

Digital Central Bank Money and the Unbundling of the Banking Function

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Abstract

Innovations in digital payment technologies and digital currencies suggest that extending access to central bank money (CBM) to firms and individuals is now feasible. This paper focuses on a recent related debate regarding alternative organizational models for the payment system and their implications for the banking industry. One of the main conclusions is that extended access to CBM will likely create a centrifuge force in the financial system that might result in the unbundling of the banking functions.

JEL Codes: E51, E58

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1. Introduction

In recent years, there have been numerous discussions and debates regarding the effects on the financial system of introducing electronic money (e-money), digital currencies, virtual currencies, cryptocurrencies, and other related innovations. The issues being discussed range from the effects of e-money on financial inclusion, to the disruptive effects of blockchain technologies for the organization of capital markets, to the possibility of pseudonymously bypassing financial controls by using cryptocurrencies such as Bitcoin.¹

This paper focuses on a recent debate on digital currencies relating to alternative organizational models for the payment system and their implications for the banking industry. Specifically, the debate relates to who can access central bank money (CBM) and how it can be used. CBM is also referred to as high-powered money or outside money, among other names, and is a straight central bank (CB) liability. For comparison, the money that results from the commercial banks liabilities that depositors receive as a medium of exchange against their deposits is usually referred to as inside money. In the language of virtual currencies, CBM is similar to an electronic dollar issued directly by the Federal Reserve, while inside money is like a “citicoin,” “bofacoin,” and so on.

Given the way the payment systems are organized today, only licensed banks can directly obtain CBM, while other firms and individuals do not have such an option and can only access the payment system through commercial banks deposits. This paper discusses whether it is a good idea for CBs to allow ordinary individuals and firms to access CBM; that is, should they be able to hold deposits and make payments denominated in CBM? One of the main conclusions is that extending access to CBM will create a centrifuge force in the financial system that might result in the unbundling of the banking functions. This process could eventually result in the endogenous formation of a financial system based on the old idea of narrow banks or full reserve banks.

¹ Bitcoin is a type of digital currency and a electronic payment system using cryptographic proof to allow parties to transact directly with each other without the need for a trusted third party (Nakamoto, 2008). The blockchain is, broadly, a distributed database that allows for a collective bookkeeping system. The system mathematically permits participants to reach agreement on the validity and approval of transactions that are recorded in a tamper-proof way.

2. Related Debates

A related discussion relates to the possibility of CBs issuing their own digital currencies, taking advantage of the new technologies that have made it viable (Ali et al., 2014b; BoE, 2015; Dyson and Hodgson; 2016; Johnson, 2016). The idea that CBs could issue a type of “digital cash” has become more relevant with the rise in innovations in digital payment technologies and emergence of cryptocurrencies, which are essentially digital currencies that use cryptography for securing transactions and prevent counterfeiting. In fact, the Bank of England (BoE) officially stated in 2015 that it is studying the possibility of issuing digital money, as well as the costs and benefits of making this new form of CBM accessible to a wider range of holders, as part of its “One Bank Research Agenda.”

In addition, an interrelated discussion focuses on the desirability of CBs providing digital currencies through distributed ledger technologies, such as Blockchains, to settle and record transactions in a decentralized fashion. The concept of a Fedcoin² and the RSCoin³, for instance, reflect CB cryptocurrencies based on a distributed ledger model; however, they entail full CB authority over the monetary supply.⁴ The main benefits of this type of system would be increased accountability, as financial transactions would be recorded in a transparent and immutable decentralized ledger, and reduced counterparty risk, as the settlement would be virtually immediate (Broadbent, 2016; Johnson, 2016; Winkler; 2015).

Related discussions are centered on proposals to limit, phase out, or eliminate the use of cash, starting with high value currency notes, to tackle illicit activities and remove the zero bound on policy interest rates.⁵ The disappearance of cash could theoretically be achieved without CBs having to issue their own digital currencies if digital payments (of commercial bank’s deposits) become truly ubiquitous and affordable, even for small transactions. However, from a practical point of view, it seems reasonable to make some provisions in terms of digital currencies, with legal tender status, to fill the void left by cash.

² The concept of Fedcoin, as conceptually presented by David Andolfatto, Vice President of the Federal Reserve Bank of St. Louis, would entail an open source, distributed consensus protocol for settlement while the CB makes the Fedcoin a legal tender and ensures its parity with U.S. dollars.

³ Danezis and Meiklejohn (2016) introduced the RSCoin in the context of a framework for “centrally banked cryptocurrencies” whereby the CB relies on a distributed set of authorities to settle transactions.

⁴ As opposed to most (private) cryptocurrencies, in these cases the (centralized) generation of money supply is decoupled from the (decentralized) maintenance of the ledger. The control over the monetary supply is needed for a CB to conduct monetary policy.

⁵ Rogoff (2014), for instance, explores the costs and benefits to phasing out paper currency, arguing, inter alia, that it is precisely its existence what makes it difficult to take policy interest rates below zero. Sands (2016) argues that eliminating high denomination notes would disrupt the business models of those pursuing financial crime and terrorism. Recently, moreover, the European Central Bank stated that it is considering getting rid of the 500-euro note while similar calls have been made in the United States.

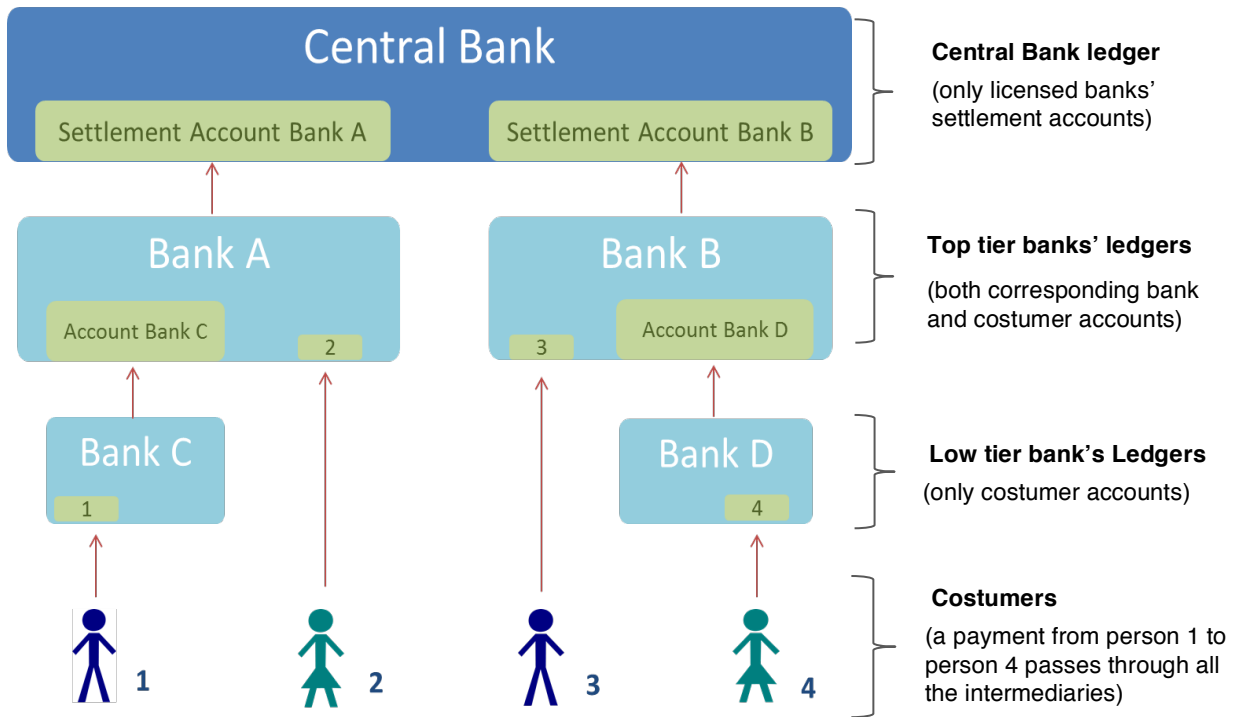
Nonetheless, issues related to digital currencies and the specific technologies used to implement them are not conceptually central to the objective of this paper. The implications of the technology used are indeed critical for other aspects, such as the settlement process. These implications will be the main subject of Ketterer and Andrade (forthcoming), which examines a range of potential implementation alternatives, from fully centralized systems to decentralized mechanisms using distributed ledger technologies with different features to validate and record transactions and their impact on key characteristics, such as the system's scalability or capacity to censor transactions.

3. Tiered Payment Systems

Central banks have historically set up multitier systems to manage payment systems considering the technological problems of dealing with large numbers of small individual accounts. (These systems were established well before the Internet era, after all!) While technological advances have reshaped several areas of the financial industry, there has been little change in the heart of the payments systems, whereby payments are settled across the CB's centralized ledger, which only few licensed institutions can access. The centralized ledger simply reflects the electronic payment system, maintained and controlled by a CB, such as the Real Time Gross Settlement System of the BoE, the European Central Bank (ECB), and the Fedwire of the United States Federal Reserve Bank.

In general, only large financial institutions that are direct participants in these systems (i.e., top-tier banks) can hold accounts at the CB and settle in CBM, while smaller institutions (i.e., lower-tier banks) access the system through the services of a direct participant bank. Firms and individuals can only access the system indirectly through a top- or low-tier bank (see Figure 1). In other words, CBs have deferred the function of managing individual accounts to the commercial banks. Hence, firms and individuals that want to access the payment system can only do so through commercial banks liabilities (deposits).

Figure 1. Tiered Payment System



In sum, for the purpose of the discussion herein, the main characteristics and implications of the tiered payment system (TPS) are as follows: (i) accounts denominated in CBM are only accessible to duly licensed financial institutions; (ii) the only current alternative for individuals and firms that want to hold CBM is to keep it in the form of cash; and (iii) those who choose not to hold cash have to deposit their money in a commercial bank and obtain, in exchange, a commercial bank liability, which is quite different from CBM. As previously mentioned, depositing one dollar in a commercial bank is equivalent to exchanging it for one unit of virtual currency (v-currency) issued by the same bank. Deposits at commercial banks are, to some extent, insured by a variety of deposit insurance schemes, but they are certainly different from risk-free CBMs.

4. New Technologies that Support Extended Access to CBM

As mentioned above, the TPS were introduced, in part, due to a gap in technology. However, this is no longer an impediment as there are different technologies available to manage the extension of CBM to ordinary individuals and firms. Over the last decade, innovation in digital payment technology (from digital wallets to mobile solutions) has been impressive. Advances in

distributed ledger technologies, in particular, represent a unique opportunity to widen access to CBM, given their advantages in terms of settlement without a central authority or intermediary and secure design due to advances in cryptography.⁶ While some skeptics may argue that implementing these technologies for the purposes of CBM is still far from possible, the creators of the RSCoin, for instance, have stated that, if a decision to launch such a scheme were made, a national pilot for England could be up and running within 18 months.

Conceptually, a universal depositary and transactional system for CBM can be set up in many different ways. It can be done through a centralized platform, similar, to some extent, to the one PayPal uses, or a decentralized, distributed ledger system, similar to the Bitcoin scheme. It can also be implemented through a platform that combines characteristics of both.

In distributed ledger models, there is no centralized authority (e.g., a CB) in charge of bookkeeping the ledger, but rather there is a cryptographic protocol in place through which all the nodes in the network reach a consensus as to which transactions are valid and thus settled and registered. Specifically, the network verifies the legitimacy of the transaction by confirming that the sender of a currency unit actually owns it and is not double spending it.⁷ This process ensures the secure settlement of transactions, in real time, between two parties without the need of an intermediary. The main difference within these distributed models relates to whether the access to the network is open to the public and “permissionless” (e.g., Bitcoin) or “permissioned.” In the case of CBM, a permissioned model would mean that the CB controls access to the network.⁸ For instance, in the aforementioned RSCoin for England, the CB maintains complete control over the monetary supply, and relies on a distributed set of authorities, designated exclusively by the CB, to verify and record transactions. In centralized systems, conversely, all issues related to the network and consensus mechanisms are irrelevant, as the CB would have sole responsibility for verification, settlement, and registration.

Besides the technological choices, it is also important for the CB to decide under what business model the platform(s) should operate. On the one hand, the platform could be a facility owned and operated by the CB itself. On the other, the CB could still own it but would outsource the development and operation to a technology company. In this case, the CB would choose the type of system it wants to implement, and then issue a request for proposals to select the developer(s) and the operator(s).

⁶ Ali et al. (2014a) presents a complete overview of the evolution of payment technology and the distributed ledger as a key technological innovation.

⁷ This is done by tracing the respective currency unit throughout the ledger up to its origin.

⁸ The main implication of permissioned access is the ability to censor some participants and/or transactions. This is why some people argue that a completely open, permissionless model would yield a digital currency similar to cash, which is not censored. Nevertheless, such a system will not be completely anonymous like cash.

A quite different alternative would be to adopt a model parallel to the one currently in place for the operation of the TPS. That is, the private firms would provide all the transactional and customer services related to CBM accounts. In this model, the CB would set standards in terms of quality of service, security, resiliency, and interoperability, as well as implement other eligibility requirements in terms of, for example, capital, governance, and reporting. It would also issue a set of specific operational regulations. Subsequently, the CB would allow interested companies to apply for a license to operate the system. In this way, the CB would invite competition among private operators of the system, thereby generating the well-known advantages in terms of service, price, and innovation, among other areas. In this case, the provision of this service to the public could be done at no cost to the CB (other than the costs associated to an extension of its central accounts to make room for the new entrants). In summary, access to CBM could easily be extended, following the same pattern by which commercial banks are today licensed to operate the TPS. The main difference between commercial banks and new entrants would be that the accounts of the latter would have to maintain a 100 percent reserve requirement (i.e., full reserve banks).

5. Reasons that could Motivate a Central Bank to Extend Access to Central Bank Money

There are several reasons that might motivate a CB to extend access to CBM, namely the following:

- To pave the way for a mostly digital currency based economy. This has several positive consequences: (i) the possibility of eliminating the socially undesirable uses of paper currency; (ii) the reduction in the costs of maintaining and distributing paper currency; (iii) the ability to make large efficiency gains foreseen by switching from paper to digital payments by, for example, reducing informality, increasing tax collection, improving convenience and value propositions for consumers, and creating new markets.⁹
- To allow new entrants (i.e., providers of CBM depositary and transactional services). This will open up competition with incumbent commercial banks and foster innovation in financial services.

⁹ These concepts are discussed in detail in Davé, Shirvaikar, and Baxter (2015).

- To offer an additional tool to manage systemic risk episodes. If private individuals and firms can avoid the commercial bank circuit in times of crisis and hold risk-free CBM deposits, this could change the nature of banking runs and systemic risk episodes.
- To provide individuals and firms a low-cost and secure way to hold large amounts of the official medium of exchange, which is currently difficult to achieve given deposit insurance limits and the inconvenience and danger of hoarding and maintaining cash.
- To facilitate financial inclusion by providing access to those individuals and firms that are excluded from traditional banks and by making financial services more affordable and accessible.
- To have new tools for monetary policy, such as the concept of helicopter money, which essentially means giving everyone in the economy direct money transfers.¹⁰
- To be on top of the probable trend, given current trends and expected generational effects.¹¹ This is even more important in a context where there is even a remote possibility that Bitcoin and/or other non-CB controlled cryptocurrencies will gain traction to the point of constraining monetary policy.

6. Possibility that such a Decision Will Be Made

There have been several recent developments that suggest that a move in such a direction is possible. At one extreme, there have been proposals to make the CB the sole responsible entity for creating new money. In Iceland, a report that the then Prime Minister commissioned and the chairman of the Parliament's Economic Affairs Committee presented in 2015 proposes a "Sovereign Money System" in which the Central Bank of Iceland (CBI) would become the sole provider of (all) money and would give individuals and businesses access to electronic risk-free transaction accounts kept at the CB and denominated in CBM.¹² In another curious possibility, this decision could be mandated by the citizens rather than the authorities, as is the case of Switzerland, which will decide in referendum whether the electronic issuance of money should be the prerogative of the state, allowing individuals and businesses to keep deposits in the CB

¹⁰ Helicopter money refers to an idea by Milton Friedman (1969).

¹¹ Research regarding the "technological native" millennials has constantly shown that millennials see financial services quite differently, preferring digital payments and banking, activities that they do not necessarily associate or demand services from traditional banks (Accenture2014; McKinsey & Company, 2015).

¹² The proposed system entails (i) a payment service consisting of transaction accounts where the electronic sovereign money created by the CBI is deposited, and (ii) an intermediary service consisting of investment accounts whose funds can be invested by banks and thus receive interest (Sigurjonsson, 2015).

and banning private banks from creating money. Elsewhere, Ecuador started to implement an electronic money system in 2015, whereby the Central Bank of Ecuador (CBE) exclusively manages e-money in the country and, as such, allows any citizen to hold an e-money account at the CBE.¹³ This case, however, is different from the proposals in Iceland and Switzerland as it only applies to e-money.

It is possible to expect that, at some point in the very near future, an influential CB might decide to provide individuals and firms access to deposit accounts at the CB and to hold CBM for the reasons previously discussed. In fact, and as mentioned earlier, the BoE is already examining this possibility, including provision of digital currency using distributed ledger technology, as part of its “One Bank Reserve Agenda” launched in 2015. Similarly, the People’s Bank of China (PBC) recently announced that the launch of its own digital currency is imminent, although it has not provided a timeline or details about its characteristics.¹⁴ The CBs in Australia¹⁵ and Canada¹⁶ have also mentioned that they are undertaking research on the potential merits of digital money. There are also cases that can be considered as first steps toward expanding access to CBM. For example, the 2014 Financial Inclusion Law in Colombia, which establishes specialized electronic deposit and payment firms as new channels for the distribution of financial products, includes the possibility of providing these firms access to deposits at the CB.

In general, an increasing number of technical papers have started to discuss these issues and possibilities, including papers by Johnson (2016) and Rogoff (2014). Another sign of the increasing relevance of this discussion is evidenced by an article about CB digital currencies using distributed ledgers in a recent print edition of *The Economist* (2016), concluding that the technology developed to free money from the grip of central bankers may soon be used to tighten their control.¹⁷

7. Consequences

The effects of granting a wider access to CBM are best analyzed within the context of the more general dynamics of the financial services industry. In recent years, the number of technology-

¹³ Resolution 005-2014-M of the CBE Board.

¹⁴ PBC’s governor Zhou Xiaochuan has stated that they will consider the current monetary policy framework, money supply, and creation mechanism, as well as monetary policy transmission channels in designing the digital currency.

¹⁵ Based on a statement made by the head of the Payments Policy Department of the Reserve Bank of Australia.

¹⁶ See <http://www.bankofcanada.ca/2015/11/innovation-central-bank-style/>.

¹⁷ See <http://www.economist.com/news/finance-and-economics/21695088-even-central-bankers-are-excited-about-blockchain-redistributed-ledger>.

based firms entering the financial services industry (i.e., FinTech firms) has increased substantially. These firms are mostly startups that are trying to compete with traditional financial services firms in different areas, mostly in consumer banking, payment services, and firm's bank lending, among others. However, the effects so far have not been too dramatic. Although FinTech firms have tried hard to disrupt and challenge traditional banks, they have been contained at the outer edges of the financial services space, nibbling small bits and pieces of the business. Despite the rapid growth in the number of new entrants and the amounts of venture capital invested in them, the real impact of these firms on traditional banking industry is still uncertain. Based on recent report by PricewaterhouseCoopers (PwC, 2016), for example, incumbent financial institutions believe that by 2020, 23 percent of their business could be at risk due to competition from FinTech firms, while FinTech firms anticipate that they may be able to obtain up to 33 percent of the incumbents' business.

This situation has led several industry analysts and insiders to expect a future evolution based on a mostly collaborative interplay among FinTech firms and traditional incumbent banks. The "collaborative solution" means that incumbent banks will deal with the FinTech phenomena by integrating technological advances along three lines: (i) process optimization, cost cutting, and productivity enhancing efficiencies; (ii) better product design and superior customer experiences or "journeys;" and (iii) development and introduction of new products with segment-specific propositions. It follows, according to this view, that by updating and integrating technological innovations, incumbent banks will be able to protect their franchises and minimize disruption. Accenture Financial Services, for instance, argues that banks are acknowledging that they need to "shake themselves out of institutional complacency," recognizing also a sense of commitment and purpose among leading bankers to re-imagine their business model (see Skan, Dickerson, and Masood, 2014).

Many other leading consulting firms and analysts share the same view regarding the collaborative–integrative perspective, provided that incumbent banks undertake important changes, in terms of not only upgrading their technology, but also in changing their culture. For example, a study sponsored by Banco Santander (Santander InnoVentures, Oliver Wyman, and Anthemis Group, 2015: 19) concludes that "banks must continue on their journeys of digitization. But they need not travel alone. They should be clear about where their market advantages and institutional strengths lie. Where they fall short they should look to work with the start-ups who can provide what they need. The same goes for the new fintechs. The message to banks and to fintechs is the same: if you can't beat them, you should join them." Similarly, PwC (2016: 29) concludes that, by partnering with FinTech firms, incumbent banks can

strengthen their competitive position. This new norm, however, will involve “turning away from a linear product push approach, to a customer-centric model in which financial service providers are facilitators of a service that enables clients to acquire advice and interact with all relevant actors through multiple channels.”

There are alternative views to this rather smooth evolution of the financial services industry, however. If access to CBM becomes available to competitors outside the banking industry (e.g., FinTech firms), the possibility of a “true” disruption (i.e., a shift in the paradigm of the financial services industry that implies a change in the nature in which its basic units of business are organized) could become real.

To make the argument, it is important to look first at the bundled nature of the conventional banking business model. Traditional banks provide the system with two main functions: (i) intermediation between savings and investments and (ii) access to the payment system (tiered, as discussed above). The crucial point here is that the two functions are currently bundled together, meaning that: (i) the two services are usually offered together; (ii) the intermediation activity is funded in part with the deposits and the float generated by the payment service; and (iii) the banks can use the information about their clients freely and exclusively to do whatever they think is best, except share it with their competitors. In exchange for having been licensed to offer both activities, banks are required to maintain a relatively large capital base (roughly 8 percent of their risky assets). The amount of regulatory capital required is calculated to maximize the probability that, under certain market assumptions, banks will not fail and will be able to preserve the value of their deposits. Once in a while, however, the methodology is contested by the facts, as banks need to draw on the deposit insurance scheme and, in some extreme instances, may need to be bailed out by their governments.

In this context, suppose that a new class of intermediaries—non-banks (NBs)—is allowed to operate in the payment system along with traditional banks. NBs would be licensed to solicit deposits with the condition that all the money received is to be kept in accounts backed 100 percent with CBM. Moreover, NBs would be required to have a solid and safe operating system and to post a performance bond roughly proportional to the amount of money handled. In this model, NBs would not be allowed to use depositor’s money for any investment or lending purpose, meaning that the entire amount of the clients’ deposits would be held in accounts at the CB and thus not exposed to any kind of intermediary risks. This is, in fact, the definition of a “full reserve bank, narrow bank, or safe bank, as deposits are fully backed by the safest asset (i.e., CB money). Moreover, in this scenario the NBs would become unbundled, since the intermediation and the investment services functions would become segregated.

The first question that comes to mind is whether the unbundled business opportunities available to the NBs would be worthwhile—that is, whether the NB’s business would be viable. If the answer to this question is yes, then the second question is why traditional banks have chosen not to unbundle themselves voluntarily earlier in the game?

Regarding the first question, it is clear that the business model chosen by the NBs would have to be based on three dimensions: (i) the quality of the payment services, (ii) the value that users place on not having commercial bank risks, and (iii) what NBs could do with the information provided by their clients. A high quality payment service offered by the NBs could, in principle, be matched by the bundled incumbent traditional banks. All that traditional banks would have to do is choose the right technology, adapt their culture, and refocus their business. If incumbents could accomplish all of this without much delay, the variable “excellent transactional services” would not necessarily deliver a strategic advantage to the NBs, as NBs would not be the only ones able to provide excellent payment services.

On the other hand, the possibility of offering risk-free deposits is a unique NB characteristic. Traditional banks cannot offer them unless they decide to unbundle. However, the value that customers-depositors attach to not having to bear commercial bank risk is very difficult to ascertain a priori. While it is reasonable to expect that some depositors would “fly to quality,” transferring some deposits away from the bundled traditional banks, other depositors may prefer to stay with (higher) interest bearing deposits offered by traditional banks. In any case, it is very likely that the value of risk-free deposits would be correlated with the overall perceived riskiness of the financial system (based on the assumption that commercial banks would pay higher interests on the deposits than the NBs). Therefore, the strategic viability of the NBs business would hinge upon what they could do with the information about their clients that traditional banks could not. The answer to this question is the key to the sustainability of the NBs business models.

In the traditional bundled banking model, banks should not, and do not, share the proprietary information about their clients, since this information is a crucial input for credit allocation decisions and it is the basis for cross-selling other financial services. Therefore, in the traditional bank subspace, the information sets about clients stay compartmentalized, because the bundled nature of the business so requires.

In the NB business model, however, there are no provisions to prevent the companies from sharing or selling their clients’ information to third parties (other than NBs), such as FinTech firms that specialize in providing other financial services, such as investments, loans,

mortgages, and insurance products. If the NB subspace is able to provide enough client information, FinTech firms could become a serious challenge to the incumbent banks.

Another possibility is that some NBs would share or sell their information to a financial services platform, over which financial services providers would offer their services and products. In either case, the overall regulatory capital required by each FinTech financial operator would be considerably less than that required by the incumbent banks, since in the new model no one would be exposed to the risk of a “bank run.” Therefore, the possibility of accessing a wider information set and much lower capital requirements could be the drivers for the emergence of a new financial services model that would significantly disrupt the current status quo.

The final question of this section is why this has not happened before. To help draw a conclusion in this respect, here is an excellent quote by Professor Simon Johnson (2016):

In part, this is due to the general inertia in all legacy systems: We do things today just as we did them yesterday, because it requires less effort and thought. In addition, the pressure for change is diminished by the implicit free subsidies provided to systemically risky activities in our current structures. The largest banks in the world are regarded as too big to fail by investors, so people are willing to hold a claim on those banks (i.e., a bank account) as part of how they make daily payments, or—in the terminology of financial markets—to accept a great deal of counterparty risk, at least until things get very bad. The problems with this structure are both that it induces inappropriate forms of risk-taking and that, when things get bad, central banks and ministries of finance have to step in with a great deal of support. And even when such support is provided—as it was on a massive scale in 2008-09—it will not necessarily prevent a deep recession, or worse. The most important source of economic and political power for large banks today is that large financial flows must move through centralized—but private—structures. These banks are protected by regulatory barriers to entry: It is hard to get a banking license. The big banks also have a hotline to the authorities, in part because they are important in the selling and holding of government debt. Tomorrow’s flows will move much more through decentralized structures. And this system will be more stable if the central bank offers ready access to the safest possible asset.

8. Risks

In this discussion, there are risks related to the expansion of access to CBM, use of digital currencies, and unbundling of the banking function. In general, the impact of these risks depends on how a wider access to CBM is implemented and the characteristics of the system; for example, whether CBM deposits would earn interest and how they would compete or not with traditional bank deposits.

The Bank for International Settlements (BIS) has extensively discussed issues related to expanding access to CBM (BIS, 2003). Overall, it argues that there is a trade-off between efficiency and safety. While expanding access to NB institutions may help reduce concentrations of activity and risk, if access to intraday credit is increased, it can also require the CB to extend larger amounts of credit to less creditworthy institutions, putting public funds at risk and potentially generating moral hazard. Another potentially negative consequence that the BIS points out is that expanded access can lead to a decrease in the use of institutions with expertise in the provision of payment services and the financial resources to support their activities.

The macroeconomic impact of expanded access to CBM would depend on the degree to which CBM deposits compete with traditional commercial bank deposits. If large amounts in deposits are moved away from traditional commercial banks, their ability to provide credit will be impacted, or at least it would become more costly, thereby affecting economic activity. As Ben Broadbent (2016: 3), Deputy Governor of the BoE, argues, in such a scenario, “banks would be more reliant on wholesale markets, a source of funding that didn’t prove particularly stable during the crisis, and could reduce their lending to the real economy as a result.” This can affect particularly those firms that do not have access to securities markets.

With respect to a full narrow banking scenario, the implied risks have been subject of debate for many decades. For example, Bossone (2001) concludes that as banks become more narrow and no alternative forms of credit emerge, costs greatly increase in terms of efficiency and creating market incompleteness. Eleven years later, however, Benes and Kumhof (2012) not only find support to all the four advantages of narrow banking as ascertained by Fischer (1936),¹⁸ but also that an implementation of a separation of the monetary and credit functions of the banking system, as proposed by the “Chicago Plan”, could lead to output gains of close to 10 percent,¹⁹ and steady state inflation could drop to zero without posing problems for the conduct of monetary policy.

In terms of risks specific to digital currencies, it is important to differentiate those entailed by privately developed, internet-based cryptocurrencies from those entailed by a potential digital currency issued or sponsored by a CB. Within this category, there are different risks depending on whether the CB digital currency is provided in a centralized or decentralized system. In the

¹⁸ The four advantages are: (i) better control of a major source of business cycle fluctuations, sudden increases and contractions of bank credit and of the supply of bank-created money, (ii) elimination of bank runs, (iii) reduction of the (net) public debt, and (iv) reduction of private debt, as money creation no longer requires simultaneous debt creation.

¹⁹ In their model, this happens for three main reasons: (i) large reductions of real interest rates due to monetary reforms, (ii) lower distortionary tax rates due to the beneficial effects of much higher seigniorage, and (iii) lower credit monitoring costs.

case of a centralized system, the main risks are operational, considering that it entails a single point of failure, and fraud, especially if the digital currency is counterfeited. These risks are thus drastically diminished with distributed ledger technologies, as the system would not depend on a single point and would have imbedded mechanisms to avoid counterfeiting or double spending. Nonetheless, distributed ledger systems are still subject to system-wide fraud and hacking, especially if the consensus mechanism for validating transactions is compromised (Ali et al., 2014b). Finally, there can also be overall risks through attacks to the digital wallets held by individuals. This, however, is equivalent to the risk of having your physical wallet with paper bills stolen, with the difference that it can be better prevented due to advances in technology.

9. Concluding Remarks

Technological advances have impacted the way money has evolved, and will continue to do so. Policy in this area has also evolved over time with changes in technology as well as in financial, political, and legal structures. The rapid development of the Internet, in addition to the advances and innovation in payment technology in a context of imminent generational change, suggest that the trend of digital currencies, including those issued by CBs, is not likely to fade anytime soon. These advances will definitely increase the competition in the financial services sector. Whether this competition becomes disruptive remains to be seen, but this outcome is definitely not implausible.

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