy, with its independence seen as being compromised.

marginally higher capital and liquidity. In evidence to the House of Lords Economic Affairs Committee, Barclays Bank suggested that the introduction of retail CBDC could reduce the diversity of bank liabilities.

In principle, these reactions could be mitigated by central banks re-cycling funds back to the commercial banking system. However, this would also have practical challenges, e.g. whether banks would be holding sufficient acceptable assets to act as collateral for the central bank.

The Stated Case for Retail CBDC: An assessment

Lane (2025) amongst others offers a comprehensive review of several concerns about current and prospective trends:

- Constraints on central banks' control of monetary policy (notably the setting of interest rates.
- The potential erosion of trust in the system if the decline in the use of cash is not offset by the creation of an alternative form of central bank money. Lane argues as follows: "Traditionally, cash has played a critical role in maintaining trust in the convertibility of commercial bank money into central bank money and supporting effective monetary policy."
- The emergence of stable coins could over time come to eclipse commercial bank money.
- Concern that large Tech Companies could issue their own crypto currencies via their substantial networks which would raise their overall market power in the economy. The concern is that the private creation of money could undermine national sovereignty in the payments system.
- The potential hazard of card systems being dominated by American companies. Offering a retail CBDC as an alternative payment instrument may help reduce, what might be considered, the unacceptably large role for the international card schemes (Visa and Mastercard) in domestic payments.

In addition to addressing specific concerns, the case for introducing retail CBDC is also made by some analysts as a means of enhancing competition in payments, the promotion of financial innovation, providing households with a riskless asset, and the promotion of safe financial inclusion. These are discussed in the sections to follow.

The next sections offer a critical review of the stated benefits of CBDC at three levels: (1) a critical review of the alleged benefits, (2) identified costs and potential risks associated with retail CBDC, and (3) some issues of methodology.

1) Are the benefits claimed for retail CBDC real?

In various published papers (many issued by central banks) several potential benefits have been claimed for retail CBDC. These stated advantages and benefits *prima facie* appear attractive. But how robust and realistic these claims are likely to be in practice can be challenged in several respects. Several of the stated benefits are considered in this section.

• The decline in the use of cash could erode the anchor to the monetary system and trust and confidence in the monetary sector

A central argument in Lane (2025) is that the two-tier monetary system (inside and outside money) has evolved in a way that central bank money provides trust and confidence in the monetary system. His concern is that recent trends (digitalisation, crypto currencies, decline in the use of cash, etc.) could over time erode this trust and the singleness of money in its various forms, which in turn could undermine the sovereignty of central banks over monetary policy. Bofinger and Haas (2023) also make the case for a digital euro as a monetary anchor to the financial system.

A central argument made by some proponents of a retail CBDC is that the public needs continued access to central bank money, in the form of a retail CBDC, as a symbol of confidence and for ensuring that it is always possible for the public to convert these private monies into safe public money. Others such as Awrey (2024) argue that confidence in the monetary system can be ensured through strengthening the law and regulation of innovative non-bank payment solutions such as private stable coins.

We agree that any loss of confidence in intermediated (commercial bank) money would be an issue of real concern. The case made for retail CBDC is that, in the absence of cash, it would provide households with the exclusive link to the country's central bank and would mean that everyone would have the option of direct access to central bank money. This could be instrumental in enhancing trust in the monetary system. Haldane (2023) suggests that cash is "a symbol of identity and sovereignty".

There are several reasons to be sceptical about this alleged problem. In the first place, the decline in the use of cash has been a choice of transactors and induced by the growth of alternative and more efficient and convenient means of payment. Secondly, there is no evidence of any decline in trust and confidence in the monetary and payments system in those countries (e.g. Sweden) where the decline in the use of cash has been particularly strong. Thirdly, the problem is probably exaggerated because such usage of cash remains substantial in absolute terms and in some countries holdings have actually increased in recent years. Fourthly, in all models of retail CBDC cash would still be available to consumers as central banks would continue to issue cash as demanded.

• Erosion of central bank power over interest rates

At one point, Lane (2025) suggests that the erosion of central bank money in the form of cash would weaken the central bank's power in setting interest. Similar concerns about the loss of central bank control over monetary policy arose and were extensively debated more than twenty years ago with the emergence of various forms of non-bank e-money. While at the time it was often argued that this was a concern, others (Goodhart, 2000 and Schmitz, 2007) pointed out that, as remains now, as long as central bank money (in the form of bank reserves maintained at the central bank) is still used for final settlement of payments, central banks are still able to control short-term rates of interest. In this respect, the anchor to the monetary system is not so much cash as central bank money in the form of bank reserves held at the central bank.

• Concern at the possibility that the use of private stable coins could become a major, if not dominant, transactions facility

Lane (2025) argues that the emergence of stable coins could come to eclipse commercial bank money and that the "moneyness" of stable coins is less credible regarding the promise of full convertibility into currency (Angeloni, 2025). Although it is possible that this could become a real concern, it could be mitigated by appropriate regulation of stable coin providers. Also, it is not self-evident that the emergence of Euro stable currencies, and concern that these could eclipse euro commercial banking, would be addressed by creating a retail CBDC.

Concern that large Tech Companies could issue their own crypto currencies via their substantial networks, enabling them to raise their overall market power in the economy, has also been expressed by some central banks. Such a private creation of money might undermine national sovereignty in the payments system. Furthermore, it has been argued that such a trend could give excessive power to the private issuers of money (stable coins, etc) which in turn would have the potential to create new financial stability risks and data concerns. As put by the then General Manager of the Bank for International Settlements, this possibility could "…threaten financial stability, fair competition and data governance" (Carstens, 2021).

Retail CBDC could be a possible replacement for such crypto currencies with superior characteristics, largely because it would be issued by a central bank.

However, there is no evidence that crypto currencies are likely to displace sovereign money as such currencies are not widely used for everyday retail transactions. Currencies such as stable coins are not ideally suited as a means of payment and/or store of value because of their volatile prices (Demertzis and Martins, 2023), operational risks, being slow in processing transactions, and their limited scalability. As noted in Danmark National Bank (2022), the potential for private money dominance is only likely to be a potential possibility in countries where the existing domestic payments system is not functioning well.

• The introduction of a retail CBDC into a domestic payments system would enhance competition which could improve the efficiency of the payments system

Lane (2025) argues that the creation of CBDC would serve as a disciplinary force in that the option of using central bank money for payments would limit the scope for commercial payment systems to exploit monopoly power to charge excessive payment fees. However, Lane also argues that the scope for the use of monopoly power in payment systems has been addressed by regulation.

Whilst enhanced competition may have the potential to raise efficiency, it is not self-evident that this would be the case with the introduction of CBDC. Users of payment services already have a wide range of different options including digital payments in a competitive market environment. There is little reason to believe that adding a further option would significantly enhance competition or efficiency.

One area that might be affected by the introduction of retail CBDC could be the charges imposed by credit and debit card issuers. The power of this would depend upon the extent that CBDC transactions would be used as an alternative to these cards. Competition with debit cards would likely be limited as a retail CBDC transaction would be no easier or cheaper than debit card transactions. Also, the extent of any size limit imposed on retail CBDC balances would limit their usefulness compared with debit cards. With respect to competition with credit cards, this too would be limited as there would be no credit facility attached to retail CBDC accounts.

Furthermore, and as argued by the Danmark National Bank (2022), if there are competition concerns in the area of payments, regulation and competition policies could be a more effective and efficient way of addressing the problem.

• Financial innovation could be enhanced through a competition effect

It is suggested that the introduction of CBDC could be a spur to increased innovation in the payments system even though the current system has proven to be innovative without it. There have been many examples of financial innovation in the payments system. Referring to crypto currencies, the BIS (2023) argues that while there have been some elements of real innovation, these can also be replicated or embedded in the traditional system.

A more fundamental critique of the argument that financial innovation would be enhanced is that research on business innovation indicates that the main constraint on the adoption of new technology is overcoming the human, organisational, and market barriers to its adoption (Milne, 2023 and 2024). Overall, the introduction of retail CBDC appears to be largely irrelevant to payments innovation.

• Retail CBDC as a riskless asset

There is advantage in any financial system for consumers (especially low-income households) having access to a riskless asset. Being issued by the central bank, a CBDC deposit would be a riskless account and could therefore be an attractive asset for some consumers. However, the practical value of this would likely be limited for two reasons: commercial bank deposits below the maximum limit of deposit insurance are also effectively riskless, and any limit applied to the holdings of CBDCs is likely to be considerably lower than the maximum limit of deposit insurance. Nevertheless, CBDC could meet the demand for a riskless asset in those jurisdictions that do not have a deposit protection scheme, although the introduction of such a scheme for commercial bank deposits could be a less costly alternative to the issue of a retail CBDC.

• US-dominated credit cards disruption

In Europe there are particular concerns in some quarters about the large role of the international card schemes (Visa and Mastercard) in domestic payments. This is both a concern about lack of competition, although this is already partially addressed by European regulation of card interchange fees. There is also a political economy concern, about the possibility that the US could become seriously antagonistic to the EU to the extent that the government might put pressure on US card companies to cease or limit their services to EU card customers. While there is certainly a case to be made for addressing these concerns by providing alternative payment solutions, it is unclear that the best alternative is a retail CBDC rather than Europe further developing its own existing card systems.

• The issue of retail CBDC has the potential to enhance financial inclusion

Financial inclusion is low in some (especially developing) countries. There are many reasons for this (Llewellyn, 2022) including that some groups and individuals are perceived by banks to be insufficiently creditworthy to justify a standard bank account. There are, however, other ways of addressing this issue and in several countries there is a legal right to a basic bank account. Nevertheless, in some cases retail CBDC could overcome some of the constraints to greater financial inclusion. In this dimension, the case for retail CBDC could apply particularly to a limited number of countries where enhancing financial inclusion is a public policy objective. In the limited number of countries where retail CBDC has been introduced, the potential to enhance financial inclusion has been viewed as the main rationale though their experience so far in this respect has been unimpressive.

It is unlikely that the introduction of CBDC would have any significant impact on financial exclusion as this reflects more fundamental problems of competition and efficiency in the financial system that need to be addressed.

2) Costs, disadvantages and risks of retail CBDC

Costs and potential risks that might follow the introduction of CBDC can be identified and have been noted in several of the published analyses by central banks and others:

• Disintermediation and lower availability of bank credit

Switches of funds from banks to CBDC accounts would mean an immediate decline in bank deposits, bank reserves at the central bank, and in banks' reserve ratios. This in turn could induce lower bank lending and the income and profits from such lending, marginally higher interest rates on bank credit as banks lose interest-free transactions accounts, asset sales by banks, and banks becoming more dependent on wholesale funding sources which on average are more costly and potentially more volatile. To the extent that deposit volatility is raised, banks might also choose to hold marginally higher capital and liquidity. In evidence to the House of Lords Economic Affairs Committee, Barclays Bank suggested that the introduction of CBDC could reduce diversity of bank liabilities.

However, any such impact could in principle be mitigated in various ways including by the central bank recycling the funds back to the commercial bank sector. However, this could also have systemic implications: e.g. whether or not banks would be holding sufficient acceptable assets to serve as collateral for the central bank.

• The Introduction of retail CBDC could induce greater fragility in the banking system

While bank runs can, and do, occur in the absence of CBDCs, some observers have warned that transfers of funds from commercial banks to CBDC accounts at times of stress are likely to increase because of the ease of making such transfers, (Broadbent, 2016, BIS, 2018, Haldane, 2023). The ease of making such transfers to safe assets in times of stress could cause greater instability in the system. When a bank run becomes systemic, shifts into CBDCs represent a shift from the banking system as a whole and would be easier to make. The experience of the failure of Silicon Valley Bank illustrates that digitalisation of bank deposits and technology-based options for shifting funds means that bank runs can occur at greater ease and speed than in the past.

• Potential cyber security risk

The IMF has noted that the financial sector generally is uniquely exposed to cyber attack (IMF, 2024). There could be a potential cyber risk at two levels: against individual CBDC accounts and against the system. As with other accounts, CBDC accounts could be subject to risks because of weaknesses in the cyber security arrangements. An additional potential operational risk is that of a cyber attack on a part of the national financial infrastructure in the form of the CBDC ledger. There could also be operational failures, for instance because the electrical system collapses (as happened in Spain and Portugal recently) or in the case of war.

• Surveillance of transactions

A particular concern has been raised about the privacy of transactions. Individual cash transactions cannot be monitored by governments or other official agencies such as central banks. The introduction of retail CBDC might infringe users' privacy by enabling the central bank (or perhaps even government) to monitor consumers' transactions. Whilst protections could be created, these might not be credible in the eyes of potential transactors. Overall, privacy concerns, whether rational or not, could again limit the demand for CBDCs.

• Business model of Payment Interface Providers

An earlier section suggested that, in the absence of a central bank having the interface with users and conducting all the necessary administration of accounts, the introduction of retail CBDC would be feasible only if third parties (probably banks) would be able and willing to supply such services. The retail CBDC model would not work unless there were PIPs in the market. This raises the issue of how the banks would be remunerated and whether it would be sufficiently profitable business to undertake given that the underlying accounts would not be available for making loans unlike the case with conventional (largely free) transaction accounts held at banks.

If PIPs were to make charges for transactions, this would likely reduce consumer demand for CBDC accounts as there are many other payment systems that are generally free of customer charges. In the UK, for instance, there are generally no charges levied on holders of transaction accounts providing they are maintained in credit.

• Infrastructure costs

The necessary infrastructure costs would be substantial which again raises the issue of whether the alleged benefits of introducing CBDC would warrant such initial and on-going costs based on cost-benefit analysis compared with existing and prospective alternatives to retail CBDC.

3) Methodology

We identify five particular reservations about methodology in the analysis of retail CBDC, its feasibility, and potential impact:

• Would the introduction of retail CBDC be an optimal solution?

It is not clear that the problems it is designed to solve would be more effectively and/or efficiently addressed through the route of a retail CBDC rather than by a combination of alternative private market innovations and (where appropriate) regulation. Transactors already have a wide variety of efficient payments options because the private system has demonstrated an ability to innovate to enhance the efficiency of the payments system. The question is whether a convincing case has been made for the superiority of CBDC, or that adding another digital option would enhance the efficiency and stability of the system as a whole. On the contrary, and as suggested above, there is reason to believe that the existence of CBDC would exacerbate the potential for financial fragility at times of stress.

• Cost benefit analysis

No robust cost-benefit analysis has been published analysing the costs and benefits of a retail CBDC in comparison with other alternatives of addressing any problems or weaknesses that exist or might come to exist in the future in the current system. The introduction of retail CBDC could prove to be a disproportionate response to address any such problems or to secure the alleged benefits of CBDC.

• Consumer demand has not been identified

No latent demand for retail CBDC has been identified and there are several reasons to be sceptical about the extent of user demand. Clearly, CBDCs must be acceptable to both sides of any payment transaction. This could be a game changer in that, if the demand is limited, the necessary critical mass to make a retail CBDC payments system viable might not be reached. Masciandaro (2018) provided a systematic modelling of the potential demand for CBDC based on various assumptions and scenarios.

The demand might be limited for several reasons not the least being that there are already several ways of making payments that can suit different transactors. In particular, and as stressed in Angeloni (2023) and Prasad (2023), there already exist several crypto and digital options for making payments (Apple Pay and GooglePay, for instance). Many existing payment systems are convenient, low cost (often free), efficient, and reliable. These have emerged through a dynamic process of financial innovation and competition. Any new additional option needs to offer superior (or at least equal) advantages compared with the many existing options that exist to make payments. As already noted, demand might also be limited due to a (probably false) perception that the introduction of retail CBDC might infringe users' privacy.

Overall, there is a danger of a low take-up of retail CBDC accounts and their use in payment transactions with associated reputational risk to central banks. In countries that have introduced a retail CBDC consumer take up has been low.

• Externalities

Many of the stated benefits of retail CBDCs are *systemic* in nature and derive from *network externalities*. The issue is whether consumers would be convinced about the non-systemic advantages compared with the many alternative options of making payments. The existence of network externality advantages may not be sufficient to induce consumer demand in the absence of *individual* incentive structures. This can be viewed as a variant of the *collective action problem*. The issue focuses upon whether critical mass would be achieved.

• Size limits on retail CBDC accounts: a trade off

As noted earlier, some potential negative impacts of CBDC (such as enhanced financial fragility due to switches from bank deposits into CBDC and a reduced financial role of the banking system) could be mitigated, if not removed entirely, by imposing limits on the maximum size of individual accounts, or even imposing limits on how the accounts could be used and for what purposes.

Herein lies a dilemma: any size or use limit would reduce the attraction of retail CBDC accounts for consumers though the impact on banks through disintermediation would also be lower. The aggregate size of volatile flows into retail CBDC accounts could also be lower. On the other hand, if no limit were to be imposed, whilst the demand for CBDC could potentially be larger, the impact on commercial banks through disintermediation would also be bigger. In essence, a dilemma would arise between having wide acceptance of the CBDC with critical mass achieved versus lower systemic risk associated with limited transfers between commercial bank deposits and CBDC accounts.

In practice, however, the effect of limiting the size of balances on the feasibility of using CBDC for payments might be limited due to the "waterfall" effect: any transaction that would take the recipients' CBDC balance above the limit would automatically be transferred back to the transactor's commercial bank account.

Assessment

There is doubt about the potential user demand for a new digital currency given the wide range of alternative transactions media including existing digital options. Retail CBDC could struggle to become a significant payments mechanism with the necessary critical mass. Two sets of incentives are needed: for consumers both to hold CBDC as an asset and to use it as a means of payment, and secondly for PIPs to be willing to provide the necessary services. Given the several reservations, not the least being that a convincing user-demand has yet to be established, there is a risk of adoption failure which could produce a reputation risk for central banks that introduced the new digital currency (Angeloni, 2023). He subsequently suggests that "Its commercial success is uncertain. It should not be counted upon to have a particular advantage" (Angeloni, 2025).

Perhaps the last word should go to the European Central Bank:

"A comprehensive and balanced policy-orientated assessment of the challenges of a digital euro and its potential relative to alternative options is necessary before issuance of the digital euro can be considered", European Central Bank, (2020)

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