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Central bank digital currencies: An assessment of their adoption in Latin America

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Summary

This document focuses on identifying factors affecting the implementation of a Central Bank digital currency (CBDC) in Latin American countries. Main conclusions apply to developing countries in general. The adoption of a CBDC (non-universal) for the interbank and wholesale payment system would lead to a relatively minor level of disruption in the economy. In this case, although Latin America could benefit more than developed countries from the implementation of a CBDC, since the gains in efficiency are potentially greater, the implementation costs is an important issue. The implementation of a universal and unidentified CBDC offers a similar alternative to cash, which is widely used in Latin America compared to developed countries. Thus, the adoption of this type of CBDC would involve improvements in the levels of financial inclusion and a reduction in the costs of transporting and managing cash, but it could lead to an increase in informality, which is already a problem in the region. Another alternative would be to adopt a universal and identified CBDC, which would drastically reduce the problems of informality. However, this type of CBDC is more disruptive and could have a negative effect on financial stability, credit markets, make it more complex to handle economic policy and increase the demand for alternative assets, such as private cryptocurrencies or foreign currencies (mainly the US dollar, in the case of Latin America). In general, although the benefits of a CBDC adoption for Latin American countries are potentially greater than for developed countries, the associated costs reduce the probability of adoption, particularly the more disruptive alternatives.

Keywords: Central Bank digital currencies, Distributed Ledger Technology, financial system, informality, financial inclusion

JEL classification: O33, E43, E58

1. Introduction

The digital era has changed the way in which economic agents use and exchange information and money. The cornerstone lies in the possibility of having access to mobile Internet. Electronic payments are widely used and technological advances, such as Distributed Ledger Technology (DLT), have opened the door to a quicker, a more efficient and a more traceable way manage money. The appearance of Bitcoin and other private cryptocurrencies based on DLT has led to an increasing interest of researchers and policymakers in analysing digital currencies. Digital currencies are assets that are issued and stored electronically and have the same functionality as physical money. The existence of this kind of money has led to a debate in a number of Central Banks that are exploring the possibility of issuing sovereign digital currencies. [1] The literature has referred to this type of currency as Central Bank Digital Currencies (CBDCs).[2]

Traditionally, the Central Banks have provided banks and other financial institutions with electronic accounts. However, the public is only allowed to keep Central Bank money in a physical form (i.e. notes and/or coins). If a Central Bank would issue a universal access CBDC, all the economic agents could store assets and make payments using the Central Bank's digital currency. This could have significant implications for monetary policy, financial stability and the way in which the economic agents relate to the financial system. There are few papers in the literature that address questions on the feasibility of a CBDC implementation, its impact on monetary policy, the financial sector and the economy (Danezis and Meiklejohn, 2015; Rogoff, 2014 and 2016; Barrdear and Kumhof, 2016; Mersch, 2017 and Cerqueira *et al.*, 2017). However, most of these papers are descriptive or look at regulatory questions from a legal perspective.[3]

The aim of this paper is to analyse the options for adopting a CBDC in Latin American (LatAm) countries in order to describe the incentives faced by these countries and the probability of adoption. We study the implications of the four scenarios described in Cerqueira *et al.* (2017)[4].

The rest of the document is organised as follows. Section 2 analyses the most important factors in each scenario for a CBDC implementation in LatAm. Section 3 describes the challenges relating to competition among physical currencies, privacy cryptocurrencies and CBDCs issued by third countries related to the region. Finally, section 4 draws some conclusions and suggests some implications for economic policy and points some issues for further research.

2. Factors for assessing the adoption of a CBDC in LatAm

CBDC's can be created with different technologies. In this paper, we focus on CBDCs issued by using DLT, which allows a number of features, such as restricted *vs.* universal, anonymous *vs.* identified, and non-interest-bearing *vs.* interest-bearing, that might have different consequences for its implementation. We look at this list of features that combined generates four different scenarios described in Cerqueira *et al.* (2017):

1 They include the Bank of England, Popular Bank of China, Bank of Canada, Bank of Sweden and Central Bank of Uruguay, among others
2: Since the appearance in 2009 of the Bitcoin protocol and the technologies that support it (basically, blockchain), the term cryptocurrency, which was initially associated only with the Bitcoin currency, issued as part of the operating mechanism of this protocol, has been extended to cover any type of digital currency whose issuance and use is governed by a combination of distributed databases and cryptographic algorithms that, in general, are grouped under the heading of DLT (Distributed Ledger Technologies).
3: DLT, as the underlying technology, has generated considerably more research.
4: The specific features of LatAm could cause the probability of implementation calculated for each of the scenarios in Cerqueira *et al* (2017) to vary, as well as its desirability.

- **Scenario A:** The CBDC is restricted to a set of identified stakeholders and is intended for use in the area of wholesale payments. No interest is paid to its holders.
- **Scenario B**: The CBDC is universal; all the country's citizens may use it. It is anonymous and does not pay interest, so that it behaves in a similar way to cash.
- **Scenario C**: The CBDC is universal and anonymous, but in this case it does pay interest, which may be either positive or negative.
- **Scenario D**: This CBDC is universal and identified, so that it is the equivalent of having a deposit in the Central Bank.

All these scenarios assume the hypothesis that the CBDC initially coexist with cash, although in some of the scenarios the disappearance of cash is one of the consequences of adopting the CBDC.

When deciding to implement a CBDC, there are some factors that are more important for developing countries (i.e. LatAm) such as the level of informality, the costs associated with issuing and transporting cash, the penetration of mobile and data networks, the level of digital literacy, the degree of financial exclusion and the ongoing low probability that the interest rates will be negative, among others. We focus on these specific problems and their consequences for LatAm derived for a CBDC adoption under each scenario. One important aspect when assessing the probability that a CBDC implementation is the level of disruption for the economy and how this affects the economic agents. These aspects range from macroeconomic issues to the financial system and policy making. Depending on the accessibility of the CBDC, we divide the scenarios into two groups. In the first group, the CBDC is reserved for the wholesale market, banks and large companies. In the second one, the digital currency extends to the retail payment system and therefore reaches consumers. The effects of these two groups of scenarios are substantially different in terms of economic welfare, as they lead to challenges and *trade-offs* from the perspective of a benevolent central planning.

2.1. A restricted CBDC: interbank and wholesale system

The adoption of a CBDC for the interbank system and wholesale payment modes is a similar scheme to the one that exists today for this market, apart from the change in the underlying technology. To evaluate its feasibility, it is necessary to understand how the finance industry operates and is organised in relation to the interbank market and the vital role played by economies of scale.

Currently, the interbank market bases its payment system on infrastructures known as central securities depositories, central counterparties or *clearing houses*. LatAm clearing houses – if regulation allow them – are usually organised under the ownership and capitalisation of a group of banks or financial institutions, reserving a liquidity cushion that is sufficiently broad to be able to settle securities transactions with a variety of financial entities. The main role of these clearing houses is to reduce or eliminate the counterparty risk – or asymmetry of information – involved in a particular transaction between financial entities. However, this risk does not disappear from the interbank system, it is merely centralised and rests on these clearing houses. Since they have sufficient capital, it ensures the security and fluidity of the wholesale payment system. Thus, clearing houses are permitted to be self-financing (with a greater or lesser degree of rate regulation), to charge a commission and/or membership fee for the service of settling an interbank transaction. In theory, in a competitive market, this commission or membership fee should reflect both the expected cost of the counterparty risk to the system and the cost of the capacity for building the infrastructure. However, the economies of scale associated with *clearing* services tend to concentrate the supply of these services on a few operators, with the risks that this involves in terms of competition.

In LatAm, the technologies underlying the settlement of deposit operations tend to be very diverse, and in some countries relatively efficient systems already exist, such as *same-day affirmation* (SDA) and *straight-through processing* (STP). However, the *back-office* and recording costs continue to be high under the current infrastructure, both for the clearing houses and regulators and for financial institutions that operate on such infrastructure.

In this situation, the very nature of this infrastructure allows the introduction of a CBDC with DLT to generate substantial cost savings for the interbank *clearing* organisation. If we think of a global interbank system, the consequences for transactional cost savings, and in some cases speed, could be wide-ranging.

2.1.1 Scenario A: A non-universal, identified, non-interest bearing CBDC

In this scenario, the interbank payment system infrastructure is replaced by one based on DLT, so that the accounts of the participants in the Central Bank are replaced by CBDC wallets and the Central Bank becomes just another node of the network, although with certain privileges. The Central Bank can still access information on all the transactions as a supervisor, decides who can join the system and is the issuer of the cryptocurrency. The main advantages of this scenario lie, on the one hand, in the increased efficiency of the interbank payment system (i.e. cost reduction and speed increase). On the other hand, in the greater resilience of a system of this type to cyberattacks since there is no vulnerable central point (Cerqueira et al., 2017). The less efficient and insecure the system is, the greater the net benefits of adopting a CBDC – discounting the cost of implementing the new infrastructure – and, therefore, the more probable its adoption. In addition, given that once the infrastructure has been created it is much simpler to add new participants than under the current models, some Central Banks have suggested implementing this type of CBDC to facilitate the entry of second-level banks or non-banking financial entities, including new players such as fintech start-ups, to promote competition in the search for innovation.[5]

In terms of the level of efficiency and cybersecurity of the current interbank payment system, in the case of LatAm, the interbank payment systems are generally less efficient than in more developed economies and, therefore, a scenario of this type would theoretically be more beneficial. However, there is great diversity between the countries, since in some of them, such as Chile, Peru, Mexico and Brazil, immediate payment infrastructures already exist. As to the cyber-resilience of the current systems, the situation also varies between the countries, although this is an intrinsic benefit of DLT that in any case offers an advantage, regardless the country status.

Regarding the appetite of the authorities for innovation in the financial system, the characteristics of DLTs mean that, after implementing the basic infrastructure, it is very simple for any organisation, even a non-financial one, to join the system simply by creating a new wallet. If receiving authorisation from the Central Bank it is straightforward for newcomers to join a DLT network. However, regardless of the expected benefits of the new system, the potential increase in competition from newcomers could clash with the interests of the incumbents, who can see their interbank payment business shrinking. This shrinkage could be compensated by the stimulus effect on innovation caused by increased competition, so that, if the authorities set up an appropriate regulatory framework, the market, which is relatively concentrated in some LatAm countries today, could be restructured.

The impact of implementing this scenario in LatAm is not very different qualitatively from implementing it in developed countries, although there could be some quantitative differences. There is a net benefit associated with the use of a new technology in terms of greater cost efficiency, speed and greater resilience, which would affect all the parties involved. However, there are two exceptions for which there is uncertainty regarding the expected benefit. One is the potential loss of market share of wholesale payment by the incumbent banks due to the entry of new players. This could be offset by a greater cost efficiency and an increase in economic activity due to the faster

5: These newcomers should be subject to the same regulations as the incumbents, so that the competition occurs on a level playing field.

flow of money brought about by a faster payment system. However, it is difficult to quantify whether this compensatory effect will be sufficient. The other exception is if the potential lowering of commissions on wholesale payments, as a result of lower operating costs for the payment processors and the increase of competition due to the entry of new players, would affect the end users, although the importance of this effect will ultimately depend on the competition dynamics that appear in the new wholesale payment environment and the possible regulatory initiatives designed to promote it. Ultimately, the end result will depend on how the industry is organised and how the structure of this market is regulated.

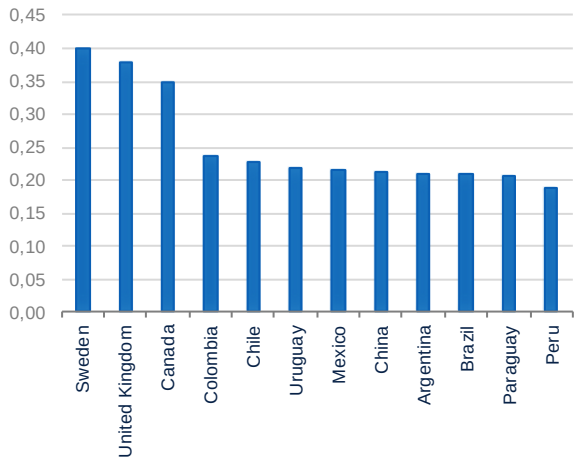
2.2. A universal CBDC: wholesalers, retailers and consumers

When implementing a universal CBDC that reaches all the economic agents, the level of disruption is potentially higher and involves significant challenges. In this section, we analyse common factors for the implementation of a universal CBDC and we discuss how idiosyncratic characteristics would affect economic agents in every scenario.

There are some common issues derived for the implementation of a universal CBDC. The first, the implementation cost of a CBDC that should theoretically be borne by the government. Such cost would not only affect the DLT infrastructure, as in the case of scenario A (only for the wholesale market) but would also impose the entire population some requirements for accessing and understanding how to manage this new instrument of exchange and savings. In terms of access, it is necessary to consider both the infrastructure for internet access and the skill required for managing devices with Internet connection to use the CBDC. Figure 1 shows that LatAm countries have a poorer Internet and communications infrastructure than some developed countries such as Canada, UK and Finland, which are evaluating the adoption of a CBDC. However, the infrastructure is very similar to other developing countries, such as China, which is also analysing that possibility. If we focus on urban areas that concentrate most of the population, coverage of at least 3G network is above 90.50% on average.[6] However, in rural areas, the levels are low. This problem is important because a more limited infrastructure in rural and remote areas could increase inequality, which is already one of the major problems in the region. [7] Together with infrastructure access, which is a necessary condition, the levels of digital adoption must also be considered. The adoption of information and communications technologies by consumers and companies in the region are at a relatively low level compared to some developed countries, but similar to the levels in China (Figures 2 and 3).[8] Low adoption decreases the probability of implementing a universal CBDC in the region.

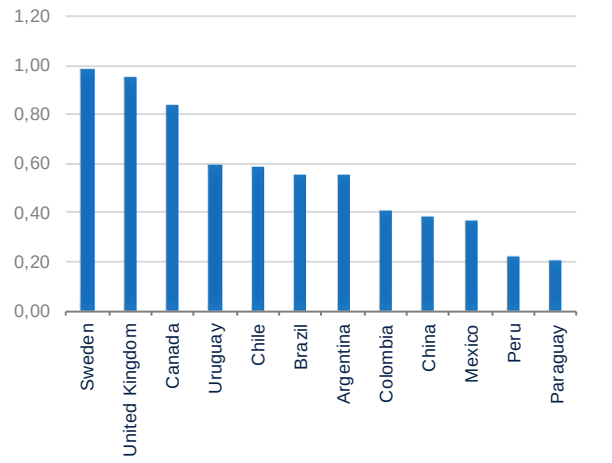
6: The countries used for this calculation are as follows: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Rep., El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru and Uruguay. Data ITU 2017.
7: There is no homogeneous information on the level of coverage of at least 3G in rural areas.
8: See Cámara and Tuesta (2017) for a detailed explanation of the indicators for digital adoption levels.

Figure 1 Digital infrastructure: 3G, broadband and secure internet servers (PCA)



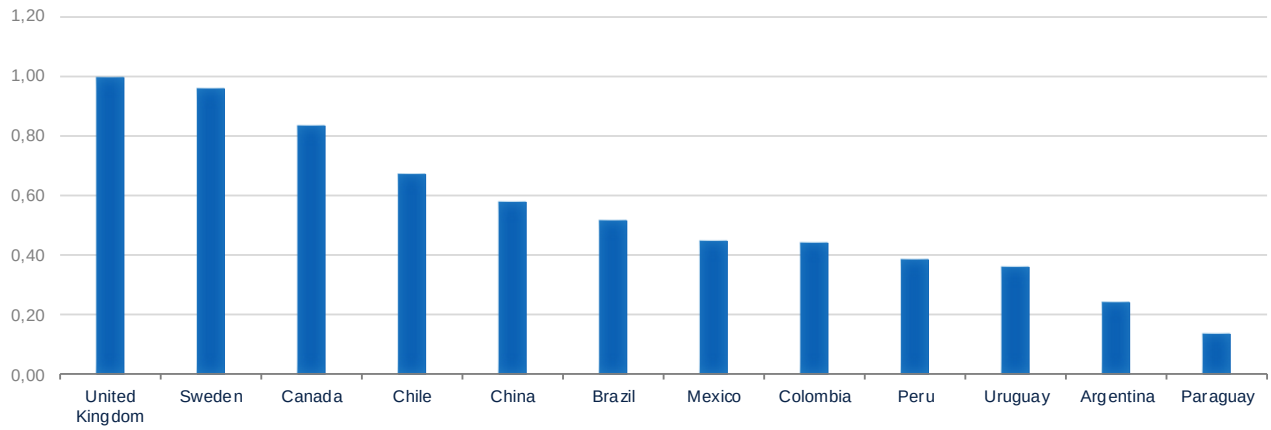
Source: Cámara y Tuesta (2017)

Figure 2 Adoption by consumers: use of internet (PCA)



Source: Cámara y Tuesta (2017)

Figure 3 Adoption by companies: B2B and B2C internet use and technology absorption (PCA)



Source: Cámara y Tuesta (2017)

The need to provide devices that allow the use of a CBDC to those who do not have them is additional necessary condition. While in the developed countries, 66% of the adult population have a smartphone, in LatAm only 43% had one in 2016. Also, 17% of the adult population does not even have a basic mobile phone.

Guaranteeing a technologically neutral and secure method of payment is another key aspect that needs to be taken into account by Central Banks. It is necessary that the population have the minimum abilities to ensure the efficient and responsible use of the digital currency, which would mean confronting the needs of a diverse population. Although there is a large percentage of population in the age groups that include digital natives (early adopters), there is also another part of the population, aged over 30, with a lower level of education and less exposed to technology. Thus, there is a challenge when guaranteeing the freedom to select the method of payment. A potential solution could be to develop simple apps that would make it easier for consumers and SMEs to use the CBDC.

The massive use of cash is another issue in the adoption of a universal CBDC. On the one hand, managing cash is costly due to logistical costs, generally borne by the finance industry, which in the case of LatAM are especially high because of security issues. On the other hand, the distance from access points to the financial system (i.e. bank branches and ATMs) creates costs for consumers and companies that rise with distance. In developing countries, access points are scarcer, which often means that great distance must be travelled to carry out financial transactions.[9] The use of a CBDC, which implicitly means completely digital operations, would avoid the logistical costs, both for users and in the transportation of cash. A CBDC is the equivalent of "digital cash" so that the countries that make more use of cash, as in the case of LatAm, would probably have a greater incentive for adopting, not only because of the advantages in terms of operability but also because it is a familiar method of payment.

Making payments or transfers using a more efficient technology would also offer benefits to the parties involved. Some Latin American economies depend in a great extent on remittances, both domestic and from abroad.[10] The cost of these transfers should be lower compared to the traditional systems. In addition to gains in efficiency, the decentralised nature of the technology could lead to an increase in competition in the payment and transfer systems, which could in turn lead to lower prices for end users.

As to the other financial services, there is uncertainty regarding how a universal CBDC might affect the finance industry, for example, in terms of commercial banks attracting deposits, granting loans and ensuring their profitability. Barker *et al.* (2017) have suggested that setting up a CBDC with universal access would reduce the balance sheets of commercial banks because of the restrictions for attracting deposits. This generates uncertainty about the ability of the system to generate credit. It would remain to be decided whether these costs would be offset by gains in efficiency – and if so, how far – in order to see whether the adoption of a universal CBDC would produce net gains for the financial industry. For governments, the effects on the transmission of monetary policy would be neutral or slightly positive, compared to an economy without a CBDC (Barker *et al.*, 2017). However, the potential fall in the money multiplier could require active policies on the part of the Central Banks. The idiosyncratic factors derived of implementing the three scenarios that result from adopting a universal-access CBDC are analysed in detail below.

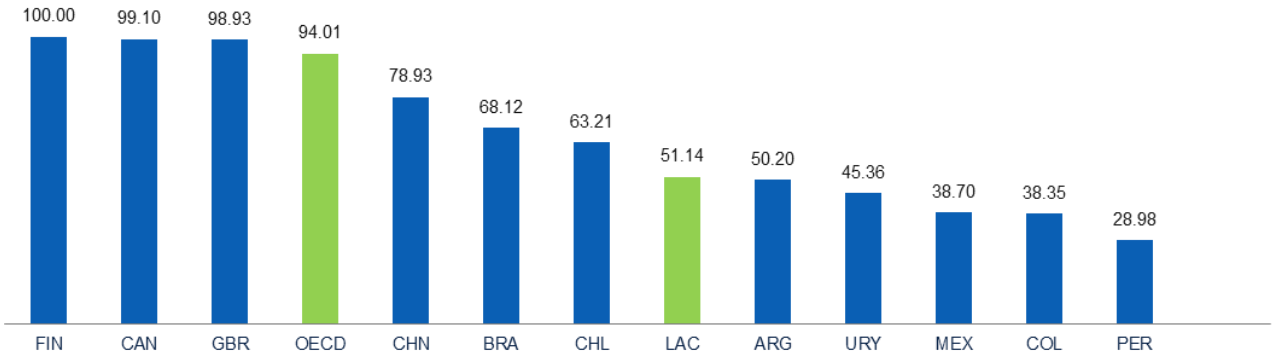
2.2.1 Scenario B: An anonymous, universal, non-interest-bearing CBDC

This scenario involves a universal, anonymous CBDC that is not interest-bearing, which gives rise to an instrument that is very similar to cash. Thus, this scenario would cause little disruption compared to others that propose a universal CBDC. In theory, the situation resulting from the implementation of this CBDC would be similar to having two types of cash, physical and digital. The adoption of a CBDC under this scenario would help to improve the levels of financial inclusion but it could also increase the informal economy.

Participation in the financial system positively affects households' well-being and enhance productive investment. Figure 4 shows the percentage of the population who have a bank account in the formal financial system. Although there are differences between countries, the levels of banking are considered to be relatively low compared to other countries that are evaluating the adoption of a CBDC, except for Uruguay.[11] Only in Brazil and Chile banking participation levels are above 50% of the adult population.

9: According to Global Findex (2015), distance to access points is one of the main reasons for financial exclusion.
10: 10% of the adult population sent in-country remittances and 11% received them (Global Findex 2014).
11: The countries that are considered to be analysing the adoption of a CBDC are: Canada, China, Finland, United Kingdom and Uruguay.

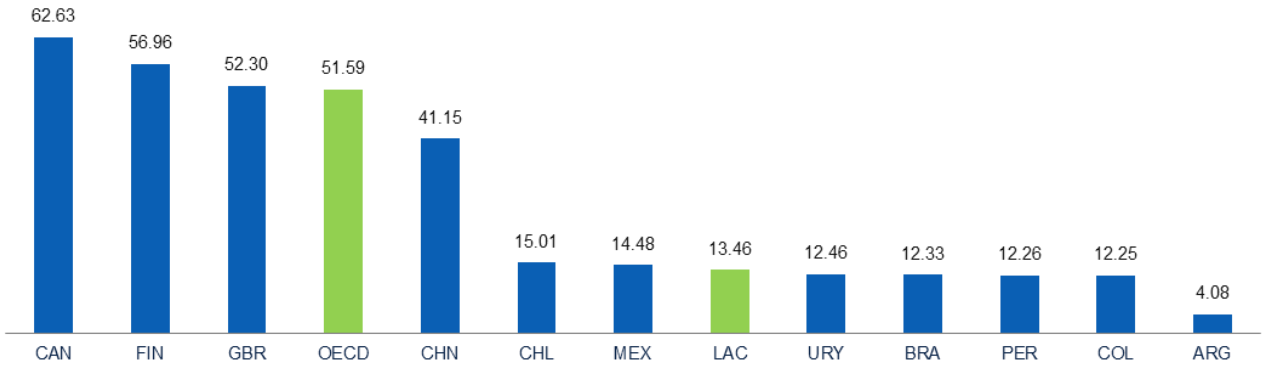
Figure 4 Accounts in a financial institution



Source: Global Findex and BBVA Research

For consumers and small and medium enterprises (SMEs), interaction with the financial system for payments, transfers and remittances would take place faster and at a lower cost since there is access to the payment method from anywhere and it is not necessary to go to a financial system access point to perform these transactions. This feature is of particular interest to developing countries, and especially for Latin America, where rural and remote areas do not generally have a sufficient number of access points. However, the restrictions associated with access to Internet networks and telephone coverage in rural areas continues to be a major challenge to improving financial Inclusion. Saving would be improved with the adoption of a CBDC since it is an instrument that allows money to be stored easily, immediately and securely. To guarantee security, the possibility of the *wallet* passwords being safeguarded by regulated institutions, such as those in the formal financial system, would be a desirable condition. According to the Global Findex (2017), the level of formal savings in the region is one of the lowest in the world as only 13.5% of adults have savings in the formal financial system (Figure 5).[12]

Figure 5 Savings in a financial institution



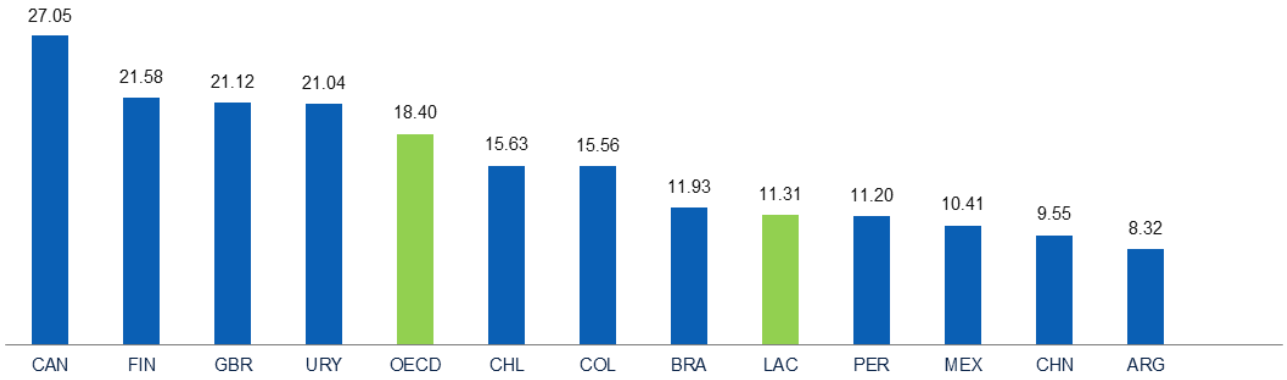
Source: Global Findex and BBVA Research

There is uncertainty about the impact of a CBDC adoption on the credit markets. If consumers decide to keep savings in their wallets, outside the formal financial system, deposits in the banking system would fall and as well as the money multiplier. In turn, the banks would lose important information on the wealth of individuals that they

12: Savings in a formal financial institution account for 15.5% (Global Findex 2017).

use to draw up credit scores. These two factors could lower credit levels, which is already low in LatAm[13]. Figure 6 shows the percentage of adults who took out loans from the formal financial system in 2017, according the Global Findex. Also, in this setting, the Central Bank could take action, such as reducing bank swaps, to try to lessen the effect of the adoption of a CBDC on the level of credit.

Figure 6 Loans from a financial institution



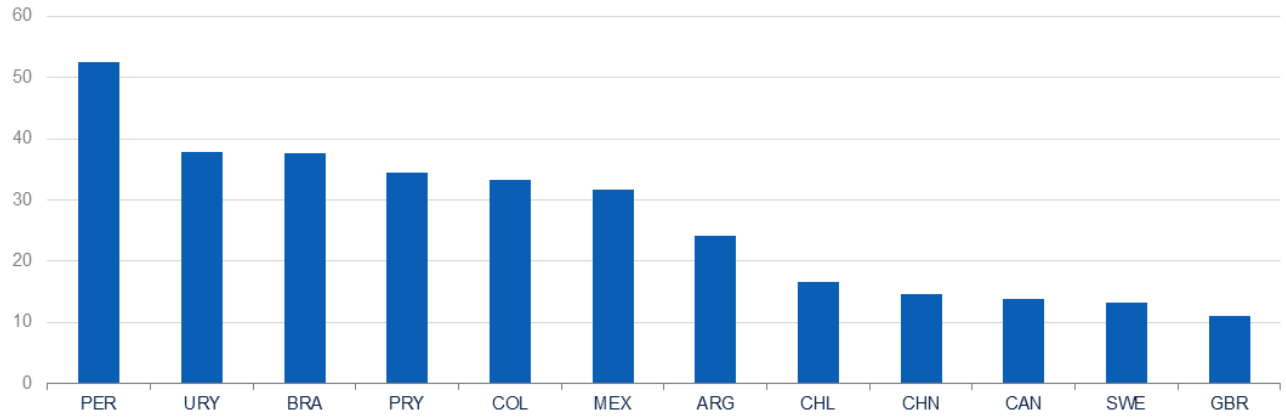
Source: Global Findex and BBVA Research

For the finance industry, a CBDC means increased efficiency in payment and transfer systems, which in turn translates into greater profits. Also, if the banks safeguard the passwords of the wallets, new businesses could emerge based on this type of service. However, if there is a drop in deposits and the Central Bank does not adopt compensatory measures, it is most probable that commercial banks will need to find additional funding on the financial markets or through alternative mechanisms. The most immediate consequence could be a drop in the amount of credit granted or an increase in the cost of credit, if there is no stabilisation policy. Unless the Central Bank adopts compensatory measures, financial stability and the credit markets could be negatively affected.

In addition, the disadvantages or costs associated with this scenario would come from a probable increase in the informality of the economy due to the option of an unidentified CBDC. According to estimates by Medina and Schneider (2018), LatAm has some of the highest levels of informality in the world, only being outstripped by the African countries. The size of the LatAm informal economy is estimated as averaging some 33% in 2010-2015, as compared to 15% in the OECD countries.[14] Figure 7 shows the levels of informality in the major Latin American countries as compared to some of the countries considering adopting a CBDC. Except for Chile and Argentina, the countries in this region have more than double the informality levels of the other reference countries. An anonymous CBDC would be an incentive to use it as a non-transparent financial tool, since it is similar to cash but more efficient. Unless limits are set for payments in cash or the amount stored in wallets, as occurs currently in some countries, there could be an increase in informality due to tax evasion. Therefore, government incentives might go against the implementation of a CBDC of this type given the high levels of informality in LatAm.

13: The same thing would occur with direct debit payments.
14: See Appendix 1 for a comparison of the levels of informality in different regions of the world and their evolution over time in LatAm countries.

Figure 7 Informal economy (% GDP) 2010-2015 (av.)



Source: Medina and Schneider (2018) and BBVA Research

In short, the main costs of implementing a CBDC under this scenario would be associated with the possibility of increased informality, e.g., through tax evasion. While the benefits include an increase in both financial inclusion and efficiency. Some conditions are necessary, such as improvements in the Internet and communication infrastructure and coverage.

2.2.2 Scenario C: An anonymous, universal, interest-bearing CBDC

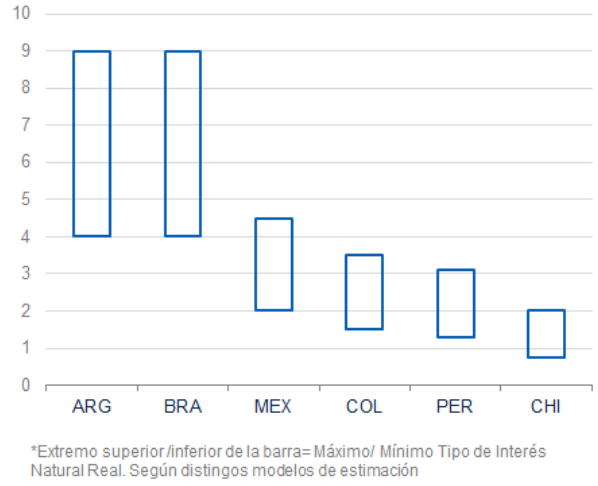
In scenario C, the CBDC is similar to cash (i.e. universal and anonymous) but with the special feature of possibly being interest-bearing. An interest-bearing currency makes it a powerful monetary policy tool and gives the Central Banks flexibility to meet their inflation targets. The Central Banks could lower the nominal value of the digital currency, which would be the equivalent of lowering the interest rates without any lower bound.[15] Thus, the application of unlimited financial repression would be a possibility.[16] Similarly, if there is a rise in interest rates, the nominal value of the CDBC would rise, leading to an increase in the monetary base. With this type of mechanism, monetary policy would be directly transferred to the economy without a need for the banking system to act as a driving force, which would accelerate the transmission of this policy and create unlimited room for action for meeting the Central Banks' inflation targets.

However, the implementation of the mechanism is not risk-free. In fact, imposing a negative interest rate on the currency could create social unrest due to a loss of its nominal value, doubts regarding the role of the currency as a unit of value and interference in fiscal policy. This situation would also occur if a positive interest rate is imposed, which would be the equivalent of a transfer of income from the Central Bank to the population. The risk of interference by the government in Central Bank decisions could limit the ability of monetary policy to break the lower bound of zero on interest rates.[17]

15: This "implicit" restriction exists as long as the commercial banks cannot pass on the negative interest rates imposed on them by the central bank to depositors, since the depositors have the option of exchanging bank deposits with negative interest rates for cash, which cannot be interest-bearing. This situation is currently occurring in the euro zone, where the European Central Bank (ECB) is applying a negative interest rate to the deposits held by the banks in the ECB as a way of fighting the risk of inflation and stimulating the economy, in a setting in which long-term interest rates are structurally low. However, the banks cannot pass on negative interest rates to depositors. This limits the transfer of negative interest rates to the entire economy.
16: Steven (2017) warns that the risk of interference by the government if a currency faces a loss of value could limit the effects of this policy.
17: To prevent the central bank from making income policy without any parliamentary control, it would be necessary for the statutes of the monetary authority continue to state that their main objective is price stability, and to reinforce their independence from government targets.

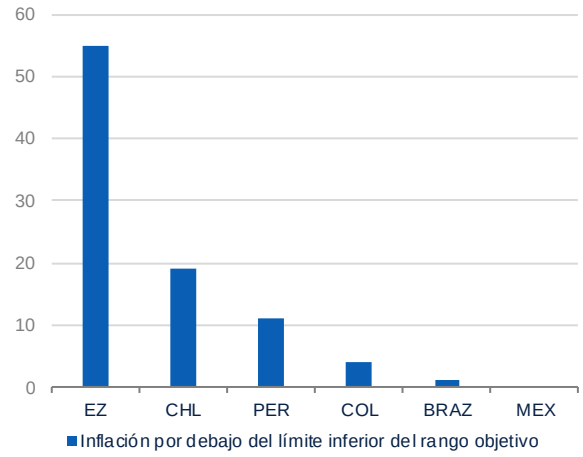
Currently, passing on negative interest rates to the economy is not a necessity for LatAm, unlike some developed countries. LatAm is far from equilibrium interest rates that are close to zero or negative and this region also has no persistent deflationist processes in place (Figures 8 and 9).[18]

Figure 8 Real rate of interest (estimated, 2017)* (%)



Source: BBVA Research

Figure 9 Inflation below the lower limit of the target range (% of times since late 1990s)

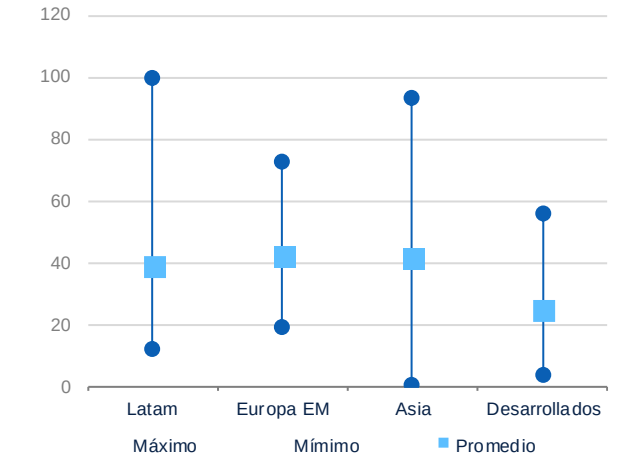


Source: BBVA Research and Haver

However, even in the hypothetical case that this need were in place, it would be very difficult for LatAm to apply negative interest rates to a digital currency, even prohibiting cash, given the extended use of the US dollar (Figures 10 and 11).[19] A CBDC with a negative interest rate would produce a greater demand for US dollars (or other alternative assets). The agents would convert the CBDC into US dollars, which would maintain their nominal value, so that the greatest advantage of this type of scheme, being able to pass on negative interest rates to the entire economy, would be reduced.

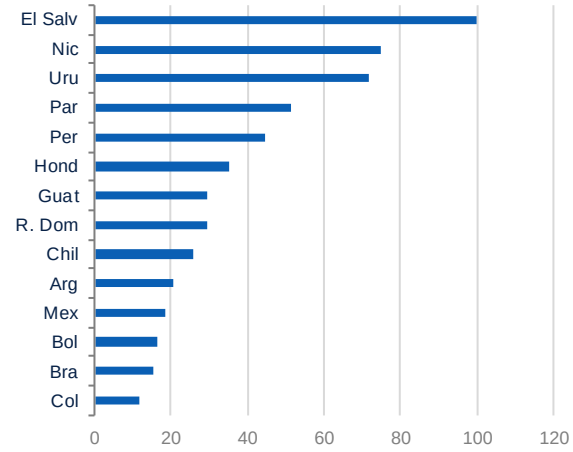
18: See Appendix 1 for a more detailed evaluation of the evolution of interest rates in the region.
19: The free use of the US dollar is supported by the constitutions of some countries, such as Peru. Political Constitution of Peru, Article 64 (http://www.pcm.gob.pe/wp-content/uploads/2013/09/Constitucion-Pol%C3%ADtica-del-Peru-1993.pdf).

Figure 10 Liabilities in foreign currency*
(% total liabilities as of end 4Q2016)



Source: IMF, SWFs and BBVA Research

Figure 11 Latam America: Liabilities in foreign currency*
(% total liabilities, 4Q2016)



Source: IMF, SWFs and BBVA Research

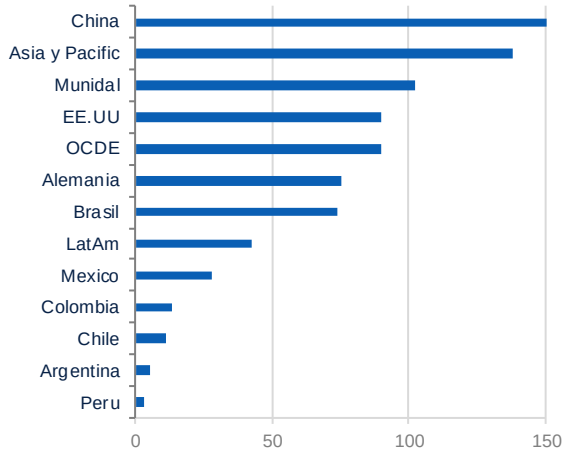
If LatAm adopted a type C scenario, it would essentially be to be able to increase the flexibility and power of monetary policy and thereby have the option to pass on raises in interest rates to the economy outside the banking system. This would mean competing with the banking sector. Individuals could decide to manage their wallets themselves and not keep deposits in commercial banks, since the CBDC would be generating some interest.[20] To alleviate this potential drop in deposits, the banking sector would need to increase the compensation to its depositors or offer a service that included greater added value, such as password safekeeping, wallet security, data analysis or credit scorings. This would minimise the incentives for consumers to manage their wallets themselves or to turn their management over to another type of company. The implications of this possible reduction in bank deposits would lead to greater volatility and higher costs for bank funding, accompanied probably by a drop in the money multiplier. The banks would have to replace part of the funding from deposits funded on the markets, mainly by issuing more debt. Although this strategy would lead to a more stable balance sheet, since the asset would be financed with a more stable liability and they would therefore be less exposed to the risk of deposit withdrawals, it is necessary to consider that the financial markets would also be prone to volatility. This fact could make obtaining funding more complicated and more expensive and, as a result, hinder the ability of the banking system to grant credit, unless the economic authorities take countervailing measures.

This risk of a loss of weight by the banking sector is particularly worrisome in the case of Latin America, since, overall, the financial markets are less developed and less far-reaching than in developed countries.[21] Figure 12 shows how there is less turnover of domestic shares on the stock market than in developed markets. In LatAm, it is less than 50% of capitalisation, while in the more developed markets it is nearer 100%, which means they are less liquid and could hamper investment. In relation to the debt markets, the volume in circulation is low and in some countries there is no risk-free reference rate that would facilitate price setting for all timeframes (Figure 13). All of these factors would lead to more expensive credit and, as a result, a reduction in the demand for credit in a region in which the impact of the credit granted by financial companies (excluding the Central Bank) to the private sector is only 50% of the region's gross domestic product (Figure 14).

20: To simplify the scenario, we have not made any assumptions in which the CBDC is not deposited in the Central Bank. However, this technology would permit this.
21: Unless the financial markets experience more development, both in the fixed income and variable income markets, they would not have sufficient size and liquidity to ensure that bank funding through the market is fluid and optimal.

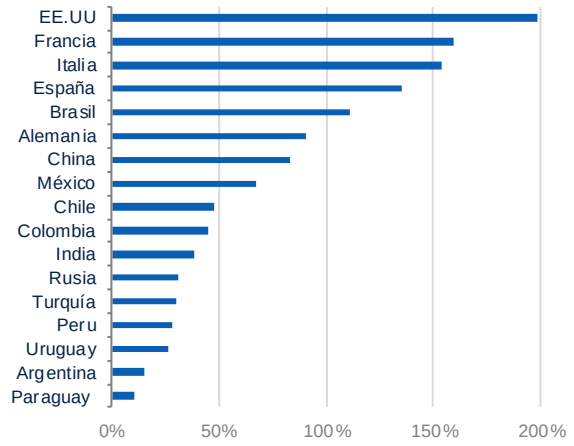
Thus, in LatAm, scenario C would lose its advantages, bearing in mind that deflation is not currently a problem and the transmission of monetary policy generally operates correctly in countries with monetary policies that are linked to an inflationary target. Generally, this scenario would lead to both positive (improvements in financial inclusion and lower costs for handling money) and negative (increase in informality) effects in a scenario with a universal, unidentified CBDC. However, in the case of LatAm, scenario B would be more appropriate given the current environment for inflation and interest rates and the disadvantages of an interest-bearing CBDC for the region.

Figure 12 Rate of turnover for domestic shares on the stock market for 2016 (%)



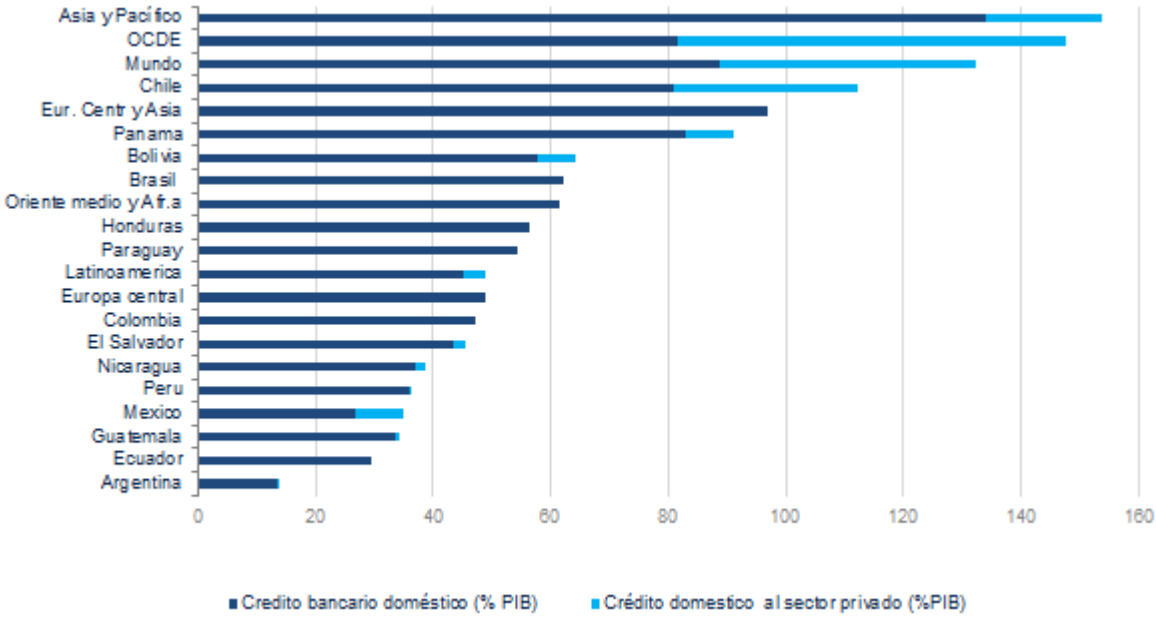
Source: IMF, FSIs and BBVA Research

Figure 13 Debt in circulation in 2016 (% of GDP)



Source: IMF, FSIs and BBVA Research

Figure 14 Domestic credit* (% GDP) 2016



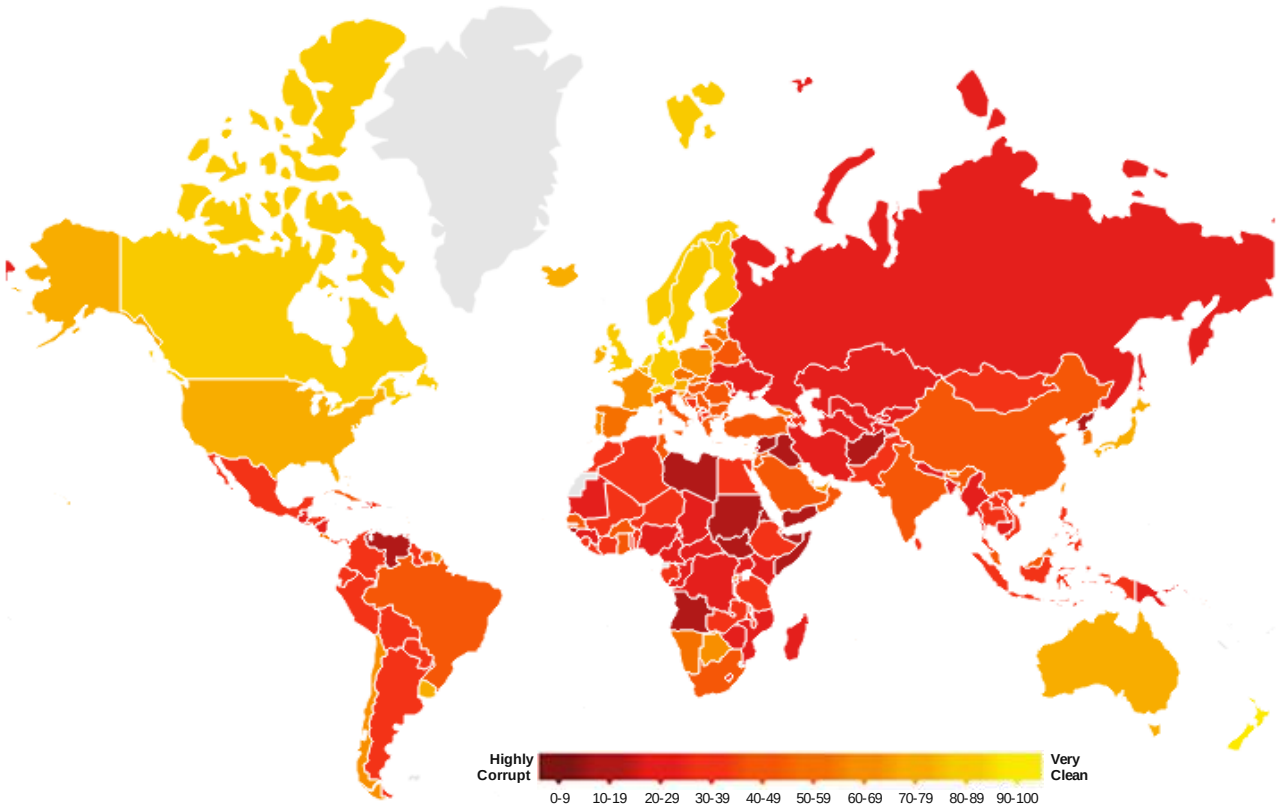
Source: World Bank and BBVA Research

2.2.3 Scenario D: An identified, universal, non-interest-bearing CBDC

This scenario generates a high level of disruption due to the fact that it proposes an identified CBDC. There are two main differentiating elements that are considered important for the adoption of a CBDC with these characteristics in the case of LatAm. Firstly, the relatively high volume of illegal activities – including efforts to evade taxes and money laundering – makes the adoption of this scenario advantageous for the government.

In practice, having a CBDC held by the general public is the equivalent of keeping a deposit in the central bank, so that the authority's power to supervise and monitor it would be substantially greater than it is today.[22] In this situation, any type of activity that circumvents compliance with the regulations could be detected, which would act as a deterrent. LatAm is a region with high levels of informal economy and a strong perception of corruption (Figure 1), so that this type of CBDC could lead to greater benefits. In addition, since the CBDC operates as an important tool in combating illegal activities, it is necessary to eliminate cash and control the use of alternative assets, which is difficult.

Figure 1 Corruption perception index 2016



Source: Transparency International and BBVA Research

22: See Cerqueira et al. (2017) for a more detailed discussion.

Secondly, as an identified CBDC began to permit the transformation of deposits in the banking system into deposits in the Central Bank, this has advantages in terms of financial stability. Therefore, countries with a history of greater financial instability could benefit from the implementation of an identified, universal CBDC. However, the potential improve in financial stability could be accompanied by significant challenges, especially for credit markets, which could shrink significantly due to a reduction in bank deposits.

Faced with a reduction in levels of credit, one possibility is that the Central Bank would again allocate the additional liquidity, which it would obtain with the CBDC, to the financial institutions. This option opens a discussion on the criteria that the monetary authority could use to re-inject liquidity into the banking system and the room for new rules and policy instruments. As an alternative way of allocating the additional central bank liquidity to the banks, unconventional instruments could be used with greater frequency to adjust the requirements for bank reserves and/or open market transactions. In the case of LatAm, this situation presents significant challenges for the ability or depth of the financial system to support more operations of this type. The pressure on the commercial banks of the cost of funding would impact the money multiplier more, which would be even more prejudicial for the creation of credit than in scenario B. In addition, implementing these unconventional measures introduces uncertainty as to the manner in which the credit is allocated in the economy. The possibility that the criterion for liquidity reallocation would be discretionary could increase the moral risk by compensating the advantages or benefits of well-being associated with improving financial stability.

There exists a probability, although low, of this scenario being implemented in LatAm. The advantage mainly comes from the reduction in illegal activities although with certain restrictions due to the potential demand for alternative assets such as, US dollars and private cryptocurrencies. One way of getting greater benefit out of its potential advantages would be to abolish only high denomination banknotes. This alternative would allow LatAm countries to conserve more of the benefits resulting from a reduction in illegal activities and to avoid the costs of the exclusion of certain segments of the population due to cash elimination.

3. Some effects of competition in LatAm

The competition for holding cash created by other legal issuers is of particular interest to the Central Banks and authorities. LatAm is a region where dollarisation is a latent phenomenon. The role played by competition between a CBDC and legal currencies issued by a country in the region or outside it is analysed through a simple framework.

This section focuses on competition due to a preference for cash faced by a particular country when another nation decides to issue a CBDC. Nonetheless, the framework for competition is broad, in the sense that it already occurs when a physical currency is issued – as happens today in some LatAm countries where there is a high degree of dollarisation. Two important factors are analysed that affect the competition between two types of legal tender, the level of identification of the CBDC and the credibility of the issuer. The degree of trust in the issuer that individuals or companies would be the most important aspect of the demand for cash. This implicitly reflects both the ability to administer the value of the money (i.e., control inflation) and other features related to confidence in institutions. Lastly, the competition that arises from the issuing of privacy cryptocurrencies is discussed.

3.1. Competition between legal (crypto) currencies

3.1.1 Cash versus CBDC: dollarisation

We look at a country in the region where the Central Bank's credibility is relatively low but it decides to issue a CBDC. The other countries have not yet implemented their own cryptocurrencies, as they continue to have cash as their legal tender. In this situation, the issuer's low credibility leads to a greater preference for the dollar or some other liquid asset. In addition, the physical money issued in the country is still an alternative if the problem is the desirability of the CBDC, due to shortcomings in the infrastructure that make access difficult, a fear of technology or a genuine preference for privacy. In both cases, either due to a lack of credibility or desirability, greater demand for cash or US dollars would be expected compared to a situation in which the country in question does not issue a CBDC.

The consequences of the low credibility and desirability of the CBDC do not affect the degree of identification. In this case, a CBDC that is not credible and not identified (scenarios B and C) offers a risk of a greater level of dollarisation or the holding of cash where the latter has not been eliminated after the adoption of the CBDC. In the case of an identified CBDC (scenario D), the risk of dollarisation or an increasing demand for cash could be greater because added to this risk would be reduced desirability on the part of the informal sector, stimulating higher relative holdings of dollars or cash.

3.1.2 One CBDC versus other CBDCs issued by third countries: early adoption and crypto-dollarisation

If we consider the competition from an external CBDC that has universal access for individuals outside the borders of the issuing country, only greater credibility and relative desirability could stimulate greater external demand for this alternative reserve cryptocurrency. However, the degree of identification with this CBDC is crucial for evaluating its relative effect on the demand for external liquidity.

Let suppose that a country in LatAm issues a credible CBDC and faces external competition from another credible CBDC, form any country inside or outside the region. On the one hand, if the CBDC that is competing externally is more credible than the anonymous domestic CBDC, there is a risk that the demand for this external CBDC will be greater than the current total dollar reserves. This would be the case, if the US issued an anonymous crypto-dollar, or, a country in the region with a greater relative degree of institutional development or greater macroeconomic stability issued a CBDC. On the other hand, if the CBDC that is competing externally is more credible than the domestic one but is identified, the effect on the demand for crypto-reserves will be uncertain. The greater relative demand for crypto-reserves that comes from greater credibility could be offset by its lack of desirability due to its being identified.[23]

Finally, if a credible competitor issues a CBDC, this move could accelerate the adoption of a public cryptocurrency in LatAm. Moreover, the probability of its adoption might be greater if the external competition comes from an anonymous CBDC.

23: This analysis does not consider the case of a non-credible CBDC that is competing externally, since its impact on the crypto-reserves of the home country should be nil or limited.

3.2 Competition with private cryptocurrencies

Competition with private cryptocurrencies is crucial when adopting a CBDC. The use of private cryptocurrencies like Bitcoin is gaining strength in many countries around the world, and in some countries in LatAm. Table 1 shows the use of private digital currencies in some countries in LatAm. Countries in which the use of private cryptocurrencies is more extensive will have a greater proportion of the population that is familiar with the use of this type of digital currency.

However, there is a risk that the demand for private cryptocurrencies will be relatively high. As a result, there is an impact on the formation of expectations and prices. The cost of not innovating with a CBDC, when faced with the growing use of private cryptocurrencies, is a loss of control over inflationary expectations, with negative consequences both for the transmission of monetary policy and for the economy. In addition, greater demand for private cryptocurrencies (or other assets) could mean a reduction in income from seigniorage.

In this situation, the competition from private cryptocurrencies and the degree of use by the general public could accelerate the adoption of a CBDC in LatAm. Similarly, the threat of competition from private crypto-issuers creates the incentives needed for greater discipline by the Central Bank, helping to avoid systematic deviations in inflation from the target and limiting the costs of fiscal dominance in stabilisation policies.

Table 1 Penetration of Bitcoin by country

Country	Number of nodes	Population	Nodes/ 100,000p	VC investment	Bitcoin Potential Index
Brazil	53	208.133.000	0,0255	--	17
Mexico	10	123.364.426	0,0081	3.89 $m	66
Colombia	3	49.434.200	0,0061	--	84
Argentina	21	44.044.811	0,0477	11.5 $m	1
Peru	1	31.826.018	0,0031	--	50
Chile	5	17.373.831	0,0288	0.4 $m	154
Uruguay	2	3.493.205	0,0572	--	16

Source: Bitnodes, National Official Population Data, Coindesk, LSE

4. Conclusions

Issuing a CBDC is a completely new way of storing and exchanging an asset. This study analyses and discusses the incentives that could stimulate the implementation of a CBDC in LatAm, as well as the potential consequences that determine the probability of adoption.

Adopting a CBDC for the interbank system and for wholesale payment generates a relatively low level of disruption to the economy and is, as a consequence, the most probable scenario of implementation. The feasibility of this scenario consists of the efficiency of DLT. All the financial records existing for the interbank market are purely digital, and this opens the possibility that DLT will transform the financial system in a relatively simple manner. Although, LatAm could benefit more from implementing this new system than the developed countries, since it is starting out under less favourable conditions, the existence of costs associated with such implementation lead to uncertainty about where it will be adopted first.

The implementation of a universal CBDC is associated with some uncertainty regarding the attraction of deposits, the granting of credit and the profitability of commercial banks. These effects could require an adjustment in the Central Bank's official interest rates that is linked to the potential reduction in the money multiplier and would hamper monetary policy until reaching a new steady state. A possible strategy therefore would be to consider the possibility of making the CBDC as similar as possible to cash, at least initially, until more experience has been gained. This would make scenario B, which involves improvements in the levels of financial inclusion and a potential increase in informality, the most probable of the three scenarios that propose a CBDC for universal use. Once a certain degree of experience has been gained, there could be a gradual transition to scenario D, in which the problems of informality would be drastically reduced by ensuring identification of the CDBC, although significant challenges would emerge, especially in regard to the credit markets. In addition, this transition could be favoured by the inertia of the system, since the launch of a CBDC under scenario B could be accompanied by the accelerated obsolescence of cash. Once the CBDC has been widely adopted for payments, the demand for physical money would shrink, especially if high commissions are imposed on deposits and withdrawals.

Although this is a short-term event, and the transition to a scenario like scenario B has benefits, such as increases in financial inclusion and efficiency, the risks of this scenario for LatAm include the potential increase of informality as a result of anonymity, which is not desirable in a region with high informality levels. In more developed economies, the prior implementation of a scenario like scenario B could be superfluous, since these are economies in which cash is used in a less extent and therefore adaptation costs would be lower.

For LatAm, scenario C has not been considered, since negative interest rates are unlikely in this region. A scenario like C would only be applied in order to have the option of passing on a rise in interest rates to the economy, without the need of using the banks as a driving force.

The implementation of a universal CBDC in requires guaranteeing some initial conditions, such as having an accurate mobile network infrastructure and coverage to minimise the impact on inequality that could be created by the issuing of a CBDC. The LatAm countries are therefore at a disadvantage compared to the developed countries, where these conditions better developed and close to be universal.

In terms of competition, private cryptocurrencies and their extensive use by the general public would create incentives for accelerating the adoption of a CBDC in any country, including those in LatAm. Also, the threat of competition from private crypto-issuers creates incentives for a greater discipline by the central bank, helping to prevent systematic deviations in inflation from the target and limiting the costs of fiscal dominance in stabilisation

policies. In addition, if a third country with credibility issued a CBDC, it would also accelerate the adoption of a public cryptocurrency in LatAm. The probability of its adoption would be accelerated even further if external competition came from an anonymous CBDC.

Further research is needed to analyse, especially from a quantitative viewpoint, the consequences that the implementation of a CBDC would have on macroeconomic variables, the financial system and stability, its interaction with fiscal and monetary policy, as well as technical requirements for its implementation. In addition, the way in which the CBDC interacts with the existing traditional currency might be analysed. Could different currencies coexist around an equilibrium path? Or would adopting a CBDC reduce the size of the financial system? In terms of technology, DLT, there is uncertainty about whether such technology is sufficiently mature to be used by Central Banks without compromising reputation. Finally, it is necessary to guarantee that there are no negative aspects associated with DLT in economic terms and that it provides secure and operationally efficient systems.

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Appendices

A1. Informality by region in LatAm and evolution over time

Figure A1 Informality

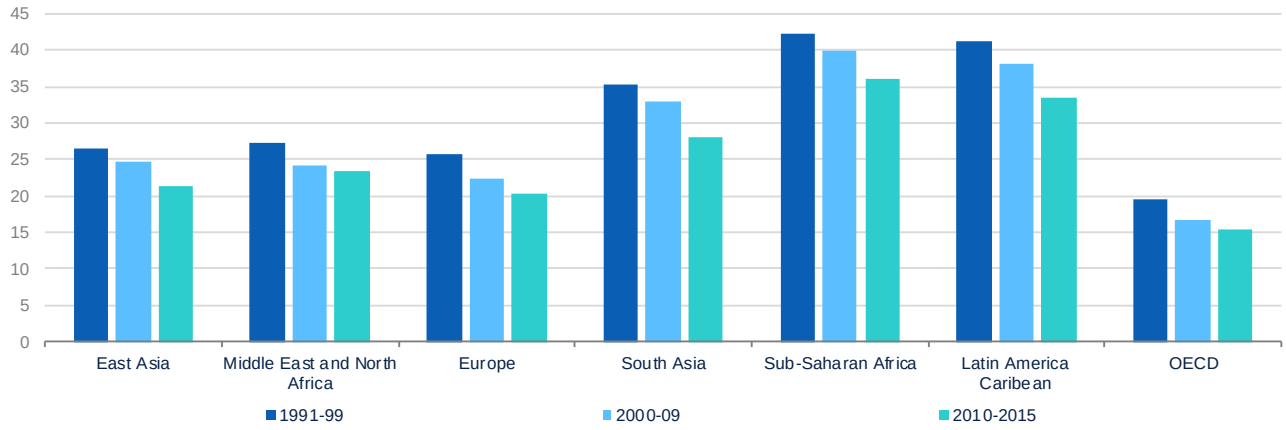
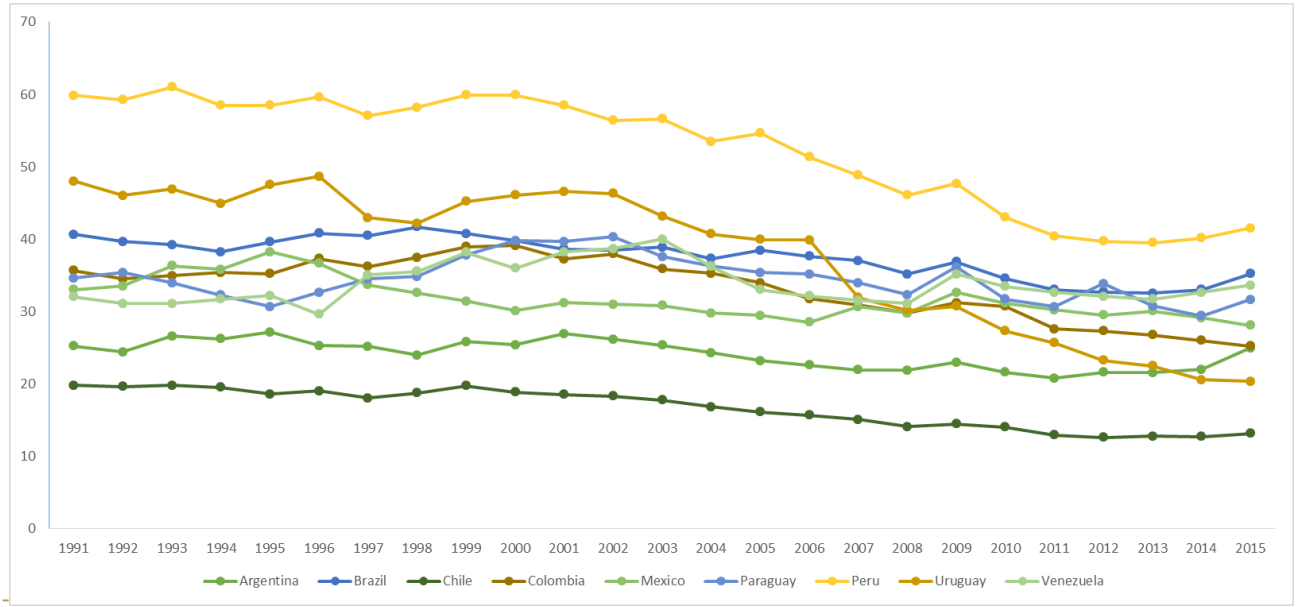


Figure A2 Size and evolution of the informal economy



A2. Interest rates in LatAm

Unlike what occurs in the developed countries, where the natural rate of interest is close to zero, in Latam **the real rate of interest[24] is far from zero**, although it has fallen in recent years. As can be seen in Figure 3, the real rate of interest (RRI) is somewhere between 9% and 2% in the major countries, with the exception of Chile, where it is between 2% and 1%, according to estimates from BBVA Research (Graph 11). The adoption of monetary policies that are linked to an inflation target, improvement in the fundamentals and more open financial markets, which has brought benefits in the form of a reduction in the overall risk premium, are factors that have favoured a lowering of the equilibrium interest rate in recent years. Although some of these factors could be reversed in the coming years (e.g., the global risk premium), greater potential growth and an absence of deflationary processes (inflation has only occasionally fallen below these levels (Figure 12) do not make it probable that nominal interest rates will fall to zero in this region.

24: This permits the economy to grow at its potential growth rate and for inflation to remain stable, so that an increase or reduction in interest rates from this level of equilibrium could create savings or investment in the economy.

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