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WILL THE BRICS BE THE LEADERS IN CENTRAL BANK DIGITAL CURRENCIES?

The study discusses the opportunity for the BRICS to implement a common supranational Central Bank Digital Currency (CBDC). Starting from the observation that many CDBC projects are under study all over the world and that the subject is hardly treated in the academic literature, we have sought to propose a general definition of the concept of CBDC. Based on this definition, both technical and monetary opportunities and constraints are studied in the case of the BRICS supranational CBDC project.
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Introduction

At the 11th Annual BRICS Summit held in Brasilia in November 2019, the BRICS Business Council discussed the possibility of creating a common central bank digital currency (CBDC for Central Bank Digital Currency). As national CBDC projects emerge around the world, the BRICS plan to launch a joint supranational CBDC using blockchain technology straight away. Although the project is only at the discussion stage, it rises innumerable questions, both on the technical aspects of its implementation and on the opportunity for the BRICS to implement it. There is little work on CBDC in the academic literature dedicated to cryptocurrencies and blockchain. The purpose of this text is to start from what is known about CBDCs in order to discuss the opportunity for the BRICS to launch their own common supranational CBDC.

After briefly presenting cryptocurrencies and how they work (section 1), we will show how CBDC is an original development (section 2). Finally, we will discuss the opportunity for the BRICS to create a common supranational CBDC (section 3).

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1. Cryptocurrencies and how they work

Bitcoin, the first of cryptocurrencies, was conceived as an alternative to the contemporary monetary order. It is part of a general movement to challenge political and banking powers, deemed unable to implement quality currency and an independent monetary policy. Bitcoin is thus thought of as a means of monetary appropriation by individuals, "a new area of freedom for several years", a "common good", a "means of democratizing finance" (Nakamoto 2008). In this system, the traditional trusted third parties (banks, financial intermediaries) are replaced by a technical infrastructure supposed to generate trust without any central authority (De Filippi & Loveluck 2016).

Origin of the cryptocurrencies

In the early 1980s, informal groups self-entitled "Cypherpunks" or "Crypto anarchists" started gathering to find out how to mix cryptography and information technologies. They decided to use the technical capacity of cryptography, for the creation of new systems (Castor, 2017). These groups aimed to conceive a decentralized I.T. protocol that could allow individual collaboration without the identification of the names and legal identities of the people exchanging information. In parallel, they developed a strong discourse against central institutions, starting by those run by the U.S. Government, as they considered their power to rule finance worldwide to be exorbitant. In a direct reference to Marx, May called decentralized I.T. protocol "a technical revolution" that allows the exchange of almost anything (even drogues and illegal products) in perfect and fluid markets: "An anonymous computerized market will even make possible abhorrent markets for assassinations and extortion" (May, 1992).

For these groups, cyberspace is seen as a ground for social interaction: "government is not destroyed, but it simply becomes redundant without any possible intervention" (Dai, 1998). Several projects of decentralized electronic coin emerged from this conceptualization giving out the bases for what would become the architecture of Bitcoin: "Digicash" (Chaum, 1983), "b-money" (Dai, 1998), "Bit gold" (Szabo, 1998 and 2005).

The founding article explaining the concept of Bitcoin was published in 2008. It's "author", Satoshi Nakamoto[2], discusses how he has been working on this conceptualization since 2007 (Nakamoto, 2008). Nakamoto announces his desire to find a solution to the problem caused by "third-party institutions" (banks and other financial institutions, central banks). The aim of these intermediaries is to solve potential conflicts (the reversibility of transactions and the eventual creation of arbitrary currencies), but this mediation also causes an increase in transaction costs and in the frequency and intensity of monetary crises. Nakamoto suggests that it could be possible to create a digital currency without any third-party institutions. A currency based on a collaborative, resilient, and secure Peer-to-Peer (P2P) architecture via the use of specific technology.

[2] The mystery remains about the identity of the designer(s).

The technical infrastructure of cryptocurrencies

Although each cryptocurrency is based on a specific technical infrastructure, all of them have the same elements in common: a protocol, a blockchain, mining. We will briefly present these elements in the case of Bitcoin.

The Bitcoin protocol is distributed to eliminate single checkpoints and build resilience across the system. By a dual-key cryptographic system, it guarantees the "pseudonymity" of the stakeholders, while making it impossible to falsify the identifiers and amounts of Bitcoins registered in users' electronic wallets. When making a payment, the issuer signs and authenticates their payment order with their private key. The beneficiary of the settlement will receive the sums sent to his own address if this key matches to the public key sent by the issuer to decrypt the transfer and authenticate the origin without revealing the identity of the actors.

The blockchain contains the history of all the transactions processed and validated by the Bitcoin system since its creation. Any validated transaction is written in a new block (a kind of transaction page) which is integrated into the blockchain. The latter is replicated identically in certain computers in the system, called "complete nodes". There is, in fact, not one but several thousand copies of the blockchain, built and managed by as many computers all over the planet. Each "full node" keeps a copy of the blockchain up to date, downloads and checks the validity of the new blocks with rules recognized by all, then distributes them on the network.

Mining, finally, by resolution of "proofs of work" (or *PoW* for *Proof of Work*), corresponds to the stage where the new transactions issued are validated and registered in a new block added to the blockchain. It is carried out by "miners", voluntary users who, in addition to holding complete nodes, are provided with special software enabling the validation of new blocks. The validation process consists of the resolution of several complex mathematical equations that are themselves dependent on an aleatory targeting system that is defined within the rules of the blockchain. This aleatory feature guarantees that it is never the same miner that validates the transaction (Ribeiro, 2016). This "randomness" avoids for a single miner to become more powerful than any other, which is one of the keys to the security of the blockchain. Once a new block is validated by a first miner, then it must be confirmed by at least 51% of the total power of the network, which makes block forgery almost impossible. The miners compete for the resolution of each *PoW*. Their chance of finding the right solution before the others depend directly on the calculation power they dedicate to it, relative to the total calculating power accumulated in the network. Minors are "paid" in new bitcoins issued for their work and for the resources mobilized. Originally, 50 bitcoins were issued every ten minutes, but this issue is halved every 210,000 blocks issued (or approximately every four years). Today, the validation of a block emits 12.5 bitcoins. Of the 21 million bitcoins predicted by the initial algorithm, 85% are already in circulation. At this rate, the emission should continue until 2140. Mining requires three types of hardware. The first is a processor (CPU), which is the most accessible computing system available for mining, but its power is very limited. The second is a graphic card (GPU) which has a more powerful capacity than a CPU. To optimize their processing power, GPUs are assembled in a rig that usually contains a power source, a motherboard, risers or adapters, GPUs and an air-conditioned stand. Thirdly, the Application-Specific Integrated Circuit (ASIC) holds a very high processing

power. It is a specialized type of hardware that can only work with a very limited number of algorithms and it cannot be used for anything else than mining. The ASIC is usually composed of one or more chips that are disposed on a card, jointed by connectors (to allow it to connect to the Internet), a power supply unit, many ventilators, and a container. To increase their benefits, miners have an incentive to join groups of miners that are known as "pools". These groups allow them to mine together and to share the gains. It is also possible to join a cloud mining system. In this case, one pays other miners to rent out an unused part of their equipment. The renters receive in return for their investment, the gains from the leased equipment. However, people choosing this option take the risk of paying rent in advance without being guaranteed that the equipment will work efficiently, or that it is not a scam.

The technical infrastructure of cryptocurrencies has proven to be efficient, secure, difficult to censor and above all incorruptible. It allows direct interaction between individuals without any use of a third party. It excludes any form of coercion. The transaction costs are almost zero and the delays of payment reduced.

Beyond cryptocurrencies

Today Blockchain technology goes far beyond the reach of cryptocurrencies. As it is drastically reducing transaction costs, intermediaries, and delays, this technology is attracting start-ups, large corporations, and public administrators. It was quickly presented as a "trust machine" capable of "changing the world" (The Economist 2015). The blockchain focuses all the attention because it allows the storage of time-stamped information that can be consulted at any time, a bit like a data centre, secure, incorruptible and inviolable. You can certainly store information relating to bitcoin payments there, but nothing prevents the storage of other data of a very different nature: proof of purchase, deeds of ownership, proof of payment, patents, tickets, etc.

To date, the academic work is mostly concerned with the technical infrastructure necessary for developing cryptocurrency (Rodima-Taylor *et al.*, 2017), the monetary nature of cryptocurrencies (Lakomski-Laguerre and Desmedt, 2015), the interest of States to use them and emerging national regulations (De Filippi, 2014), or the role of cryptocurrencies as a new sociotechnical construct (De Filippi and Loveluck, 2016), (Rolland and Slim, 2017). Some other research has treated blockchain on a more technological approach (Risius and Spohrer, 2017), (Meroni *et al.*, 2019), (Ruoti *et al.*, 2020), speaking about data and information controls (Cappiello *et al.*, 2019), of the rules necessary to treat information (Yeoh, 2017), (Ólnes *et al.*, 2017), (van Rijswijk *et al.*, 2019) and discussing the role of the capitalist economic institution in the deployment of the technology (Davidson *et al.*, 2018). Some rare examples have attempted a classification of applications based on Blockchain technology (Ribeiro, 2016), (Godebarge and Rossat, 2016), (Labazova *et al.*, 2019).

They are different types of blockchain. After the creation of Bitcoin, more than 1,500 cryptocurrencies have been launched. Each of them is based on a specific Blockchain technology (some are faster, while others are more traceable, some are cheaper to trade with, while others have tougher authentication protocols). Blockchains are said to be "public"

because the entirety of its repository (historic of the transaction) is visible to everyone. A way of imagining public blockchain is by thinking about a "big public book, anonymous, impossible to falsify, that everyone can consult and read" (Ribeiro, 2016). They are two main types of public blockchain: the classical Blockchains and the "infrastructure" ones.

Classical Blockchains gather information than can be consulted by everyone. They work as safe datacenters (Kolb *et al.*, 2020). For example, the Blockchain of Bitcoin has all the blocks that trace all the transactions in Bitcoins ever since the first emission of a "block genesis" by Satoshi Nakamoto in 2009. These blocks stock all the electronic signatures as well as other data, including the purchases, the ownership of Bitcoins, the payments, etc.

The "infrastructure" Blockchains are capable of keeping and managing other types of information such as "Smart Contracts". The first blockchain of this type, called Ethereum, was conceived in 2013 by Vitalik Buterin, a Canadian developer of Russian origin. In his white paper, he defines Smart Contracts as: "cryptographic 'boxes' that contain value and only unlock it if certain conditions are met" (Buterin, 2013). Smart contracts are not contracts in the true sense of the term, but more as stand-alone computer applications that have saved the terms of an agreement and that self-execute when the conditions of the agreement are met. They do not have legal authority in themselves. When a legal contract exists, the smart contract is its technical application. They operate on the principle of "if-then" (**if** the condition is verified, **then** the consequence is executed). The originality here lies in the fact that these smart contacts are written on a blockchain and therefore benefit from all the advantages of this technology (time stamping, inviolability, reduced transaction costs, etc.). They avoid the high costs of drafting a contract, legal intervention, opportunistic behaviour and the ambiguities inherent in written language. We are certain that smart contracts will be executed as expected, quickly and without human intervention (a potential source of bias).

Buterin saw three great opportunities for the implementation of Blockchain infrastructures: "In general, there are three types of applications on top of Ethereum. The first category is financial applications, providing users with more powerful ways of managing and entering into contracts using their money. This includes sub-currencies, financial derivatives, hedging contracts, savings wallets, wills, and ultimately even some classes of full-scale employment contracts. The second category is semi-financial applications, where the money is involved, but there is also a heavy non-monetary side to what is being done; a perfect example is self-enforcing bounties for solutions to computational problems. Finally, there are applications such as online voting and decentralized governance that are not financial at all" (Buterin, 2013)

The emergence of private (or "permissible") Blockchains (Blockchains that contain information that is only accessible by specific predetermined entities) and "consortium Blockchain" (a mix between public and private ones) helped to expend the diffusion of Blockchain technology to other economic activities.

Since then, countless outlets have opened up for these technologies: financial applications, insurance, traceability, content storage, control and certification, authentication, Internet of Things, collaborative activities, fund-raising by Initial Coin Offering (ICO)… Companies highlight seven main factors of attractiveness of the blockchain: non-falsifiable data, security by cryptography, significant drop in transaction costs, authentication of data by consensus,

community organization, public account register and speed of transactions. (Arreola *and all*. 2020). For instance, Wyman believes that blockchain could result in transaction cost economies of about 15 to 20 billion a year (Wyman, 2016).

ICOs are probably the best illustration of the use of the blockchain without cryptocurrencies. As opposed to an IPO (*Initial Public Offering*), which implies the launch of new stock in the trading market, the ICO is a "mechanism to raise external funding through the emission of tokens" (Momtaz, 2018). An ICO is a fund-raising exercise under the crowdfunding model, that is collected in cryptocurrencies. Concretely, a firm emits tokens that it sells as cryptocurrencies for launching a new project, and people (and firms) can buy these tokens. The ICO allows firms to overcome the very complex and difficult access to the venture capital system, which tends to only finance projects that are at a very early stage. Also, the tokens can be given many other uses, including buying the product at the origin of the ICO, be resold as a financial title, or be reconverted into fiat currency. Platforms such as *Waves* in Russia or *Trade.io* in Hong Kong allow firms to get started in a few clicks. In 2019, USD 2.83 billion was raised in ICOs worldwide, after peaking at USD 13.54 billion in 2018 (Perreau, 2020). The ten largest ICOs to date: EOS (USD 4000 million), Telegram (1700), Bitfinex (1000), TaTaTu (575), Dragon Coin (320), HDAC (258), Filecoin (257), Tezos (233), Sirin Labs (157) and Bancor (153). The ICOs are more frequently used to finance the launch of decentralized applications. Nevertheless, there is no guarantee for investors and some ICO can be real scams.

Therefore, there is a rapid evolution of the juridical and regulatory standards for launching ICOs. In France, the PACTE law (22 May 2019) has a section dedicated to ICOs in its article 26. The law stipulates that the French Financial Market Authority (AMF) could deliver a pre-approval to ICO projects that provide guarantees of protection to investors, such as the provision of the funds raised. Moreover, the creators of tokens will have to be registered to operate in France and the ICOs will have minimum standards for the number of people necessary to validate the projects (at least 150 people). Finally, ICOs will be required to provide a white paper presenting the project's potential risks.

More than a technical revolution, blockchain could also become a vector for profound social change. It is in this context that central banks began to take an interest in this technology and to consider the issue of central bank digital money (MDBC).

2. National CBDC or supranational CDBC for the BRICS?

We are witnessing a profusion of CBDC projects: China, Cambodia, Dubai, Estonia, France, Iran, Kazakhstan, Turkey, South Korea, Russia, Switzerland, Sweden, Uzbekistan... Some projects are in the test phase (test-launched in South Korea on 7 April 2020), but for the moment, only the Venezuelan CBDC project (the petro) was completed in 2018. Despite their differences, all these MDBC projects are nationwide. National CBDCs are an unexpected and original evolution of cryptocurrencies. Recall that cryptocurrencies were designed to reject any form of the central monetary authority. However, with the CDBCs, it is the central banks that are taking the lead and are now seizing on these technologies.

Definition of national CBDCs

A domestic CBDC can be defined as a digital asset issued and destroyed by the central bank alone, exchanged with banknotes and reserves, permanently available and for peer-to-peer transactions and circulating on digital media. The motive for issuing a CBDC commonly put forward by central banks is to offer a payment instrument that is perfectly liquid, secure and adapted to technological developments.

A distinction is made between wholesale CBDCs, i.e. accessible to all or some of the financial institutions in a country, and retail CBDCs, i.e. accessible to everyone (financial institutions, administrations, companies, individuals).

With wholesale CBDCs, it is thus possible to perform end-to-end transactions, including final settlement, in so-called "tokenized" assets on the blockchain. This will boost the capacity for innovation and the productivity of the financial sector. Retail CBDCs, on the other hand, reduce the transaction costs of retail payments while ensuring access to central bank money for all, in a dematerialized form complementary to fiat money.

The BRICS: supranational CBDC or network of national CDBCs?

The BRICS are immediately involved in the process of creating a common supranational CBDC. Several options exist for the creation of a common CBDC without the BRICS having yet expressed a clear strategy in this area.

The optimal option would be to create a common supranational CBDC managed collectively by the central banks of the five countries of the group. Each central bank should issue a determined volume of this supranational CBDC. All transactions in this common cryptocurrency would be recorded in a single private blockchain where only institutions chosen by the BRICS could "mine" the transactions to authenticate them. We can imagine in this option that the supranational CBDC issued can be wholesale or retail.

A second option would be to first create a network of national CBDCs within the BRICS and then define a supranational CBDC designed as a basket of national CBDCs, a bit like the ECU in the 1979 EMS.

A third option would be to create a common supranational CBDC guaranteed to be 100% on deposits in national currencies (*fiat currencies*) of the BRICS with an international monetary authority set up for the occasion.

A fourth option would be to let one of the countries in the group (China or Russia for example) create its own national CBDC and then have it adopted by the other BRICS.

For now, although the BRICS say they are in favour of a joint supranational CBDC project, none of these options has yet been discussed. To date, only China and Russia seem to have embarked on plans to create national CBDCs. Brazil, India and South Africa have yet to announce any such plans.

The Chinese Central Bank (PBoC for *People's Bank of China*) announces on its site the upcoming launch (without giving any date) of a digital currency, called DCEP (for *Digital*

Currency Electronic Payment) on which it has been working since 2015. The stated objective of the PBoC is to provide an alternative to cash for retail payments. The DCEP would be issued on the basis of a private blockchain and its distribution would be based on commercial banks and Chinese web giants: Alipay (owned by e-commerce giant Alibaba), WeChat pay (owned by Tencent messaging), Industrial and Commercial Bank of China, Bank of China, Agricultural Bank of China, China Construction Bank and Union Pay. These institutions would have direct access to the DCEP and would oversee opening and managing the DCEP portfolios of the general public (individuals and businesses). Finally, the PBoC announces that there will be a cap per transaction in order to limit the use of the DCEP to retail payments and that a mobile application will be developed for easy access. It was the metropolis of Shenzhen (13 million inhabitants) that was selected for the first DCEP test. Shenzhen Financial Technology Co. Ltd (a company specializing in blockchain and 100% owned by the PBoC Digital Currency Institute) was established there in 2018.

Since May 2016, Russia has been considering introducing a CryptoRuble. However, the question of the legality of cryptocurrencies remained unresolved in the country, due to strong dissensions between Russian institutions. In October 2017, Russian President V. Putin called for the establishment of a balanced regulatory environment for cryptocurrencies. Indeed, according to him, "the use of cryptocurrencies carries serious risks such as money laundering, tax evasion and terrorist financing" (De 2017). This shift has resulted in massive investments in mining infrastructure, particularly in eastern Siberia (Estecahandy & Limonier 2020). At the same time, a bill On Digital Financial Assets (DFA) was tabled by the Russian Ministry of Finance (following the request of the President; List of instructions Pr-2132 of 21 October 2017) in the Duma on 25 January 2018. Eventually, Duma passed the DFA law on Wednesday, 22 July 2020. The new law, which will come into force from 1 January 2020, gives legal status to cryptocurrencies in the country, but it prohibits their use for paying for goods and services. The cryptocurrencies are being recognized as an aggregate of electronic data capable of being accepted as the payment means. The DFA law states that "possession of digital currency, its acquisition and transfer by legal means are allowed only if declared". It institutes the Central Bank of the Russian Federation (CBR) as the authority to issue digital currencies inside Russian jurisdiction as well as oversee the activities on the authorized platforms.

Brazil has yet to announce any plans for a national CBDC. With the most bitcoin transactions in Latin America, the country officially recognized cryptocurrencies as legal currencies in August 2019. In the process, the Mile Unity Foundation, issuer of XDR (a stablecoin anchored on a basket of five currencies: dollar, euro, yen, Chinese yuan and pound sterling), was received at the Brazilian Ministry of Industry and Trade in the prospect of using XDR on a large scale for international remittances from the country.

India has not announced any plans for a national CBDC. However, the Indian central bank (RBI for *Reserve Bank of India*) has declared itself in favour of the introduction of such a currency based on a private blockchain. RBI hopes in this way to alleviate the corruption which exists in the country and reduce the dependence of Indians working abroad on financial intermediaries when they make their remittances. The Indian government, meanwhile, recently declared itself in favour of issuing a CBDC to reduce the population's dependence on other cryptocurrencies.

South Africa has also not announced any official plans for CBDC. The country's Central Bank (SARB for *South African Reserve Bank*) has declared itself in favour of a CBDC based on a private retail blockchain open directly to the population, without going through the intermediary of banks. The objective would be the financial inclusion of the 11 million unbanked people and, in doing so, the stimulation of economic development.

3. The interest of a common supranational CBDC for the BRICS

The BRICS represent 41.6% of the world population (*i.e.* 3.16 billion people), 23.6% of world GDP, 27.4% of inward FDI flows, 16.2% of world exports, 15, 9% of world imports, 11% of the current world transfers. With such weight in the global economy, the joint CBDC project initiated by the BRICS is likely to have repercussions around the world. We will limit ourselves here to discussing the interest for the BRICS alone, retaining the hypothesis of the issuance of a common retail CBDC, open to all.

The advent of an international blockchain-based payment system

The issuance of a joint retail CBDC by the BRICS would offer an unprecedented international payment system to all economic players in these countries (banks and financial institutions, businesses, administrations, individuals). According to the common CBDC model retained, the possibilities for users would not be the same. One can imagine four major models of common retail CBDC (Figure 1).

Figure 1

The four models of common retail CBDC for the BRICS

	Direct	Intermediated
With tokens	Token-based model without intermediation	Token-based model with intermediation
With accounts	Account-based model without intermediation	Account-based models with intermediation

The token-based model means that the CBDC is accessible to the public on dedicated wallets, which are opened and managed either by intermediaries (token-based model with intermediation) or directly by the supranational monetary authority responsible for the common CBDC common (disintermediated token-based model). In the case of the BRICS, this would mean that users could use the common CBDC to settle international as well as national transactions, placing orders directly from their wallets (via a computer, mobile phone, etc.). The transfer of units would be done electronically from wallet to wallet.

The account-based model means that the common CBDC is stored on an account, accessible online, associated with its holder. This account can be opened and managed either by banks (account-based model with intermediation) or directly by the supranational monetary authority responsible for the CBDC (disintermediated account-based model). In the case of the BRICS, this means that users could make their national and international account-to-account payments.

Regardless of the CBDC model adopted by the BRICS, the resulting international payment system will benefit from all the advantages of blockchain technology: speed of payments, reduced transaction costs, security, time-stamping and archiving of all transactions. Models without intermediaries (whether token-based or account-based) in which the central monetary authority responsible for the common CBDC directly ensures the availability to users of monetary units are those which would make it possible to reduce the most sharply transaction costs and delays. However, adopting this type of model would be particularly restrictive for central banks, which are not used to dealing with so many counterparties and are not intended to ensure such granularity of the transactions carried out by all economic agents. Moreover, these models would call into question the very existence of financial intermediaries. It is, therefore, likely that the BRICS will choose a common CBDC model with intermediaries: banks, other payment service providers, insurers, agents/brokers, exchange offices, post offices, etc.

The BRICS have raised the idea of a mobile phone-based electronic payment system for the general public called BRICS Pay. The platform would use a mobile application linked either to wallets (token-based model) or to accounts (account-based model) that would allow users from any BRICS country to settle their transactions with users in other BRICS countries.

Such an undertaking requires the BRICS to engage in an approach aimed at ensuring the interoperability of their already existing infrastructures in the field of international payments. The efforts, already undertaken to bring together the Russian (SPFS) and Chinese (CIPS) payment systems, show a willingness to move in this direction. India plans to connect to the Russian central bank system through a service currently under development. Finally, the effort of international standardization of infrastructures based on a blockchain which has just been undertaken by the International Standard Organization within the framework of its ISO / TC 307 Technical Committee will constitute an essential tool to make the MDBC project common to the BRICS operational.

Overcome the dollar and the constraints imposed by the United States

Kirill Dmitriev, director of the Russian Direct Investment Funds (RDIF), said in November 2019 that “an efficient and functioning BRICS payment system could stimulate settlements between national currencies and ensure the stability of settlements and investments between our countries, which form more than 20% of the global inflow of foreign direct investment. Cryptocurrency payments will be made through the BRICS payment system, the creation of which is under discussion”. In other words, the existence of a common supranational CBDC would overcome the dollar’s hegemony in currency settlements between the BRICS. In 2019, the dollar represented nearly 50% of settlements within the group (against 14% for the ruble, for example). Beyond the dollar, the advent of a stand-alone payment system between BRICS would bypass the US SWIFT network for international payments, which would be particularly useful for countries targeted by U.S. economic sanctions.

Stimulate economic activity and support growth

There are several indications that a CBDC is likely to boost economic growth in the BRICS. Economists at the Bank of England have attempted to assess the potential impact of a CBDC that would be issued as a new monetary policy instrument and circulate alongside fiat money. The positive impact on the level of GDP would come in part from the purchase of assets that it would finance. The authors estimate that a CBDC issue of up to 30 points of GDP (the equivalent of the average Q.E. effort made by central banks after the subprime crisis) would generate a permanent increase in the level of GDP of 3% "due to the fall in real interest rates" and "a reduction in transaction costs" (Barrdear and Kumhof, 2016). In addition, the authors consider that adopting a countercyclical rule in the setting of interest rates would improve the transmission of monetary policy and better stabilize the economic cycle. It is also likely that the issuance of a CBDC will lead to the creation of an intra-day money market, i.e. exchanges of CBDCs between financial institutions for durations of less than a day. This would raise the question of switching to real-time monetary policy implementation.

It can be added that a common retail CBDC would offer users greater manoeuvrability than coins and banknotes. In addition, if the BRICS CBDC were to be based on an "infrastructure" blockchain, it could then integrate smart contracts, which would automate payments, simplify invoicing and accounting monitoring, further reduce delays and even carry out fund-raising (such as Initial Coin Offering - ICO type).

In addition, the CBDC would offer an alternative to traditional electronic payments (transfer, bank cards), which would help reduce the rents of established operators and stimulate consumption, trade and activity accordingly (Hasan et al. 2013).

Reduce the use of historical cryptocurrencies

A supranational CBDC for the BRICS would work like a stablecoin. It could thus be backed either by national CBDCs (which do not yet exist) or by a basket of national fiat currencies. In the event that it is not backed by any collateral, the stability of its value could still be ensured by smart contracts, which will automatically buy back the CBDC in circulation when its price is too low and sell it when it is too high. This last option obviously assumes that the common CBDC chosen by the BRICS is based on an "infrastructure" blockchain.

In any case, the issuance of a common supranational retail CBDC would offer greater guarantees of stability than historical cryptocurrencies issued on public blockchains and which present numerous risks: high volatility, high operational risk, liquidity risk, etc. (Agur 2018). The CBDC chosen by the BRICS, appearing as a stable, operational, liquid payment instrument, should therefore logically be preferred by users to historical cryptocurrencies for the settlement of transactions. At the same time, it will help preserve the monetary sovereignty of the BRICS against historical cryptocurrencies using public blockchains and private stablecoins with global reach (such as Libra).

Extend the BRICS area of influence

A common retail CBDC, because of the strengths discussed above, could attract many more participants. Its adoption by other countries outside the group would *de facto* extend BRICS

hegemony. One can imagine, for example, that the African countries of the former CFA franc zone are interested in the BRICS CBDC, especially since China is already very present economically in Africa. If such a scenario were to happen, we would witness an unprecedented development of economic relations (trade, FDI, loans, current transfers, remittances) between Africa and the BRICS. We can therefore understand the reasons which push the Banque de France to speed up the schedule for developing a European CBDC so as not to give way to China! Moreover, it is not excluded that a local CBDC initiative emerges directly from the countries of UEMOA (West African countries) or CEMAC (Central African countries) or from both groups combined. Such an initiative would constitute a real mode of emancipation for these countries, while the eco (replacement currency for the CFA franc) is contested even before its entry into force.

Conclusion

This foresight exercise made it possible to define the notion of CBDC and to establish a typology of possible models. It appeared that the desire of the BRICS to create a common CBDC is part of a more general movement which can be explained by the intensification of competition between international payment systems: historical cryptocurrencies which nibble at the monetary sovereignty of States, new Private stablecoins with global pretension carried by the digital giants (Facebook, Telegram, etc.)... CBDCs finally are constrained choice for States in order not to fall too far behind in the blockchain race and to try to preserve a form of minimal monetary sovereignty.

Despite their common will displayed in November 2019, the BRICS are running in dispersed order with a very clear lead for China. It is a safe bet that the future supranational payment system that will emerge within the group will be largely based on a Chinese CBDC.

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