The Impact of Monetary Policy on Financial Inclusion in Colombia

Autor

David Francisco Lara Larrota

Trabajo presentado como requisito para optar por el título de:

Magíster en Economía

Director

Umberto Muratori

Universidad del Rosario

Facultad de Economía

Maestría en Economía

Bogotá - Colombia

2025

Abstract

This paper examines the relationship between monetary policy and financial inclusion in Colombia, a financially developing yet institutionally complex economy with ongoing inclusion gaps between urban and rural areas. First, it introduces a subnational dimension, capturing heterogeneity in financial inclusion and monetary transmission that aggregate studies overlook. Second, it combines local projections with a Panel Vector Autoregressive Regression (VAR) approach, commonly used to analyze dynamic interactions between the two. Third, it examines whether monetary policies can temporarily boost inclusion through deposits, but their long-term effects usually reduce financial participation, highlighting the vulnerability of inclusion to contractionary cycles. On the other hand, panel VAR estimates reveal a partially bidirectional relationship with inflation: inflation shocks affect only a limited set of inclusion indicators, whereas financial inclusion exerts broader effects on prices, with deposit products and branch expansion generating upward pressures, and credit, particularly housing loans and credit cards, dampening them. Overall, this study offers new country-specific evidence on the interaction between the relationship and inclusion, showing that the relationship is neither one-way nor uniform across different aspects. This suggests that policymakers should address negative spillovers of monetary tightening, especially in credit access, by implementing complementary programs that shield vulnerable households and microenterprises from exclusion.

Introduction

In Colombia, monetary policy has kept prices stable over the past twenty years, despite ongoing challenges with financial inclusion. While nearly all adults in major cities hold at least one financial product, in rural and remote areas the percentage drops to 56. This creates a key question: how can monetary policy be effectively transmitted in an economy where many households and businesses remain outside the financial system?

Evidence highlights multiple channels through which financial inclusion can enhance the effectiveness of monetary policy—such as making output more responsive to interest rate changes (Loukoianova et al., 2018, p. 16), supporting price stability (Blancher et al., 2019, p. 56; Mehrotra & Yetman, 2014, p. 22), and smoothing consumption (Mehrotra & Yetman, 2014, p. 21). However, beyond these mechanisms, the overall relationship between monetary policy and financial inclusion remains unresolved. Most studies rely on cross-country comparisons—particularly in African and Asian economies—and produce mixed conclusions about causality. Some identify bidirectional links (Ciobanu, 2024; Elsherif, 2019; Komala & Widodo, 2022; Yıldırım et al., 2025), often depending on financial development (Oanh et al., 2023) and structural factors (Anarfo et al., 2019; Arshad et al., 2021; Elsaid, 2025; Jungo et al., 2022). Others identify only a one-way effect —sometimes from monetary policy to inclusion (Evans, 2016; Lapukeni, 2015; Ozili, 2023; Yin et al., 2019), other times from inclusion to monetary policy effectiveness (Biswas & Ahamed, 2023; Bourainy et al., 2021; Cavoli et al., 2023; Garbobiya et al., 2024; Huong, 2018; Lenka & Bairwa, 2016; Saraswati et al., 2020)—while some studies find no significant relationship (Ascari et al., 2011).

Cross-country approaches, however, face significant limitations. Even small changes in variable choice or model specification can lead to substantially different conclusions (Levine & Renelt, 1991, 1992), and such frameworks are unable to capture heterogeneity within countries. Moreover, much of the literature relies on international sources such as the World Bank's Global Findex or the IMF's Financial Access Survey. Both are highly valuable for ensuring cross-country comparability, but their annual frequency makes it challenging to capture short-term dynamics that matter for understanding monetary transmission (Ferrari & Ters, 2017; Geweke & Runkle, 1995). In addition, as a survey-based instrument, the Global Findex may face some of the usual challenges of self-reported data, such as measurement biases or limited ability to reflect local contexts (Grimm, 2010; S. Shah, 2025)[1]. The Financial Access Survey, in turn, avoids these issues by drawing on supply-side data but still shares the limitation of annual coverage.

This paper addresses these gaps by examining the relationship between monetary policy and financial inclusion in Colombia from a regional perspective. The contribution is

[1] Global Findex estimates differ markedly from those based on administrative data from TransUnion used by Banca de las Oportunidades (BDO). For 2024, Findex reports that 57.1% of adults aged 15 and above held an account at a formal financial institution, compared to 95.8% of adults (18+) with at least one deposit product in BDO's records. Similarly, while Findex indicates that 43.4% of adults had a savings account, BDO estimates 95.8%. For mobile money, Findex reports 39.1% of adults (15+) using such services, whereas BDO data show 64% of adults (18+) holding an active mobile money account.

twofold. First, it introduces a subnational dimension, capturing heterogeneity in financial inclusion and monetary transmission that aggregate studies overlook. Second, it employs a novel quarterly dataset from a credit bureau, which avoids the drawbacks of international surveys and extends beyond 2020—a period marked by the rapid expansion of mobile money accounts following the pandemic, along with the continued growth of digital payments and fintech infrastructure that have progressively reshaped financial access (Demirgüç-Kunt et al., 2022; Finnovista et al., 2024). These developments remain largely absent from previous studies.

The analysis investigates whether monetary policy functions as a mechanism that broadens financial inclusion or, conversely, whether gaps in financial access undermine its effectiveness in stabilizing inflation. This question is particularly relevant in Colombia, where, unlike in many economies, the central bank has no explicit mandate on financial inclusion. Confirming such a transmission channel would enable better coordination between monetary policy and inclusion strategies, particularly during contractionary or expansionary phases that affect access to formal financial services. Beyond monetary transmission, this study also contributes to the literature on the distributional effects of monetary policy. While aggregate outcomes may offset each other across income groups (Taboada Arango et al., 2024, p. 204), there is evidence that monetary policy can exacerbate inequality through differential access to financial services and credit (Loukoianova et al., 2018). This highlights the need for complementary policy instruments to ensure that monetary policy does not inadvertently widen existing disparities.

Methodologically, the study combines local projections (Jordà, 2005)—which flexibly estimate impulse–response functions robust to lag misspecification and allow transparent cross-regional inference—with panel Vector Autoregressive Regression (VAR) models, commonly used to analyze dynamic interactions between monetary policy and financial inclusion.

The analysis spans 2018Q1–2024Q4. Results show that contractionary monetary policy exerts asymmetric effects on financial inclusion: while it temporarily increases deposit access—particularly through savings accounts—its long-term impact is predominantly negative, reducing both account usage and credit access. Conversely, panel VAR estimates reveal a partially bidirectional relationship with inflation: inflation shocks affect only a limited set of inclusion indicators, whereas financial inclusion exerts broader effects on prices, with deposit products and branch expansion generating upward pressures, and credit—especially housing loans and credit cards—dampening them.

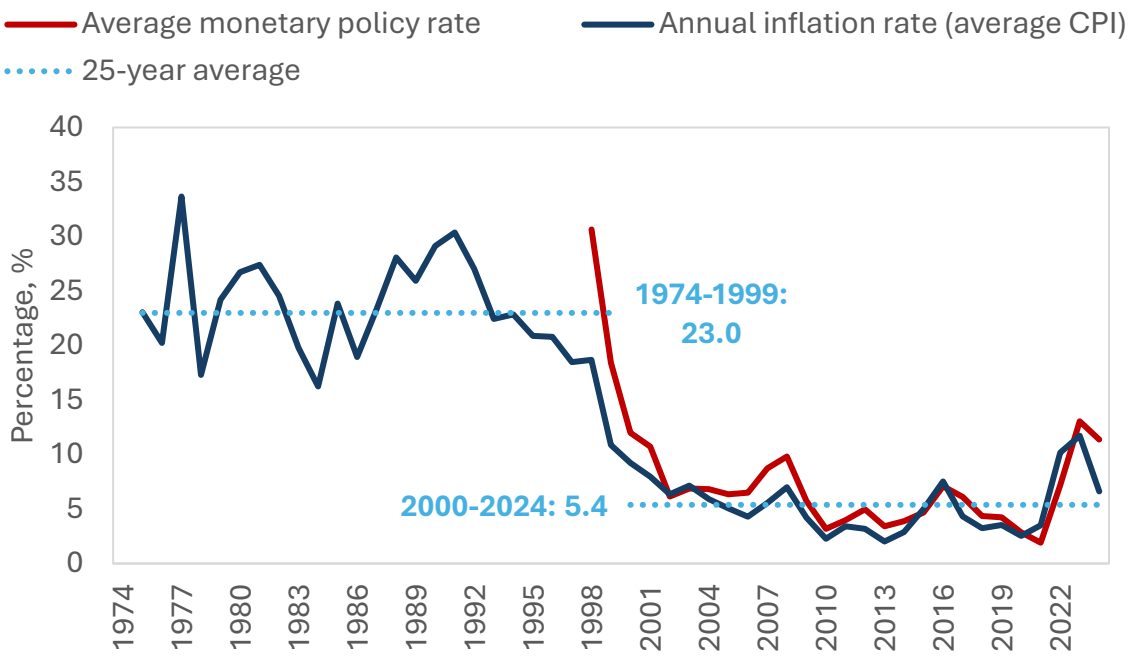
The remainder of the paper is organized as follows. Section 2 presents the institutional background. Section 3 reviews the related literature. Section 4 introduces the data. Section 5 outlines the empirical methodology. Section 6 presents the main results. Section 7 concludes and discusses policy implications. Section 8 provides a technical appendix with additional details on the methodology and robustness checks.

Institutional Background

Over the past two decades, monetary policy has played a central role in the Colombian economy, particularly following the adoption of an inflation targeting framework at the end of 1999. This shift marked a turning point in stabilizing the economy, as annual inflation fell sharply from an average of 23% between 1975 and 1999 to 5.4% between 2000 and 2024. The central bank has relied on a range of instruments to pursue its objectives, with the intervention rate—defined as the interest rate at which the central bank provides liquidity to intermediaries through open market operations, being the most prominent. By influencing the cost of credit and the money supply, this instrument has become the cornerstone of monetary policy implementation in Colombia. Figure 1 shows the co-movements between the intervention rate and the inflation rate.

Figure 1

Monetary Policy Rate and Inflation in Colombia: 1974–2024



Note: Banco de la República and DANE. Calculations by the author: annual inflation was derived from the average of monthly CPI values, and the monetary policy rate was averaged over each calendar year.

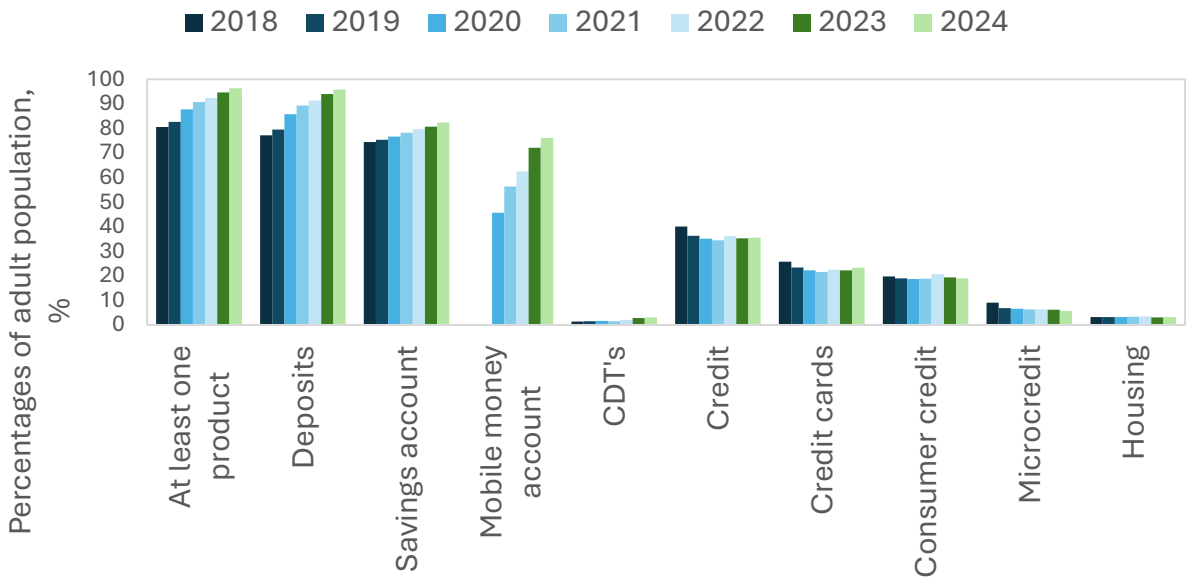
During this period, monetary policy has been repeatedly tested by major shocks. Among the most significant are the global financial crisis of 2008, the collapse in oil prices between 2014 and 2016, the COVID-19 pandemic, and the more recent inflationary shock of 2021–2024. The latter combined global pressures—such as supply-chain disruptions, commodity price increases, exchange-rate depreciation, and geopolitical tensions—with domestic factors, including expansionary fiscal policy and episodes of social unrest. These events challenged the credibility and effectiveness of monetary policy, forcing the central bank to adjust its stance to contain inflation and stabilize expectations.

Parallel to these macroeconomic developments, financial inclusion in Colombia expanded markedly. As emphasized in Figure 2, between 2018 and 2024, the share of adults with at least one financial product increased from 80.6 to 96.3%. This improvement was driven primarily by the steady growth of deposit products, while credit displayed more cyclical behavior. Credit expanded in 2022, reflecting the lagged impact of low interest rates in 2021, but contracted again in 2023 following the sharp monetary tightening of 2022. Deposits, by contrast, maintained continuous growth, albeit with some deceleration in 2022 before accelerating again in 2023. In 2024, the results were mixed: credit showed a slight recovery, likely reflecting a base effect from the contraction in the previous year, whereas deposits, particularly savings accounts, reverted to stronger growth, consistent with the high monetary policy rates observed in 2023.

While deposits followed a steadier upward trend, this growth was strongly reinforced by the spread of mobile money accounts, which substantially broadened access to financial services and became a key driver of inclusion during the period. At the same time, higher-yield products such as certificates of deposit (CDTs) gained popularity, as rising interest rates made them more attractive. Together, these dynamics illustrate how both traditional and digital instruments shaped the trajectory of financial inclusion and how their evolution was closely intertwined with the monetary policy cycle.

Figure 2

Financial inclusion indicators



Note: Banca de las Oportunidades, TransUnion and DANE. Calculations by the author.

Changes in financial inclusion have shown marked regional disparities in Colombia[2]. Figure 3 shows that the access indicator followed broadly similar trends across regions from

[2] **Central East Region:** Bogotá D.C., Santander, Cundinamarca, Norte de Santander, and Boyacá.

Caribbean Region: Atlántico, Bolívar, Magdalena, Córdoba, Cesar, Sucre, La Guajira, San Andrés, Providencia, and Santa Catalina.

Coffee Region: Antioquia, Risaralda, Quindío, and Caldas.

South Central Region: Tolima, Huila, Caquetá, Putumayo, and Amazonas.

Llanos Region: Meta, Casanare, Arauca, Guaviare, Guainía, Vichada, and Vaupés.

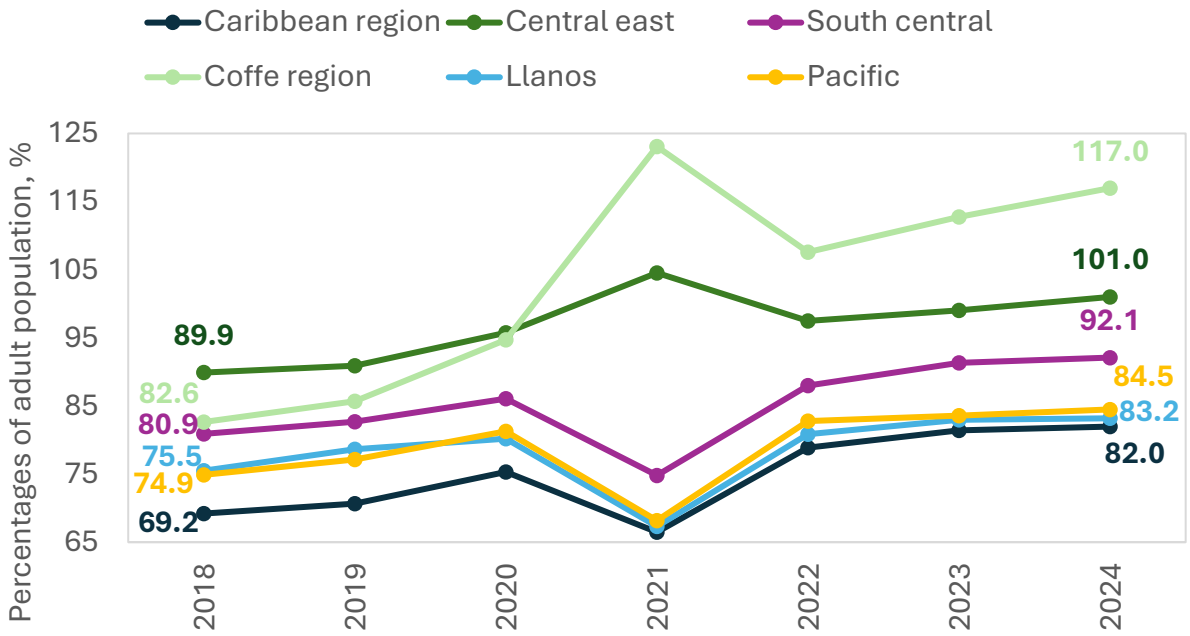
Pacific: Cauca, Chocó, Nariño and Valle del Cauca.

2018 to 2020 but diverged significantly in 2021 and 2022. For instance, in 2021 the Caribbean, Llanos, and South-Central regions experienced declines in access to financial products, while the Central-East and Coffee region—home to key departments such as Bogotá and Antioquia—recorded increases. By 2022, this pattern reversed: the former group recovered, while the latter registered declines. Since then, financial inclusion has risen across all regions, although the Central-East and Coffee region have continued to widen their lead over the rest of the country.

At the rural–urban level, Figure 4 presents the access indicator for at least one financial product, based on the rurality classification developed by the National Planning Department (DNP) (Cruz et al., 2021). The evidence shows that urban centers and metropolitan areas have the highest levels of financial access in the country. However, the gap relative to dispersed rural municipalities has widened consistently over time, reaching 51.2 percentage points (pp) by the end of the sample.

Figure 3

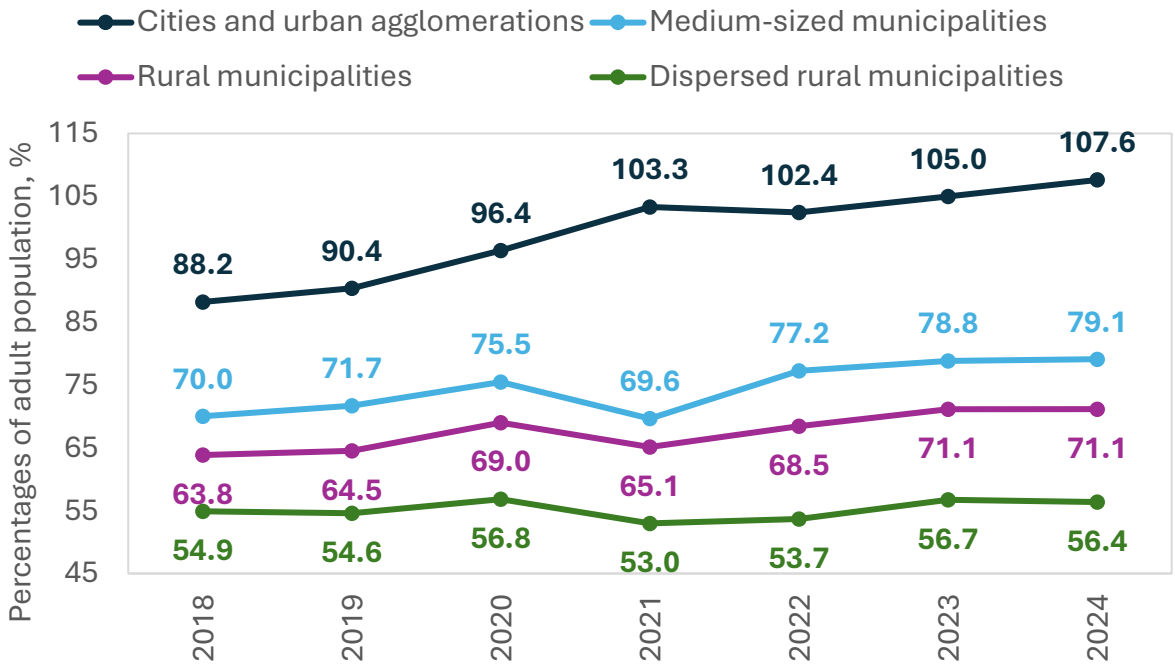
General financial access indicator by regions



Note: Banca de las Oportunidades, TransUnion and DANE. Calculations by the author.

Figure 4

General financial access indicator by level of rurality

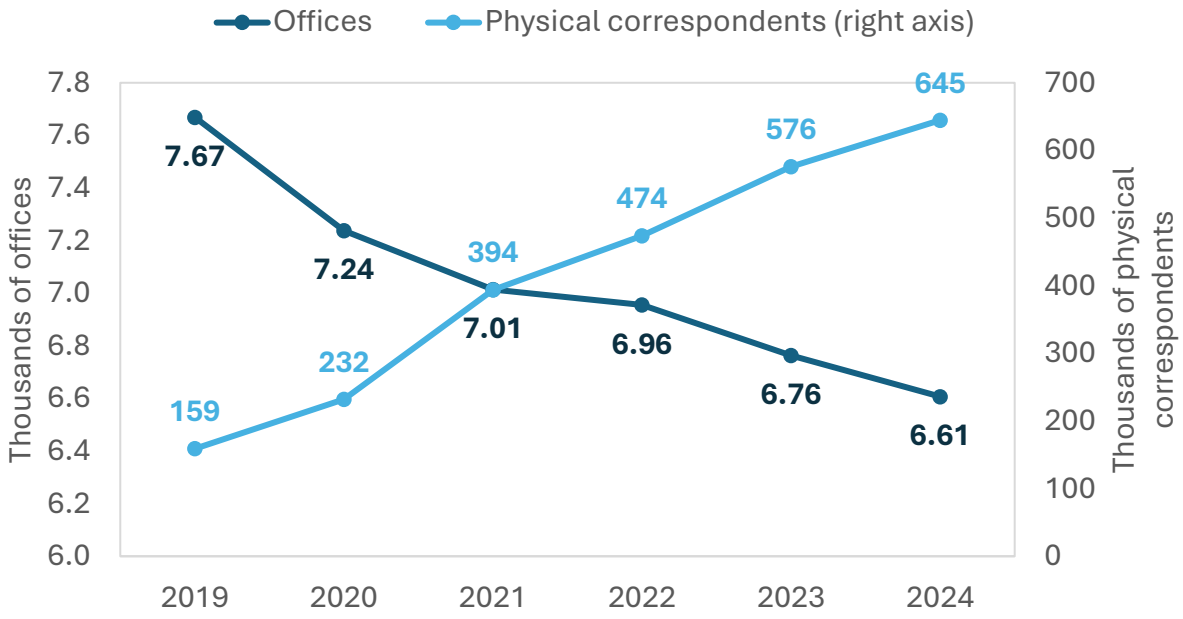


Note: Banca de las Oportunidades, TransUnion and DANE. Calculations by the author.

In terms of financial coverage, a differentiated evolution can be observed among physical service channels. Since 2019, the number of banking correspondents has increased steadily, reflecting their strategic role in expanding financial services in areas with limited institutional presence. Conversely, the number of bank branches has experienced a slight decline, mainly attributable to the ongoing digitalization of the financial sector. This trend is depicted in Figure 5, which shows the evolution of offices and physical correspondents from 2019 to 2024.

Figure 5

Offices and physical correspondents 2019-2024

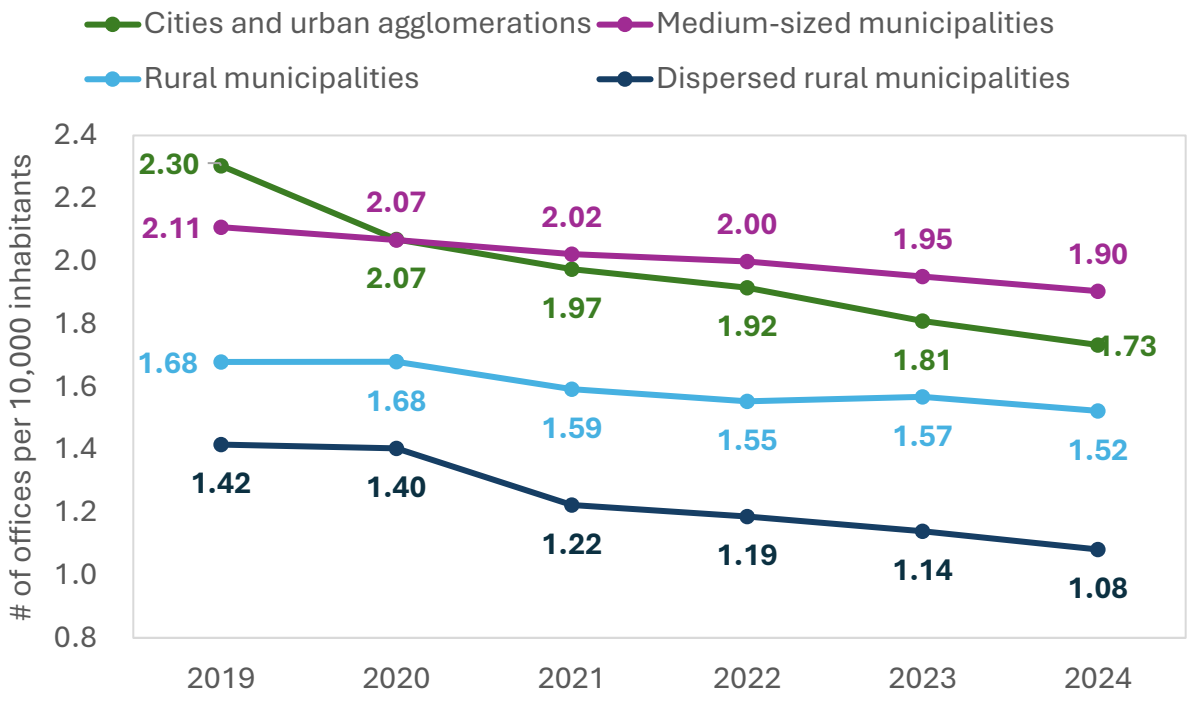


Note: Banca de las Oportunidades. Calculations by the author.

Despite these changes, physical coverage remains significantly lower in rural areas compared to urban ones, highlighting persistent challenges in achieving financial inclusion in historically underserved regions. Figure 6 and Figure 7 illustrates this gap by showing the distribution of offices and physical correspondents according to levels of rurality.

Figure 6

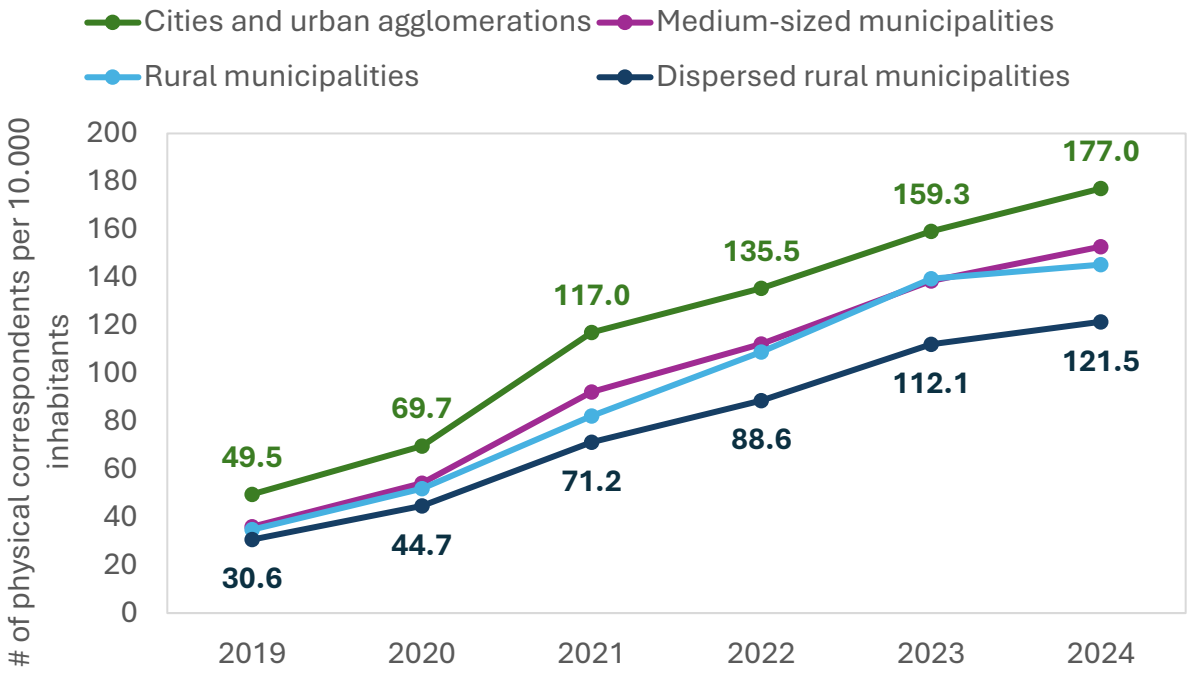
Offices by level of rurality



Note: Banca de las Oportunidades. Calculations by the author.

Figure 7

Physical correspondents by level of rurality

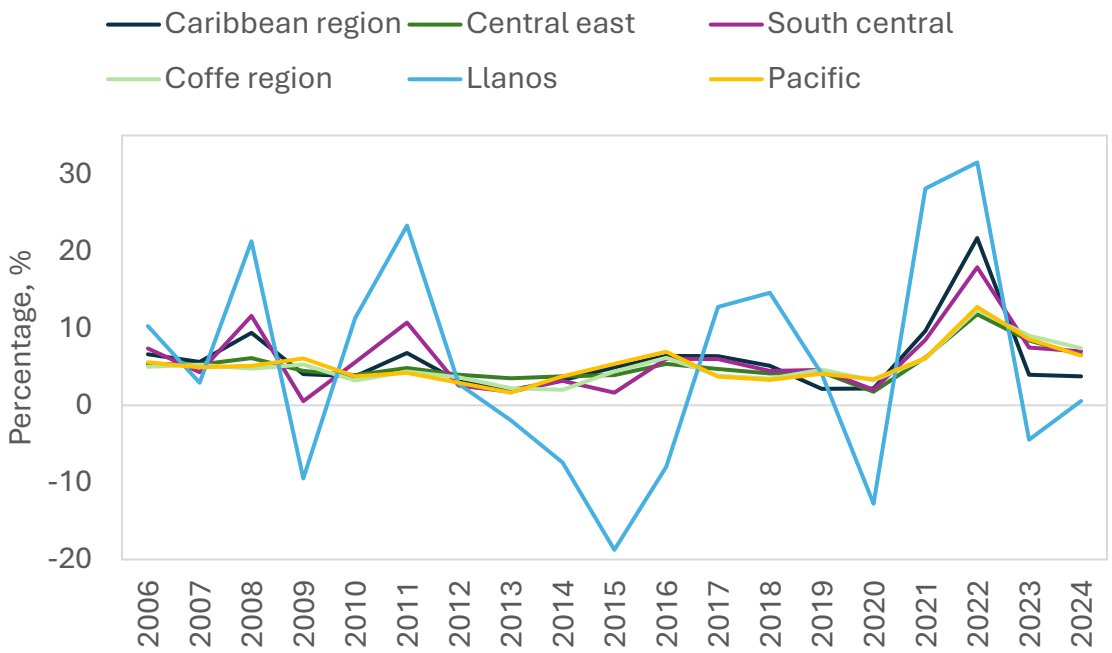


Note: Banca de las Oportunidades. Calculations by the author.

Comparable heterogeneity is also observed in regional price dynamics, as measured by the Gross Domestic Product (GDP) deflator. Figure 8 shows that the Llanos consistently reported the highest inflation, followed by the South-Central and Caribbean regions. These areas were also the most affected by the 2022 inflation surge, yet they experienced the sharpest corrections in 2023. Such variability highlights the uneven impact of macroeconomic shocks across regions and suggests the possibility of asymmetric monetary policy transmission in Colombia.

Figure 8

Regional annual inflation measured by the GDP deflator



Note: DANE. Calculations by the author

Overall, Colombia's institutional background highlights the close link between monetary policy and financial inclusion within a context characterized by recurrent shocks and ongoing regional disparities. The adoption of the inflation-targeting framework has enhanced credibility and helped anchor expectations, though recent episodes have shown the limitations of monetary policy effectiveness under combined domestic and external pressures. Meanwhile, the expansion of financial inclusion—driven by both traditional deposit products and the rapid growth of digital services—has extended the reach of the financial system. However, significant gaps still exist across different regions and levels of rurality. These patterns indicate that monetary policy transmission in Colombia is not

uniform but is heavily influenced by the depth and structure of financial markets in various areas.

From Transmission Channels to Regional Gaps: Financial Inclusion in Monetary Policy

The effectiveness of monetary policy depends critically on the transmission mechanisms through which policy actions propagate across the economy. Literature has traditionally identified four primary channels. The interest rate channel describes how changes in the policy rate are transmitted along the yield curve, influencing intertemporal consumption, saving, and investment decisions of households and firms. The balance sheet channel emphasizes that higher interest rates reduce the value of financial assets, eroding the net worth of borrowers and financial institutions and thereby constraining credit supply. The risk-taking channel highlights that policy rates shape the risk appetite of banks: higher rates make borrowers appear riskier. In comparison, lower rates encourage financial institutions to expand credit in search of returns. Finally, the exchange rate channel reflects how interest rate adjustments affect capital flows, appreciating or depreciating the domestic currency with direct implications for trade and foreign currency-denominated balance sheets (Taboada Arango et al., 2024, pp. 109–117)

Within this framework, financial inclusion—understood as access to and use of affordable financial products and services tailored to household and firm needs (World Bank, n.d.)—emerges as a key determinant of monetary transmission. When households and firms participate in formal financial markets, the transmission channels become more effective. Loukoianova et al. (2018) demonstrate that output is more responsive to policy rate adjustments in more inclusive systems. Similarly, Mehrotra and Yetman (2014), combining models of “rule-of-thumb” consumers (Galí et al., 2004) with panel VAR estimations, argue that financial inclusion enhances monetary policy’s ability to stabilize

prices and smooth consumption. Blancher et al. (2019) also stress its role in supporting macro-financial stability. Together, these contributions establish financial inclusion not only as a development objective but also as a determinant of macroeconomic policy effectiveness.

Despite this consensus, empirical evidence remains highly heterogeneous. A first strand of studies identifies bidirectional links between monetary policy and financial inclusion. Ciobanu (2024), through an extensive review, underscores the two-way relationship across institutional contexts. Yildrim et al. (2025), applying a panel VAR with two-step system Generalized Method of Moments (GMM) estimator and panel Granger causality to 24 upper-middle-income countries (2010–2020), construct a multidimensional inclusion index based on branch and Automated Teller Machine (ATM) density, deposit penetration, and private credit to GDP. They show that inflation reduces inclusion, while higher inclusion mitigates inflationary pressures. Elsherif (2019), focusing on Egypt with a principal component analysis (PCA) based index, reports similar dynamics: financial inclusion shocks reduce inflation, while inflationary shocks erode inclusion.

Evidence from Southeast Asia points in the same direction. Komala and Widodo (2022), analyzing ASEAN[3] economies (2010–2019) through VECM models, find that greater financial inclusion—proxied by deposit-to-GDP ratios—lowers inflation in both the short and long run. They also show heterogeneous causalities: branch and ATM penetration primarily drives inflation, while inflation shocks affect the credit-to-GDP ratio.

[3] Association of Southeast Asian Nations.

Complementing this, Kebede et al. (2024), using a PSVAR for eight WAEMU[4] countries (2006–2020), find that inflation initially rises after inclusion shocks but falls over time, with policy rates adjusting downward. Importantly, usage indicators (deposits per capita, credit-to-GDP) shape inflation dynamics, while outreach indicators (branch and ATM density) do not. Moreover, contractionary monetary shocks do not significantly alter inclusion, suggesting that the composition of financial inclusion matters more than its aggregate level.

Other contributions highlight that this bidirectionality varies with structural characteristics and financial development. Oanh et al. (2023), using a panel VAR for 58 countries (2004–2020), find that in low financial development systems, inclusion reduces inflation and monetary expansion while enhancing stability. In highly developed systems, however, inclusion increases inflation and monetary growth while undermining stability, pointing to long-term trade-offs. Anarfo et al. (2019) show for Sub-Saharan Africa (1990–2014) that inclusion lowers policy rates while expansionary policy fosters inclusion, reinforcing the two-way link. Similarly, Arshad et al. (2021), using a 10-variable PCA index for 40 countries (2004–2018), conclude that in developed economies causality runs both ways, whereas in underdeveloped economies the relationship is unidirectional mainly from policy to inclusion, often with negative effects.

Regional evidence further nuances these findings. Elsaid (2025), examining 12 MENA economies (2004–2022) with a PCA index and PVAR GMM, shows that in oil-rich

[4] West African Economic and Monetary Union

countries inclusion raises inflation in the short run but stabilizes prices in the long run, while in non-oil countries inclusion immediately reduces inflation. Moreover, inflation also fosters inclusion in non-oil economies, reinforcing the bidirectional nexus. Jungo et al. (2022), comparing Sub-Saharan Africa (SSA) and Latin America and the Caribbean (LAC) over 2005–2018, find contrasting patterns: in SSA, inclusion reduces inflation while inflation fosters inclusion, whereas in LAC inclusion fuels inflation and inflation reduces inclusion by more than 40%. These contrasts underscore the importance of institutional and macroeconomic contexts.

A second line of research emphasizes unidirectional effects, though findings diverge on direction. Several studies argue that monetary policy fosters inclusion. Evans (2016), analyzing 15 African countries (2005–2014) with a VECM, finds that inflation reduces inclusion (depositors per 10,000 adults) in the long run. However, inclusion does not affect inflation, with interest rate shocks explaining most variation. Yin et al. (2019), using regional data from eight Chinese provinces (2011–2019) and separate VARs, report that both M2 growth and policy rate increases boost financial inclusion in the short run, measured by credit disbursement indicators.

Other evidence points to mixed effects. Ozili (2023), applying fixed-effects panels for five major emerging markets (2004–2020), finds that higher policy rates reduce the number of depositors but increase the number of branches, implying that both tightening and easing can yield inclusionary outcomes. However, following the 2008 crisis, rate hikes consistently harmed inclusion by reducing the number of branches, ATMs, and accounts. Similarly, Lapukeni (2015), analyzing Malawi (2001–2013) with cointegration and Granger

causality, finds that money supply drives deposits and credit as GDP shares, while lending rates determine credit, but neither variable explains inflation significantly in the short or long run.

A third body of research contends that financial inclusion enhances monetary effectiveness. Biswas and Ahamed (2023), using data for 10 developing countries (2004–2020), show that higher ATM penetration lowers inflation. Bourainy et al. (2021), analyzing 37 developing economies (2009–2018) with a multidimensional PCA index, also find that inclusion reduces inflation. Lenka and Bairwa (2016), studying SAARC[5] countries (2004–2013), confirm a negative relationship between inclusion and inflation across multiple panel estimators. Huong (2018) finds a similar result for Vietnam (2004–2015), showing that inclusion—proxied by ATMs, deposits, and credit to GDP—reduces inflation and enhances stability. At the country level, Saraswati et al. (2020) show for Indonesia (2009–2018) that inclusion lowers inflation in both the short and long run, while fintech adoption amplifies volatility effects. Cavoli et al. (2023) add that higher inclusion systematically associates with lower policy rates.

In contrast, some studies suggest that inclusion could weaken monetary effectiveness. Garbobiya et al. (2024), analyzing ECOWAS[6] countries (2004–2020) with PVAR GMM, find that inclusion increases prices and interest rates, thereby reducing policy effectiveness. Others find no significant relationship: Ascari et al. (2011), using staggered

[5] South Asian Association for Regional Cooperation.

[6] Economic Community of West African States.

wage-price contracts (Erceg et al., 2019), limited asset market participation models (Bilbiie, 2008), argue that LAMP has minimal implications for optimal monetary design, as interest rate rules remain active regardless of participation.

This diversity partly reflects methodological and data limitations. Cross-country regressions are highly sensitive to model specification (Levine & Renelt, 1991, 1992). Widely used data sources such as the Global Findex (survey-based, with probability of self-reporting biases: Grimm, (2010); S. Shah, (2025) and the IMF's Financial Access Survey (administrative but annual only) constrain the study of short-term dynamics critical for monetary shocks (Ferrari & Ters, 2017; Geweke & Runkle, 1995).

The monetary policy literature itself has long recognized heterogeneous transmission mechanisms across dimensions, shaped by structural features such as price rigidities (Pasten et al., 2020), exchange rate regimes (Deb et al., 2023), and firm size (Ehrmann, 2005; Meltzer, 2024). It follows that these heterogeneities often manifest regionally as well, generating divergent transmission patterns (Carlino & Defina, 1998; Owyang & Wall, 2005)

In Colombia, such heterogeneity is well documented. Romero (2008) shows uneven GDP responses across departments, with short-lived effects diffusing spatially. Quintero Otero (2019) highlights sectoral variation, with manufacturing, construction, and transportation particularly sensitive. Quintero Otero and González G. (2012) show that export-oriented and mining-intensive regions respond more strongly, while Zuccardi-

Huertas (2004) finds no differentiated responses at the city level. Together, these studies confirm the importance of regional heterogeneity in Colombia's monetary transmission.

Nevertheless, no study systematically explores the intersection of regional heterogeneity and financial inclusion. While monetary policy is influenced by local economic structures, and financial inclusion affects transmission, how these two aspects interact remains unexamined. This gap is particularly significant in Colombia, where disparities are striking. Urban inclusion rates are nearly universal, but in scattered rural areas, fewer than 60% of adults have a formal financial product.

This dissertation addresses this omission by introducing a subnational perspective and leveraging a novel quarterly credit bureau dataset covering 2018–2024. This dataset allows capturing both regional heterogeneity and high-frequency dynamics absent from cross-country approaches, and incorporates structural changes such as the rise of mobile money and digital payments after the COVID-19 pandemic (Demirgüç-Kunt et al., 2022; Finnovista et al., 2024). The study asks whether monetary policy broadens inclusion or whether persistent gaps undermine stabilization capacity, with implications for policy coordination in emerging economies.

Finally, the policy relevance of this nexus extends beyond efficiency to equity. Financial inclusion promotes growth (Chaudhry et al., 2024; Van et al., 2021) and reduces poverty and inequality (Koomson et al., 2020; Omar & Inaba, 2020). Loukoianova et al. (2018) show that unequal access amplifies the heterogeneous effects of monetary tightening, disproportionately harming poorer households. Likewise, Taboada Arango et al.

(2024) argue that even under aggregate neutrality, distributional asymmetries persist across income groups due to differences in access to credit and savings. This perspective underscores that the monetary policy–inclusion nexus concerns not only macroeconomic efficiency but also distributional equity.

Data

This section describes the measures of financial inclusion and the related macroeconomic variables used in the analysis. It emphasizes the accessibility and utilization of financial products by individuals, especially deposit and credit services.

The information concerning financial inclusion originates from the TransUnion credit bureau and is shared with *Banca de las Oportunidades* (BDO). TransUnion, recognized as Colombia's premier credit bureau, compiles reports from financial service providers at the municipal level for the resident population. Although data collection commenced in 2012 with the inaugural Financial Inclusion Report, jointly conducted by BDO and the Financial Superintendence of Colombia (SFC), the analysis covers exclusively the period from the first quarter of 2018 to the fourth quarter of 2024 to ensure comparability across series. The database consolidates reports from three groups of entities: (i) institutions supervised by the SFC, including banks, financial corporations, financing companies, financial cooperatives, and specialized deposit and electronic payment companies (SEDPEs); (ii) entities overseen by the Superintendence of the Solidarity Economy (SES), such as savings and credit cooperatives; and (iii) non-supervised microfinance institutions, including NGOs, foundations, and simplified joint-stock companies (SAS) specializing in microcredit provision. On the deposit side, the data encompasses savings accounts, CDTs, and mobile money accounts (e.g., *Nequi, Daviplata, Dale*). On the credit side, it includes consumer, housing, and microcredit, as well as credit cards. Although the information can be disaggregated by individuals and firms, this study focuses exclusively on individuals, as this

constitutes the most comprehensive dataset. Conversely, firm-level figures are still under review at BDO.

Financial inclusion is quantified through the parameters of access and utilization. Access pertains to the proportion of adults possessing financial products, either viewed collectively—by enumerating those with at least one product—or distinguished by specific product categories. Utilization, conversely, refers to the count of adults actively engaging with these products. For credit offerings and CDTs, having a contract suffices to classify an individual as an active user. Conversely, for deposit-based products such as savings accounts and mobile money accounts, tangible activity is requisite for the product to be deemed active.

Geographic assignment mainly depends on address information provided by financial institutions, supported by third-party demographic and administrative records, such as those from the DNP and the bureau's own branch databases. In some instances, location data may be missing, but this is minimal: in 2024, adults with at least one financial product but no geographic identifier represented only 0.3% of the total.

BDO also consolidates related sources, including SFC's Form 534 on the use of financial products and services, reports from SES-supervised entities, and voluntary submissions from non-supervised microfinance NGOs. These provide additional indicators such as disbursement volumes, the number of credit operations across modalities, the stock of savings accounts and deposits, and coverage through correspondents and branches.

Macroeconomic series were obtained from the Central Bank of Colombia and the National Administrative Department of Statistics (DANE). From the Central Bank, the DTF rate was used as a proxy for short-term nominal interest rates. The DTF is calculated weekly as the weighted average of effective interest rates on 90-day CDTs offered by supervised financial institutions and is widely regarded as a benchmark for the cost of funds. Inflation was computed from the Consumer Price Index (CPI), using end-of-quarter levels to derive quarterly variations. To incorporate expectations, two surveys collected by the Central Bank were used: the Monthly Survey of Economic Analysts' Expectations (EME), which began in 2003, and the Quarterly Survey of Business Economic Expectations (ETE), which began in 2000. The EME provides forecasts of inflation one year ahead, while the ETE collects forecasts of GDP growth. Both sets of forecasts were initially reported as annualized rates and were converted to quarterly frequency under the assumption of constant monthly or quarterly growth rates.

From DANE, annual departmental GDP data were obtained for 2005–2024 in both nominal terms and chained volume series, with 2015 as the base year. These were temporally disaggregated to quarterly frequency using the Chow–Lin method (Chow & Lin, 1971), employing the corresponding national GDP series as the indicator variable in the disaggregation. This procedure enabled the computation of quarterly real GDP growth rates and the extraction of sectoral shares for mining, industry, and construction.

Population data were also obtained from DANE, based on projections derived from the 2018 National Population and Housing Census. The adult population, used by BDO to weight financial inclusion indicators, was derived under the assumption of a constant

growth rate. For the total population, annual series were disaggregated to quarterly frequency using the Denton–Cholette method (Dagum & Cholette, 2006). Together, these demographic series support the construction of per capita indicators and ratios central to the analysis.

Finally, complementary structural variables were incorporated from the Departmental Competitiveness Index, produced by the Private Council of Competitiveness. Three dimensions were initially considered: external market size, business density, and ICT infrastructure. External market size reflects departments' international exposure through exports and imports as a share of GDP and the log of total exports. Business density captures the intensity of entrepreneurial activity through the number of firms relative to the population, the net business registration rate (new registrations minus closures), and the share of medium and large firms in each department. ICT infrastructure summarizes the availability of telecommunications and digital connectivity, including broadband penetration, average download speed, household computer ownership, and internet use among individuals aged five or older. These indicators, available annually from 2019 onward, were disaggregated to quarterly frequency using the Denton–Cholette method (Dagum & Cholette, 2006), since with relatively short series the Chow–Lin procedure would have been less precise.

The financial inclusion indicators were aggregated to the departmental level and merged with macroeconomic and structural variables, yielding a balanced panel of 33 departments from 2018Q1 to 2024Q4, with up to 924 observations. Descriptive statistics of the variables are presented in Table 1.

Table 1

Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Financial inclusion indicator, percentage of adults					
Access to at least one financial product	924	75.3	18.4	21.6	143.4
Use of at least one financial product	924	61.9	16.9	16.1	124.4
Access to at least one deposit product	924	73.7	18.3	21.6	141.5
Use of at least one deposit product	924	58.1	16.6	15.2	121.2
Access to savings accounts	924	67.2	15.9	21.4	125.1
Use of savings accounts	924	42.8	12.5	12.9	90.7
Access to at least one mobile money account	462	54	17	10.3	98.9
Use of at least one mobile money account	462	42.4	15.2	6	88.4
Access to CDTs	924	1.2	1	.1	6
Access to credit	924	28.8	10.3	5.7	64.4
Access to credit cards	924	16.3	8.1	1.9	48.2
Access to consumer credit	891	14.7	5.8	2.6	37.2
Access to microcredit	891	7.8	4.1	1.8	22.8
Access to housing credit	891	2	1.4	.2	8.4
Number of products per 10,000 adults					
Savings accounts	792	16337.2	6945.2	5514.6	41802.3
Active savings accounts	792	6490	2663.8	2187.2	14772.4
Consumer credit	792	4093.6	7382.2	16	64683.4
Microcredits	792	148.4	94.6	8.1	668.7
Housing credit	763	8.4	7.9	.1	59.4
Financial coverage: number of offices and correspondents per 10,000 adults					
Physical correspondents	792	98	60.3	13.6	412.2
Active physical correspondents	792	57.1	30.4	8.6	157.3
Offices	792	1.7	.6	.7	3.4
Balances and disbursed amounts in billions of Colombian pesos (COP)					
Balance of savings accounts	792	6651	20446	68.7	145318.7
Balance of active savings accounts	792	6224.8	19077	63.9	135058.1
Amount of consumer credit	792	892.7	2334.3	0	16482.7
Amount of microcredit	792	74.8	75.2	.3	345
Amount of housing credit	763	165.1	441.9	0	4100.4
Percentage					

Annual variation of the GDP deflator	792	7.4	8	-15.5	62.7
Fixed broadband penetration rate (% of population)	744	9	5.6	.1	23.8
% of households with computer, laptop, or tablet	744	26.6	11.3	4.4	47.3
Population over age 5 that uses the internet	744	58.8	16.8	12.7	82.9
(Exports + Imports) / GDP	744	16.5	15.8	0	83.9
% of medium and large enterprises	744	4.1	1.9	0	7.9
Others					
Log (Exports)	744	24.9	7.8	0	31.1
Download speed, weighted by the number of subscribers (Mbs)	744	23.1	27.2	1.1	133.3
Business entities in the department per 100,000 inhabitants	744	5.2	2.8	1	13.1
Net difference in the number of newly established and dissolved business entities per 10,000 inhabitants	744	7.8	3.7	1.4	19.4
Real GDP per capita (Millions of COP)	924	2.5	.5	1.4	3.5
Population	924	1530120.7	1748024	40051.8	7918660
Departmental adult population	792	1121341.9	1347349.6	19238	6238693

Note: The table was created using asdoc, a Stata program (A. Shah, 2018). Monetary amounts are deflated by the December 2018 base CPI and are in billions of COP. Access and usage variables represent the number of adults aged 18 and over with the respective products as a proportion of the total adult population of the department. The number of products is expressed as rates per 10,000 adults.

As shown in the descriptive statistics, deposit products—particularly savings accounts—are the most widely used financial instruments in Colombia, whether measured by the number of accounts or by the number of adults holding them. However, a considerable share of these accounts remains inactive, revealing persistent gaps in

effective usage. Average values also diverge significantly from aggregate totals, underscoring the marked heterogeneity of financial inclusion across regions.

On the credit side, consumer loans register the highest penetration, both in terms of the number of borrowers and the total value disbursed. Yet the large dispersion—evidenced by a standard deviation exceeding the mean—indicates that credit is heavily concentrated in certain departments. A similar pattern emerges for housing credit, which is clustered in major economic centers. By contrast, microcredit exhibits the lowest penetration, consistent with its objective of reaching the smallest economic units through specialized methodologies.

Regarding physical access, banking correspondents constitute the dominant entry point to the financial system across departments, though all regions maintain at least one formal financial institution office per 10,000 adults.

Finally, average departmental inflation between 2018Q1 and 2023Q4 stood at 7.7 percent, exceeding the national mean of 6.5 percent. This divergence highlights the persistence of regional disparities in price dynamics.

Empirical Strategy

To address the research questions, I implemented three econometric strategies that allow examining both directions of the relationship between monetary policy and financial inclusion. The analysis combines a model to estimate monetary policy shocks, the local projections method to trace their effects on financial inclusion, and a panel VAR framework to assess the impact of financial inclusion on inflation.

Estimation of monetary policy shocks

The first step is to estimate monetary policy shocks following the methodology proposed by (Flamini et al., 2023, p. 10). The specification, using quarterly data, is given by:

$$(i_t - i_{t-1}) = \alpha_0 + \alpha_1 g^F_{t+4} + \alpha_2 \pi^F_{t+4} + \alpha_3 g_t + \alpha_4 \pi_t + \sum_{j=1}^{2} \alpha_5 i_{t-j} + \varepsilon_t$$

where $(i_t - i_{t-1})$ denotes the first difference of the DTF rate, used as a proxy for the short-term nominal interest rate. The residuals $\hat{\varepsilon}_t$ obtained from the estimation of the model serve as indicators of monetary policy shocks.

The variable g_t represents the quarterly GDP growth rate, and π_t corresponds to quarterly inflation, calculated as the quarter-end CPI variation. Expectations for both variables are incorporated through forecast series one year ahead: g^F_{t+4} and π^F_{t+4}. Inflation expectations come from the EME, while GDP expectations are drawn from the ETE, which collects firms' perceptions and forecasts of economic performance. The ETE was chosen for GDP expectations given its more extended historical coverage relative to the analysts' survey.

Since both surveys report expected annual variations, I transformed them into consistent quarterly series. For inflation, annual expectations were first converted into implied monthly rates using:

$$\pi_m = \left(1 + \frac{\pi_{12}}{100}\right)^{\frac{1}{12}} - 1$$

and then expressed at the quarterly frequency. For GDP, annual expectations were converted into implied quarterly rates using:

$$g_q = \left(1 + \frac{g_{12}}{100}\right)^{\frac{1}{4}} - 1$$

These transformations ensure that the expectations series are expressed in the same quarterly frequency as the realized macroeconomic data used for shock identification.

Local projections

After identifying monetary policy shocks, their effects on financial inclusion are evaluated using the local projections method. This approach estimates impulse–response functions (IRFs) with OLS. It is often preferred to VARs because it requires less system-wide specification, handles nonlinearities and state dependence more easily, mitigates concerns with serially correlated errors, and performs better in small samples or when the lag structure is uncertain. In addition, the framework extends naturally to panel settings (Brugnolini, 2018; Jordà, 2023; Jorda & Taylor, 2025).

The empirical specification is:

$$y_{k,t+h} - y_{k,t-1} = \sum_{j=1}^{4} \beta_{h,j} \hat{\varepsilon}_{k,t-j} + \sum_{j=1}^{4} \rho_{h,j} y_{k,t-j} + \delta_h X_{k,t} + \alpha_{k,h} + \theta_{t,h} + \epsilon_{k,t,h}$$

Where $h = 1,2, \dots ,8$ denotes the forecast horizon and k indexes departments. The dependent variable y corresponds to a financial inclusion indicator, expressed either as the proportion of adults or as a rate per 10,000 adults. Comparing $y_{k\ ,t+h}$ to its lagged level $y_{k,t-1}$ ensures that the estimated IRFs represent cumulative changes in the indicator. The term $\hat{\varepsilon}_t$ is the estimated monetary policy shock, $\epsilon_{k,t}$ is the idiosyncratic error term and $X_{k,t}$ is a vector of control variables.

In this study, the control variables are the quarterly growth rate of real GDP and the quarterly difference of the share of mining in departmental GDP. The inclusion of the mining share is motivated on both structural and empirical grounds. Structurally, mining is a capital-intensive sector that responds strongly to interest rate movements, making it a natural channel through which monetary policy operates. In addition, mining constitutes the largest component of Colombia's traditional exports, serving as a useful proxy for external demand sensitivity. Empirically, there is evidence that monetary policy in Colombia is transmitted through the exchange rate, with significant effects on exports and mining activity (Quintero Otero & González G., 2012). From a practical perspective, the mining share also provides wider coverage across departments and quarters, and its temporal disaggregation using the Chow–Lin method yields more consistent estimates (Chow & Lin, 1971).

Together, the quarterly growth of real GDP and the quarterly change in the mining share, which are used to render the series stationary, capture heterogeneity in economic conditions and structural characteristics that are central to explaining regional variation in monetary policy transmission.

The external market size indicator compiled by the Private Council of Competitiveness was excluded because of its close association with mining output, much of which is destined for external markets, making it difficult to disentangle their separate effects. Similarly, other potential controls—such as the share of secondary activities (industry and construction) in departmental GDP and the proportion of medium- and large-sized firms—were tested but ultimately discarded, as empirical evidence indicated no significant effect on the transmission of monetary policy (Quintero Otero & González G., 2012).

The parameters $\alpha_{k,h}$ capture unobserved, time-invariant heterogeneity at the department level, while $\theta_{t,h}$ corresponds to a fixed effect for 2020, introduced to account for the extraordinary disruption caused by the COVID-19 pandemic. For statistical inference, standard errors are clustered at the department level to address potential serial correlation and heteroskedasticity within regions, ensuring robust confidence intervals around the Impulse Response Functions (IRFs).

Four lags of the dependent variable and the monetary policy shock are included, corresponding to one year of dynamics. This choice strikes a balance between the need to capture persistence in the data and the loss of degrees of freedom resulting from longer lag

structures. Importantly, evidence indicates that over-specifying the lag length has only a minor effect on the results (Montiel Olea & Plagborg-Møller, 2021).

Regarding the projection horizon, eight quarters are considered, consistent with evidence that in Colombia monetary policy typically transmits to output within 9–12 months and to inflation within 12–18 months (Taboada Arango et al., 2024, p. 36).

Panel var

After estimating the local projections, the analysis also employs a PVAR to examine the reverse direction of causality, namely the effect of financial inclusion on inflation. While local projections are preferred for identifying dynamic responses due to their robustness to model misspecification, PVARs are better suited for evaluating predictive performance, particularly in terms of mean squared error. This is particularly relevant in the current context, where the cross-sectional dimension is moderate (Li et al., 2022), and precision in capturing the interactions between financial inclusion and regional inflation is crucial for assessing the effectiveness of monetary policy.

The PVAR analysis estimates fourteen separate models, each including the quarterly growth rate of GDP deflator as a constant endogenous variable and varying the financial inclusion indicator. For all models, the quarterly growth rates of inflation and the quarterly differences of the inclusion indicators are used to ensure stationarity of the series. This transformation is necessary because, when a series contains a unit root, the moment conditions become uninformative: both first differencing (FD) and forward orthogonal deviations (FOD) would leave only idiosyncratic noise, rendering instruments in levels

irrelevant (Abrigo & Love, 2016, p. 27). By applying growth rates and differences, the variables are rendered stationary, preserving the informational content of the instruments and ensuring the validity of the GMM estimation.

The model can be expressed as:

$$Y_{k,t} = Y_{k,t-1}\boldsymbol{A_1} + Y_{k,t-2}\boldsymbol{A_2} + \cdots + Y_{k,t-m}\boldsymbol{A_m} + \mu_i + e_{k,t}$$

where $Y_{k,t}$ is the vector of endogenous variables for department k at time t,, μ_i captures unobserved department-specific heterogeneity, and $e_{k,t}$ is the idiosyncratic error term. The matrix $\boldsymbol{A}$ contains the coefficients to be estimated.

Estimation is carried out using the difference GMM estimator (Arellano & Bond, 1991; Holtz-Eakin et al., 1988). Following the approach of FOD (Arellano & Bover, 1995), the transformation is applied instead of first differencing. This reduces data loss and improves efficiency and is well-suited for dynamic panel models with short time dimensions (Abrigo & Love, 2016). FOD also addresses several econometric challenges: it mitigates endogeneity concerns stemming from the inclusion of lagged dependent variables by using past realizations as instruments for the differenced equation; it accounts for unobserved heterogeneity across departments, which could otherwise bias the estimates; it reduces state dependence and simultaneity issues, ensuring that short-term dynamics do not confound the estimated long-run effects; and it corrects for potential autocorrelation in the error term, providing consistent and robust estimates of the impact of financial inclusion on inflation.

Instruments are constructed following the approach proposed by (Holtz-Eakin et al., 1988), in which missing values in lagged instruments are replaced with zeros rather than being dropped. This increases the effective estimation sample and improves efficiency. Lag lengths for instruments are determined using moment-selection criteria (MMSC) to help identify the appropriate lag order in the model. MMSC are an adaptation of the Akaike information criterion (AIC) (Akaike, 1998), Bayesian information criterion (BIC) (Schwarz, 1978), and Hannan and Quinn information criterion (HQIC) (Hannan & Quinn, 1979) for panel-data VAR models (Andrews & Lu, 2001). Following this approach, we use the MMSCBIC, as the primary criterion for selecting the optimal lag length (Andrews & Lu, 2001), in conjunction with ensuring that Hansen's J statistic of overidentifying restrictions does not reject the null hypothesis (Hansen, 1982).

After applying FOD, each variable is further adjusted by subtracting its cross-sectional mean, which removes common time fixed effects from all variables before any other transformation (Abrigo & Love, 2016). This is particularly relevant given events such as the 2020 pandemic and other macroeconomic shocks that simultaneously affect multiple regions, including currency depreciations, supply shocks due to strikes, and climatic phenomena.

The stability of the resulting VAR system is verified to ensure reliable dynamic interpretations.

Results

Estimation of monetary policy shocks

In Table 2 and Figure 9, I present the estimation of the monetary policy shock. The residuals appear to adequately capture the various interventions by the central bank in interest rates, including the 2009 financial crisis, the recession caused by the COVID-19 pandemic, and the recent increases driven by food price shocks, the war in Ukraine, and the depreciation of the exchange rate.

The transformed series shows similar patterns to those reported by Quintero Otero & González G. (2012), including the policy relaxation in 2005 and the decline in oil prices between 2014 and 2016. However, their study used a monthly frequency.

The coefficients indicate that, according to the Taylor rule, the most relevant variables are the one-year-ahead forecasts of GDP and inflation. Nonetheless, the results suggest that the Banco de la República responds more strongly to price expectations than to growth expectations, reflecting the priority of its constitutional mandate.

Table 2

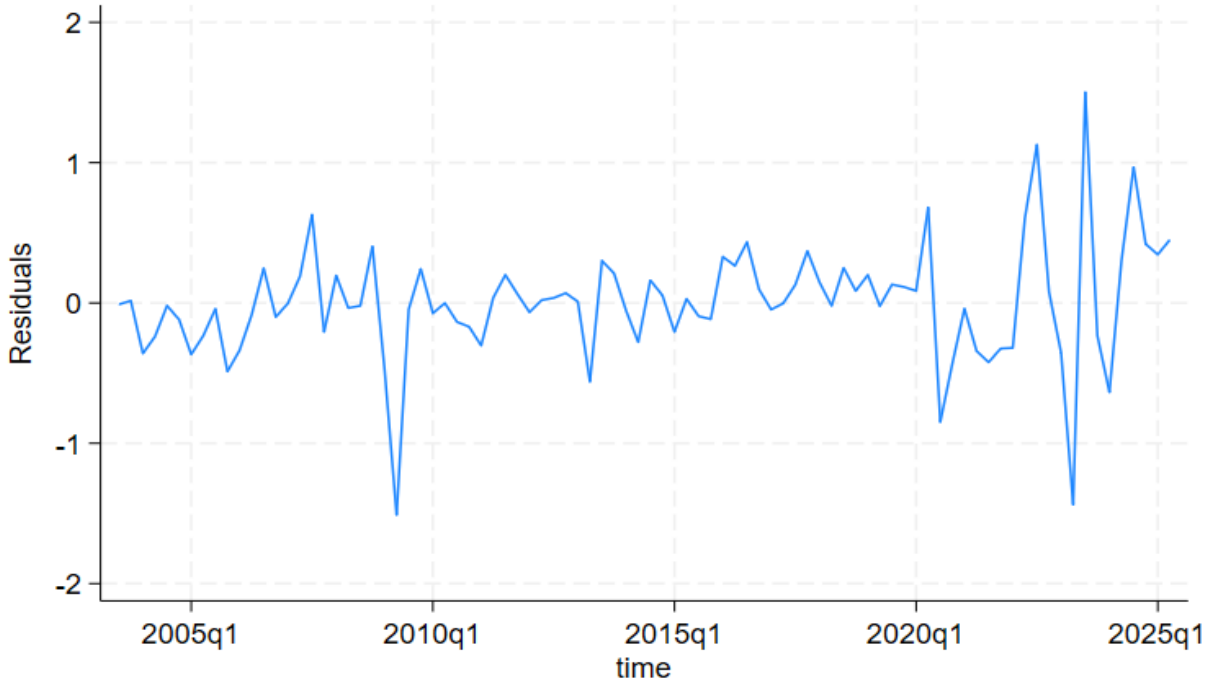
Monetary policy shock estimation

Variables	(1) DTF first difference
Quarterly real GDP growth forecasted one year ahead	0.769***
	(0.254)
Quarterly inflation forecasted one year ahead	3.884***
	(0.864)
Quarterly Variation in Real GDP	7.37e-06
	(5.63e-06)
Quarterly Variation in End-of-Period CPI	0.249***
	(0.0778)
DTF lag1	0.179
	(0.139)
DTF lag2	-0.348**
	(0.135)
Constant	-1.255***
	(0.411)
Observations	88
R-squared	0.723

Note: Robust standard errors in parentheses. *** *p<0.01,* ** *p<0.05,* * *p<0.1*

Figure 9

Monetary policy shock 2003q3-2025q2



Local projections

Results from the local projections method indicate that contractionary monetary policy leads to a short-term increase in access to deposit products among the adult population. A 1 pp increase in the policy rate is associated with a statistically significant rise in financial access within the first two to three months, primarily driven by increased use of savings accounts. As shown in Figure 10, overall financial access increases by approximately 2 pp, access to deposit products by 1.9 pp, and access to savings accounts by 2.1 pp. This pattern is consistent with a substitution effect; whereby higher interest rates encourage consumers to allocate more resources toward saving. In contrast, more profitable instruments such as CDTs exhibit a more muted response, peaking at just 0.2 pp

three quarters after the shock—suggesting both their limited penetration in the Colombian population and the continued predominance of basic savings products in household financial behavior.

However, these initial gains are not sustained. Starting around the third quarter, the indicators begin to decline, reaching their lowest point by the sixth quarter—consistent with the widely documented 18-month lag in the transmission of monetary policy. By the eighth quarter, the overall financial access indicator registers a cumulative decline of 1.5 pp relative to the pre-shock level. This drop is driven mainly by a 3.4 pp reduction in the share of adults holding savings accounts, and to a lesser extent, by a 0.8 pp decline in CDT usage. Together, these effects translate into a 0.8 pp decrease in the deposit access indicator. These dynamics may reflect an income effect among savers. As the returns to saving increase, individuals may choose to save less in absolute terms, reducing the incentive to open or maintain deposit accounts.

Regarding usage, the indicator capturing adults with active financial products begins to decline only from the sixth to the eighth quarter, with a cumulative drop of approximately 5.1 pp. However, this effect is not reflected in the deposit usage indicator, which shows a statistically significant decline only in the first quarter (-0.6 pp). This may be influenced by the behavior of low-value deposits, which were excluded from the impulse response estimation due to a shorter time series but whose presence becomes more prominent between 2020 and 2021. The main driver of the observed decline appears to be active savings accounts, which experience significant reductions starting in the fifth quarter, reaching a cumulative drop of nearly 9 pp by the eighth quarter. This reverses the

modest increases observed in the second (2.4 pp) and third (2.0 pp) quarters in the usage indicator.

On the credit side, the dynamics are consistently negative. A 1 pp monetary policy shock has a broadly adverse effect across the general credit access indicator and all credit modalities, except for mortgage loans. This contributes to the downward trend in the overall financial inclusion indicator throughout the estimated horizon. The most affected categories are credit cards (-5.1 pp) and microcredit (-3.2 pp), followed by consumer loans, which decline by approximately 2.9 pp. These effects result in a cumulative drop of 8.1 pp in the general credit access indicator.

In contrast, mortgage credit initially falls until the third quarter (-0.2 pp), followed by a sustained increase through the eighth quarter (+0.2 pp). This rebound may be explained by the delayed transmission of monetary policy to mortgage interest rates, which evidence suggests occurs with a lag of approximately 3 to 5 months and peaks around the sixth month. Moreover, this impact tends to be partial and short-lived, potentially allowing for a subsequent recovery in mortgage credit (Vargas et al., 2010).

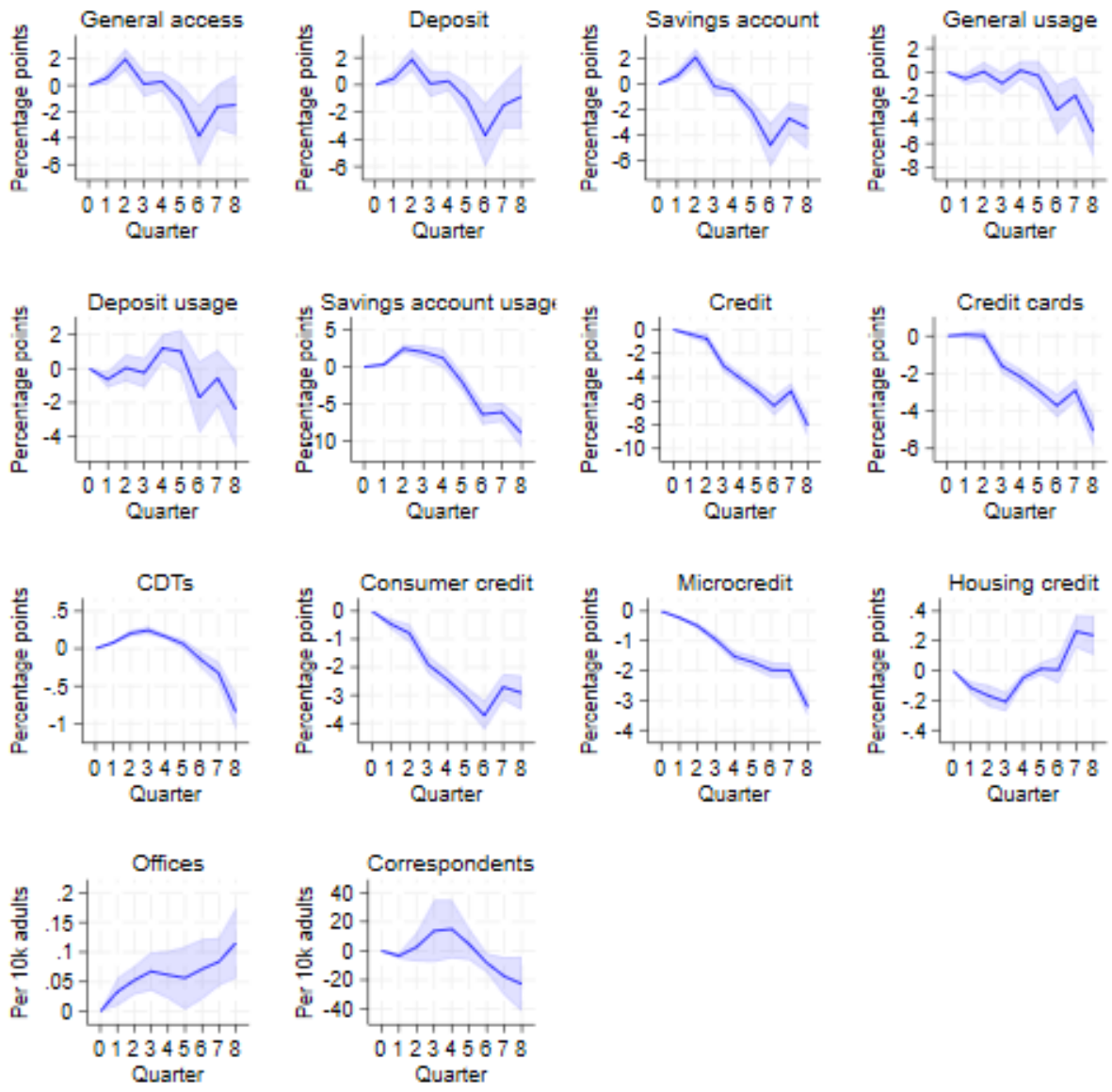
Finally, in terms of outreach, the increase in interest rates has had a positive effect on the number of bank branches, with an estimated increase of 0.12 branches per 10,000 adults. Given the downward trend observed in the institutional background section, this represents a significant shift and aligns with findings reported by Ozili (2023). This contrasts with Kebede et al., (2024), which posits that such policy shifts exert negligible influence on outreach dynamics.

Conversely, the number of physical banking agents declines sharply—by nearly 23 agents per 10,000 adults—after an initial increase that is not statistically different from zero in the early quarters following the shock. This may be explained by the drop in transaction volumes during later quarters, driven by the economic slowdown. Lower transaction volumes reduce agent revenues, negatively affecting their profitability—an issue historically difficult to overcome in Colombia (CGAP & Marulanda consultores, 2013).

These findings are broadly consistent with the short-term dynamics identified by Yin (2019), who documents that higher interest rates can exert a positive influence on financial inclusion. Similarly, Anarfo et al. (2019) argue that expansionary monetary policy can foster financial inclusion.

Figure 10

Response of financial inclusion indicators to a 1 pp monetary policy shock



Panel var[7]

This section presents the results from the PVAR models analyzing the relationship between inflation and fourteen financial inclusion indicators. A detailed account of the unit root tests, lag selection, instrument choice, and regression specifications is provided in the Technical Appendix. For illustrative purposes, this section focuses on the impulse–response functions, highlighting the dynamic effects of inflationary shocks on financial inclusion. Figure 11 displays the estimated responses of each indicator to an inflation shock.

Among the fourteen indicators, only four show statistically significant responses: access to savings accounts, usage of savings accounts, the percentage of adults with a consumption loan, and the number of bank branches per 10,000 adults. The most

[7] All variables ending in _trim represent quarterly differences (i.e., first differences of the original series). infl_ denotes quarterly inflation, measured as the percentage change in the departmental GDP deflator. The remaining variables reflect changes in financial access and usage: dep_trim refers to general access to financial products; ahorro_trim to access to savings accounts; cdt_trim to access to CDTs; credito_trim to access to credit products; tdc_trim to access to credit cards; consumo_trim to access to consumer loans; micro_trim to access to microcredit; viv_trim to access to housing credit; uso_trim to general usage of financial products; depu_trim to usage of deposit products; ahorru_trim to usage of savings accounts. oficinas_trim and corresp_trim indicate the quarterly change in the number of bank branches and banking correspondents per 10,000 adults in each municipality.

consistent effects are observed in the savings and credit dimensions. Inflationary shocks tend to increase both the number of savings accounts and the demand for consumer loans, although the impact on account usage remains relatively small. This pattern suggests that households, facing higher living costs, increase their engagement with the formal financial system—using deposit accounts to preserve liquidity and consumer credit to smooth consumption.

In the Colombian context, this behavior is supported by the structure of the consumer credit market, where payroll-deducted loans (*libranzas*) are the dominant form, accounting for nearly 32 percent of disbursements in 2024. These products allow households to use their salaries as collateral to finance expenses such as taxes, education, travel, or vehicle purchases. In this sense, savings accounts and consumer credit serve as complementary mechanisms for households to adapt to inflationary pressures.

On the other hand, inflation shocks are associated with a decline in the number of bank branches per 10,000 adults, suggesting that financial institutions may respond to macroeconomic uncertainty by consolidating their physical presence rather than expanding it. No significant responses were observed for the other financial inclusion indicators, indicating that the transmission of inflationary shocks is focused on specific dimensions of access, usage, and outreach.

These findings stand in contrast to Elsaid (2025), who reports no link from inflation to financial inclusion in oil-exporting economies. They also differ from Arshad et al. (2021),

who document the adverse effects of inflation on inclusion in less developed countries such as Mexico and Argentina, as well as from Jungo et al. (2022), who identify similar adverse effects for Latin America and the Caribbean. Taken together, our results suggest that in the Colombian case, inflationary shocks may activate some mechanisms of engagement with the financial system rather than eroding them, highlighting the importance of country-specific institutional contexts.

Turning to the opposite relationship, the results in Figure 12 show that financial inclusion also has measurable effects on inflation. At the overall level, indicators of access and usage show a positive impact on inflation in the first few quarters after a shock. This effect seems to be mainly driven by deposit products. In the case of CDTs, the relationship is clear and statistically significant, whereas for savings accounts, the effects are weaker and often not significant. On the usage side, the effects are even more limited, especially in savings accounts, where increases tend to fade quickly. These results suggest that greater access to and mobilization of deposits may signal better economic conditions—for example, when people join the labor market, they often open deposit accounts, which can lead to higher overall demand and a slight upward pressure on prices.

From the credit side, the dynamics are different. Credit indicators tend to counteract the inflationary effects of deposits, as their impact on inflation is primarily negative. This is mainly due to decreases in credit card and mortgage lending, while microcredit has a small positive effect, and consumer credit remains insignificant. The negative link between credit and inflation can be seen as a sign that borrowing limits household spending capacity. For housing loans, higher debt reduces disposable income

and therefore lowers consumption. With credit cards, the adverse effect may also relate to liquidity constraints: households often use credit cards when facing short-term financial difficulties, which suggests that higher usage reflects financial stress rather than increased buying power. The small positive effect of microcredit on inflation aligns with the idea that these funds are primarily used for operating costs and basic expenses. According to DANE (2025), 85% of microbusinesses that received credit used it for working capital and daily expenses. This dependence on debt to maintain cash flow, rather than to grow production, can temporarily boost overall demand and lead to mild upward price pressures.

In terms of outreach, an increase in the number of bank branches is linked to higher inflation, consistent with the idea that expanding physical financial infrastructure can improve intermediation and boost local demand. Conversely, no significant effects were observed for banking correspondents, probably because they offer fewer credit products compared to traditional branches.

Overall, these findings highlight that the relationship between financial inclusion and inflation varies across different areas: access to deposits tends to increase inflationary pressures. At the same time, credit generally has a dampening effect—except for microcredit—and outreach influences local economic activity through physical expansion.

Table 3 presents the results of the Granger Causality Tests between inflation and various financial inclusion indicators. The findings indicate an asymmetric relationship. On one side, several inclusion indicators are shown to Granger-cause inflation, including overall access, access to deposit products, access to CDTs, credit (especially housing

loans and credit cards), deposit usage, and the number of bank branches. On the other side, inflation Granger-causes changes in access to savings accounts, savings account usage, access to consumer credit, and branch penetration. Overall, these results suggest that financial inclusion has a broader and more consistent impact on inflation than the other way around.

Meanwhile, some indicators show no significant causal relationship in either direction, such as access to microcredit, overall usage, and the presence of banking correspondents. The lack of causality in these cases may reflect structural limitations, low penetration rates, or the relatively passive role of specific inclusion channels in influencing macroeconomic dynamics.

Overall, these findings closely mirror previous evidence highlighting the inflationary potential of financial inclusion. Oanh et al. (2023) demonstrate that in financially developed economies—including Colombia, which is classified within this group—greater financial inclusion is positively linked to inflation. Likewise, Jungo et al. (2022) reports that financial inclusion drives inflationary pressures in Latin America and the Caribbean, while Garbobiya et al. (2024) shows similar results for the ECOWAS sub-region. Elsaid (2025) further finds that in oil-exporting economies of the MENA region, financial inclusion tends to boost inflation, a finding particularly relevant given Colombia's role as a commodity-exporting, oil-producing country. Collectively, this body of evidence emphasizes that the inflationary effects of financial inclusion are not limited to a specific region but are observed across different economic contexts, with Colombia fitting well within this broader pattern.

Figure 11

Impulse Responses of Financial Inclusion Indicator to Inflation Shocks

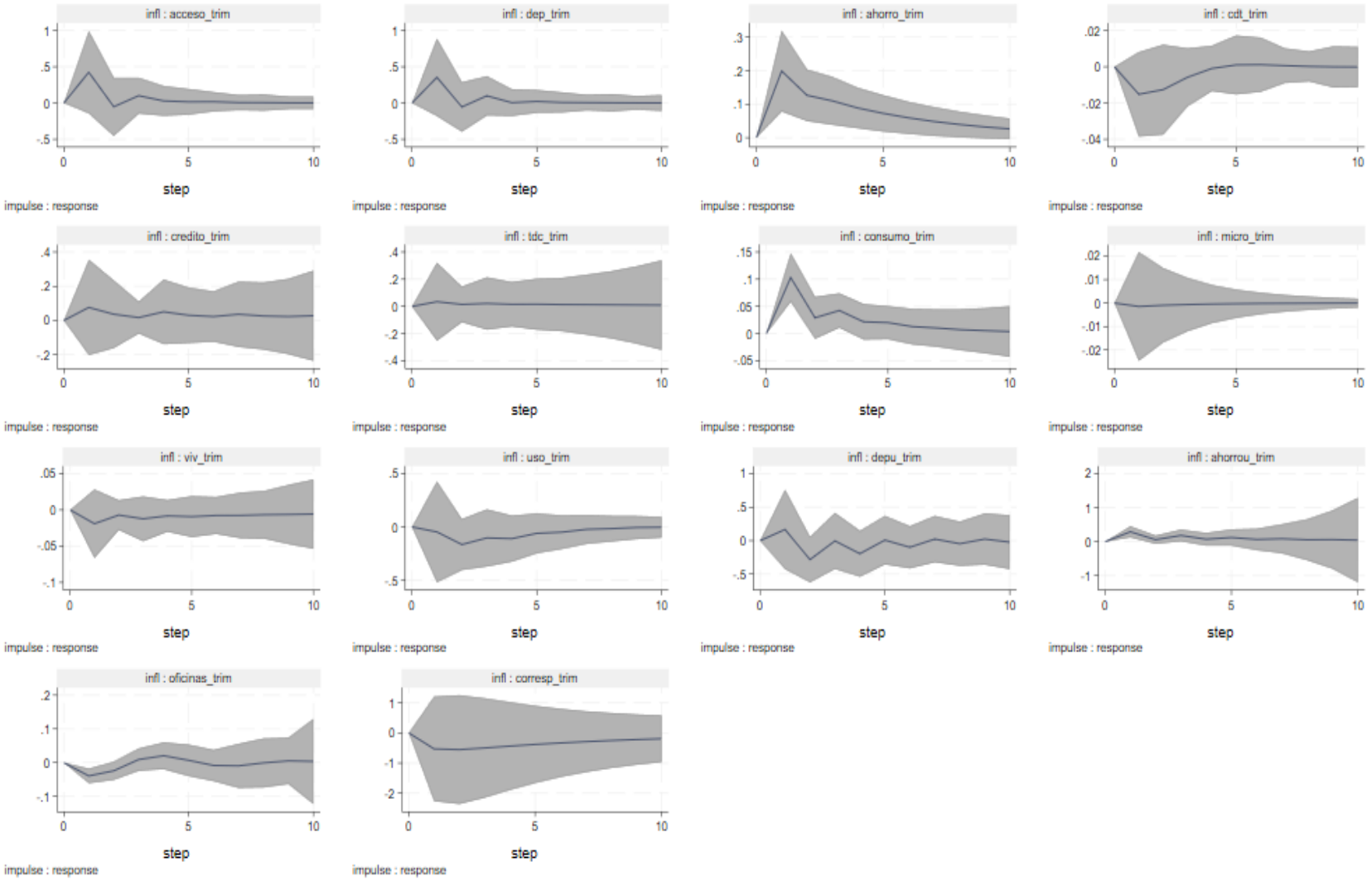


Figure 12

Impulse Responses of Inflation to Shocks in Financial Inclusion Indica

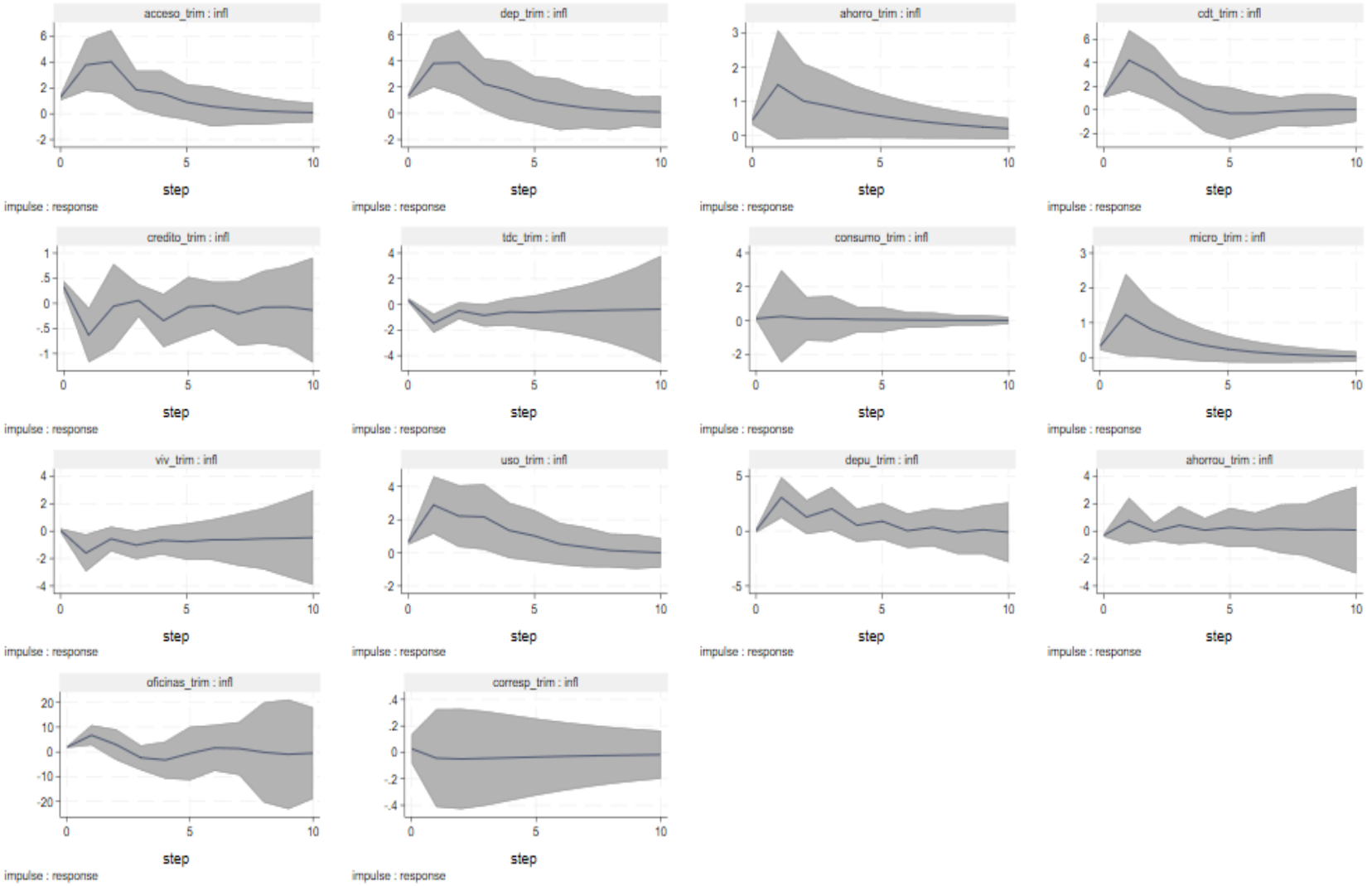


Table 3

Panel VAR Granger Causality Results: Inflation and Financial Access Indicators

Model	Dependent Variable (Y)	Excluded Variable (X)	Chi^2	df	p-value	Granger Causality?
1	General access	Inflation	2.30	2.00	0.32	No
	Inflation	**General access**	**7.93**	**2.00**	**0.02**	**Yes**
2	Access to Deposit Products	Inflation	1.66	2.00	0.44	No
	Inflation	**Access to Deposit Products**	**7.39**	**2.00**	**0.03**	**Yes**
3	**Access to Savings Accounts**	**Inflation**	**6.84**	**1.00**	**0.01**	**Yes**
	Inflation	Access to Savings Accounts	1.52	1.00	0.22	No
4	Access to CDTs	Inflation	1.27	1.00	0.26	No
	Inflation	**Access to CDTs**	**4.27**	**1.00**	**0.04**	**Yes**
5	Access to Credit	Inflation	0.30	2.00	0.86	No
	Inflation	**Access to Credit**	**10.84**	**2.00**	**0.00**	**Yes**
6	Access to Housing Credit	Inflation	0.40	1.00	0.53	No
	Inflation	**Access to Housing Credit**	**3.90**	**1.00**	**0.05**	**Yes**
7	Access to Microcredit	Inflation	0.01	1.00	0.92	No
	Inflation	Access to Microcredit	1.83	1.00	0.18	No
8	**Access to Consumer Credit**	**Inflation**	**12.06**	**1.00**	**0.00**	**Yes**
	Inflation	Access to Consumer Credit	0.01	1.00	0.92	No
9	Access to Credit Cards	Inflation	0.05	1.00	0.82	No
	Inflation	**Access to Credit Cards**	**15.47**	**1.00**	**0.00**	**Yes**
10	General use	Inflation	1.54	2.00	0.46	No
	Inflation	General use	4.42	2.00	0.11	No
11	Deposit Usage	Inflation	2.40	2.00	0.30	No
	Inflation	**Deposit Usage**	**8.12**	**2.00**	**0.02**	**Yes**
12	**Savings Account Usage**	**Inflation**	**7.11**	**1.00**	**0.01**	**Yes**
	Inflation	Savings Account Usage	0.85	1.00	0.36	No
13	**Bank Branches**	**Inflation**	**9.73**	**1.00**	**0.00**	**Yes**
	Inflation	**Bank Branches**	**6.95**	**1.00**	**0.01**	**Yes**
14	Banking Correspondents	Inflation	0.23	1.00	0.63	No
	Inflation	Banking Correspondents	0.11	1.00	0.74	No

Conclusions

This study aimed to fill a key gap in literature: the lack of country-specific evidence on the link between monetary policy and financial inclusion, especially in contexts where subnational differences are important. Most previous studies relied on cross-country data with annual observations, which made it hard to capture short-term dynamics and overlooked regional disparities affecting monetary transmission. By introducing a new quarterly dataset at the subnational level and combining local projections with a panel VAR approach, this paper provides new evidence for Colombia, a financially developing yet institutionally complex economy with ongoing inclusion gaps between urban and rural areas.

The findings reveal a partly bidirectional relationship. On one hand, contractionary monetary policy shocks temporarily increase access to deposit products—mainly savings, due to a substitution effect. Nevertheless, these gains faded after the third quarter, leading to declines in account ownership and usage, especially of active savings accounts. On the credit side, the effects of monetary tightening are generally adverse across all categories except mortgages, which recover slightly after an initial drop. At the same time, branch penetration rises and banking correspondents decline. Overall, these results suggest that monetary policy can temporarily boost inclusion through deposits, but its long-term effects usually reduce financial participation, highlighting the vulnerability of inclusion to contractionary cycles.

On the other hand, the panel VAR results show that inflation shocks also affect financial inclusion, though in a more limited way. Higher inflation is associated with increases in savings accounts and consumer credit—likely as households seek liquidity buffers and smooth consumption under rising costs—but it simultaneously reduces branch penetration. Most other indicators remain unaffected, indicating that inflationary pressures activate only a narrow subset of inclusion channels.

Conversely, financial inclusion has measurable effects on inflation. Access to and mobilization of deposits generally push prices upward, while credit—especially mortgages and credit cards—tends to have a dampening effect. Microcredit is an exception, as it slightly promotes inflation. Expanding bank branch outreach also increases inflation, reflecting local demand effects from improved financial infrastructure. This asymmetric pattern indicates that although inflation shocks influence a narrow set of inclusion variables, financial inclusion more broadly and consistently impacts inflationary trends.

These findings support earlier evidence that financial inclusion can drive inflationary pressures in financially advanced or commodity-exporting economies (Elsaid, 2025; Garbobiya et al., 2024; Jungo et al., 2022; Oanh et al., 2023). They also emphasize the importance of local institutional and structural factors: in Colombia, the short-term benefits of monetary policy on deposit access, coupled with its negative impact on credit, suggest that inclusion gaps can limit the effectiveness of monetary transmission.

From a policy standpoint, the results imply that monetary policy and financial inclusion strategies should not be viewed separately. For the central bank, understanding

that contractionary shocks might temporarily expand access but ultimately undermine usage can help anticipate distributional effects and transmission asymmetries. For policymakers focused on inclusion, the findings highlight the need to address negative spillovers of monetary tightening—especially in credit access—by implementing complementary programs that shield vulnerable households and microenterprises from exclusion.

Overall, this study offers new country-specific evidence on the interaction between monetary policy and financial inclusion, showing that the relationship is neither one-way nor uniform across different aspects. Instead, it is shaped by structural features, institutional contexts, and the composition of financial products. By providing high-frequency, subnational data, this analysis advances the debate on how monetary policy can align with inclusion goals in developing economies, offering a framework for better coordination between stabilization and distributional objectives.

Technical Appendix

This appendix provides supporting econometric tests, model diagnostics, and exact outputs that reinforce the robustness of the empirical analysis.

Local projections

This section presents the exact numerical values of the impulse response functions (IRFs) estimated using the local projections method. These values allow for precise interpretation of the dynamic effects of shocks over time and are reported in Table 4 for complete transparency and reproducibility.

Table 4

Numerical Values of Impulse Response Functions Estimated via Local Projections

Period	General access (%)				Deposits (%)			
	IRF	Std.Err.	IRF LOW	IRF UP	IRF	Std.Err.	IRF LOW	IRF UP
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.55	0.31	0.03	1.08	0.46	0.31	-0.07	0.98
2	1.97	0.50	1.13	2.82	1.85	0.50	1.01	2.69
3	0.10	0.58	-0.88	1.08	0.08	0.58	-0.90	1.05
4	0.29	0.44	-0.46	1.03	0.28	0.44	-0.47	1.02
5	-1.16	0.76	-2.45	0.14	-1.09	0.76	-2.38	0.20
6	-3.84	1.40	-6.21	-1.47	-3.70	1.39	-6.05	-1.34
7	-1.62	1.00	-3.31	0.07	-1.50	1.00	-3.20	0.20
8	-1.49	1.36	-3.80	0.82	-0.84	1.39	-3.20	1.52
Period	**Savings account (%)**				**CDTs (%)**			
	IRF	Std.Err.	IRF LOW	IRF UP	IRF	Std.Err.	IRF LOW	IRF UP
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.63	0.26	0.19	1.07	0.08	0.01	0.05	0.10
2	2.09	0.42	1.38	2.80	0.20	0.03	0.16	0.25
3	-0.18	0.44	-0.94	0.57	0.24	0.03	0.19	0.30
4	-0.49	0.28	-0.96	-0.02	0.16	0.02	0.12	0.20
5	-2.13	0.51	-2.98	-1.27	0.06	0.04	0.00	0.13
6	-4.75	1.02	-6.48	-3.02	-0.15	0.06	-0.25	-0.04
7	-2.68	0.76	-3.96	-1.40	-0.33	0.09	-0.48	-0.18

8	-3.41	1.02	-5.14	-1.68	-0.85	0.14	-1.09	-0.61

Period	Credit (%)				Credit cards (%)			
	IRF	Std.Err.	IRF LOW	IRF UP	IRF	Std.Err.	IRF LOW	IRF UP
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	-0.37	0.16	-0.64	-0.10	0.07	0.11	-0.12	0.25
2	-0.76	0.27	-1.22	-0.30	0.01	0.19	-0.31	0.33
3	-3.05	0.32	-3.60	-2.50	-1.60	0.25	-2.02	-1.18
4	-4.10	0.28	-4.58	-3.63	-2.18	0.24	-2.59	-1.77
5	-5.15	0.32	-5.70	-4.61	-2.90	0.28	-3.37	-2.43
6	-6.40	0.49	-7.23	-5.57	-3.71	0.37	-4.34	-3.08
7	-5.16	0.41	-5.86	-4.47	-2.90	0.35	-3.49	-2.31
8	-8.07	0.60	-9.09	-7.05	-5.09	0.51	-5.95	-4.22

Period	Consumption (%)				Microcredit (%)			
	IRF	Std.Err.	IRF LOW	IRF UP	IRF	Std.Err.	IRF LOW	IRF UP
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	-0.46	0.11	-0.64	-0.27	-0.22	0.03	-0.27	-0.17
2	-0.79	0.19	-1.11	-0.46	-0.50	0.06	-0.60	-0.40
3	-1.91	0.19	-2.24	-1.58	-0.97	0.09	-1.13	-0.81
4	-2.43	0.19	-2.75	-2.11	-1.53	0.11	-1.72	-1.33
5	-3.04	0.21	-3.39	-2.68	-1.71	0.13	-1.93	-1.50
6	-3.73	0.31	-4.25	-3.20	-1.98	0.16	-2.24	-1.71
7	-2.71	0.28	-3.19	-2.23	-1.99	0.15	-2.24	-1.74
8	-2.92	0.37	-3.54	-2.30	-3.23	0.20	-3.56	-2.90

Period	Housing credit (%)				Physical correspondents (Per 10.000 adults)			
	IRF	Std.Err.	IRF LOW	IRF UP	IRF	Std.Err.	IRF LOW	IRF UP
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	-0.11	0.02	-0.16	-0.07	-3.46	1.30	-5.66	-1.26
2	-0.17	0.04	-0.24	-0.10	2.59	5.87	-7.35	12.52
3	-0.21	0.04	-0.28	-0.14	13.70	12.63	-7.70	35.09
4	-0.05	0.02	-0.08	-0.01	14.94	11.89	-5.20	35.07
5	0.01	0.03	-0.03	0.06	4.50	6.47	-6.45	15.46
6	0.01	0.05	-0.09	0.10	-8.22	3.87	-14.78	-1.66
7	0.26	0.07	0.15	0.37	-17.53	7.83	-30.79	-4.27
8	0.24	0.08	0.10	0.37	-22.80	11.18	-41.74	-3.85

Period	Offices (Per 10.000 adults)				General usage (%)			
	IRF	Std.Err.	IRF LOW	IRF UP	IRF	Std.Err.	IRF LOW	IRF UP
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.03	0.01	0.01	0.06	-0.56	0.29	-1.05	-0.07
2	0.05	0.01	0.03	0.08	0.03	0.48	-0.79	0.85
3	0.07	0.02	0.04	0.10	-0.95	0.55	-1.88	-0.02
4	0.06	0.02	0.02	0.10	0.14	0.46	-0.64	0.92

5	0.06	0.03	0.00	0.11	-0.32	0.73	-1.55	0.91
6	0.07	0.03	0.02	0.12	-3.18	1.26	-5.32	-1.04
7	0.08	0.02	0.04	0.12	-1.97	0.95	-3.57	-0.36
8	0.12	0.04	0.06	0.18	-5.08	1.29	-7.26	-2.90

Period	Deposit usage (%)				Savings account usage (%)			
	IRF	Std.Err.	IRF LOW	IRF UP	IRF	Std.Err.	IRF LOW	IRF UP
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	-0.64	0.28	-1.12	-0.16	0.30	0.17	0.02	0.59
2	0.03	0.47	-0.77	0.83	2.4	0.35	1.84	3.03
3	-0.25	0.52	-1.13	0.63	2.0	0.53	1.09	2.90
4	1.19	0.48	0.37	2.00	1.20	0.74	-0.05	2.45
5	1.00	0.75	-0.28	2.27	-2.15	0.66	-3.26	-1.03
6	-1.70	1.26	-3.83	0.43	-6.37	0.83	-7.77	-4.96
7	-0.56	0.98	-2.23	1.10	-6.09	0.77	-7.39	-4.79
8	-2.41	1.35	-4.69	-0.12	-8.97	1.19	-10.98	-6.97

Panel var

To validate the panel VAR specification, we perform a series of diagnostic and specification tests. First, we assess **cross-sectional dependence** using Pesaran's test (Pesaran, 2021), which reports both the test statistic and the average absolute value of the off-diagonal elements of the residual correlation matrix. The test is applied to the residuals obtained from fixed-effects regressions where each variable is regressed on its own lag. As shown in Table 5, all Pesaran tests—both for variables in levels and in first differences—indicate the presence of cross-sectional dependence. Moreover, the average absolute correlation of the residuals exceeds 0.6 in all cases, further supporting this conclusion. This finding is crucial, as it determines whether first-generation unit root tests are appropriate or whether second-generation tests, such as Pesaran's CADF (CIPS), should be used instead.

Table 5

Pesaran's Test of Cross-Sectional Independence

Variable	N	Pesaran's Z-statistic	p-value	Average absolute value of the off-diagonal elements
Access to financial products	891	60.937	0.0000	0.658
Access to deposit products	891	60.094	0.0000	0.661
Access to savings accounts	891	60.947	0.0000	0.652
Access to CDTs	891	60.508	0.0000	0.524
Access to credit	891	68.066	0.0000	0.655
Access to credit cards	891	68.813	0.0000	0.655
Access to consumer credit	825	59.124	0.0000	0.668
Access to microcredit	825	86.916	0.0000	0.762
Access to housing credit	825	45.936	0.0000	0.597
Use of financial products	891	67.944	0.0000	0.687
Use of deposit products	891	65.699	0.0000	0.691
Use of savings accounts	891	51.644	0.0000	0.565
Banking agents per 10,000 adults	759	55.629	0.0000	0.506
Bank branches per 10,000 adults	759	47.184	0.0000	0.540
GDP Deflator	891	108.202	0.0000	0.906
Quarterly change in access	858	56.669	0.0000	0.704
Quarterly change in deposit products	858	56.829	0.0000	0.701
Quarterly change in savings accounts	858	55.683	0.0000	0.697
Quarterly change in CDTs	858	64.632	0.0000	0.563
Quarterly change in credit	858	70.647	0.0000	0.704
Quarterly change in credit cards	858	69.169	0.0000	0.692
Quarterly change in consumer credit	792	61.787	0.0000	0.720
Quarterly change in microcredit	792	87.551	0.0000	0.782
Quarterly change in housing credit	792	55.188	0.0000	0.673
Quarterly change in use of financial products	858	64.488	0.0000	0.720
Quarterly change in use of deposit products	858	63.265	0.0000	0.709
Quarterly change in use of savings accounts	858	55.752	0.0000	0.621

Quarterly change in banking agents	726	44.824	0.0000	0.418
Quarterly change in bank branches	726	42.911	0.0000	0.542
Quarterly inflation (Deflator variation)	858	101.140	0.0000	0.863

Given the presence of cross-sectional dependence, we evaluate the **stationarity** of the variables using Pesaran's simple panel unit root test in the presence of cross-sectional dependence (Pesaran, 2007). As shown in Table 6, most variables in levels exhibit unit roots, indicating non-stationarity. Although some results are borderline or mixed, the overall pattern suggests caution. Moreover, from an economic standpoint, many of these indicators are expected to follow persistent trends over time, reinforcing the statistical evidence of non-stationarity. Therefore, to ensure robustness, we proceed using the first differences of the series—particularly the quarterly changes in financial inclusion indicators and the percentage change in the GDP deflator—which consistently appear stationary under the test.

Table 6

Panel unit root test in the presence of cross-section dependence

Variable	N	Pesaran's Z-statistic	p-value	Average absolute value of the off-diagonal elements
Access to financial products	891	60,937	0.0000	0.658
Access to deposit products	891	60,094	0.0000	0.661
Access to savings accounts	891	60,947	0.0000	0.652
Access to term deposit certificates (CDTs)	891	60,508	0.0000	0.524
Access to credit	891	68,066	0.0000	0.655
Access to credit cards	891	68,813	0.0000	0.655

Access to consumer credit	825	59,124	0.0000	0.668
Access to microcredit	825	86,916	0.0000	0.762
Access to housing credit	825	45,936	0.0000	0.597
Use of financial products	891	67,944	0.0000	0.687
Use of deposit products	891	65,699	0.0000	0.691
Use of savings accounts	891	51,644	0.0000	0.565
Banking agents per 10,000 adults	759	55,629	0.0000	0.506
Bank branches per 10,000 adults	759	47,184	0.0000	0.540
GDP Deflator	891	108,202	0.0000	0.906
Quarterly change in access	858	56,669	0.0000	0.704
Quarterly change in deposit products	858	56,829	0.0000	0.701
Quarterly change in savings accounts	858	55,683	0.0000	0.697
Quarterly change in term deposit certificates (CDTs)	858	64,632	0.0000	0.563
Quarterly change in credit	858	70,647	0.0000	0.704
Quarterly change in credit cards	858	69,169	0.0000	0.692
Quarterly change in consumer credit	792	61,787	0.0000	0.720
Quarterly change in microcredit	792	87,551	0.0000	0.782
Quarterly change in housing credit	792	55,188	0.0000	0.673
Quarterly change in use of financial products	858	64,488	0.0000	0.720
Quarterly change in use of deposit products	858	63,265	0.0000	0.709
Quarterly change in use of savings accounts	858	55,752	0.0000	0.621
Quarterly change in banking agents	726	44,824	0.0000	0.418
Quarterly change in bank branches	726	42,911	0.0000	0.542
Quarterly inflation (Deflator variation)	858	101,140	0.0000	0.863

The results of the **instrument selection process** for the lagged dependent variable in each of the estimated models are presented next. The iterative procedure evaluated multiple lag windows and led to the selection of structures associated with some of the lowest Hansen J-statistics, for which the null hypothesis of valid overidentifying restrictions is not rejected. Model selection criteria—MBIC, MAIC, and MQIC—were used to identify parsimonious specifications that balance fit and complexity. The panel VAR models also satisfy the stability condition. As shown in Table 7 to Table 20, I report on the instrument

selection outcomes, Hansen test results, and information criteria for each specification. Additionally, the roots of the companion matrix are plotted within the unit circle, confirming the dynamic stability of the system and providing a reliable foundation for the subsequent analysis (Figure 13).

Table 7

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Financial Access and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest 5 MBIC Values	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.91	53.82	0.00	-25.23	29.82	8.58			
	2	0.92	28.97	0.00	-23.73	12.97	-1.19			
	3	0.92	22.39	0.00	-3.96	14.39	7.31			
	4	0.92	.	.	.	.	.			
4–8	1	0.42	33.50	0.01	-71.91	1.50	-26.83	Yes	No	
	2	0.58	12.95	0.37	-66.11	-11.05	-32.30	Yes	Yes	No
	3	0.29	7.29	0.51	-45.41	-8.71	-22.87			
	4	0.02	3.24	0.52	-23.11	-4.76	-11.84			
8–12	1	0.81	26.94	0.04	-78.46	-5.06	-33.38	Yes	No	
	2	**0.48**	**15.97**	**0.19**	**-63.08**	**-8.03**	**-29.27**	**Yes**	**Yes**	**Yes**
	3	-0.02	9.79	0.28	-42.91	-6.21	-20.37			
	4	-0.28	5.93	0.20	-20.42	-2.07	-9.15			
12–16	1	0.87	28.93	0.02	-76.48	-3.07	-31.40	Yes	No	
	2	0.77	16.60	0.17	-62.45	-7.40	-28.64			
	3	0.33	9.39	0.31	-43.31	-6.61	-20.77			
	4	-4.87	0.94	0.92	-25.41	-7.06	-14.14			
16–20	1	0.88	46.57	0.00	-58.83	14.57	-13.76			
	2	0.81	30.48	0.00	-48.57	6.48	-14.77			
	3	0.32	14.25	0.08	-38.45	-1.75	-15.91			
	4	0.74	0.87	0.93	-25.48	-7.13	-14.21			

Table 8

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Access to Deposit Products and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest 5 MBIC Values	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.91	53.29	0.00	-25.76	29.29	8.05			
	2	0.92	28.50	0.00	-24.20	12.50	-1.67			
	3	0.92	22.12	0.00	-4.23	14.12	7.04			
	4	0.92	.	.	.	.	.			
4–8	1	0.40	32.62	0.01	-72.78	0.62	-27.71	Yes	No	
	2	0.57	12.80	0.38	-66.25	-11.20	-32.44	Yes	Yes	No
	3	0.25	6.95	0.54	-45.75	-9.05	-23.21			
	4	0.00	2.95	0.57	-23.40	-5.05	-12.13			
8–12	1	0.78	25.41	0.06	-79.99	-6.59	-34.91	Yes	No	
	2	**0.54**	**15.41**	**0.22**	**-63.64**	**-8.59**	**-29.83**	**Yes**	**Yes**	**Yes**
	3	0.08	9.63	0.29	-43.07	-6.37	-20.53			
	4	-0.19	6.06	0.19	-20.29	-1.94	-9.02			
12–16	1	0.87	29.17	0.02	-76.23	-2.83	-31.15	Yes	No	
	2	0.76	16.53	0.17	-62.52	-7.47	-28.71			
	3	0.32	9.45	0.31	-43.25	-6.55	-20.71			
	4	-5.17	0.90	0.92	-25.45	-7.10	-14.18			
16–20	1	0.88	47.48	0.00	-57.92	15.48	-12.84			
	2	0.81	30.59	0.00	-48.46	6.59	-14.65			
	3	0.36	14.80	0.06	-37.90	-1.20	-15.37			
	4	0.74	0.95	0.92	-25.40	-7.05	-14.13			

Table 9

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Access to Savings Accounts and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest MBIC	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.91	55.21	0.00	-23.84	31.21	9.97			
	2	0.92	28.43	0.00	-24.28	12.43	-1.74			
	3	0.93	20.15	0.00	-6.20	12.15	5.07			
	4	0.92	.	.	.	.	.			
4–8	1	0.54	33.21	0.01	-72.19	1.21	-27.11			
	2	0.51	10.02	0.61	-69.03	-13.98	-35.22			
	3	0.30	6.61	0.58	-46.09	-9.39	-23.55			
	4	0.22	2.92	0.57	-23.43	-5.08	-12.17			
8–12	**1**	**0.83**	**23.34**	**0.105**	**-82.06**	**-8.66**	**-36.99**	**Yes**	**Yes**	**Yes**
	2	0.61	10.59	0.56	-68.46	-13.41	-34.65			
	3	-0.52	3.55	0.90	-49.15	-12.45	-26.61			
	4	-0.46	2.60	0.63	-23.75	-5.40	-12.48			
12–16	1	0.86	27.75	0.03	-77.65	-4.25	-32.57			
	2	0.81	17.85	0.12	-61.20	-6.15	-27.39			
	3	0.24	11.16	0.19	-41.54	-4.84	-19.00			
	4	-6.72	1.19	0.88	-25.16	-6.81	-13.89			
16–20	1	0.88	44.91	0.00	-60.49	12.91	-15.41			
	2	0.77	29.70	0.00	-49.35	5.70	-15.54			
	3	0.19	12.97	0.11	-39.73	-3.03	-17.19			
	4	0.76	1.44	0.84	-24.91	-6.56	-13.64			

Table 10

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Access to CDTs and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest MBIC	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.88	55.31	0.00	-23.74	31.31	10.07			
	2	0.89	29.92	0.00	-22.78	13.92	-0.25			
	3	0.92	7.94	0.09	-18.41	-0.06	-7.14			
	4	0.93	.	.	.	.	.			
4–8	1	0.81	35.85	0.00	-69.55	3.85	-24.47			
	2	0.51	19.06	0.09	-59.99	-4.94	-26.18			
	3	0.40	4.90	0.77	-47.80	-11.10	-25.26			
	4	-308.14	1.61	0.81	-24.74	-6.39	-13.47			
8–12	1	-0.01	10.01	0.87	-95.39	-21.99	-50.32			
	2	0.15	5.77	0.93	-73.28	-18.23	-39.48			
	3	-0.13	2.88	0.94	-49.82	-13.12	-27.29			
	4	-2.91	1.55	0.82	-24.80	-6.45	-13.53			
12–16	1	0.84	13.93	0.60	-91.47	-18.07	-46.40			
	2	0.67	9.64	0.65	-69.41	-14.36	-35.60			
	3	-0.13	8.36	0.40	-44.34	-7.64	-21.80			
	4	-0.45	0.99	0.91	-25.36	-7.01	-14.10			
16–20	**1**	**0.47**	**9.01**	**0.91**	**-96.39**	**-22.99**	**-51.32**	**Yes**	**Yes**	**Yes**
	2	-0.73	4.04	0.98	-75.01	-19.96	-41.21			
	3	-0.54	0.69	1.00	-52.01	-15.31	-29.47			
	4	-0.44	0.53	0.97	-25.82	-7.47	-14.55			

Table 11

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Access to Credit and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest 5 MBIC Values	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.92	54.54	0.00	-24.51	30.54	9.29			
	2	0.93	23.16	0.00	-29.54	7.16	-7.00			
	3	0.93	13.35	0.01	-13.00	5.35	-1.73			
	4	0.94	.	.	.	.	.			
4–8	1	0.69	35.86	0.00	-69.54	3.86	-24.47	Yes	No	
	2	0.35	12.58	0.40	-66.48	-11.42	-32.67	Yes	Yes	No
	3	0.15	9.86	0.28	-42.84	-6.14	-20.31			
	4	0.51	3.29	0.51	-23.06	-4.71	-11.79			
8–12	1	0.79	27.87	0.03	-77.53	-4.13	-32.45	Yes	No	
	2	0.61	18.14	0.11	-60.91	-5.86	-27.11			
	3	0.47	11.65	0.17	-41.05	-4.35	-18.51			
	4	0.23	5.16	0.27	-21.19	-2.84	-9.92			
12–16	1	0.85	26.04	0.05	-79.36	-5.96	-34.28	Yes	No	
	2	**0.87**	**17.62**	**0.13**	**-61.43**	**-6.38**	**-27.63**	**Yes**	**Yes**	**Yes**
	3	0.44	9.15	0.33	-43.55	-6.85	-21.01			
	4	-7.95	2.34	0.67	-24.01	-5.66	-12.74			
16–20	1	0.89	49.09	0.00	-56.31	17.09	-11.23			
	2	0.74	28.56	0.00	-50.49	4.56	-16.68			
	3	-1.52	8.58	0.38	-44.12	-7.42	-21.58			
	4	-1.54	3.33	0.50	-23.02	-4.67	-11.75			

Table 12

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Access to Housing Credit and Inflation

Instrument Lag Window	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest MBIC	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.90	54.91	0.00	-23.00	30.91	10.01			
	2	0.91	24.98	0.00	-26.96	8.98	-4.95			
	3	0.92	13.03	0.01	-12.94	5.03	-1.93			
	4	0.93	.	.	.	.	.			
4–8	1	0.49	27.63	0.04	-76.25	-4.37	-32.23			
	2	-0.59	5.16	0.95	-72.75	-18.84	-39.74			
	3	-1.56	3.96	0.86	-47.98	-12.04	-25.97			
	4	-0.27	1.36	0.85	-24.61	-6.64	-13.60			
8–12	1	0.74	20.88	0.18	-82.99	-11.12	-38.98			
	2	0.59	14.46	0.27	-63.45	-9.54	-30.44			
	3	0.73	3.84	0.87	-48.09	-12.16	-26.09			
	4	0.70	3.34	0.50	-22.63	-4.66	-11.62			
12–16	**1**	**0.77**	**13.20**	**0.66**	**-90.68**	**-18.80**	**-46.66**	**Yes**	**Yes**	**Yes**
	2	0.74	7.28	0.84	-70.63	-16.72	-37.62			
	3	0.37	2.17	0.98	-49.77	-13.83	-27.76			
	4	-7.71	2.01	0.73	-23.96	-5.99	-12.95			
16–20	1	-0.05	26.77	0.04	-77.10	-5.23	-33.09			
	2	0.61	5.92	0.92	-71.98	-18.08	-38.97			
	3	0.06	3.52	0.90	-48.42	-12.48	-26.41			
	4	-6.70	0.08	1.00	-25.89	-7.92	-14.89			

Table 13

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Access to Microcredit and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest MBIC	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.95	40.80	0.00	-37.10	16.80	-4.09			
	2	0.95	14.91	0.06	-37.02	-1.09	-15.02			
	3	0.96	5.51	0.24	-20.46	-2.49	-9.45			
	4	0.96	.	.	.	.	.			
4–8	1	0.94	42.62	0.00	-61.25	10.62	-17.24			
	2	0.59	14.84	0.25	-63.07	-9.16	-30.06			
	3	0.05	2.30	0.97	-49.64	-13.70	-27.63			
	4	0.00	1.22	0.87	-24.75	-6.78	-13.74			
8–12	**1**	**0.92**	**22.64**	**0.12**	**-81.24**	**-9.36**	**-37.22**	**Yes**	**Yes**	**Yes**
	2	0.34	13.72	0.32	-64.18	-10.28	-31.17			
	3	-0.08	8.90	0.35	-43.04	-7.10	-21.03			
	4	-3.22	5.04	0.28	-20.93	-2.96	-9.93			
12–16	1	0.92	24.25	0.08	-79.62	-7.75	-35.61			
	2	0.90	9.01	0.70	-68.89	-14.99	-35.88			
	3	0.73	4.34	0.83	-47.60	-11.66	-25.59			
	4	0.70	1.05	0.90	-24.92	-6.95	-13.91			
16–20	1	0.92	40.60	0.00	-63.28	8.60	-19.26			
	2	0.84	25.24	0.01	-52.67	1.24	-19.66			
	3	0.77	9.60	0.29	-42.34	-6.40	-20.33			
	4	0.43	2.28	0.68	-23.69	-5.72	-12.69			

Table 14

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Access to Consumer Credit and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest MBIC	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.92	53.28	0.00	-24.63	29.28	8.38			
	2	0.93	22.07	0.00	-29.87	6.07	-7.86			
	3	0.93	14.57	0.01	-11.40	6.57	-0.40			
	4	0.93	.	.	.	.	.			
4–8	1	0.40	28.37	0.03	-75.51	-3.63	-31.49			
	2	-1.64	5.74	0.93	-72.16	-18.26	-39.15			
	3	-0.88	4.33	0.83	-47.60	-11.67	-25.59			
	4	-0.71	0.67	0.95	-25.30	-7.33	-14.29			
8–12	**1**	**0.90**	**18.97**	**0.27**	**-84.91**	**-13.03**	**-40.89**	**Yes**	**Yes**	**Yes**
	2	0.83	10.40	0.58	-67.51	-13.60	-34.50			
	3	0.30	5.69	0.68	-46.25	-10.31	-24.24			
	4	0.23	2.62	0.62	-23.35	-5.38	-12.35			
12–16	1	0.90	20.67	0.19	-83.21	-11.33	-39.19			
	2	0.84	10.30	0.59	-67.61	-13.70	-34.59			
	3	-0.39	3.39	0.91	-48.55	-12.61	-26.54			
	4	-38.43	0.33	0.99	-25.64	-7.67	-14.63			
16–20	1	0.82	26.83	0.04	-77.04	-5.17	-33.03			
	2	0.13	14.54	0.27	-63.37	-9.46	-30.36			
	3	-1.25	6.20	0.63	-45.74	-9.80	-23.73			
	4	-8.35	0.74	0.95	-25.23	-7.26	-14.22			

Table 15

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Access to Credit Cards and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest MBIC	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.91	52.38	0.00	-26.67	28.38	7.14			
	2	0.92	20.77	0.01	-31.93	4.77	-9.39			
	3	0.92	11.72	0.02	-14.63	3.72	-3.36			
	4	0.93	.	.	.	.	.			
4–8	1	0.52	32.78	0.01	-72.62	0.78	-27.54			
	2	-0.18	6.78	0.87	-72.28	-17.22	-38.47			
	3	-0.39	6.29	0.62	-46.41	-9.71	-23.88			
	4	0.09	1.05	0.90	-25.30	-6.95	-14.03			
8–12	1	0.41	19.66	0.24	-85.74	-12.34	-40.67			
	2	0.51	11.39	0.50	-67.66	-12.61	-33.85			
	3	0.32	6.00	0.65	-46.70	-10.00	-24.16			
	4	-0.23	1.47	0.83	-24.88	-6.53	-13.61			
12–16	**1**	**0.74**	**19.66**	**0.24**	**-85.74**	**-12.34**	**-40.67**	**Yes**	**Yes**	**Yes**
	2	0.82	10.02	0.61	-69.03	-13.98	-35.23			
	3	0.61	7.02	0.53	-45.68	-8.98	-23.14			
	4	-35.23	1.18	0.88	-25.17	-6.82	-13.90			
16–20	1	0.85	47.11	0.00	-58.29	15.11	-13.22			
	2	0.84	34.08	0.00	-44.97	10.08	-11.17			
	3	-9.34	14.15	0.08	-38.55	-1.85	-16.01			
	4	-2.22	5.63	0.23	-20.72	-2.37	-9.45			

Table 16

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Use of Financial Products and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest 6 MBIC Values	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.92	52.36	0.00	-26.69	28.36	7.12			
	2	0.93	29.93	0.00	-22.77	13.93	-0.24			
	3	0.93	22.44	0.00	-3.91	14.44	7.36			
	4	0.93	.	.	.	.	.			
4–8	1	0.37	28.23	0.03	-77.17	-3.77	-32.10	Yes	No	
	2	0.36	8.45	0.75	-70.60	-15.55	-36.79	Yes	Yes	No
	3	-0.09	5.41	0.71	-47.29	-10.59	-24.75			
	4	-0.23	3.25	0.52	-23.10	-4.75	-11.83			
8–12	1	0.84	31.06	0.01	-74.34	-0.94	-29.27	Yes	No	
	2	**0.70**	**18.18**	**0.11**	**-60.87**	**-5.82**	**-27.07**	**Yes**	**Yes**	**Yes**
	3	0.31	11.70	0.17	-41.00	-4.30	-18.47			
	4	-2.12	5.98	0.20	-20.37	-2.02	-9.10			
12–16	1	0.88	30.75	0.01	-74.65	-1.25	-29.57	Yes	No	
	2	0.80	17.73	0.12	-61.32	-6.27	-27.51	Yes	Yes	No
	3	0.62	10.41	0.24	-42.29	-5.59	-19.75			
	4	-5.10	0.97	0.91	-25.38	-7.03	-14.12			
16–20	1	0.88	40.80	0.00	-64.60	8.80	-19.53	Yes	No	
	2	0.82	36.74	0.00	-42.31	12.74	-8.50			
	3	0.29	9.40	0.31	-43.30	-6.60	-20.76			
	4	0.69	2.31	0.68	-24.04	-5.69	-12.77			

Table 17

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Use of Deposit Products and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest 4 MBIC Values	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.92	51.78	0.00	-27.27	27.78	6.54			
	2	0.93	29.22	0.00	-23.48	13.22	-0.94			
	3	0.93	22.49	0.00	-3.86	14.49	7.40			
	4	0.93	.	.	.	.	.			
4–8	1	0.32	27.45	0.04	-77.95	-4.55	-32.88	Yes	No	
	2	0.31	10.15	0.60	-68.90	-13.85	-35.10			
	3	-0.42	6.21	0.62	-46.49	-9.79	-23.96			
	4	-0.13	3.13	0.54	-23.22	-4.87	-11.95			
8–12	1	0.78	25.64	0.06	-79.77	-6.36	-34.69	Yes	No	
	2	**0.53**	**10.06**	**0.61**	**-68.99**	**-13.94**	**-35.18**	**Yes**	**Yes**	**Yes**
	3	0.41	6.45	0.60	-46.25	-9.55	-23.72			
	4	0.24	6.09	0.19	-20.26	-1.91	-8.99			
12–16	1	0.90	33.63	0.01	-71.77	1.63	-26.69	Yes	No	
	2	0.78	17.75	0.12	-61.30	-6.25	-27.49			
	3	0.70	10.73	0.22	-41.98	-5.27	-19.44			
	4	-4.41	1.50	0.83	-24.85	-6.50	-13.58			
16–20	1	0.89	40.06	0.00	-65.34	8.06	-20.26			
	2	0.84	36.57	0.00	-42.48	12.57	-8.67			
	3	0.46	10.49	0.23	-42.21	-5.51	-19.67			
	4	0.68	1.89	0.76	-24.46	-6.11	-13.19			

Table 18

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Use of Savings Accounts and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest MBIC	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.91	57.05	0.00	-22.00	33.05	11.81			
	2	0.92	32.10	0.00	-20.61	16.10	1.93			
	3	0.92	22.77	0.00	-3.58	14.77	7.68			
	4	0.92	.	.	.	.	.			
4–8	1	0.72	39.69	0.00	-65.71	7.69	-20.64			
	2	0.53	12.87	0.38	-66.18	-11.13	-32.37			
	3	-0.95	5.10	0.75	-47.60	-10.90	-25.06			
	4	-2.00	2.40	0.66	-23.95	-5.60	-12.68			
8–12	**1**	**0.83**	**23.18**	**0.11**	**-82.22**	**-8.82**	**-37.15**	**Yes**	**Yes**	**Yes**
	2	0.27	9.89	0.63	-69.16	-14.11	-35.36			
	3	-4.45	4.71	0.79	-47.99	-11.29	-25.45			
	4	-12.64	0.12	1.00	-26.23	-7.88	-14.96			
12–16	1	0.88	37.95	0.00	-67.45	5.95	-22.37			
	2	0.82	17.56	0.13	-61.49	-6.44	-27.68			
	3	0.61	9.56	0.30	-43.14	-6.44	-20.60			
	4	-367.00	0.44	0.98	-25.91	-7.56	-14.64			
16–20	1	0.89	34.74	0.00	-70.66	2.74	-25.58			
	2	0.83	29.12	0.00	-49.93	5.12	-16.13			
	3	0.30	8.92	0.35	-43.78	-7.08	-21.24			
	4	0.38	7.01	0.14	-19.34	-0.99	-8.07			

Table 19

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Bank Branches per 10,000 Adults and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest MBIC	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.33	31.59	0.00	-45.06	7.59	-12.92			
	2	0.89	8.41	0.39	-42.69	-7.59	-21.26			
	3	0.91	3.09	0.54	-22.46	-4.91	-11.74			
	4	0.91	.	.	.	.	.			
4–8	1	0.73	25.07	0.07	-77.12	-6.93	-34.26			
	2	0.64	20.86	0.05	-55.78	-3.14	-23.64			
	3	0.74	3.42	0.91	-47.67	-12.58	-26.24			
	4	0.35	2.04	0.73	-23.51	-5.96	-12.79			
8–12	**1**	**-0.18**	**17.80**	**0.34**	**-84.39**	**-14.20**	**-41.54**	**Yes**	**Yes**	**Yes**
	2	-0.85	5.94	0.92	-70.70	-18.06	-38.56			
	3	0.12	2.85	0.94	-48.25	-13.15	-26.82			
	4	-1.08	2.26	0.69	-23.28	-5.74	-12.57			
12–16	1	0.83	24.13	0.09	-78.06	-7.87	-35.21			
	2	0.55	13.34	0.34	-63.30	-10.66	-31.16			
	3	-0.24	6.72	0.57	-44.38	-9.28	-22.95			
	4	-61.99	2.48	0.65	-23.07	-5.52	-12.35			
16–20	1	0.68	29.13	0.02	-73.06	-2.87	-30.20			
	2	0.13	21.62	0.04	-55.02	-2.38	-22.88			
	3	0.44	20.39	0.01	-30.70	4.39	-9.28			
	4	-1.57	10.14	0.04	-15.41	2.14	-4.69			

Table 20

Model Selection Criteria and Validity Tests Across Lag Windows in a Panel VAR of Banking Agents per 10,000 Adults and Inflation

Instrument lag structure	Lag	CD	J	J p-value	MBIC	MAIC	MQIC	Lowest 4 MBIC Values	p > 0,1	¿Eigenvalues lie inside the unit circle?
1–4	1	0.84	35.17	0.00	-41.48	11.17	-9.34			
	2	0.83	5.16	0.74	-45.94	-10.84	-24.51			
	3	0.91	0.39	0.98	-25.16	-7.61	-14.44			
	4	0.93	.	.	.	.	.			
4–8	1	0.80	44.71	0.00	-57.48	12.71	-14.63			
	2	0.46	30.82	0.00	-45.82	6.82	-13.68			
	3	0.50	3.81	0.87	-47.28	-12.19	-25.86			
	4	0.34	2.47	0.65	-23.08	-5.53	-12.36			
8–12	**1**	**0.79**	**22.95**	**0.11**	**-79.24**	**-9.05**	**-36.38**	**Yes**	**Yes**	**Yes**
	2	0.75	13.17	0.36	-63.47	-10.83	-31.33			
	3	0.55	3.63	0.89	-47.47	-12.37	-26.04			
	4	0.35	2.07	0.72	-23.48	-5.93	-12.76			
12–16	1	0.77	26.81	0.04	-75.38	-5.19	-32.53			
	2	0.67	23.68	0.02	-52.96	-0.32	-20.82			
	3	0.32	9.02	0.34	-42.07	-6.98	-20.65			
	4	-0.74	0.71	0.95	-24.83	-7.29	-14.12			
16–20	1	0.80	38.03	0.00	-64.16	6.03	-21.30			
	2	0.36	13.99	0.30	-62.65	-10.01	-30.51			
	3	0.67	10.86	0.21	-40.23	-5.14	-18.80			
	4	-0.32	2.78	0.60	-22.77	-5.22	-12.06			

Figure 13

Eigenvalue stability - Panel VAR models

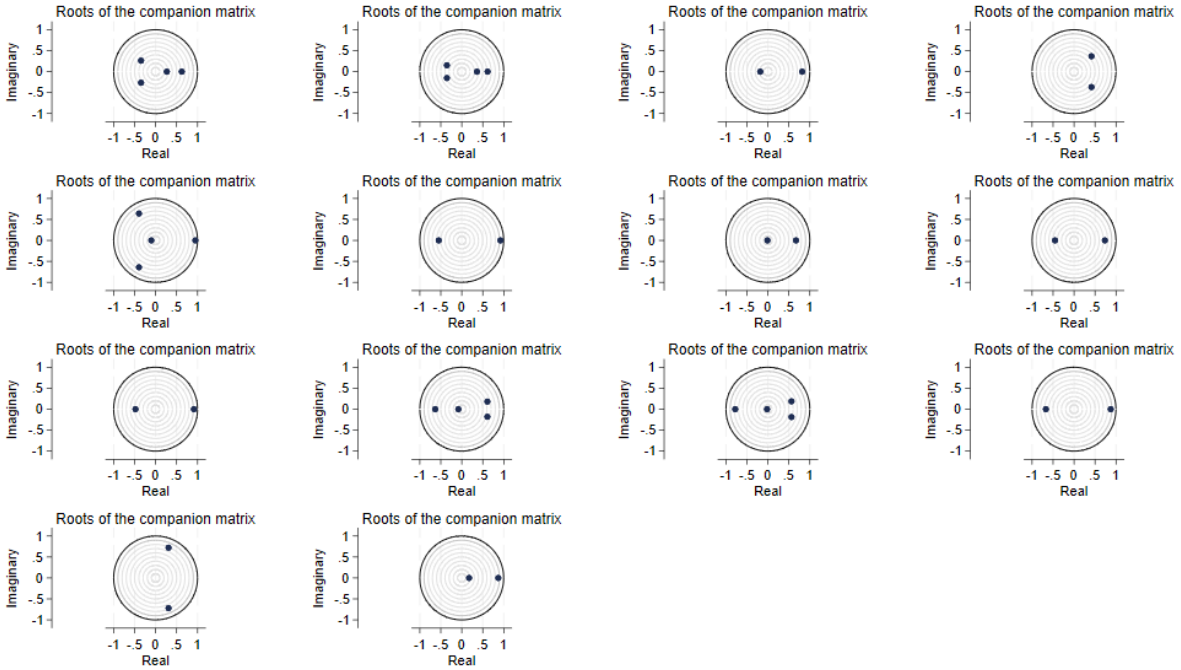


Table 21 through Table 34 present the panel VAR estimation results for each financial access indicator, detailing the quarterly dynamics between the respective variable and inflation. Each table includes the estimated coefficients and standard errors for the lagged endogenous variables, allowing for a precise assessment of short-term interactions.

Table 21

Panel VAR Results: Quarterly Dynamics of Access to Financial Products and Inflation

Variables	(1) Quarterly change in access	(2) Quarterly inflation
L.Quarterly change in access	-0.247	0.949***
	(0.187)	(0.347)
L2.Quarterly change in access	0.0335	0.887**
	(0.158)	(0.429)

L.Quarterly inflation	0.110	0.444**
	(0.0858)	(0.179)
L2.Quarterly inflation	-0.0350	0.0143
	(0.0737)	(0.175)
Observations	792	792

Note: Standard errors clustered at the department level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 22

Panel VAR Results: Quarterly Dynamics of Access to Deposit Products and Inflation

Variables	(1) Quarterly change in deposit products	(2) Quarterly inflation
L. Quarterly change in deposit products	-0.223	0.929***
	(0.215)	(0.349)
L2. Quarterly change in deposit products	0.105	0.750*
	(0.177)	(0.401)
L.Quarterly inflation	0.101	0.492***
	(0.0861)	(0.182)
L2.Quarterly inflation	-0.0426	0.0133
	(0.0738)	(0.174)
Observations	792	792

Note: Standard errors clustered at the department level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 23

Panel VAR Results: Quarterly Dynamics of Access to Savings Accounts and Inflation

Variables	(1) Quarterly change in savings accounts	(2) Quarterly inflation
L. Quarterly change in savings accounts	-0.143	0.388
	(0.169)	(0.315)
L. Quarterly inflation	0.0948***	0.779***
	(0.0363)	(0.0489)
Observations	825	825

Note: Standard errors clustered at the department level are reported in parentheses. ***

p<0.01, ** p<0.05, * p<0.1

Table 24.

Panel VAR Results: Quarterly Dynamics of Access to CDTs and Inflation

Variables	(1) Quarterly change in CDTs	(2) Quarterly inflation
L. Quarterly change in CDTs	0.276	35.18**
	(0.216)	(17.03)
L. Quarterly inflation	-0.00439	0.555***
	(0.00391)	(0.104)
Observations	825	825

Note: Standard errors clustered at the department level are reported in parentheses. ***

p<0.01, ** p<0.05, * p<0.1

Table 25.

Panel VAR Results: Quarterly Dynamics of Access to Credit and Inflation

Variables	(1) Quarterly change in credit	(2) Quarterly inflation
L. Quarterly change in credit	-0.809***	-0.595***
	(0.152)	(0.188)
L2. Quarterly change in credit	-0.573***	-0.183
	(0.135)	(0.267)
L Quarterly inflation	0.0395	0.858***
	(0.0859)	(0.127)
L2. Quarterly inflation	0.0170	0.101
	(0.0599)	(0.117)
Observations	792	792

Note: Standard errors clustered at the department level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 26

Panel VAR Results: Quarterly Dynamics of Access to Housing Credit and Inflation

Variables	(1) Quarterly change in housing credit	(2) Quarterly inflation
L. Quarterly change in housing credit	-0.497**	-9.514**
	(0.215)	(4.820)
L. Quarterly inflation	-0.00765	0.871***
	(0.0121)	(0.176)
Observations	759	759

Note: Standard errors clustered at the department level are reported in parentheses. ***

p<0.01, ** p<0.05, * p<0.1

Table 27

Panel VAR Results: Quarterly Dynamics of Access to Microcredit and Inflation

Variables	(1) Quarterly change in microcredit	(2) Quarterly inflation
L. Quarterly change in microcredit	-0.0140	3.449
	(0.130)	(2.552)
L. Quarterly inflation	-0.000738	0.673***
	(0.00701)	(0.0790)
Observations	759	759

Note: Standard errors clustered at the department level are reported in parentheses. ***

p<0.01, ** p<0.05, * p<0.1

Table 28

Panel VAR Results: Quarterly Dynamics of Access to Consumer Credit and Inflation

Variables	(1) Quarterly change in consumer credit	(2) Quarterly inflation
L. Quarterly change in consumer credit	-0.443	0.176
	(0.279)	(1.689)
L. Quarterly inflation	0.0608***	0.726***
	(0.0175)	(0.0999)
Observations	759	759

Note: Standard errors clustered at the department level are reported in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 29

Panel VAR Results: Quarterly Dynamics of Access to Credit Cards and Inflation

Variables	(1) Quarterly change in credit cards	(2) Quarterly inflation
L. Quarterly change in credit cards	-0.497***	-1.774***
	(0.0865)	(0.451)
L Quarterly inflation	0.0133	0.929***
	(0.0580)	(0.144)
Observations	825	825

Note: Standard errors clustered at the department level are reported in parentheses. ***

p<0.01, ** p<0.05, * p<0.1

Table 30

Panel VAR Results: Quarterly Dynamics of Use of Financial Products and Inflation

Variables	(1) Quarterly change in use	(2) Quarterly inflation
L. Quarterly change in use	-0.163	0.761**
	(0.235)	(0.362)
L2. Quarterly change in use	0.282	0.207
	(0.211)	(0.229)
L Quarterly inflation	-0.0171	0.672***
	(0.103)	(0.138)
L2. Quarterly inflation	-0.0517	0.0343
	(0.0764)	(0.154)

Observations	792	792

Note: Standard errors clustered at the department level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 31

Panel VAR Results: Quarterly Dynamics of Use of Deposit Products and Inflation

Variables	(1) **Quarterly change use of deposit products**	(2) **Quarterly inflation**
L. Quarterly change in use of deposit products	-0.371	0.989***
	(0.270)	(0.347)
L2. Quarterly change in use of deposit products	0.237	0.0860
	(0.198)	(0.246)
L. Quarterly inflation	0.0482	0.697***
	(0.104)	(0.117)
L2. Quarterly inflation	-0.0979	-0.0132
	(0.0713)	(0.138)
Observations	792	792

Note: Standard errors clustered at the department level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 32

Panel VAR Results: Quarterly Dynamics of Use of Savings Accounts and Inflation

Variables	(1) Quarterly change in use of savings account	(2) Quarterly inflation
L. Quarterly change in use of savings account	-0.633**	0.411
	(0.267)	(0.445)
L. Quarterly inflation	0.144***	0.836***
	(0.0542)	(0.102)
Observations	825	825

Note: Standard errors clustered at the department level are reported in parentheses. ***

p<0.01, ** p<0.05, * p<0.1

Table 33

Panel VAR Results: Quarterly Dynamics of Bank Branches per 10,000 Adults and Inflation

Variables	(1) Quarterly change in bank branches	(2) Quarterly inflation
L. Quarterly change in bank branches	0.684**	72.25***
	(0.341)	(27.42)
L Quarterly inflation	-0.00914***	-0.0668
	(0.00293)	(0.283)
Observations	693	693

Note: Standard errors clustered at the department level are reported in parentheses. ***

p<0.01, ** p<0.05, * p<0.1

Table 34

Panel VAR Results: Quarterly Dynamics of Banking Agents per 10,000 Adults and Inflation

Variables	(1) Quarterly change in banking agents	(2) Quarterly inflation
L. Quarterly change in banking agents	0.177	-0.00359
	(0.176)	(0.0109)
L. Quarterly inflation	-0.287	0.869***
	(0.600)	(0.0634)
Observations	693	693

Note: Standard errors clustered at the department level are reported in parentheses. ***

p<0.01, ** p<0.05, * p<0.1

References

Abrigo, M. R. M., & Love, I. (2016). Estimation of Panel Vector Autoregression in Stata. *The Stata Journal: Promoting Communications on Statistics and Stata*, *16*(3), 778–804. https://doi.org/10.1177/1536867X1601600314

Akaike, H. (1998). Information Theory and an Extension of Information the Maximum Theory Likelihood and an Principle Extension of the Maximum Likelihood Principle. *Biogeochemistry*, *1998*, 199–213. https://doi.org/10.1007/978-1-4612-1694-0_15

Anarfo, E. B., Abor, J. Y., Osei, K. A., & Gyeke-Dako, A. (2019). Monetary Policy and Financial Inclusion in Sub-Sahara Africa: A Panel VAR Approach. *Journal of African Business*, *20*(4), 549–572. https://doi.org/10.1080/15228916.2019.1580998

Andrews, D. W. K., & Lu, B. (2001). Consistent model and moment selection procedures for GMM estimation with application to dynamic panel data models. *Journal of Econometrics*, *101*(1), 123–164. https://doi.org/10.1016/S0304-4076(00)00077-4

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies*, *58*(2), 277–297. https://doi.org/10.2307/2297968

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Arshad, M. U., Ahmed, Z., Ramzan, A., Shabbir, M. N., Bashir, Z., & Khan, F. N. (2021). Financial inclusion and monetary policy effectiveness: A sustainable development approach of developed and under-developed countries. *PLoS ONE*, *16*(12), e0261337. https://doi.org/10.1371/journal.pone.0261337

Ascari, G., Ascari, G., Colciago, A., Rossi, L., Rossi, L., & COLCIAGO, A. (2011). *Limited asset market participation: Does it really matter for monetary policy?* (edsoai.on1311400267). https://research.ebsco.com/linkprocessor/plink?id=bb635a02-f846-3fab-8fe4-61447879779c

Bilbiie, F. O. (2008). Limited asset markets participation, monetary policy and (inverted) aggregate demand logic. *Journal of Economic Theory*, *140*(1), 162–196. https://doi.org/10.1016/j.jet.2007.07.008

Biswas, G. K., & Ahamed, F. (2023). *Financial Inclusion and Monetary Policy: A Study on the Relationship between Financial Inclusion and Effectiveness of Monetary Policy in Developing Countries* (No. arXiv:2308.12542). arXiv. https://doi.org/10.48550/arXiv.2308.12542

Blancher, N., Appendino, M., Bibolov, A., & Fouejieu, A. (2019). *Financial Inclusion of Small and Medium-Sized Enterprises in the Middle East and Central Asia*. International Monetary Fund. https://doi.org/10.5089/9781484383124.087

Bourainy, M. E., Salah, A., & Sherif, M. E. (2021). Assessing the Impact of Financial Inclusion on Inflation Rate in Developing Countries. *Open Journal of Social Sciences*, *09*(01), 397–424. https://doi.org/10.4236/jss.2021.91030

Brugnolini, L. (2018). *About Local Projection Impulse Response Function Reliability* (SSRN Scholarly Paper No. 3229218). Social Science Research Network. https://doi.org/10.2139/ssrn.3229218

Carlino, G., & Defina, R. (1998). The Differential Regional Effects of Monetary Policy. *The Review of Economics and Statistics*, *80*(4), 572–587.

Cavoli, T., Gopalan, S., & Rajan, R. (2023). *Financial Inclusion, Inflation Targeting and the Policy Rate: Evidence from Emerging Economies* (SSRN Scholarly Paper No. 4379912). Social Science Research Network. https://doi.org/10.2139/ssrn.4379912

CGAP, & Marulanda consultores. (2013). *Incentivos para la Apertura de Corresponsales No Bancarios de la Banca de las Oportunidades en Colombia*. https://www.cgap.org/sites/default/files/colombia_agent_subsidy_program_spanish.pdf

Chaudhry, I. S., Yusop, Z., & Habibullah, M. S. (2024). Dynamic common correlated effects of financial inclusion on economic growth: Empirical evidence from Organization of Islamic Cooperation (OIC) countries. *International Journal of Emerging Markets*, *19*(10), 3088-3088–3110. Emerald Insight. https://doi.org/10.1108/IJOEM-11-2021-1751

Chow, G. C., & Lin, A. (1971). Best linear unbiased interpolation, distribution, and extrapolation of time series by related series. *The Review of Economics and Statistics*, 372–375.

Ciobanu, S. E. (2024). Financial Inclusion and Monetary Policy: A Review of Literature. *Annals of the University Dunarea de Jos of Galati: Fascicle: I, Economics & Applied Informatics*, *30*(3), 314–324. https://doi.org/10.35219/eai15840409457

Cruz, L. P., Rueda Gallardo, J. A., Acosta Amador, N. M., & Zamudio Villareal, A. P. (2021, November 30). *Lineamientos técnicos o metodologías en Categorías de ruralidad y la prestación de bienes y servicios en la ruralidad*. Dirección de Desarrollo Rural Sostenible. https://colaboracion.dnp.gov.co/CDT/Desarrrollo_Rural_Sostenible/Documentos%20PAI%20DDRS/2021/2021%20-%20Categor%C3%ADas%20de%20ruralidad.pdf

Dagum, E. B., & Cholette, P. A. (2006). *Benchmarking, Temporal Distribution, and Reconciliation Methods for Time Series* (Vol. 186). Springer New York. https://doi.org/10.1007/0-387-35439-5

DANE. (2025). *Encuesta de Micronegocios 2024* (No. 2020 Nacional Anexo). https://www.dane.gov.co/files/operaciones/EMICRON/anex-EMICRON-2024.xlsx

Deb, P., Estefania Flores, J., Firat, M., & Furceri, D. (2023). *Monetary Policy Transmission Heterogeneity: Cross-Country Evidence*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4619831

Demirgüç-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2022). *The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. World Bank Publications. https://books.google.com/books?hl=es&lr=&id=ZtiVEAAAQBAJ&oi=fnd&pg=PT14&dq=the+global+findex+database+2021:+financial+inclusion,+digital+payments,+and+resilience+in+the+age+of+covid-19&ots=hu3e-PZrae&sig=Oz0ZjzlbF9156I0NYvF_TwuB5h4

Ehrmann, M. (2005). Firm Size and Monetary Policy Transmission—Evidence from German Business Survey Data. In J.-E. Sturm & T. Wollmershäuser (Eds.), *Ifo Survey Data in Business Cycle and Monetary Policy Analysis* (pp. 145–172). Physica-Verlag. https://doi.org/10.1007/3-7908-1605-1_7

Elsaid, J. M. (2025). The Impact of Financial Inclusion on Inflation in the MENA region: Oil vs Non-oil countries. *Master's Thesis, the American University in Cairo*.

Elsherif, M. (2019). The relationship between financial inclusion and monetary policy transmission: The case of Egypt. *Proceedings of International Academic Conferences*, *9010737*. https://ideas.repec.org/p/sek/iacpro/9010737.html

Erceg, C. J., Henderson, D. W., & Levin, A. T. (2019). Optimal Monetary Policy with Staggered Wage and Price Contracts. *Credit & Capital Markets / Kredit Und Kapital*, *52*(4), 537–571.

Evans, O. (2016). The Effectiveness of Monetary Policy in Africa: Modeling the Impact of Financial Inclusion. *Iranian Economic Review*, *20*(3), 323–337.

Ferrari, M., & Ters, K. (2017). The benefits of using large high frequency financial datasets for empirical analyses: Two applied cases. *IFC Bulletins Chapters*, *43*. https://ideas.repec.org//h/bis/bisifc/43-41.html

Finnovista, Bank, I. A. D., & Invest, I. D. B. (2024). Fintech en América Latina y el Caribe: Un ecosistema consolidado con potencial para aportar a la inclusión financiera regional. *IDB Publications*. https://doi.org/10.18235/0013032

Flamini, V., Gomes, D., Huang, B., Kolovich, L., Puig, A., & Zdzienicka, A. (2023). *Monetary Policy and Labor Market Gender Gaps*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4592233

Galí, J., López-Salido, J. D., & Vallés, J. (2004). Rule-of-Thumb Consumers and the Design of Interest Rate Rules. *Journal of Money, Credit and Banking*, *36*(4), 739–763.

Garbobiya, T. S., Oladipo, O., & Iorember, P. T. (2024). Financial inclusion and monetary policy targets: Evidence from the ECOWAS countries. *Modern Finance*, *2*(1). https://doi.org/10.61351/mf.v2i1.107

Geweke, J., & Runkle, D. (1995). *A Fine Time for Monetary Policy?* (edsoai.on1197430094). https://research.ebsco.com/linkprocessor/plink?id=f4f477f8-74fc-317f-9be6-11e68f9990c6

Grimm, P. (2010). Social Desirability Bias. In *Wiley International Encyclopedia of Marketing*. John Wiley & Sons, Ltd. https://doi.org/10.1002/9781444316568.wiem02057

Hannan, E. J., & Quinn, B. G. (1979). The Determination of the Order of an Autoregression. *Journal of the Royal Statistical Society. Series B (Methodological)*, *41*(2), 190–195.

Hansen, L. P. (1982). Large Sample Properties of Generalized Method of Moments Estimators. *Econometrica*, *50*(4), 1029–1054. https://doi.org/10.2307/1912775

Holtz-Eakin, D., Newey, W., & Rosen, H. S. (1988). Estimating Vector Autoregressions with Panel Data. *Econometrica*, *56*(6), 1371–1395. https://doi.org/10.2307/1913103

Huong N. T. T. (2018). The Impact of Financial Inclusion on Monetary Policy: A Case Study in Vietnam. *Journal of Economics and Development*, *20*(2), 5–5.

Jordà, Ò. (2005). Estimation and inference of impulse responses by local projections. *American Economic Review*, *95*(1), 161–182.

Jordà, Ò. (2023). Local Projections for Applied Economics. *Annual Review of Economics*, *15*(1), 607–631. https://doi.org/10.1146/annurev-economics-082222-065846

Jorda, O., & Taylor, A. M. (2025). Local Projections. *Journal of Economic Literature*, *63*(1), 59–110. https://doi.org/10.1257/jel.20241521

Jungo, J., Madaleno, M., & Botelho, A. (2022). The Relationship between Financial Inclusion and Monetary Policy: A Comparative Study of Countries' in Sub-Saharan Africa and Latin America and the Caribbean. *Journal of African Business*, *23*(3), 794–815. https://doi.org/10.1080/15228916.2021.1930810

Kebede, J., Selvanathan, S., & Naranpanawa, A. (2024). Financial inclusion and monetary policy effectiveness in a monetary union: Heterogenous panel approach. *Economics of Transition & Institutional Change*, *32*(3), 779–805. https://doi.org/10.1111/ecot.12402

Komala, M. D., & Widodo, W. (2022). The Nexus between Financial Inclusion and Monetary Policy: The Case Study of Selected ASEAN Countries. *Journal of Economics, Business & Accountancy*, *25*(1), 123–134. https://doi.org/10.14414/jebav.v25i1.2920

Koomson, I., Villano, R. A., & Hadley, D. (2020). Effect of Financial Inclusion on Poverty and Vulnerability to Poverty: Evidence Using a Multidimensional Measure of Financial Inclusion. *Social Indicators Research*, *149*(2), 613–639. https://doi.org/10.1007/s11205-019-02263-0

Lapukeni, A. F. (2015). The impact of financial inclusion on monetary policy effectiveness: The case of Malawi. *International Journal of Monetary Economics and Finance*, *8*(4), 360. https://doi.org/10.1504/IJMEF.2015.073229

Lenka, S. K., & Bairwa, A. K. (2016). Does financial inclusion affect monetary policy in SAARC countries? *Cogent Economics & Finance*, *4*(1), 1127011. https://doi.org/10.1080/23322039.2015.1127011

Levine, R., & Renelt, D. (1991). Cross-country studies of growth and policy: Methodological, conceptual, and statistical problems. *World Bank Publications*, *608*.

Levine, R., & Renelt, D. (1992). A Sensitivity Analysis of Cross-Country Growth Regressions. *American Economic Review*, *82*(4), 942–963.

Li, D., Plagborg-Møller, M., & Wolf, C. K. (2022). *Local projections vs. vars: Lessons from thousands of dgps*. National Bureau of Economic Research. https://www.nber.org/papers/w30207

Loukoianova, E., Yang, Y., Guo, S., Hunter, L., Jahan, S., Jamaludin, F., & Schauer, J. (2018). Financial Inclusion in Asia-Pacific. *Departmental Papers / Policy Papers*, *18*(17), 1. https://doi.org/10.5089/9781484371015.087

Mehrotra, A., & Yetman, J. (2014). *Financial inclusion and optimal monetary policy*. https://www.bis.org/publ/work476.htm

Meltzer, A. H. (2024). *Mercantile Credit, Monetary Policy, and Size of Firms*.

Montiel Olea, J. L., & Plagborg-Møller, M. (2021). Local Projection Inference Is Simpler and More Robust Than You Think. *Econometrica*, *89*(4), 1789–1823. https://doi.org/10.3982/ECTA18756

Oanh, T. T. K., Van, L. T. T., & Dinh, L. Q. (2023). Relationship between financial inclusion, monetary policy and financial stability: An analysis in high financial development and low financial

development countries. *Heliyon*, *9*(6), e16647. https://doi.org/10.1016/j.heliyon.2023.e16647

Omar, M. A., & Inaba, K. (2020). Does financial inclusion reduce poverty and income inequality in developing countries? A panel data analysis. *Journal of Economic Structures*, *9*(1), 37. https://doi.org/10.1186/s40008-020-00214-4

Owyang, M., & Wall, H. J. (2005). *Structural Breaks and Regional Disparities in the Transmission of Monetary Policy* (SSRN Scholarly Paper No. 927240). https://doi.org/10.2139/ssrn.927240

Ozili, P. K. (2023). *Impact of Monetary Policy on Financial Inclusion in Emerging Markets* (SSRN Scholarly Paper No. 4497817). https://papers.ssrn.com/abstract=4497817

Pasten, E., Schoenle, R., & Weber, M. (2020). The propagation of monetary policy shocks in a heterogeneous production economy. *Journal of Monetary Economics*, *116*, 1–22.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, *22*(2), 265–312. https://doi.org/10.1002/jae.951

Pesaran, M. H. (2021). General diagnostic tests for cross-sectional dependence in panels. *Empirical Economics*, *60*(1), 13–50. https://doi.org/10.1007/s00181-020-01875-7

Quintero Otero, J. D. (2019). Regional and sectoral impacts of monetary policy in Colombia. *Cuadernos de Economía*, *38*(76), 259–288. https://doi.org/10.15446/cuad.econ.v38n76.62538

Quintero Otero, J. D., & González G., A. (2012). *Política monetaria y ciclos económicos regionales en Colombia*. https://repositorio.uniandes.edu.co/entities/publication/repositorio.uniandes.edu.co

Romero, J. (2008). *Transmisión regional de la política monetaria en Colombia*. Banco de la República, Centro de Estudios Económicos Regionales. https://core.ac.uk/download/pdf/7075104.pdf

Saraswati, B. D., Maski, G., Kaluge, D., & Sakti, R. K. (2020). The effect of financial inclusion and financial technology on effectiveness of the Indonesian monetary policy. *Business: Theory and Practice*, *21*(1), Article 1. https://doi.org/10.3846/btp.2020.10396

Schwarz, G. (1978). Estimating the Dimension of a Model. *The Annals of Statistics*, *6*(2), 461–464. https://doi.org/10.1214/aos/1176344136

Shah, A. (2018). *ASDOC: Stata module to create high-quality tables in MS Word from Stata output*. *Statistical Software Components S458466, Boston College Department of Economics*.

Shah, S. (2025). The Influence of Framing on Financial Decision-Making and Risk Tolerance. *International Journal of Transformations in Business Management*, *15*(1), 9–27. https://doi.org/10.37648/ijtbm.v15i01.002

Taboada Arango, B., Villamizar-Villegas, M., Bernal Rojas, M., Steiner Sampedro, R., & Arango Lozano, L. (2024). *Mitos y realidades de la política monetaria*. Banco de la República. https://doi.org/10.32468/Ebook.664-488-4

Van, L. T.-H., Vo, A. T., Nguyen, N. T., & Vo, D. H. (2021). Financial Inclusion and Economic Growth An International Evidence. *Emerging Markets Finance and Trade*, *57*(1), 239–263. https://doi.org/10.1080/1540496X.2019.1697672

Vargas, H., Hamann, F., & González, A. (2010). Efectos de la política monetaria sobre las tasas de interés de los créditos hipotecarios en Colombia. *Desarrollo y Sociedad*, *66*, 45–64.

World Bank. (n.d.). *Inclusión financiera* [Text/HTML]. World Bank. Retrieved November 21, 2024, from https://www.bancomundial.org/es/topic/financialinclusion/overview

Yin, X., Xu, X., Chen, Q., & Peng, J. (2019). The Sustainable Development of Financial Inclusion: How Can Monetary Policy and Economic Fundamental Interact with It Effectively? *Sustainability*, *11*(9), 2524. https://doi.org/10.3390/su11092524

Yıldırım, H., Özkan, T., Lögün, A., & Doğan, M. (2025). The mutual relationship between financial inclusion and effectiveness of monetary policy: Evidence from upper-middle-income countries. *Journal of Research in Economics, Politics & Finance / Ekonomi, Politika & Finans Arastirmalari Dergisi*, *10*(2), 619–635. https://doi.org/10.30784/epfad.1642086

Zuccardi-Huertas, I. E. (2004). Efectos regionales de la política monetaria en Colombia. *Capítulo 1. Efectos regionales de la política monetaria en Colombia. Pág.:14-57.* https://repositorio.banrep.gov.co/handle/20.500.12134/471