

# Some thoughts about the issuance of a retail CBDC in Colombia

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## 1. Introduction

This note presents some thoughts on the issuance of a retail central bank digital currency (CBDC) in Colombia. To provide some context, it first describes some relevant features of low-value payments in Colombia. Then it discusses the implications of a retail CBDC for financial intermediation, financial stability and the transmission of monetary policy in the country, based on some results from the specialised literature and the characteristics of the Colombian financial and payment systems. Next, it provides some ideas regarding the implications of the issuance of foreign CBDCs by advanced economies for the risk of digital dollarisation and capital mobility. Finally, some preliminary policy implications are offered.

## 2. Some features of low-value payments in Colombia

Cash is the preferred instrument for low-value payments in Colombia. According to a survey conducted by the central bank in 2019, 88.1% of adults use cash as their main payment instrument for monthly purchases of non-durable consumer goods and services (Central Bank of Colombia (2021a, p 94)). Likewise, cash is widely used by businesses in the retail and service sectors. A central bank survey of these firms in 2020 found that 77% of their expenses were paid in cash (mostly payroll payments; see Arango et al (2021)). Despite this, cash holdings as a percentage of GDP in Colombia (7.1% in 2019) are close to the average of a sample of emerging market and advanced economies (Arango et al (2020, p 12) and Central Bank of Colombia (2021a, p 82)).

The use of electronic payment instruments (credit cards, debit cards and electronic funds transfers) has been growing in the country in the last decade, but is still comparatively small (see Graph 1 and Central Bank of Colombia (2021a, pp 79-81)), even after controlling for differences in per capita income (Arango et al (2020, p 11)).

The country's lag in the use of these payment instruments for low-value transactions has been attributed to several factors. To begin with, it has been shown that the speed and "steady state" level of adoption positively depend on per capita income (Arango et al (2020, pp 18–20)). Since a significant fraction of the population

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is poor, it is natural to expect a low penetration of these instruments. In fact, substantial differences between the use of payment instruments across income strata are observed (Graph 2). Furthermore, there are factors affecting both sides of the payment markets in a way that mutes the cross externalities that characterise them (acceptance by businesses depends on use by consumers, and vice versa; see Arango et al (2020, pp 28–34)). On the customer side, cost of access to electronic payment instruments is high relative to cash. Informality and low income reduce the ability to pay those costs. On the side of the merchants (especially the small ones), high installation and service costs, tax avoidance and mistrust of financial institutions are determinants of low acceptance of electronic payment instruments. Of course, lack of access to internet and telecommunication services also limits the adoption and use of these payment instruments. Nevertheless, internet access has increased over time, reaching 80% of the population in 2020 (Arango et al (2021)).

The Covid-19 shock brought about some remarkable changes. Government transfers to the vulnerable segments of the population were channelled through the financial system (mostly by means of electronic simplified deposit accounts, also called “electronic wallets”), pushing financial inclusion. The probability of opening an account increased by 14 percentage points for the beneficiary households vis-à-vis non-eligible similar households, while the probability of using it for payments or transfers rose by 7.5% with respect to the same benchmark (Gallego et al (2021)). Similarly, a central bank survey found that after the Covid-19 shock, the acceptance of electronic payment instruments in retail and service businesses rose and reached 50% of the firms surveyed, with one in two informal businesses now accepting at least one such instrument (Arango et al (2021)).

However, the use of those payment instruments is still lagging. The results provided by Gallego et al (2021) suggest that cash transfer beneficiary households did not increase use of electronic payment methods on a par with electronic account opening. Likewise, Arango et al (2021) report that, despite wider acceptance of electronic payment instruments by retail establishments, their use has been limited. In fact, cash demand rose significantly in 2020 (19.4% in real terms), while overall electronic payments remained stable in nominal terms, with electronic funds transfer increases being compensated by a decrease in debit and credit card payments (Central Bank of Colombia (2021b, p 65)). These observations are compatible with an increase in the demand for cash as a store of value and a decline in consumption during the pandemic (Central Bank of Colombia (2021a, pp 92–3)).

Colombia is also lagging in the development of an instant payment system. There are two automated clearing houses (ACHs), one managed by the central bank that handles government transfers and payments, and the other managed by a firm owned by banks that handles virtually all private transfers and online payments. The latter offers an instant payment service limited to person-to-person transfers that includes only 11 financial institutions. Transfers and payments between banks outside this service are not instantaneous and are subject to fees paid by the end users that vary from bank to bank and can be very expensive in some cases. The central bank currently offers real-time gross settlement (RTGS) for wholesale payments in its deposit accounts, but its services are not available 24/7.

In this setting, the development of the low-value payment system has been driven by proprietary networks mostly provided by large banks. These networks are based on traditional deposit accounts and the more recently created simplified electronic deposit accounts or “electronic wallets” that manage small amounts of

receipts and payments. Within these networks, the cost of payments and transfers for the consumer is lower but, while they are interoperable, incentives are set so that consumers prefer to remain in one network. In 2020 *intra*bank transfers were 87% larger than *inter*bank transfers and this difference has been growing since 2011 (Central Bank of Colombia (2021a, p 67)).

Individual banks benefit from this arrangement by gathering valuable information about potential customers of some of their products. This is compatible with financial inclusion within each individual network, but hinders the development of a fast, inexpensive low-value payment system and limits competition in financial services. Thus, a key and complex issue under discussion among policymakers is whether a stronger regulation of the incumbent private ACH, coupled (or not) with public provision of an infrastructure (eg an enhancement of the central bank's ACH), are necessary to significantly improve low-value payments in the country (Arango et al (2022)). Recently, the government changed the regulation pertaining to the credit and debit card payment process (issuance, acquiring, processing, compensation and settlement) to increase competition in each of its phases and enhance transparency about costs and tariffs (Decree 1692 of 2020, Central Bank of Colombia (2021a, pp 68–71)). The results of this change remain to be seen.

Meanwhile, Colombia lags other advanced and emerging market economies that have successfully implemented widely accessible, inexpensive and interoperable low-value payment systems. In Latin America, Brazil, Mexico and Costa Rica already have such systems in place. In this context, a line of defence against a widespread use of cryptocurrencies and stablecoins is weaker in Colombia than in other jurisdictions and the discussion about the adoption of a retail CBDC becomes particularly interesting.

The country's credible, low-inflation environment and strong financial system are factors that reduce the risk of currency substitution by a cryptoasset or a stablecoin, especially one that is not linked to the Colombian peso. As a matter of fact, financial and transactional dollarisation is virtually non-existent in Colombia and exchange rate pass-through is among the lowest in Latin America (IMF (2016)). However, the absence of an inexpensive, accessible and fast low-value payment system might give an advantage to a stablecoin. Although the development of such a system within the current technological framework is feasible and may be socially efficient, the persistence of institutional and market structure obstacles could support the case in favour of a retail CBDC.

Similarly, the low speed and high costs of cross-border remittances in the traditional financial system provides an additional motivation for an arrangement of CBDCs (BIS (2021)), particularly if no cross-border connection of inexpensive and fast low-value payment systems is possible. This is an important consideration for Colombia, where worker remittances are approximately 3.3% of GDP. The central bank has explored the concept of a CBDC. In 2017 it experimented with a direct CBDC and during 2019 it did so with a hybrid, account-based model in which five banks participated (DSIF (2021)).

### 3. Implications of a CBDC for financial intermediation, financial stability and the transmission of monetary policy

#### Financial intermediation

A CBDC, especially a retail one, would primarily be aimed at substituting cash. Arango et al (2020) show that the expansion of electronic payment networks significantly reduces the demand for cash for a panel of countries, affecting in particular the demand for high-denomination bills. A similar impact could be expected from the development of a CBDC. Of course, this effect depends on the design aspects of the CBDC and, specifically, on its remuneration and associated convenience services. Also, depending on these design aspects, a CBDC may compete with sight and short-term deposits offered by banks and other financial institutions. Therefore, a natural question is whether the issuance of a CBDC would reduce financial intermediation and hamper credit supply.

Andolfatto (2020) shows that if the CBDC interest rate is below the policy rate, then a monopolist bank will optimally link its lending rate to the policy interest rate and not to the CBDC rate. As a result, equilibrium loans will not change after the introduction of a CBDC. On the deposit side, if the CBDC interest rate is above the initial deposit rate, the monopolist bank will optimally match the CBDC yield. Consequently, bank profits will be lower and the CBDC will substitute only cash in equilibrium.

In the Colombian financial system total deposits exceed loans (Graph 3). A significant fraction of deposits are in either savings accounts (sight deposits) or current accounts, and this fraction jumped up after the Covid-19 shock (Graph 4). Within savings accounts, three categories may be distinguished: accounts held by corporates, accounts held by public institutions and accounts held by households and small firms (Graph 5). As expected, certificate of deposit (CD) and bond interest rates are generally greater than or equal to the policy interest rate (Graph 6). By contrast, there are differences between the interest rates paid on the different categories of savings accounts, with the returns on the households' and small firms' accounts being generally lower than the policy interest rate and rather insensitive to its shifts (Graph 7). In addition, several current and savings accounts are subject to fees and commissions that reduce their yields and might even imply negative rates of return.<sup>2</sup>

In this setting, a CBDC that earns a zero or low interest rate (certainly lower than the policy rate), and provides wide-ranging and inexpensive transactional services would directly compete with current accounts and savings accounts currently demanded by households and small firms, including the above-mentioned "electronic wallets", which accounted for 39% of total deposits and 30% of total loans in 2021. According to Andolfatto's (2020) argument, banks with market power would match the return and payment convenience of the CBDC, which would imply lower fees and commissions on deposits and transactions, and even higher deposit interest rates.

<sup>2</sup> See, for example, this table of deposit costs published by the Financial Superintendence of Colombia: <https://www.superfinanciera.gov.co/descargas/institucional/pubFile1057845/ctasahorro1221.xlsx>.

Importantly, loan supply would be only slightly affected, since the CBDC interest rate is lower than the policy rate, which is the opportunity cost for bank loans.<sup>3</sup>

This would be a desirable outcome from the point of view of payments in the country, but could have an impact on bank profitability. The latter might be an issue in the short run if banks faced substantial risks to their solvency. However, despite the challenge posed by the Covid-19 shock, Colombian banks have remained solid and profitability has recovered (Graph 8). In the long run, lower profitability would reflect reduced market power of banks, which is convenient from an efficiency standpoint.<sup>4</sup>

A key assumption of the previous analysis is that banks have market power on the deposit side and the CBDC interest rate is low enough to make deposits profitable for the commercial bank. But, what if deposit markets are more competitive or deposits and transactions are costlier than assumed? In this case, the CBDC could crowd out some current accounts or households' and small firms' saving accounts, since banks would not find it worth their while to match the CBDC's return and services. Loan supply could be affected if banks are unable to substitute central bank credit for deposits, which might happen because central bank financing facilities are concentrated in short maturities or banks face collateral constraints to access central bank funding.

Although sustaining financial intermediation through a permanent expansion of central bank financing of banks is possible (see eg Brunnermeier and Niepelt (2019) and Fernandez-Villaverde et al (2020)), it might not be desirable. It implies that the central bank must permanently get involved in the selection of maturity transformation for the economy (which is different from setting regulatory limits to privately chosen maturity transformation). As stated by Fernandez-Villaverde et al (2020), enlarged central bank power in the deposit market may reduce the central bank's incentives to deliver the socially optimal deposit contract (one that supports efficient maturity transformation) and exposes it to political pressure. Also, increased exposure to credit risk may imply greater reputational risk and interference with central bank autonomy, especially in an institutional framework in which central bank losses must be absorbed in the government's budget, as in Colombia.

However, setting the CBDC features appropriately could avoid the need for a significant substitution of central bank funding for bank deposits. In particular, the return on the CBDC could be set so that it does not exceed the marginal (average) net benefit of a deposit for an efficient price-taking bank. As an illustration of this calculation for Colombia, consider that, with a 3% inflation target, a long term natural real interest rate around 2% and an 8% reserve requirement on sight deposits, the gross marginal (average) benefit from a COP 1 deposit would be  $(3\% + 2\%) \times (1 - 0.08) = 4.6\%$ . Hence, a zero-nominal return, central bank balance sheet preserving CBDC would be feasible if an efficient bank's deposit and transaction marginal (average)

<sup>3</sup> In fact, Andolfatto (2020) argues that if banks match a higher return on the CBDC, total deposits would increase (at the expense of cash holdings). This could end up raising loan supply if the additional deposits relax binding liquidity regulation constraints.

<sup>4</sup> Torres and Castaño (2020) report an increasingly non-competitive market structure for financial intermediation after the 1998–99 financial crisis in Colombia using the Lerner index and Boone indicator. They also show increasing Herfindahl-Hirschman (HH) concentration indices for loans and deposits in the same period. Likewise, Rodríguez and Cabrera (2020) claim that loan markets exhibit a non-competitive structure based on the Panzar-Rosse measure, and show an increasing (although still moderate) concentration in the loan, savings deposit and current account deposit markets since 2008, according to HH indices.

costs are equal to or lower than 4.6%. Notice that in this calculation the gross benefit of a COP 1 deposit is limited to the after-reserve requirement policy interest rate (over the cycle), and that it does not include the benefit associated with the information gathered on potential new customers of the banks' products. Notice also that reducing the reserve requirement would expand the set of "feasible" CBDC nominal returns.

A related issue is whether a CBDC would support or hinder financial inclusion. Financial inclusion will increase if banks match a higher CBDC return and, consequently, deposits rise. If deposits remain constant, but cash holdings are reduced in favour of CBDC, there is the potential for increased financial inclusion, provided that the information on CBDC transactions is voluntarily shared with financial intermediaries that might offer their products to new customers or expand their supply to existing ones.<sup>5</sup> On the other hand, if the CBDC crowds out some bank deposits, then some information could be lost and financial inclusion may be hindered, unless CBDC transaction information is voluntarily shared with financial intermediaries. Therefore, according to the discussion above, the design and features of the CBDC would influence the outcome regarding financial inclusion.

## Financial stability

It has been argued that the existence of a retail CBDC could threaten financial stability by making it easier for households and firms to run against bank deposits, especially those that are uninsured (Cecchetti and Schoenholtz (2017)). In assessing this risk, it is important to acknowledge that runs on deposits may vary in their extent and nature. In some runs, funds are withdrawn from some intermediaries to be deposited in others (eg public and large banks), so that aggregate deposits are not substantially reduced. In this case, the central bank's task is to ensure that liquidity from surplus intermediaries flows to those that need it, especially when the interbank markets have probably seized up as part of the stress episode that includes the run. Typically, the central bank ends up substituting for the market for a while.

In other runs, certain types of deposits are withdrawn to be replaced by other types of deposits within the system. For example, after the Covid-19 shock, term deposit demand fell in Colombia, as bond prices collapsed and money market funds faced large withdrawals. However, the money returned to the system in the form of sight deposits (Graph 4). In this case, financial authorities had to deal with an instantaneous increase in term mismatches (possibly requiring longer-term central bank financing) and ensure that sufficient liquidity was available for those institutions that did not rely on sight deposits.

So long as the CBDC design provides for a sufficiently low interest rate, it is possible that these types of runs would not substantially reduce total deposits and, therefore, that the described central bank responses would remain adequate. However, despite a low interest rate, by construction the liquidity and safety of a CBDC make it a natural alternative to flee to during a run. In this case, aggregate deposits may be affected and a more active role of the central bank as lender of last resort (LOLR) may be in order. Of course, a systemic run typical of a full-blown

<sup>5</sup> Following Andolfatto (2020), if banks match a higher return of the CBDC, total deposits will increase at the expense of cash holdings.

financial or currency crisis requires a complete macro-financial policy response to stabilise the system that would include a very active LOLR component as well.

In sum, the introduction of a retail CBDC requires a strengthening of the LOLR facilities to deal with potentially larger effects of bank runs on aggregate deposits and credit. This has been acknowledged in the literature (Brunnermeier and Niepelt (2019)),<sup>6</sup> but in practice it means that the readiness of central bank LOLR facilities and financial intermediaries' access requirements must be adequately and frequently verified, including legal and operational aspects. For the same reason, on the prudential policy side, the introduction of a CBDC would require an even more watchful eye to ensure that liquidity and capital buffers remain adequate and, consequently, runs on banks have low probability.<sup>7</sup>

### Monetary policy transmission

The effect of the introduction of a CBDC on the transmission of policy interest rate movements to deposit and lending interest rates depends on the features of the CBDC, namely its rate of return and the convenience services that it provides. If the return on the CBDC is lower than the interest rate on the existing deposits, then the CBDC will only substitute cash holdings, leaving unchanged the deposit and lending interest rates, as well as their response to policy interest rate shifts.

Otherwise, if banks match a return on the CBDC that is higher than the initial interest rate on deposits, but lower than the policy rate (as in one of the cases covered by Andolfatto (2020)), then the transmission from policy rates to deposit interest rates could be weakened, since the latter would be fixed at the CBDC yield and only for relatively high policy rates would the link between them be re-established (see eg Garratt and Zhu (2021)). This assumes that the interest on the CBDC is *not* changed along with the policy interest rate. If the CBDC substituted part of the deposits (for which banks find matching the return on the CBDC not worth their while), then the central bank would have to expand its financing of intermediaries and a larger fraction of bank funding would be directly linked to the policy interest rate. In either case, transmission from policy rates to lending interest rates would not be significantly affected, since the introduction of a CBDC does not change the fact that the policy rate is the opportunity cost for bank loans (Andolfatto (2020)).

Based on the foregoing arguments, it is likely that the issuance of a zero or low interest rate CBDC in Colombia would have only a limited impact on the transmission of monetary policy. If banks match the CBDC return on the fraction of their sight deposits that currently yield a low interest rate, then the latter's interest rate would become decoupled from the policy interest rate. However, as shown in Graph 7, the interest rate on these deposits already exhibits low sensitivity to policy rate shifts.

Interestingly, a CBDC that delivers a wide array of payment services may reduce the advantage that large banks have over smaller ones on account of their greater payment network and services. In this case, the CBDC would "level the playing field"

<sup>6</sup> Interestingly, Brunnermeier and Niepelt (2019) and Fernandez-Villaverde et al (2020) state that an equilibrium in which deposits are substituted for by CBDC exhibits greater financial stability, since there will be no runs on the CBDC and the central bank funding to banks is stable.

<sup>7</sup> This is especially relevant if, as a consequence of the introduction of the retail CBDC, banks' deposit and transaction fees are cut, and bank profitability is consequently reduced. In this case, capital buffer build-up becomes harder and incentives for risk-taking on banks' asset side increase.

and produce a convergence of deposit interest rates across banks, which would restore their link to the policy rate (Garratt and Zhu (2021)).

#### 4. Foreign CBDC and the threat of digital dollarisation

From an emerging market economy point of view, access of residents to a foreign CBDC (especially an advanced economy CBDC) may be a concern on two accounts: the possibility of “digital dollarisation” and increased capital mobility. As mentioned above, a credible, low-inflation environment and a solid financial system have prevented transactional or financial dollarisation in Colombia. If these conditions persist, it seems unlikely that transactional digital dollarisation would become an issue, especially if an inexpensive and fast low-value payment system is implemented locally either within the existing framework or through the adoption of a domestic CBDC. Access to the foreign CBDC would have to be very easy and its transaction cost advantage substantial to overcome the costs and difficulties associated with currency conversion in daily payments with a currency as volatile as the Colombian peso.

Would access to a foreign CBDC increase capital mobility and facilitate asset reallocation across currencies? The answer to this question depends on the design of and ease of access to the foreign CBDC. Today, Colombians may hold assets abroad, including current and savings accounts. They can also shift their exposure to foreign currency-denominated assets through local investment funds. Hence, the impact of a foreign CBDC on capital mobility and the sensitivity of capital flows to domestic and foreign financial conditions depend on whether the cost of acquiring or trading it is lower than doing so with the currently available foreign assets. For example, if purchasing a foreign CBDC requires a foreign bank account, the advantage of the CBDC would be reduced. On the other hand, if this purchase can be made through an intermediary in Colombia, then the system would work as it does today with USD bills and could increase capital flows and capital flow sensitivity to their determinants.

The previous discussion has policy implications on two fronts. First, developing an inexpensive low-value payment system would contribute to fending off the threat of transactional digital dollarisation. Second, maintaining a credible regime of low inflation and a flexible exchange rate is key to minimise the risk of both transactional and financial digital dollarisation. Exchange rate volatility and low inflation reduce residents’ incentives to make payments in a digital foreign currency. At the same time, nominal stability and a flexible exchange rate could discourage large holdings of foreign currency assets as a store of value and introduce uncertainty about the local currency return on them.

#### 5. Conclusion and policy implications

In a context of an underdeveloped low-value payment system and institutional and market structure obstacles to its improvement, the introduction of a retail CBDC is an



option worth considering in Colombia.<sup>8</sup> Its design aspects (return, convenience attributes) can be set so that it substitutes mostly cash holdings, with a moderate impact on bank deposits and financial intermediation. In particular, the return on the CBDC could be calibrated for that purpose. The adoption of a CBDC could augment the effects of a run on bank deposits, requiring a strengthening of the LOLR facilities and processes. For the same reason, maintaining a solid prudential framework is essential to minimise the probability of a run.

Issuance of a low-return CBDC would not significantly affect the transmission of policy rate movements to deposit and loan interest rates in Colombia, since policy rates would remain the opportunity cost of bank loans and a stable CBDC yield would probably influence the interest rates of a fraction of deposits that already exhibit low sensitivity to policy rate shifts.

The threat of “digital dollarisation” from a foreign CBDC or a stablecoin does not seem significant, as long as the credible low-inflation regime with exchange rate flexibility and a solid financial system is maintained. The development of an inexpensive and fast low-value payment system would further reduce such a threat.

Looking ahead, Colombia could adopt a strategy along the lines of Japan’s, in which further progress is made in understanding and developing different aspects of a CBDC (DSIF (2021)), and Canada’s (Auer et al (2020)), in which a contingent plan is designed to introduce it. However, the contingency plan in Colombia would consider the impossibility of developing an inexpensive instant payment system as a criterion for adoption, in addition to a scenario in which a cryptocurrency or a stablecoin substantially gain in popularity in the country as a means of payment. If a CBDC is seriously considered, issues on cross-border interoperability and insertion in multi-CBDC arrangements must be taken into account in order to expand its benefits to remittances and other cross-border payments (Auer et al (2021)).

These aspects could be considered in an evaluation of benefits and risks of issuing a CBDC that the central bank will perform in accordance with its new Strategic Plan.

<sup>8</sup> Further analysis is required to determine the structure of the CBDC. Most likely, it would be a hybrid or intermediated digital currency to facilitate the management of operational risk and anti-money laundering and combating the financing of terrorism (AML/CFT) activities.

## References

Andolfatto, D (2020): "Assessing the impact of central bank digital currency on private banks", *Federal Reserve Bank of St Louis Working Paper*, no 2018-026B, April, <https://doi.org/10.20955/wp.2018.026>.

Arango, C, F Arias, N Rodríguez, N Suárez and H Zárte (2020): "Efectivo y pagos electrónicos", *Ensayos Sobre Política Económica (ESPE)*, no 93, February, <https://investiga.banrep.gov.co/espe93>.

Arango, C, Y Betancourt, M Restrepo and G Zuluaga (2021): "Pagos electrónicos y uso del efectivo en los comercios colombianos 2020", *Borradores de Economía*, no 1180, November, <https://repositorio.banrep.gov.co/handle/20.500.12134/10232>.

Arango, C, A Ramírez and M Restrepo (2022): "Person-to-business instant payments: could they work in Colombia?", *Journal of Payments Strategy and Systems*, vol 15, no 4, forthcoming.

Auer, R, G Cornelli and J Frost (2020): "Rise of the central bank digital currencies: drivers, approaches and technologies", *BIS Working Papers*, no 880, August, [www.bis.org/publ/work880.htm](http://www.bis.org/publ/work880.htm).

Auer, R, P Haene and H Holden (2021): "Multi-CBDC arrangements and the future of cross-border payments", *BIS Papers*, No 115, March, [www.bis.org/publ/bppdf/bispap115.htm](http://www.bis.org/publ/bppdf/bispap115.htm).

Bank for International Settlements (2021): *Annual Economic Report 2021*, Chapter III: "CBDCs: an opportunity for the monetary system", June, [www.bis.org/publ/arpdf/ar2021e3.htm](http://www.bis.org/publ/arpdf/ar2021e3.htm).

Brunnermeier, M and D Niepelt (2019): "On the equivalence of private and public money", *Journal of Monetary Economics*, vol 106, October, pp 27–41, [www.sciencedirect.com/science/article/abs/pii/S0304393219301229](http://www.sciencedirect.com/science/article/abs/pii/S0304393219301229).

Cecchetti, S and K Schoenholtz (2017): "Fintech, central banking and digital currency", *Money and Banking Blog*, 12 June, [www.moneyandbanking.com/commentary/2017/6/11/fintech-central-banking-and-digital-currency](http://www.moneyandbanking.com/commentary/2017/6/11/fintech-central-banking-and-digital-currency).

Central Bank of Colombia (2020): *Reporte de Sistemas de Pago*, June, [https://repositorio.banrep.gov.co/bitstream/handle/20.500.12134/9876/rept\\_sist\\_pag\\_2020?sequence=1&isAllowed=y](https://repositorio.banrep.gov.co/bitstream/handle/20.500.12134/9876/rept_sist_pag_2020?sequence=1&isAllowed=y).

——— (2021a): *Reporte de Sistemas de Pago*, June, <https://repositorio.banrep.gov.co/bitstream/handle/20.500.12134/10039/reporte-sistemas-de-pago-2021.pdf>.

——— (2021b): *Informe de la Junta Directiva al Congreso de la República*, July, <https://repositorio.banrep.gov.co/bitstream/handle/20.500.12134/10052/informe-congreso-julio-2021.pdf>.

DSIF, Central Bank of Colombia (2021): "Una primera aproximación a la pertinencia de la emisión de moneda digital por parte del Banco de la República", mimeo, May.

Fernandez-Villaverde, J, D Sanches, L Schilling and H Uhlig (2020): "Central bank digital currency: central banking for all?", *NBER Working Papers*, no 26753, February, [www.nber.org/papers/w26753](http://www.nber.org/papers/w26753).

Gallego, J, B Hoffman, P Ibarán, M Medina, C Pecha, O Romero, M Stampini, D Vargas and D Vera'Cossio (2021): "Impactos del programa Ingreso Solidario frente a la crisis del COVID-19 en Colombia", *Nota técnica* no IDB-TN-2162, BID, May, <https://publications.iadb.org/publications/spanish/document/Impactos-del-programa-Ingreso-Solidario-frente-a-la-crisis-del-COVID-19-en-Colombia.pdf>.

Garratt, R and H Zhu (2021): *On interest-bearing central bank digital currency with heterogeneous banks*, MIT, September, [https://www.mit.edu/~zhuh/GarrattZhu CBDC.pdf](https://www.mit.edu/~zhuh/GarrattZhu_CBDC.pdf).

International Monetary Fund (2016): *Western Hemisphere Regional Economic Outlook*, Chapter 4, April,

[www.imf.org/en/Publications/REO/WH/Issues/2017/01/07/~/\\_media/Websites/IMF/imported-flagship-issues/external/pubs/ft/reo/2016/whd/eng/pdf/0416/chap4pdf.ashx](http://www.imf.org/en/Publications/REO/WH/Issues/2017/01/07/~/_media/Websites/IMF/imported-flagship-issues/external/pubs/ft/reo/2016/whd/eng/pdf/0416/chap4pdf.ashx).

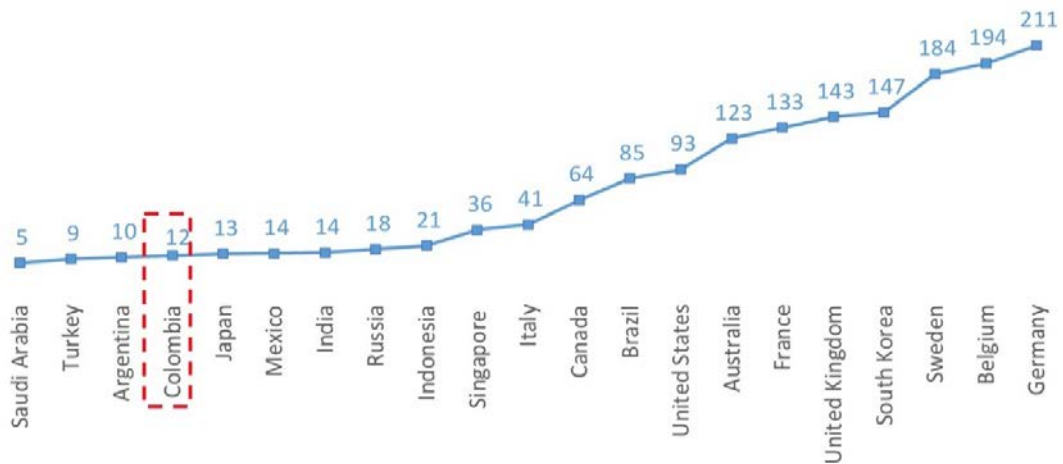
Rodríguez, D and W Cabrera (2020): "Concentración y competencia en los mercados de depósitos y crédito", *Informe Especial de Estabilidad Financiera*, Central Bank of Colombia, II semester, [https://repositorio.banrep.gov.co/bitstream/handle/20.500.12134/9961/informe\\_especial\\_concentracion-V.ext.pdf?sequence=1&isAllowed=y](https://repositorio.banrep.gov.co/bitstream/handle/20.500.12134/9961/informe_especial_concentracion-V.ext.pdf?sequence=1&isAllowed=y).

Torres, A and J Castaño (2020): "Concentración bancaria, competencia y estabilidad financiera en Colombia", *Revista de Economía del Rosario*, vol 23, no 1, January–June, <https://revistas.urosario.edu.co/index.php/economia/article/download/8632/7992/33807>.

## Electronic funds transfers

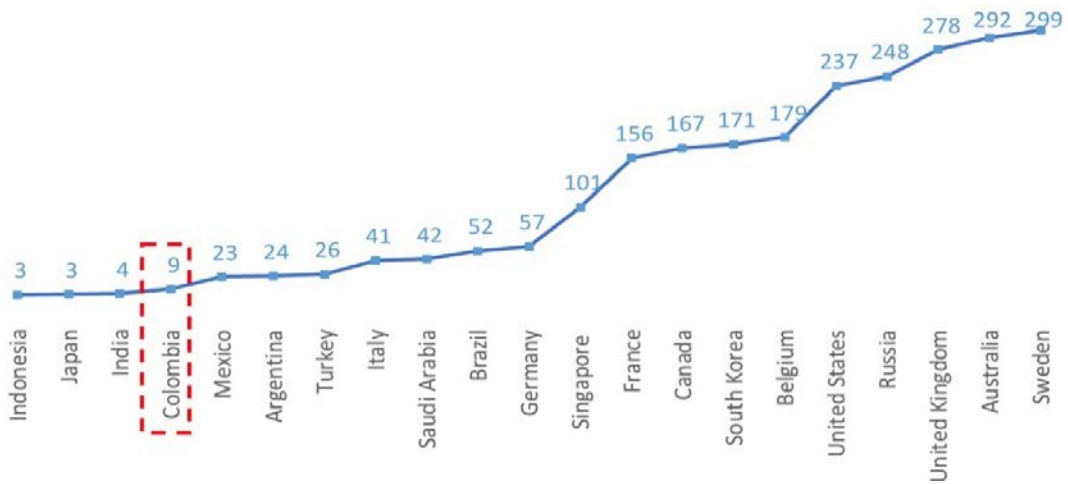
Number of transactions per capita

Graph 1



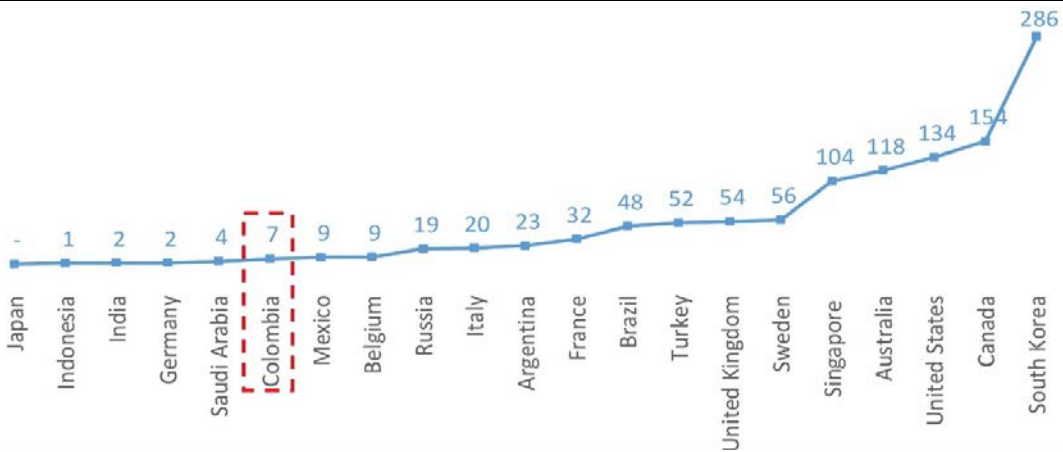
## Debit cards

Number of transactions per capita



## Credit cards

Number of transactions per capita

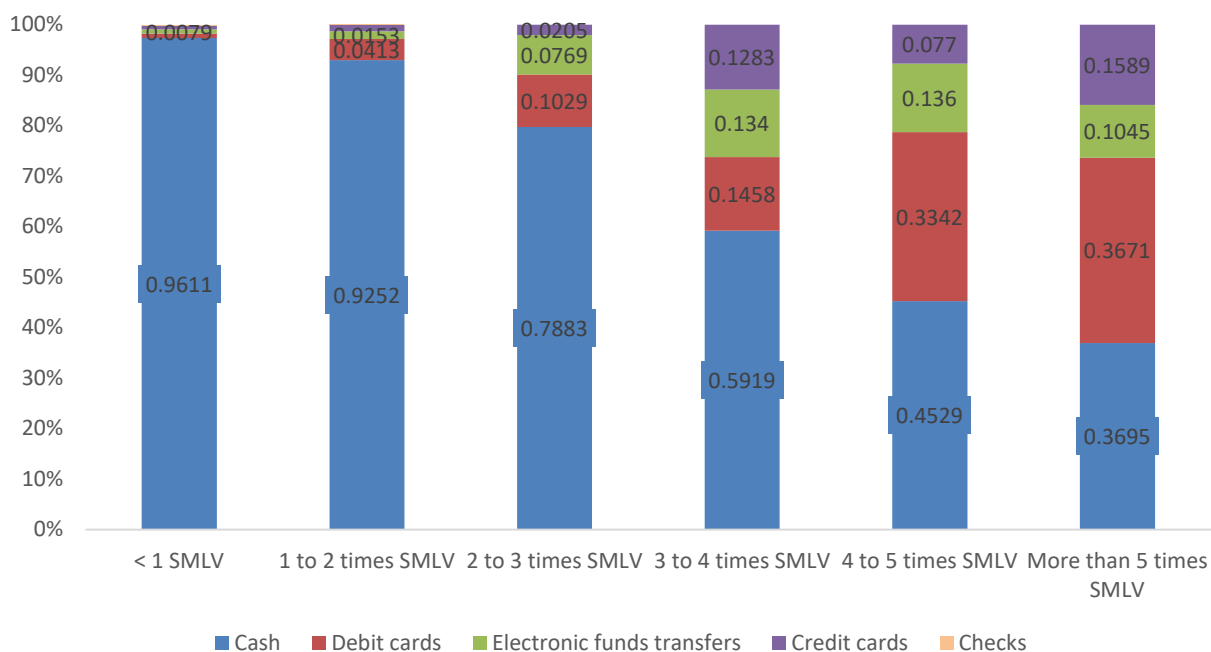


Source: Central Bank of Colombia (2021a).

## Preferred payment instrument

Number of transactions by income bracket

Graph 2

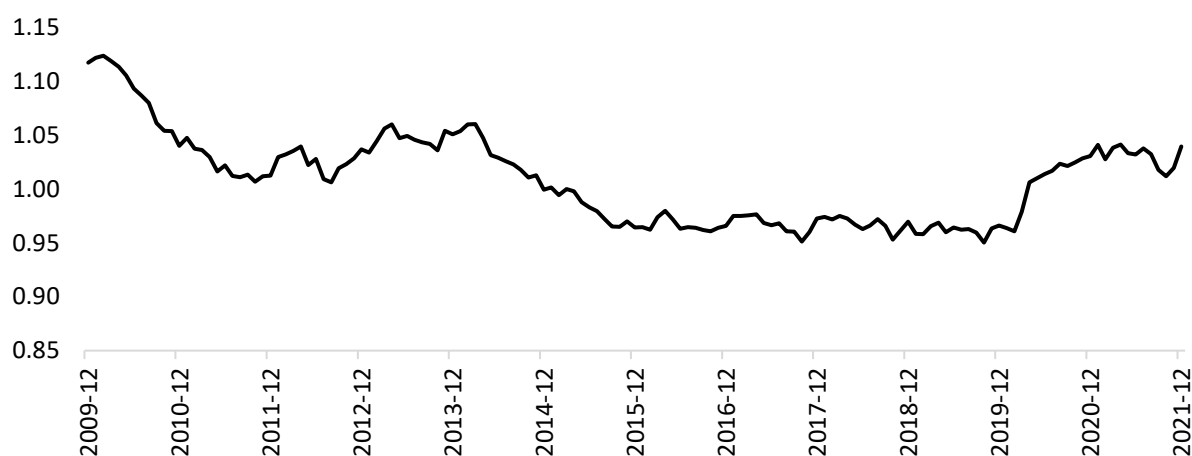


SMLV: legal minimum wage.

Source: Central Bank of Colombia (2020).

## Ratio of deposits<sup>1</sup>/loans<sup>2</sup>

Graph 3



<sup>1</sup> Includes CD and bond holdings by the Central Bank of Colombia.

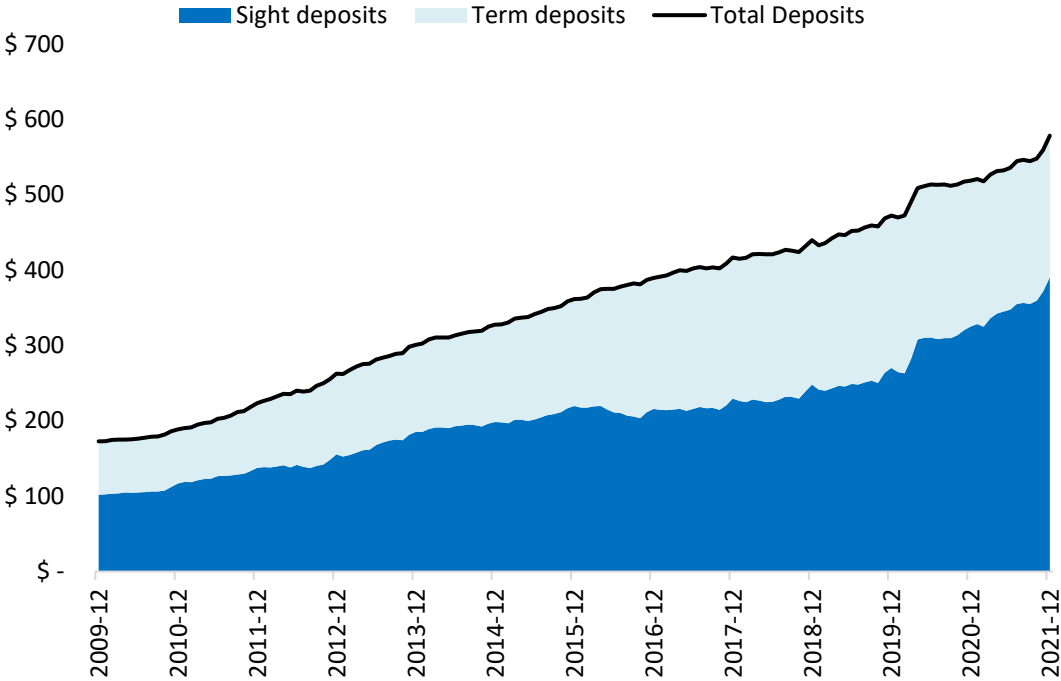
<sup>2</sup> Loans in local and foreign currency.

Source: Calculations by the Central Bank of Colombia with information from the Financial Superintendence of Colombia (weekly balance sheets).

# Deposits by term<sup>1</sup>

In trillions of Colombian pesos

Graph 4

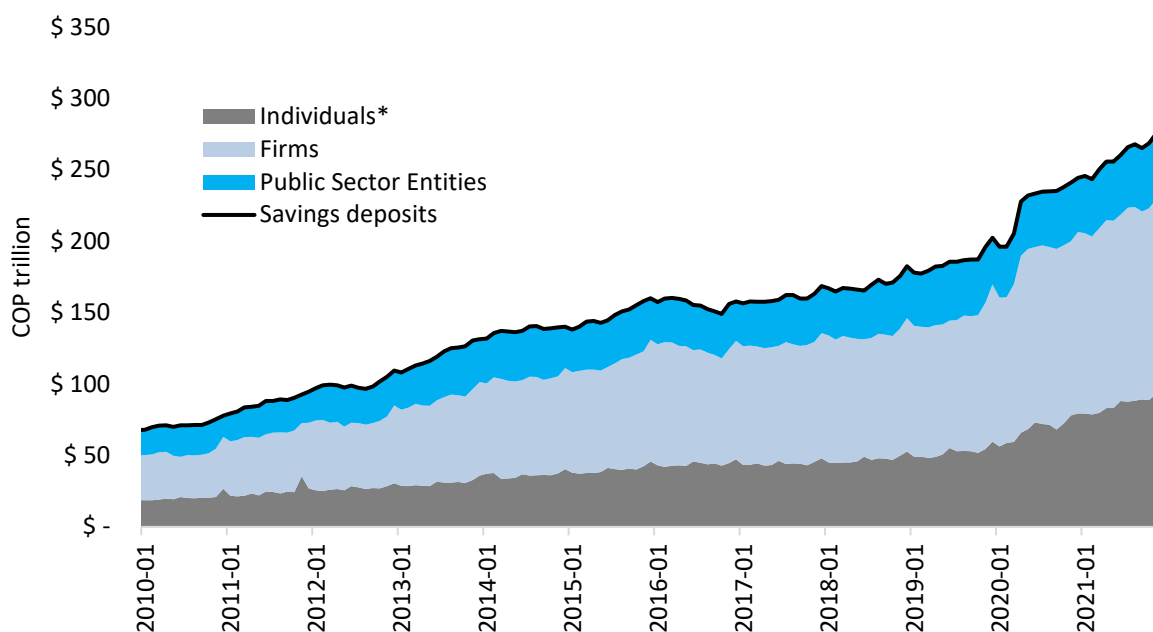


<sup>1</sup> Excludes CD and bond holdings by the Central Bank of Colombia and the National Treasury.

Source: Calculations by the Central Bank of Colombia with information from the Financial Superintendence of Colombia (weekly balance sheets).

## Savings deposits by holder

Graph 5

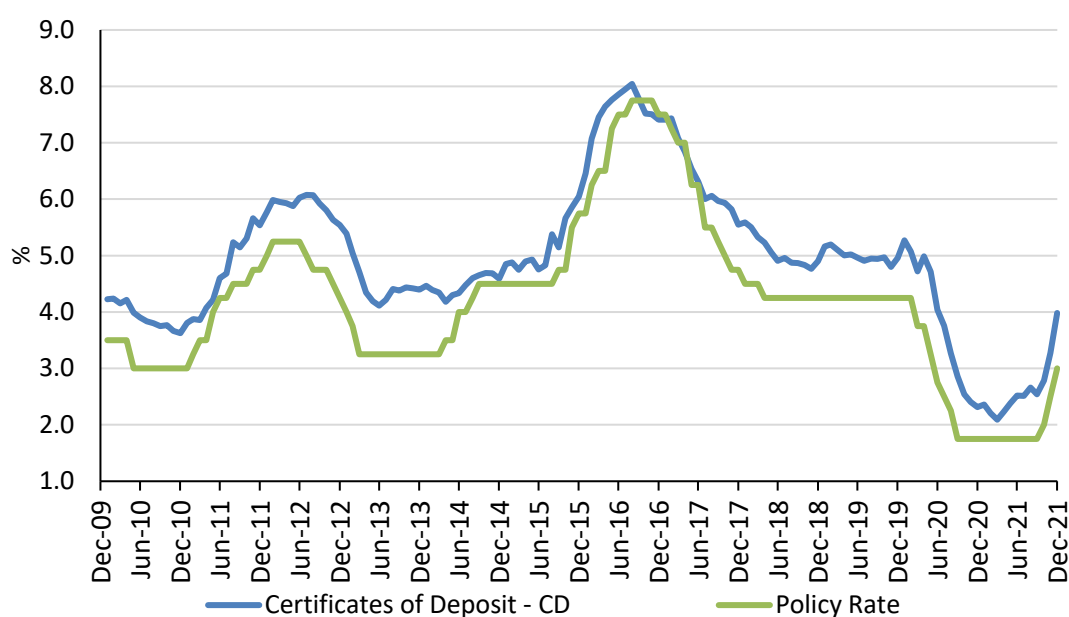


\* Includes electronic deposits.

Source: Calculations by the Central Bank of Colombia with information from the Financial Superintendence of Colombia (weekly balance sheets). Sectoral breakdown based on Form 441 of the Financial Superintendence of Colombia.

## Certificate of deposit interest rate<sup>1</sup> and monetary policy rate<sup>2</sup>

Graph 6

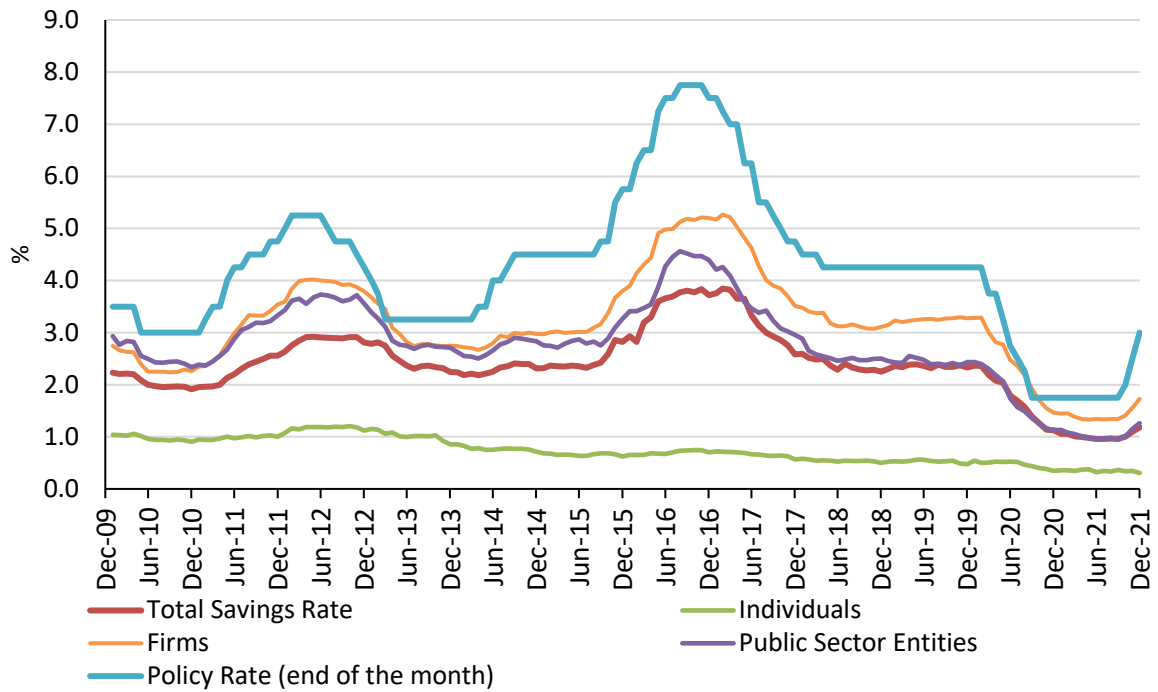


<sup>1</sup> Monthly average. <sup>2</sup> End of the month.

Source: Calculations by the Central Bank of Colombia with information from the Financial Superintendence of Colombia (Form 441).

Savings interest rates<sup>1</sup> by holder and monetary policy rate<sup>2</sup>

Graph 7



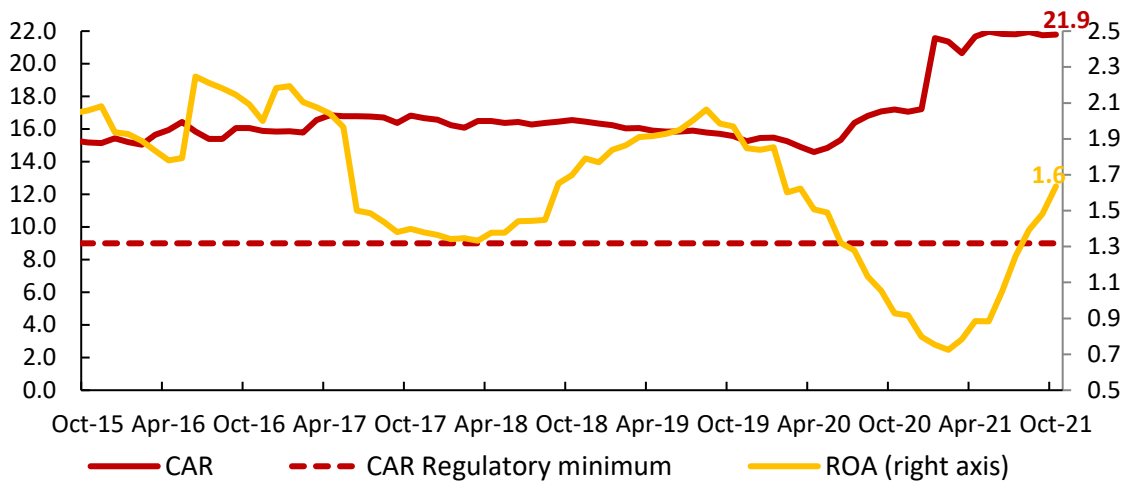
<sup>1</sup> Monthly average. <sup>2</sup> End of the month.

Source: Calculations by the Central Bank of Colombia with information from the Financial Superintendence of Colombia (Form 441).

Capital adequacy ratio (CAR) and return on assets (ROA) for the Colombian banking sector

In per cent

Graph 8



Source: Calculations by the Central Bank of Colombia based on data from the Financial Superintendence of Colombia.