

# Assessing CBDC potential for developing payment systems and promoting financial inclusion in Peru<sup>1</sup>

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## Abstract

In many countries, research on central bank digital currencies (CBDCs) has gained traction. At the Central Reserve Bank of Peru (BCRP) there is an ongoing exploratory assessment of the potential benefits and challenges of CBDC issuance. In particular, we explore the potential role of CBDC implementation in promoting financial inclusion, the lack of which is a significant obstacle to further development of domestic payment systems in Peru. From a policy standpoint, we discuss domestic idiosyncratic factors such as the preference for cash, and potential impacts on monetary policy

JEL Codes: E42, E58, G21, O32, L86.

Keywords: CBDC, digital currency, cash, financial intermediation, financial stability, monetary policy, payment system, financial inclusion.

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## 1. Initial conditions

The Central Reserve Bank of Peru (BCRP) is currently assessing the potential benefits and risks of issuing a domestic central bank digital currency (CBDC). In particular, we explore the potential role of CBDC implementation in promoting financial inclusion and improving the payment system in Peru.

In recent decades, the Peruvian economy has faced two main challenges, namely a bi-monetary financial system and a sizeable unbanked population. As an outcome of the inflation targeting regime and other policies, dollarisation has diminished. For instance, dollarisation of credit to the private sector has fallen sharply from around 80% in 2000 to 23% in 2021 (Graph 1). In the same period, total credit to the private sector increased from around 28% to 47% of GDP, and broad money from 25% to 51% of GDP<sup>5</sup>.

Aside from this progress in de-dollarisation, in Peru some transactions can still be invoiced in US dollars (USD). Additionally, residents can freely open bank accounts and make ATM withdrawals in either soles (PEN) or USD (although to a lesser extent in the latter case). Such practice aligns with the dual currency settlement system of the national real-time gross settlement (RTGS) system, which was created in 2000 and is managed by the BCRP. In brief, Peru is a dual currency economy that, in the last decades, has achieved a downtrend in financial dollarisation with low levels of inflation.

Evolution of financial dollarisation

Graph 1



Currency in circulation (CiC) also increased from a relatively low level of 2.5 % of GDP in 2000 to 9.5 % of GDP in 2021 (with a print of 6.8 % of GDP in 2019 before the pandemic). While the de-dollarization process contributed to a higher CiC, a key structural factor is that, with more access to roads, the population of rural areas reduced significantly the share of production for self-consumption during this century.

All in all, there is still an important gap in terms of financial inclusion, as it greatly depends on structural factors such as a preference for cash and a low penetration of financial services in remote rural areas. Based on the Global Findex statistics, the

<sup>5</sup> Correspond to the BCRP statistical series PN03500MQ and PN03497MQ, respectively.

implied unbanked population was 80% in 2011 and had fallen to 57% in 2017. Based on local data from Peru's national statistics institute (INEI), it is comforting to see that financial inclusion has advanced, as the share of the adult population with a savings account was 53% as of the third quarter of 2021, implying a proxy unbanked population of 47% in 2021. However, further progress is required in promoting access to financial services, thereby reinforcing the transmission mechanisms of monetary policy.

Worldwide, there is an increasing debate on the impact of CBDC issuance on cross-border payments,<sup>6</sup> especially the potential savings from less costly and faster international transactions. In a similar vein, Brunnermeier et al (2019) point out the possibility that digital networks could strengthen the internationalisation of some invoicing currencies. In particular, Adrian (2019) suggests that e-dollarisation can arise because digital money avoids some of the standard entry barriers facing physical money (eg conversion premiums, storage costs, capital controls, etc.). According to Levy Yeyati (2021), there are three kinds of dollarisation in the LAC region: (1) financial dollarisation resulting from limited space for funding in domestic currency, so that liability dollarisation becomes entrenched; (2) real dollarisation, where FX volatility passes through prices via transactions and wages; (3) official dollarisation, where the US dollar is adopted as legal tender. The e-dollarization could arrive under the form of currency and asset substitution. In turn, the IMF (2020) envisions a scenario where a foreign fiat CBDC could accelerate the domestic use of a foreign digital currency, thereby intensifying currency substitution effects. Regarding the international use of CBDCs, the 2021 BIS Survey shows that the main potential risks reviewed by some central banks relate to currency substitution, tax avoidance and heightened foreign exchange volatility.<sup>7</sup>

In this context of ongoing consensus-building, it is relevant to reflect on each country's initial conditions before establishing design and strategic issues.

### Enhancing the payment system

In 1997, and in close coordination with the participating financial institutions, the BCRP led an initiative to modernise the payment system, aiming to enhance the safety and efficiency of domestic wholesale transactions. As a result, in 2000, the dual currency RTGS system began operations under BCRP management. In 2009, legislation was enacted to provide a legal structure for addressing the systemic relevance of payment systems as a means to reinforce financial stability. To date, the BCRP plays three essential roles related to the payment system: (1) a regulatory function; (2) a managerial role for the dual currency RTGS system;<sup>8</sup> and (3) a user role

<sup>6</sup> CPMI (2021) defines cross-border payments as those in which the parties involved reside in different jurisdictions. For instance, a remittance is a type of cross-border payment, which can be invoiced in the same or different currencies (cross-currency). Other examples of cross-border payments are related to tourism and e-commerce transactions.

<sup>7</sup> The *BIS Annual Economic Report 2021* refers to Auer et al (2021a), which is based on a survey conducted on a sample of 50 central banks (from 18 advanced economies and 32 emerging market economies). Although matching potential risks to each central bank is not possible, it can be approximated via cross-border cases, such as non-residents using a domestic CBDC (eg tourists); digital dollarisation (e-dollarisation), where a foreign CBDC is used in the domestic market, replacing the recipient's currency in some transactions; or tax avoidance, where residents make transactions using foreign token-based CBDCs.

<sup>8</sup> RTGS settles one-to-one transactions, mainly transfers of interbank loans and FX transactions, as well as CAVALI (Settlement and Custody Institution of bonds and stocks) and CCE (electronic clearing house) transactions.

in settling BCRP monetary and FX instruments, as well as intraday operations.<sup>9</sup> By 2014, a multi-institution commission had been created to oversee progress in the national financial inclusion strategy.<sup>10</sup> In this high-level group, the BCRP is responsible for policies to promote the development of retail payments, including digitalisation.<sup>11</sup> While the high-level group has been replaced for national-level financial inclusion policies, the BCRP is working to enhance the domestic payment system, as a large part of the population does not have access to digital payment instruments, and so continues to live within a cash ecosystem.

In this sense, the BCRP articulates efforts to promote a proper ecosystem for electronic payments. For instance, since 2013, a national law provided BCRP with the powers for regulating the private working group on digital payments, whose participants include banks and microfinance entities<sup>12</sup>. BCRP is also involved in the regulation of customer to business payments done through QR codes. Accordingly, the digital payments have registered an uptrend in both value and number of transactions.

In 2021, the growth of digital payments was led by two innovations in the retail sector, namely, digital wallets and immediate payments. The former is already well-established as the preferred channel to transfer money within a financial institution, with a 270% growth in number of transactions. Due to the new service of immediate payments, fund transfers can be performed in real-time, available 24 hours, seven days a week. As of end-2021, the number of immediate transfers has grown more than 350%. While the immediate payment service is not as comprehensive as a FPS, this experience has shed lights on how to approach the technological change and to internalize the fact central banks play a key role in the early stages of adoption

In the medium to long term, another venue of progress might stem from CBDC issuance. In that scenario, design features such as interoperability and scalability will play vital role to improve the efficiency of the payment system and promote financial inclusion. For instance, CBDC interoperability could reduce interconnection costs among private payment infrastructures that otherwise would not be profitable to operate. In this regard, it is relevant to explore the demand and supply side issues that could arise in the process.

Further development of the domestic payment system is limited by low financial inclusion. In the context of Peru's large informal sector (engaging around 70% of the workforce), the Global Findex report indicated that 57% of the adult population did not hold a bank account<sup>13</sup> as of 2017. That survey-based source also reported the main reasons why the unbanked population refuse to open a bank account, which in

<sup>9</sup> Intraday operations include overdrafts in PEN against USD; and those in PEN or USD against BCRP's instruments (eg certificates of deposit).

<sup>10</sup> The commission is formed by the Ministry of Economy and Finance (MEF), the Ministry of Education (MINEDU), the Ministry of Development and Social Inclusion (MIDIS), the banking authority (SBS), the state-run national bank (BN) and the BCRP.

<sup>11</sup> See [www.bcrp.gob.pe/sistema-financiero/inclusion-financiera.html](http://www.bcrp.gob.pe/sistema-financiero/inclusion-financiera.html).

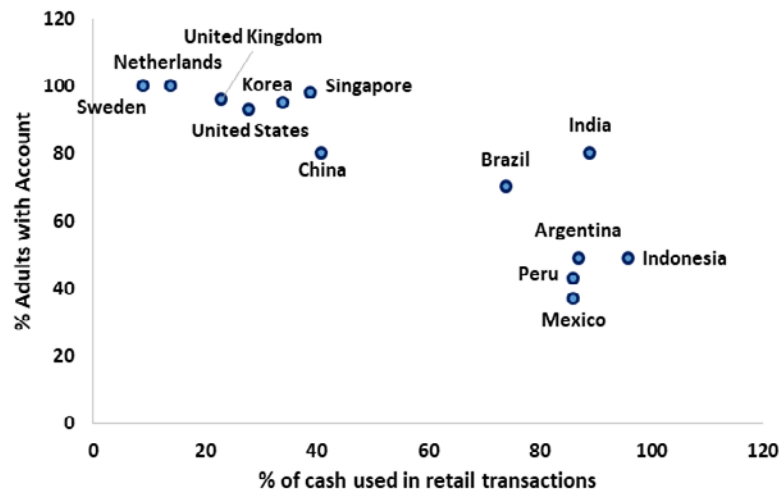
<sup>12</sup> The national-level law N° 29985, regulates the basic traits of electronic money as an instrument of financial inclusion. Moreover, this law establishes the regulatory and supervisory for issuers of electronic money.

<sup>13</sup> The unbanked percentage is inferred from Global Findex statistics as one minus the percentage of accounts held by people 15 years of age or older (including those with a financial institution or a mobile-money service provider). In Peru, the latter metric has increased from 20% in 2011, to 29% in 2014 and 43% in 2017.

the case of Peru related to high costs, low income, and distrust of the financial system (Table 1). At different degrees, other LAC countries also have sizeable shares of unbanked population (Mexico 63%, Colombia 54%, Brazil 30%, and Chile 26% as of 2017). Currently, there is still a share of the population that cannot access digital payments and remains confined to a cash ecosystem (Graph 2).

Use of cash and financial inclusion

Graph 2



Sources: McKinsey (2020); World Bank (2017).

| Reasons for not having a bank account |       |        |          |      |        |
|---------------------------------------|-------|--------|----------|------|--------|
| As a percentage of the unbanked       |       |        |          |      |        |
| Country                               | Chile | Brazil | Colombia | Peru | Mexico |
| High costs                            | 55    | 52     | 59       | 59   | 51     |
| Lack of money                         | 58    | 58     | 66       | 48   | 57     |
| Distrust                              | 41    | 26     | 28       | 38   | 36     |
| Does not need                         | 40    | 37     | 34       | 35   | 35     |
| Distance                              | 18    | 32     | 20       | 32   | 30     |
| Required documentation                | 25    | 18     | 29       | 30   | 27     |
| A relative has                        | 22    | 52     | 20       | 23   | 22     |
| Religion                              | 5     | 5      | 6        | 14   | 6      |

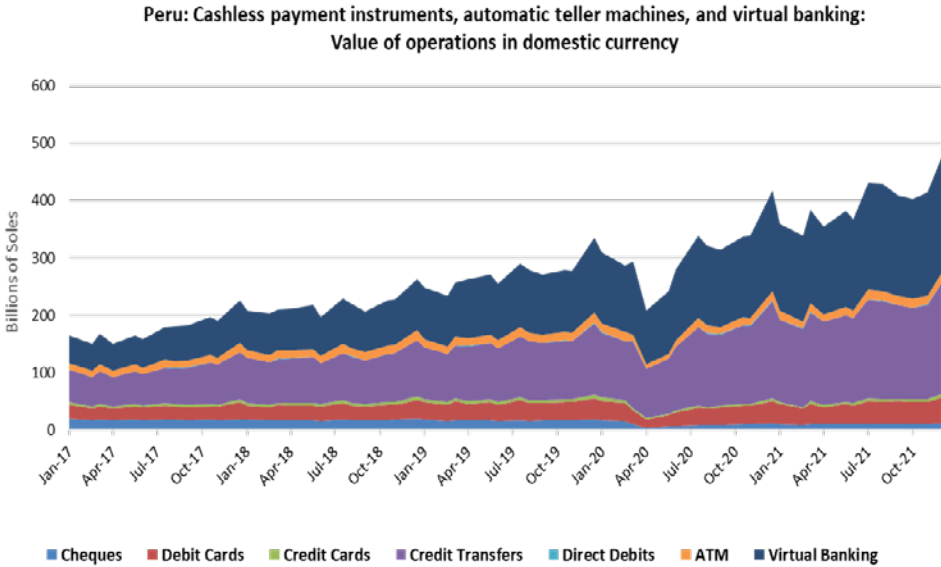
Source: World Bank (2017).

However, data published by the INEI shows progress on this front, as 53% of the population had a savings account as of late 2021, compared to 43% as of mid-2020. To explain this progress, it is relevant to recall that demand for liquidity, including the currency stock, surged during the Covid-19 crisis. According to Alfonso et al (2020), a common household response in LAC countries was to reduce cash withdrawals and

POS usage in favour of mobile and internet banking. In Peru, the sudden lockdown reduced the use of digital payments in April 2020, at a time in which economic activity fell by almost 40% against April 2019; however, as soon as the digital offer increased and the economy started to recover, so did the use of digital instruments (Graph 3). This wave of innovation stemmed from the urgent need to make online and contactless payments and, in some cases, to receive monetary subsidies targeted to vulnerable families. In particular, the government faced the challenge of how to make cash transfers to impoverished families, which were mostly unbanked and lived in remote rural areas. In this context, Covid-19-driven digitalisation was visible in both the private sector (via increased virtual banking transactions and digital payment offerings) and the public sector (via a digital account initiative based on the national identification number). In the public sector, the national bank (BN) launched a savings account related to an ID number (“Cuenta DNI”) for making government cash transfers to vulnerable segments of the population. This facility allows users to withdraw cash from ATMs, affiliated retail stores, and BIM (BN’s e-wallet). However, it is not accessible to the general public. It is not comparable to a domestic CBDC, as it is only distributed through BN and therefore lacks interoperability (a main CBDC feature). This digitalisation process was supported by the SBS’s flexible regulatory approach. By the end of 2021, the ratio between the value of digital payments to GDP is almost twice that of 2015<sup>14</sup>.

Digitalisation through the Covid-19 crisis

Graph 3



Although even banked people used to prefer cash instead of digital payments, in the last five years the trend towards greater use of digital payment instruments has increased steadily. The latter was enhanced by the Covid-19 pandemic, as the need for digital payment instruments increased substantially in response to mobility restriction measures.

<sup>14</sup> The ratio increased from 3.5 times in 2015 to 6.3 times in 2021. In the same period, the number of digital transactions per capita per year increased from 28 to 94.

From a business perspective, many small merchants are unable to accommodate the plethora of payment systems that have been introduced into Peru's National Payment System (NPS). This involves different technologies and devices, as well as difficulties in fully understanding them or keeping up with updates, resulting in very patchy acceptance levels for digital payments (Table 2). Sometimes the costs, relative to the low transaction volumes involved, are considered too high. Therefore, the default option is falling back to cash. A drawback of the latter is its lack of traceability (ie its anonymity), meaning that it might be used for tax evasion purposes. As Peru has a bi-monetary financial system, USD bills are accepted as a means of payment and can also be held in bank accounts.

Payment instruments by entity

Table 2

(Participation in per cent, calculated from value of operations in domestic currency, last 12 months to September 2021)

| Value                        | Transfers     | Debit cards   | Credit cards |
|------------------------------|---------------|---------------|--------------|
| <b>Banks</b>                 | 99.7%         | 99.1%         | 99.1%        |
| - BCP                        | 68.8%         | 48.8%         | 21.5%        |
| - Banco de la Nación (BN)    | 7.9%          | 24.3%         | 26.0%        |
| - Interbank                  | 3.8%          | 13.3%         | 18.3%        |
| - BBVA                       | 9.1%          | 6.1%          | 10.5%        |
| - Scotiabank                 | 9.5%          | 4.6%          | 13.9%        |
| - Other banks                | 0.5%          | 1.9%          | 8.9%         |
| <b>Microfinance entities</b> | 0.3%          | 0.9%          | 0.9%         |
| <b>Total</b>                 | <b>100.0%</b> | <b>100.0%</b> | <b>100%</b>  |
| Source: Financial entities.  |               |               |              |

On the supply side, payment services are mainly represented by banks and other payment infrastructure providers. Although there are several banks operating in Peru, the industry is highly concentrated in the four largest private banks. Cooperation to achieve full interoperability between payment systems has not been completed. Recent innovations in the retail payments market do not facilitate interoperability. For instance, some private digital wallets issued by main banks have emerged as closed loops. Another example is electronic money,<sup>15</sup> which works as a closed loop and does not have interconnection with other payment systems. In this context, most funds transfers are made among clients of the same financial entity; and card payment networks are used by prepaid card issuers.

Other challenges to greater use of digital payment instruments include:

1. The ability to use payment instruments requires opening a bank account, which needs time and documentation.
2. Points of access would need to serve clients across the country, but tend to be geographically restricted to certain areas.
3. Some reputational fears remain among the unbanked population due to a lack of financial literacy.

<sup>15</sup> Implemented to promote financial inclusion, although its use is very low.

4. Most payment instruments do not work 24/7.
5. Most people working in the informal sector seek to avoid traceability.
6. The cost of digital payments among financial institutions increases substantially for transfers to other regions within the country.
7. Limited access to digital infrastructure. According to the National Household Survey (ENAH) for Q1 2021, internet access reaches around 67% of the population over six years of age at the national level, but declines dramatically in rural areas (34%). However, home internet connectivity reaches only 13% of households in remote areas, given that 91% of internet access occurs through mobile phones.

## 2. Analysis

### 2.1. The role of CBDC issuance in facilitating financial inclusion

CBDC issuance can play a key role in allowing the unbanked population to access digital payment instruments. In this regard, the payment flows that CBDC implementation should focus on are the ones that are used in the cash ecosystem or on the margin where prepaid cards are used. The design of a retail CBDC must be consumer-centred and based on the needs of the ecosystem; therefore, CBDC issuance is not intended to replace other digital payment instruments currently used by the financially included population. CBDC design must assure wide use, ie acceptance by the unbanked population as a means of payment via a cash-like solution. It is important to highlight that consumers are unlikely to adopt a CBDC if it is less convenient to use than cash. Other features to be considered in CBDC design are security, accessibility, real-time payment, and privacy.

From an operational perspective, a CBDC unveils the trade-off between data management and supervisory intensity. To schematise this situation, Auer and Böhme (2021c) recall that a technical architecture model depends on the roles and controls of each component within the distributed record-keeping systems, as well as on the communication interplay. As such, in their view, there are four types of CBDC models:

1. Direct: a central bank runs the retail CBDC system itself, and intermediaries might only participate in the onboarding process.
2. Indirect: a non-retail CBDC in which a central bank only handles wholesale payments. Intermediaries issue fully-backed claims to the public, against CBDC held at the central bank.
3. Hybrid: a two-tier retail model where CBDC represent a direct claim on the central bank which records periodically retail balances. Real-time payments are executed by intermediaries.
4. Intermediated: a two-tier retail model that resembles the hybrid one, except for the fact that the central bank would record wholesale balances only. As central banks record aggregated balances, intermediaries would need close supervision to avoid misstatements of accounts.



In Peru, the exploratory assessment is still an ongoing process, so that no choice has been made regarding the type of CBDC model. The decision would also evaluate the experience gathered by other CBDC projects and the evolution of the literature. Besides that, it is essential to evaluate two key design choices: (1) whether the CBDC should function at a wholesale or retail level; and (2) whether an account- or token-based CBDC is congruent with the expected use and availability of data. Indeed, it is key to envision the feasibility of user cases at both the wholesale (central bank and third parties) and retail (third parties and final users) levels. This choice also implies identifying authorized third parties, which operations would be recorded at the central bank and who would be responsible for user onboarding. Only in the direct model is there no room for third party CBDC distributors, as users have a direct claim on the central bank.

As mentioned above, either model can be account- or token-based. In a wholesale CBDC, the former relates to an ID system and the latter to cryptographic schemes that do not require identification. Whether a system is account- or token-based depends on the legal claim on, and recording at, the central bank. In the case of retail CBDC, a token-based CBDC satisfies the anonymity feature of physical cash. In turn, an account-based retail CBDC brings the advantage of programmability. For instance, Usher et al (2021) assert that programmable payments enhance development of smart contracts, whose features vary depending on identifiable characteristics of the holder to allow for automated execution. If an account-based CBDC were to be successful in fostering competition around this type of technology, Usher et al anticipate that it could enhance market competition and efficiency in payment systems.

Beyond theoretical models, it is key to define the critical issues that CBDC issuance should address in order to be accepted by unbanked people in Peru. Basically, it is important to identify why existing payment instruments do not fulfil people's needs. From a payment efficiency perspective, the potential benefits of CBDC issuance in the realm of financial inclusion relate to the types of payment flows that can be digitalised using this innovation:

- a. **Accelerate financial inclusion (person to person):** There are digital wallets distributing prepaid cards among unbanked people. However, prepaid cards are a closed loop solution restricted to vendors within a network.<sup>16</sup> Hence, this innovation tends to fragment rather than centralise payment solutions. CBDC may provide the unbanked with strong authentication, some level of anonymity, and full interoperability.
- b. **Funds transfers where the banking network is not present (person to person):** Rural migrants moving into the capital city typically send money back to their relatives. Those transactions bear higher costs than those conducted within urban areas.<sup>17</sup> CBDC may allow relatives in both locations to

<sup>16</sup> A closed loop resembles a gift card, while an open loop is akin to a credit card. Hence, prepaid cards bring the benefit of anonymity, balance top-up, and timely check-out.

<sup>17</sup> The available instrument is *giro* (bank draft), a service provided by BN, which charges PEN 5–25 (depending on the amount transferred). Alternatively, some people prefer to give cash to a family member or friend travelling to the family's area of residence in order to avoid additional costs.

have a CBDC wallet for making funds transfers at a low (or zero) cost.

- c. **Payments on public transportation (person to business):** Currently 80% of Lima's population travel by bus.<sup>18</sup> In this user case, bus lines should take CBDC payments along with other digital payments. In offline cases, embedding the CBDC in a chip would make it possible to transfer funds from wallet to chip.
- d. **Payment of wages in the informal sector and in rural areas (business to person):** With their anonymity and digital features, CBDCs have the potential to replace cash due to lower robbery exposure and transportation costs.
- e. **Payments to small merchants' suppliers (business to business):** There are around half a million retail stores nationwide, which are usually small, single-person, or family businesses. These businesses pay their suppliers in cash.<sup>19</sup> Merchants that receive CBDC payments from their customers may pay suppliers without using cash; and delivery costs may decrease if suppliers do not need to collect cash payments. In addition, a CBDC can make it possible to extend working capital loans to merchants located far from the main cities.
- f. **Programmes to promote social inclusion among the unbanked population (government to person):** Peru's Ministry of Development and Social Inclusion (MIDIS) is responsible for managing the government's social programmes.<sup>20</sup> CBDC may solve the problem of handling cash and the need to travel to a different location to withdraw cash from ATMs. A wide network of small merchants using CBDC, or other interoperable means of payment, must be implemented.
- g. **Extend accessibility of digital payments to the government (person to government):** Currently, online payments to the government are made through a proprietary website<sup>21</sup> that settles transactions through credit cards. CBDC has the potential to be accepted as an additional means of

Moreover, it is common for rural inhabitants to have to commute long distances to withdraw the transfers.

<sup>18</sup> The population of Lima City is nearly a third of Peru's total population (33 million). Cash is used to buy prepaid bus cards at stations, where long queues form. Another problem is related to the lack of interoperability among transport lines, as not all buses accept the same prepaid cards.

<sup>19</sup> For their part, suppliers provide or contract services, usually by truck, to deliver goods and collect payments; and must hire security to protect the cash.

<sup>20</sup> There are two main programmes, with a scope of 1.2 million people, involving money transfers: *Juntos* (a conditional cash transfer programme) and *Pensión 65* (a monetary incentive to provide protection and support to people 65 years of age and older in extreme poverty). In many cases beneficiaries must be paid in cash, which involves high transportation costs.

<sup>21</sup> The website "pagalo.pe" is used to pay fees and service charges to government agencies without having to go to a BN branch in person. Transactions can be performed with Visa, MasterCard, or American Express cards.

payment by unbanked citizens, thereby increasing the scope for person-to-government payments.

## 2.2. Credit card usage

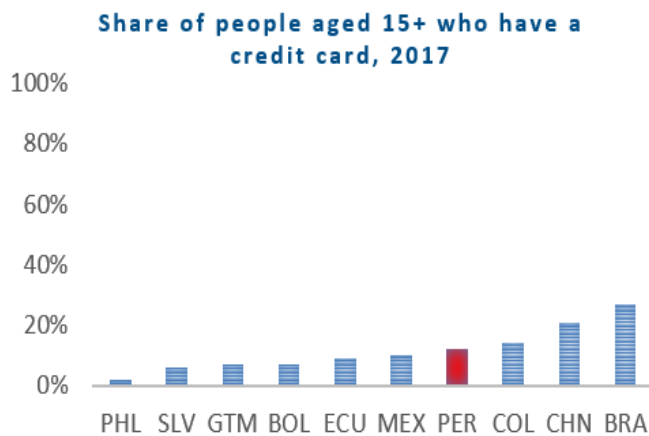
In some countries, the digitalisation gap has been filled via online credit card payments. However, more generally, low use of credit cards has encouraged a search for non-bank digital payment systems. In Peru, the share of credit card holders<sup>22</sup> was 12% in 2017, slightly more than 10% and 9% in Mexico and Ecuador, respectively (Graph 4). However, credit card penetration can be a double-edged sword. On the one hand, it allows smooth online payments for credit card holders, but it also creates an entry barrier for unbanked users. Even so, countries with high levels of credit card penetration, such as Canada (83% as of 2017), seem to ponder the advent of CBDC adoption positively as an alternative online means of payment. Particularly, it is expected to moderate POS interchange fees and provide as safe a means of payment as offline physical cash.

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Credit card usage

Graph 4

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Source: World Bank - Global Findex Database.

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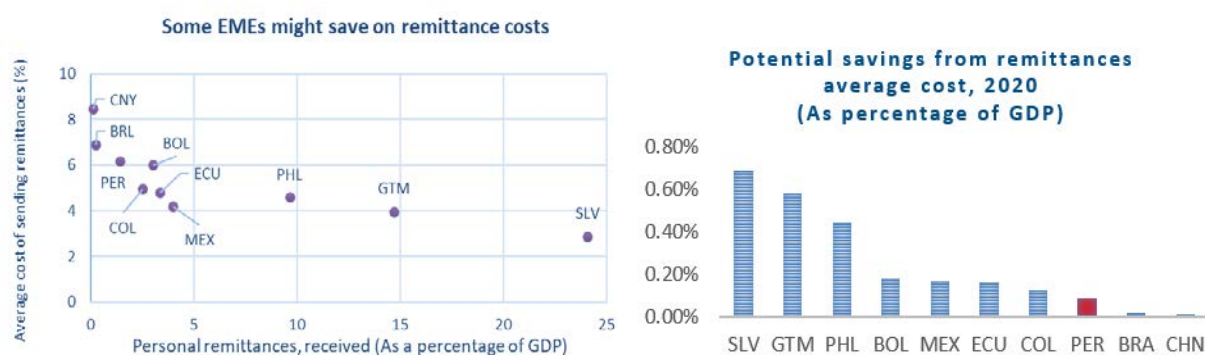
<sup>22</sup> As a percentage of people 15 years of age and older.

## Remittances

Due to its heterogeneous geography, a focus in Peru is to reduce the costs associated with fund transfers into remote rural areas. However, worldwide, there is increasing interest on whether CBDCs can play a role in lowering the costs of cross-border remittances. Based solely on the average cost of sending remittances, Peru ranks in the middle range of peer countries at 6.16%, with cheaper costs than Costa Rica (6.60%), Brazil (6.90%), and Paraguay (9.17%), to name a few. However, data is usually uneven so that comparing only costs is not accurate. Alternatively, country-level savings potential might be better in showcasing the economic benefits. Auer et al (2021a) report that, for a sample of more than 100 emerging market economies (EMEs), the annual fee on bank-based remittances is USD 50 billion per year. Based on the balance of payments statistics reported to the IMF, personal remittances received by low- and middle-income countries were USD 508 billion in 2020.<sup>①</sup> If the reported 6.8% average cost of sending remittances is considered, average fees would amount to around USD 35 billion. This savings potential is often regarded as a benefit of CBDC issuance. Standardising these savings by economic size<sup>②</sup>, Peru's savings potential is roughly 0.09% of GDP, well below those of El Salvador and Guatemala, which stood at 0.69% and 0.58% of GDP, respectively, in 2020 (Graph 5). Having in mind the international landscape of the CBDC evaluation, as a first stage, one option is to consider the merits of a domestic digital currency issued by the BCRP with the aim of improve efficiency and encourage further competition. This choice stems from the fact that current technological infrastructure in Peru lacks a full interoperability and has high cost of operations. Then, a second stage could include an assessment of the international use of CBDC.

### Potential savings from remittances

Graph 5

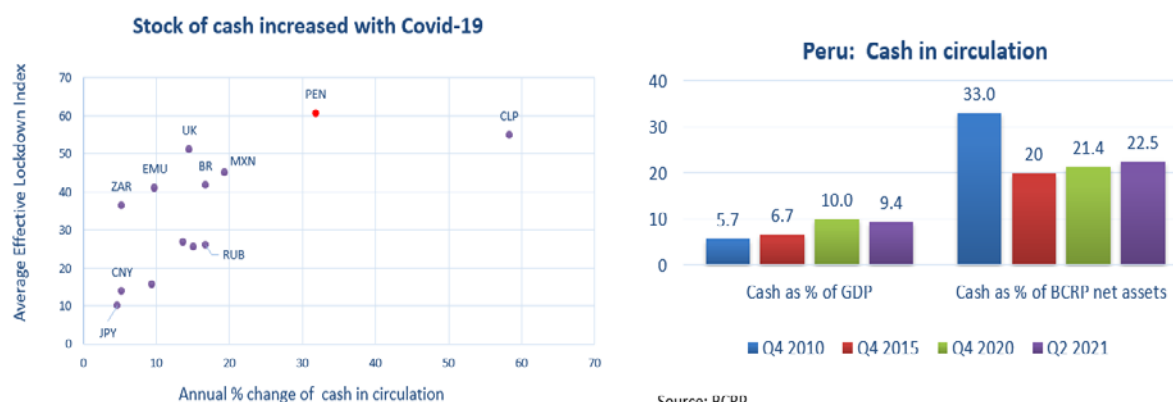


Source: World Bank.

<sup>①</sup> Of which 98% was directed to middle-income countries. <sup>②</sup> Savings potential is calculated by multiplying the average cost of sending remittances to a country (%) and the personal remittances received (as a percentage of GDP).

### 2.3. Impact on monetary policy

Ayuso and Conesa (2020) maintain that enhancing the efficiency of monetary policy (MP) is not commonly stated as a motivation for CBDC issuance, and the impact on MP transmission will depend crucially on the features of CBDC design. The main effects relate to bank reserve management and the degree of disintermediation. In brief, irrespective of the design option, it seems that a physical cash/CBDC coexistence would be the norm, at least in the foreseeable future.



Source: Official websites of central Banks; Goldman Sachs.  
Both the annual change and the Average of Effective Lockdown Index comprise the 12-month rolling period as of April 2021.

Source: BCRP.  
In the September 2018 issue of the *BIS Quarterly Review*, it was indicated that the value of cash (as a percentage of GDP) in 2016 was: 3.7% (Brazil), 9.2% (China), 7.3% (Mexico). In their sample, the average cash/GDP ratio was 9.7% for ALs and 8% for EMEs.

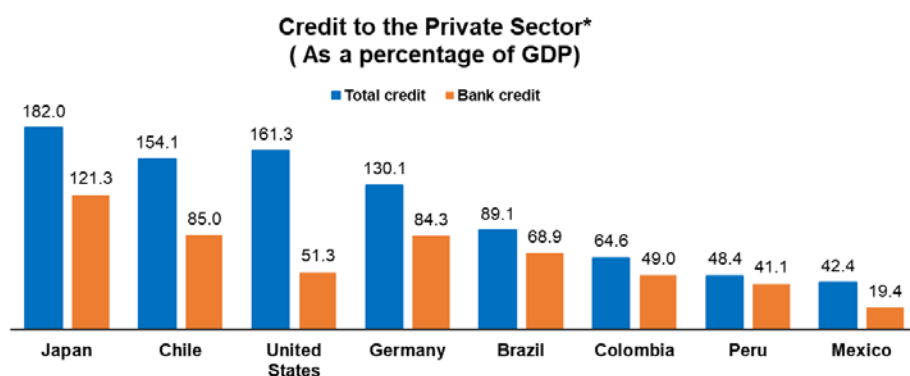
This arises mostly from the fact that the use of cash is quite common for carrying out transactions. Peru's ratio of cash in circulation to GDP was roughly 7% in 2018, much higher than for developed economies like Sweden, the United Kingdom, Australia, and Canada (3% on average).<sup>23</sup> However, the Covid-19 crisis encouraged cash hoarding for precautionary purposes, bringing cash in circulation in Peru to about 10% of GDP as of end-2020 (Graph 6).

In terms of design, a wholesale issuance scenario would be very similar to bank reserve management. The central bank would issue digital money through financial intermediaries, which would distribute it to the economy. These financial intermediaries could include non-banking entities, such as technological firms, taking as a reference the experience of other countries (eg China). In Peru, most credit is sourced by banks, with funding by non-bank financial institutions<sup>24</sup> standing at only 7% of GDP (Graph 7). In contrast, other LAC economies have more diverse funding sources (eg non-banking credit as a percentage of GDP was 16% in Colombia, 20% in Brazil, and 23% in Mexico as of Q2 2021). However, the overall level of financial intermediation, measured as the ratio of total credit to GDP, was around 48% as of Q2 2021, lower than in other LAC countries.<sup>25</sup>

<sup>23</sup> In Peru, the cash in circulation-to-GDP ratio was 9.4% as of Q2 2021.

<sup>24</sup> Difference between total credit and bank credit, both as a percentage of GDP.

<sup>25</sup> The latest BCRP Inflation Report (December 2021) forecasts the credit/PBI ratio at 44% as of end 2021, and at 42% in 2022 and 2023.



\* As of Q2 2021  
Source: BIS.

Usher et al (2021) pose a scenario where the absence of credit risk and a ubiquitous account-based CBDC would tend to increase competition for retail deposits. So far, the trend among CBDCs that are fully open to the public is for no remuneration on CBDC accounts.<sup>26</sup> In theory, the substitution effect between an account-based CBDC and bank deposits depends on whether (and at which level) a central bank pays interest on CBDC accounts. If the so-called CBDC rate remains sufficiently below the interbank corridor, then the likely result is that typical saving decisions would be tilted towards bank deposits that offer higher deposit rates to households.<sup>27</sup>

Particularly, this design option involves discussing the relevance of yield-bearing funds, as this element would increase the substitution degree between a retail CBDC and bank deposits.<sup>28</sup> Bordo and Levin (2017) argue that the interest paid on a CBDC account would act as a main policy tool and magnify the degree of monetary accommodation. These authors also foresee that, in the extreme case where a CBDC is extensively used in a cashless society, it would discourage domestic tax evasion, money laundering, and other illegal transactions.<sup>29</sup> This hypothetical case seems to hold for an account-based CBDC, but it is likely that a token-based retail CBDC would not rule out the possibility of illegal activities (Graph 8)

While an account-based CBDC represents no credit risk for account holders, the main concern comes from the bank lending channel, as a shrinking deposit balance might defy the asset liability management (ALM) capabilities of the banking sector. If banks become underfunded, their lending activities would deteriorate, and their

<sup>26</sup> The existing CBDCs as of late 2021 are: the sand dollar (officially launched in October 2020 in The Bahamas); and two ongoing pilots, DCash (launched in March 2021 in the Eastern Caribbean) and eNaira (launched in October 2021 in Nigeria).

<sup>27</sup> Such a decision will depend on households' risk aversion, as the credit risk associated with CBDC deposits is negligible vis-à-vis bank deposits. For risk-averse households, the decision would be biased towards making deposits at the central bank (no credit risk). However, caps on the amount that can be held in CBDC accounts should help.

<sup>28</sup> In this scenario, the authors theorise that the spread between short-term government debt and CBDC rates would be trivial, as these two assets would be substitutes from the perspective of the holders of excess funds.

<sup>29</sup> The authors contend that those transactions are more common in a cash-dominated ecosystem, where large-denomination bills are used for illegal purposes.

borrowing costs would increase. To avoid this, the CBDC rate could be adjusted so as not to become a contender for bank deposits.

| Scenario A: No remuneration  | Scenario B: Interest-bearing   |
|--|--|
| <p>The interest rate paid on the reserves placed at central banks would remain as the floor of the short-term interbank market</p> | <ul style="list-style-type: none"> <li>▪ The CBDC rate would be an effective lower rate, altering interbank rates. It would also become the lower limit for deposit rates.</li> <li>▪ Changes in the CBDC rate would impact on spending and saving decisions, either:               <ul style="list-style-type: none"> <li><input type="checkbox"/> Directly, to families and non-financial corporations</li> <li><input type="checkbox"/> Indirectly, to bid rates to attract deposits at commercial banks</li> </ul> </li> </ul> |

Source: Adapted from Ayuso and Conesa (2020).

In the event of a crisis, a surge in the demand for CBDC would be expected. More research is needed about options for mitigating liquidity constraints under this new type of money format. One argument is that the speed of a bank run might be faster under a monetary system with CBDC issuance vis-à-vis the traditional pace of physical cash withdrawals. Therefore, a central bank might need to provide more liquidity and, in consequence, monitor the availability of suitable collateral for larger monetary operations. On the other hand, the risk of vault cash shortages in the financial system should decrease as CBDC preference increases.

At the same time, residents' access to CBDCs denominated in the main international currencies would expedite capital outflows. Therefore, the central bank of a small, open economy should enhance its FX buffers, particularly in the presence of currency mismatches.

#### 2.4 Considerations for CBDC design in Peru

CBDC research in Peru builds on the acknowledgement that access and efficiency depend greatly on the degree of development of the payment system. Moreover, some issues might arise such as data silos, especially under low competition in the banking system. In this respect, a prudent approach might be to allow central banks to access data already collected by intermediaries at a certain level. The success of this design will depend on the interplay between the public and private sectors, shaping their roles in a two-tier system. For instance, a central bank could oversee the interoperability of payments and a regulatory body could foster competition among intermediaries; in turn, the private sector could be in charge of the client-facing role and of increasing the cost efficiency of the payment system.

On the other hand, a retail CBDC would provide broader access through either an account at the central bank or tokens, thus facilitating financial inclusion. Moreover, it would be beneficial to holders since there would be no credit risk, as the counterparty would be the central bank. In traditional monetary operations, the interest on reserves paid to commercial banks and, if applicable, to other financial counterparties, is commonly thought to enhance competition in the search to secure retail deposits. In the context of CBDC design, an account-based CBDC would

represent an alternative within the digital environment, which holders could use to perform 24/7 online transactions and engage in peer-to-peer (P2P) transfers.

The implementation of a CBDC under a two-tier system, would involve cooperation between the public and private sectors. In particular, the public sector would foster competition in the private sector, providing clear rules regarding the use of information and promoting the entry of new participants. In this model, the central bank would have a subsidiary role, providing what the private sector cannot provide. Some examples include interoperable platforms for retail payments, an upgraded RTGS, etc.

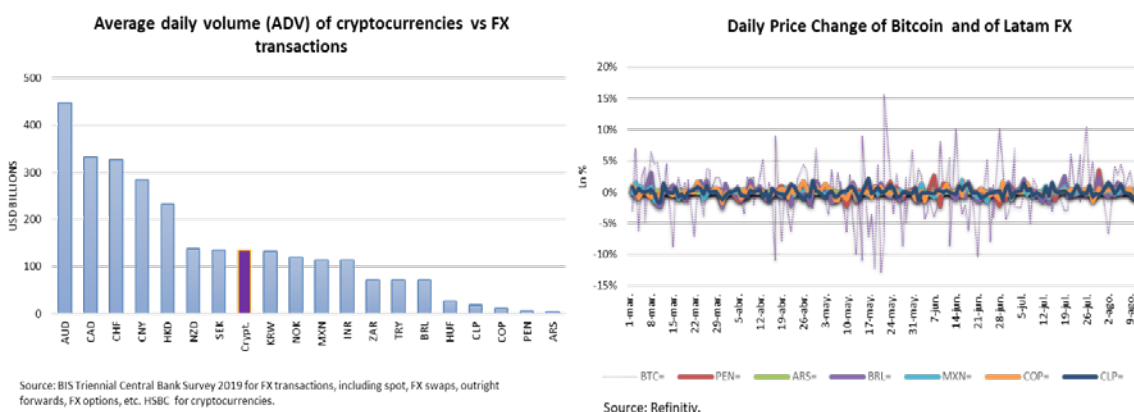
Box 2

### Spillover effects and risks

According to Kaminsky et al (2005), procyclical capital flows have a positive correlation with output. Moreover, capital inflows tend to coincide with episodes of accommodative international financial conditions, thus reinforcing the business cycle. From a conceptual view, Auer et al (2021a) assert that spillover effects would arise from the international use of CBDCs, mainly from digital dollarisation, whereby a foreign CBDC is used in the domestic market, partially replacing the recipient’s currency in some payments or transactions. However, with no prior data on CBDCs, the implications could only be inferred from other digital markets. A major development in the global digital environment is the emergence of cryptocurrencies, which are high-risk assets that do not contend with money, as they are not government-backed<sup>①</sup>. However, average daily transaction value of cryptocurrencies has surpassed that of some national currencies (Graph 9). It is also relevant to note that the cryptocurrency market cap size is mainly determined by the bitcoin market cap (about 41%).<sup>②</sup> While bitcoin is rarely used as a means of payment, its abrupt price swings may affect financial conditions, especially when colliding with otherwise stable prices. The question that arises is whether bitcoin transactions could affect MP transmission and efficiency.

Cryptocurrencies: daily volume and volatility

Graph 9



① On top of that, cryptocurrencies represent a threat to climate sustainability due to the high-energy consumption that bitcoin mining entails. ② As of the first half of 2021, the global money supply was USD 103 trillion, the US Fed balance sheet was USD 7.94 trillion, the cryptocurrency market cap was USD 1.63 trillion, and the bitcoin market cap was USD 669 billion.



Following von Luckner et al (2021), bitcoin transactions can be classified as: (1) speculative or investment operations; and (2) FX conversion via crypto transactions. Using information on P2P transactions,<sup>30</sup> they find evidence that around 7.4% of bitcoin transactions were performed for FX conversion purposes. Using the algorithm proposed by the authors, the Venezuelan bolivar and the Russian rouble remained at the top of the per capita crypto ranking in 2018–20. Nonetheless, Peru has remained within the top 10 per capita ranking since 2018. Like Cheng and Dai (2020), these authors argue that cross-border transactions are driven by growing capital controls in certain geographic areas (Table 3).

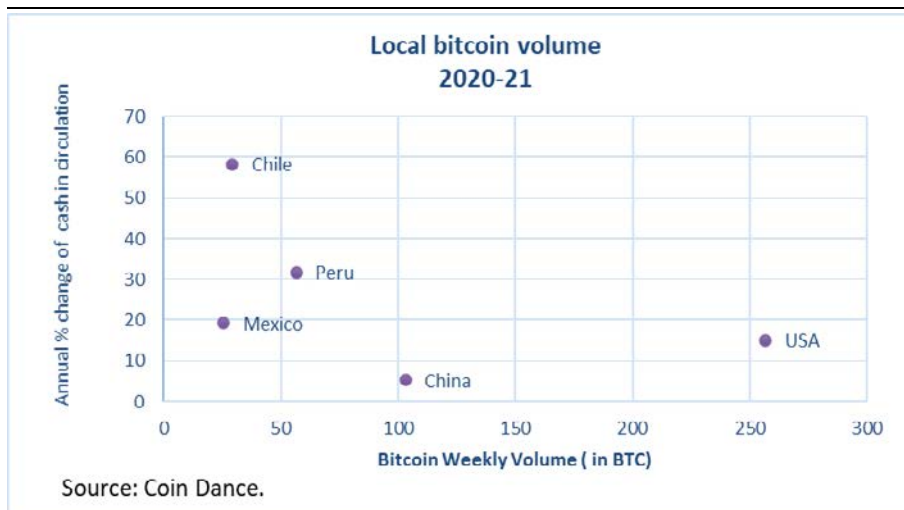
|          | 2018   | 2019  | 2020  |
|----------|--|---|---|
| Top 1–5  | <b>Russia, Venezuela</b> , Belarus, Sweden, Panama   | <b>Venezuela, Russia</b> , Belarus, Panama, PERU    | <b>Venezuela, Russia</b> , Belarus, Colombia, Chile |
| Top 6–10 | United Kingdom, PERU, New Zealand, Colombia, Nigeria | Sweden, Colombia, Chile, United Kingdom, Kazakhstan | PERU, Sweden, Panama, United Kingdom, Argentina     |

Source: von Luckner et al (2021).

Additionally, it is commonly assumed that bitcoin use as an investment vehicle is more pronounced when cash in circulation is more significant, as people with a preference for anonymous transactions would prefer to shift from notes to cryptocurrencies. However, using raw data on P2P local bitcoins, the opposite seems to hold true. In some countries, the larger the cash injections, the lower the volume traded in P2P local bitcoins (Graph 10). For example, in Peru, this finding is related to the sample period 2020–21, when the pandemic boosted the demand for cash for precautionary purposes.

Peer-to-peer transactions and cash in circulation

Graph 10



<sup>30</sup> Data collected from <https://localbitcoins.com/>, including 135 legal currencies, in the period from 15 March 2017 to 23 July 2021.

Based on von Luckner et al (2021), the PEN-VES FX crypto vehicle ranks among the most sizeable cross-border capital flows, with 56.8% of total crypto vehicle trades starting in PEN.<sup>31</sup> This finding might partially reflect the large number of migrants from Venezuela,<sup>32</sup> where capital controls are strict.<sup>33</sup> Similarly, in LAC countries there are more crypto-local currency pairs with a high share of cross-border capital flows into Venezuela, originated from Argentine pesos (ARS, 46.2%), Chilean pesos (CLP, 44.6%), balboas (PAB, 37.2%), Mexican pesos (MXN, 36.2%) and Colombian pesos (COP, 24.8%). Considering these findings, further research should clarify whether the transactions respond to global (ie linked to speculative or investment reasons) or idiosyncratic factors (ie related to domestic economic conditions of the initial transaction). To further discuss this result, it is key to evaluate the coverage of the data.

The P2P market remains relatively small in the region. Volume trends show a shrinkage in P2P transactions across LAC countries, possibly signalling a common motivation. In the region, only Colombia and Venezuela have seen a significant increase in their share of the weekly BTC volume in the last five years (Table 4), with Colombia as the main destination of Venezuelan emigrants as of mid-2020.<sup>34</sup> Based on this compact sample, it appears that in Peru the P2P domestic BTC volume has decreased steadily since 2019. In a hypothetical scenario of CBDC issuance to promote financial inclusion, the theory suggests that the volatility of capital flows could increase. However, we contend that this P2P information is not sufficient to prove the cross-currency conversion motives, and therefore further research is needed to measure potential CBDC use for cross-currency conversions. In this regard, IMF (2020) argues that, to facilitate the payment function, it is necessary to decide whether access would be constrained by residency status. Considering the absence of comprehensive data, the most conservative approach would be to monitor the trading volume of BTC.

Share of average weekly volume of local P2P bitcoins

Table 4

| Year | ARG | BRL | CHI | COL | MEX | PER | VEN | Total (units) |
|------|-----|-----|-----|-----|-----|-----|-----|---------------|
| 2015 | 31% | 15% | 7%  | 9%  | 34% | 5%  | 0%  | 390           |
| 2016 | 22% | 24% | 5%  | 17% | 27% | 5%  | 0%  | 377           |
| 2017 | 7%  | 25% | 7%  | 42% | 13% | 6%  | 0%  | 443           |
| 2018 | 3%  | 6%  | 3%  | 28% | 5%  | 10% | 44% | 888           |
| 2019 | 2%  | 3%  | 2%  | 24% | 3%  | 8%  | 57% | 1687          |
| 2020 | 5%  | 3%  | 4%  | 29% | 4%  | 8%  | 47% | 997           |
| 2021 | 4%  | 5%  | 6%  | 30% | 6%  | 8%  | 40% | 168           |

Yearly Average Percentage is calculated as the share of the total BTC exchanged for all the currencies listed above.

Source: Coin Dance.

<sup>31</sup> This acronym indicates that transactions begin in PEN to buy bitcoins which are then used to buy VES (bolivares), where the destination currency is the one driving demand. This percentage relates to the total FX conversion crypto transactions identified in the origin currency.

<sup>32</sup> According to data published in Statista as of 2020, the ranking of LAC countries with more Venezuelan emigrants are: Colombia (1.8 million), Peru (0.9 million), Chile (0.5 million), Ecuador (0.4 million), Brazil (0.3 million) and Argentina (0.2 million).

<sup>33</sup> Weekly data of domestic transactions could be shown in either local currency or bitcoin (BTC). As of mid-2021, The PEN-BTC weekly average YTD is PEN 2.3 million, lower than the weekly average for 2020 (PEN 3 million). Recall that von Luckner et al (2021) found that 57% of transactions were cross-border of the type PEN-VES. Using that percentage as a lower bound limit of the cross-country transactions into VES, we could assume that at most the PEN-BTC-USD could reach 43% of average weekly volume (AWV). That is, 43% times the 2021 AWV times 52 weeks per year, leads to a 2021 accumulated volume of PEN 51 million changed into BTC (only including this local bitcoin P2P exchange). Hence this yearly PEN 51 million is assumed to be the 2021 cap limit for any other type of transactions (domestic or cross-border into non-VES currencies).

<sup>34</sup> Based on local bitcoin data, average weekly volumes have fallen significantly from 2015 to 2021 YTD: -94% in Argentina, -93% in Mexico, -85% in Brazil, and -23% in Peru. In contrast, they increased by 43% and 68% in Colombia and Venezuela, respectively.

### 3. Closing remarks

CBDC issuance is not a “one size fits all” solution. Issues with existing payment instruments, the share of unbanked people operating within a cash ecosystem, and the user cases matter to properly design a CBDC that can deliver a more inclusive, efficient and accessible National Payment System. The introduction of a domestic CBDC must also consider the initial economic conditions and the context where it would take place to prevent unintended consequences. At different levels, the e-dollarisation effect is likely to arise in small, open economies whose currencies are not established as global invoicing currencies. Indeed, while hard-currency economies could mainly focus on envisioning the design choices of a domestic CBDC, other countries must also thoroughly reflect on the potential currency substitution effect derived from a foreign CBDC. This poses challenges on other fronts, such as faster and more volatile capital flows, as this innovation could expedite the settlement of cross-border transactions. However, as Peru’s experience shows, it is possible to maintain an independent monetary policy in a bi-monetary system. The necessary conditions to meet this objective are establishing a credible monetary policy and achieving low and stable inflation in line with international levels.

According to Alfonso et al (2020), in LAC countries there are three types of initiatives to increase the efficiency of retail payments, namely, retail fast payment systems (FPS), open banking, and CBDC issuance. In Peru, a potential CBDC initiative would be tied to the fact that further NPS development is key to promoting financial inclusion. At the same time, central banks in other countries (eg Brazil) have already adopted an FPS while continuing to assess the possibility of CBDC issuance.<sup>35</sup> In the medium term, we foresee that some payment flows could be improved by introducing a domestic CBDC. Some argue that CBDC implementation could be a two-edged sword, as it has positive implications for end users in terms of timeliness and cost, but might also magnify effects typically associated with dollarisation. Nonetheless, Peru has built considerable experience in conducting an independent monetary policy in the context of partial dollarisation. For instance, the US dollar can still be used as an invoicing currency for some transactions and residents can hold bank accounts in a dual currency economy. Even so, the BCRP has achieved low inflation while playing the manager’s role in the dual currency RTGS since 2000. Peru’s experience in tackling financial dollarisation provides some learning leverage to navigate the potential effects of CBDC adoption.

In the near term, innovations could provide several paths for improving payment efficiency. For instance, in the case of open banking, the BIS (2019) highlighted the role of the regulatory approach, which may be prescriptive, facilitative, or market-driven. Likewise, it is likely that for CBDC adoption, the level of oversight intensity and data management would also play a pivotal role. All in all, the innovations to come ahead support a forward-looking approach in regulatory policy.

<sup>35</sup> Alfonso et al (2020) characterised CoDi (Mexico) and Pix (Brazil) as FPS platforms operated by central banks with similarities from a user-end perspective. The BIS defines FPS as a system whose payment flows occur in real time on a 24/7 basis, where the time lapse accounts from the transmission of an order to the availability of funds to the payee. According to the March 2020 *BIS Quarterly Review*, Chile’s FPS has operated for nearly 10 years with around 30 payments per capita as of 2018.

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