Short-term effects of productive credit, savings and money demand on Ecuador's economic growth, 2006–2020

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Abstract

Purpose – This paper aims to determine causal relationships between the level of productive credit, real deposits and money demand – all of them in real terms – and Gross National Product between 2006 and 2020.
Design/methodology/approach – The vector autoregressive technique (VAR) was used, where data from real macroeconomic aggregates published by the Central Bank of Ecuador (BCE) are correlated, such as productive credit, gross domestic product (GDP) per capita, deposits and money demand.
Findings – The results indicate that there is no causal relationship, in the Granger sense, between GDP and financial activity, but there is between the growth rate of real money demand per capita and the growth rate of total real deposits per capita.
Originality/value – The study shows that bank credit mainly finances the operations of current assets and/or liabilities. In addition, economic agents use the banking system mainly to carry out transactional and precautionary activities.

Keywords Economic growth, Productive credit, Money demand, Real deposits, Autoregressive vectors
Paper type Research paper

1. Introduction

The literature that addresses the issue of the impact of credit and other monetary aggregates on economic growth in the short term is numerous and diverse (Clavellina, 2014). This author claims that in developing economies few companies have access to direct financing (issuance of shares and bonds/obligations) and, for this reason, indirect financing is used (promissory notes, use of discounts, or supplier credit). According to Urdaneta-Montiel *et al.* (2020) when characterizing the evolution of savings and credit and regional economic growth per capita,

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with monthly data for the period 2014–2019, the hypothesis was verified that an increase in savings and credit in each of the regions is translated into economic growth.

The relationships presented above try to explain how the public's loanable funds are used for productive purposes. Ramírez (2016) argues that credit is a transmission channel to boost economic growth in the short term. However, this channel produces fluctuations in real GDP and that is why the author proposes regulatory measures, especially after the Subprime crisis in the United States. In the case of Latin America, according to Leal (2016), the credit transmission channel was affected by global financial and monetary instability, caused—among other things—by the Federal Reserve's monetary policy and the volatility in oil prices.

Sassi and Gasmi (2014), by studying the effect of business and family credit on economic growth in 27 European Union countries for the period 1995–2012 with panel data, were able to demonstrate that the business credit market positively affects economic growth, while the domestic credit market has a negative effect by reducing the savings rate, resulting in less availability of loanable funds for credit to companies. This situation occurs in Ecuador: On average for the period under study, 47.02% of the credit portfolio is allocated to productive credit and 9.91% to microcredit, which represents a fundamental element for the economic growth of Ecuador.

These policies, in conjunction with the banking sector, would increase the financing granted by banks to companies in recessive cycles of the economy (Levy, 2014). To this end, it is necessary to make the guarantees and credit requirements more flexible but at the same time, provide advice to companies, especially SMEs, due to their insolvency problems (long-term borrowing capacity) (Canto-Cuevas *et al.*, 2016). The emphasis on SMEs is because, in developing economies, as in advanced ones, they represent 90% of the business park (De Giorgi and Rahman, 2014; Manzoor *et al.*, 2021).

However, in developing countries, it is also important to consider foreign direct and public investment—in addition to productive credit to the private sector—to be determining factors to explain real GDP growth in the short term (Kasuga, 2007). Likewise, it is important to consider the distribution of bank credit in terms of the participation of households and companies in the total credit portfolio. According to Škare *et al.* (2019), investigating the values of credit distribution helps to account for the empirical relationship between the destination of the demand for loanable funds and economic growth.

Regarding Ecuador, Barriga-Yumiguano *et al.* (2018) analyzed the relationship between financial development and economic growth between 2000 and 2017. In this study, evidence of co-integration was found between financial deepening and real GDP by using variables such as deposit and credit deepening as a percentage of real GDP. For his part, Levine (2002) recommends relating monetary and financial aggregates and their incidence on economic growth in terms of GDP. Finally, Xu (2007) suggests using the percentages of capital formation and total bank deposits to explain the behavior of the level of economic activity in the short term.

This paper intends to explain how the credit channel could contribute to the growth of the gross domestic product. Consequently, the objective of this study is to determine the short-term effects of productive credit, savings, and the demand for money on the economic growth of Ecuador, from 2006 to 2020.

This paper is organized as follows: it starts from the approach of the proposed objectives, followed by a review of the bibliography, highlighting the categories of financial development and productive credit. Then, the methodology, results, conclusions, and recommendations to be offered will be presented.

2. Literature review

When analyzing the relationship between productive credit and public deposits, as will be presented in this work—either in an absolute way or in a per capita way—two important

aspects of the so-called financial development are being addressed. According to Levine (1997), financial development is the process of improving the quality, quantity, and efficiency of the services offered by banks.

However, what is crucial in financial development is the legal environment and the quality of financial services present in the economy (La Porta *et al.*, 1998). Levine (1999) and Levine *et al.* (2000) mention that it is the combination of the advance of the structure and the legal system (the system of banking and financial contracts) that influences economic growth.

However, Anguiano-Pita and Ruiz-Porras (2020) argue that there is no agreed indicator to measure what is meant by financial development. For Fitzgerald (2007), financial development is the creation and expansion of institutions, instruments, and markets that support the process of economic growth. For Hernández (2015), financial development has to do with the financial structure, the financial system with an emphasis on bank loans or financial deepening, and the financial system with a preponderance of stock market operations (Goldsmith, 1969). For the authors of this paper, financial development can be approached from the perspective of productive credit and total public deposits. Consequently, in this study, productive credit is the sum of the disbursement of money for working capital and net investment that has an influence on the gross domestic product (GDP).

However, it is interesting to learn the relationship between financial development and economic growth. In this relationship, the discussion focuses on the type of causality (Demetriades and Hussein, 1996). In this sense, two approaches stand out: (1) within the hypothesis of supply and monitoring of demand developed by Hugh (1966) is the idea that countries with developed financial systems experience much faster economic growth (Belinga *et al.*, 2016); and (2) the hypothesis where economic growth is the basis for financial development (Gurley and Shaw, 1967; Goldsmith, 1969).

From a more empirical perspective, in a study of the Cameroonian economy, Belinga *et al.* (2016) found evidence that only monetary liquidity (M2) has a unidirectional causal relationship for real GDP growth in the economy. This result is supported by data obtained from both the Johansen (1995) co-integration test and the Wald test. For their part, domestic credit to the private sector, trade liberalization, and bank deposits exhibit a unidirectional causal relationship in the Johansen co-integration test. In conclusion, there is a long-term link between bank credit to the private sector and economic growth, which supports the leading supply hypothesis.

From the viewpoint of economic policy, this result suggests applying policies that generate incentives such as interest rate reductions to facilitate credit expansion (Ketteni and Kottaridi, 2019). The aforementioned is ratified in the works of other scholars (Benczúr *et al.*, 2019; Erlando *et al.*, 2020; Hasanov and Huseynov, 2014) since they demonstrate an effective relationship between the behavior of the financial sector and economic growth. In addition, the studies underlined the importance of adopting financial liberalization measures.

However, because of the effects caused by the global financial crisis in 2009, the link between the financial sector and the real economy once again became the subject of theoretical empirical studies. In the work of Mensi *et al.* (2020), three elements are presented: (1) a positive non-linear relationship between the development of the banking sector and economic growth for those Islamic countries with a high level of financial development (especially in their stock markets); and (2) an asymmetric relationship between macroeconomic variables and economic growth is shown depending on the level of financial development of each Islamic country considered.

However, in the work of Tariq (2020), evidence was found that financial development is also influenced by economic growth. That is, financial growth is an engine of economic growth, but this, in turn, allows financial development. This conclusion then suggests a two-way relationship, since economic growth drives the demand for financial services and their development (Demetriades and Hussein, 1996; Tariq, 2020).

Likewise, the threshold panel model applied by Araújo *et al.* (2020) expresses a positive correlation between credit and economic growth, when the relationship between credit and real GDP is below the estimated threshold. However, a marginal negative effect of credit on growth occurs when real GDP is above the threshold. Said result supports the existence of a credit threshold of 135% concerning real GDP. The analysis marks credit as relevant in today's economies, but not the role it played before Second World War.

The analysis carried out by Clavellina (2014) establishes that access to financing is a fundamental condition for economic growth. In addition, Saksonova and Koleda (2017) assert that the financial function can affect economic growth by (1) the accumulation of capital, because it increases the savings rate or by reallocating these through different productive technologies; and (2) the legal system and political institutions.

Regarding point two, Berger *et al.* (2021) point out that greater financial integration and democratization of credit positively influence the growth of the level of economic activity and therefore growth. Along the same lines, Levy (2014) states that these measures must be accompanied by a monetary policy that promotes the channeling of savings through new credit policies towards the key productive sectors of the economy.

The placement of credit in Latin America has been characterized by its volatility, because of external economic shocks, and its expansion is produced by the strong increases in sight deposits, on which banks depend for the financing of loans to different segments. In this way, during the 2007–2008 crisis, the placement of credit did not exceed 1%; between 2009 and 2011, it had an average growth of 7.37%, and from 2012 to 2016, the volume of credit was reduced to 3.7% on average (Barriga-Yumiguano *et al.*, 2018).

In the case of Ecuador in 2015, 96.15% of the active operations of the National Financial System correspond to the Private Financial System (SFPr), and 3.85% to the Public Financial System (SFP). Portfolio segmentation in the SFPr is productive, ordinary commercial, priority commercial, ordinary consumption, priority consumption, educational, public interest housing, real estate, and microcredits (Banco Central del Ecuador, 2015).

Following the regulation established by the Monetary and Financial Policy and Regulation Board of Banco Central del Ecuador (2015), Article 1 states that productive credit is granted to natural or legal persons to finance productive projects that are established in three subsegments: productive corporate, productive business, and productive Small and Medium Enterprises. For 2002, the credit granted by the Ecuadorian SFPr increased from $2.8 trillion to $7.3 trillion in December 2007, which represents approximately 10% of GDP in the same year, with a compound annual growth rate of 21% (Astorga and Morillo, 2010).

3. Data and econometric strategy

The present investigation carried out different methodological procedures to try to understand the causal relationships of the elements studied (Hurtado, 2000). Based on the postulates of Palella and Martins (2010), the following were considered in the first stage: (1) ECB statistics for the year 2021 referring to its system of quarterly accounts of the real sector of the economy and weekly monetary bulletins; (2) the variables considered were: real per capita GDP, money demand, and total real bank deposits in per capita terms as shown in Table 1; and (3) the quarterly time series was plotted using the use of logarithmic smoothing methods for the period 2006Q1 to 2020Q4 to eliminate the presence of disturbances, subsequently evaluating the presence of unit root and individual causality relationships that support the application of simultaneity that requires a VAR according to Urdaneta and Borgucci (2019) and Court and Rengifo (2011).

In the period under study, the real GDP per capita variable oscillates between $3822.51 and $4995.07, reaching a maximum value of $5165.67 and a minimum value of $3133.35. Likewise, the real productive credit per capita fluctuates between $595.96 and $1032.40,

achieving a maximum amount of $1161.40 and a minimum of $407.57. The demand for money per capita varies in a similar amount, between $15095.93 and $31096.07, achieving a maximum value of $39948.38 and a minimum value of $11579.56. Finally, the total deposits per capita oscillate between a maximum value of $2089.32 and a base value of $620.90, fluctuating between $893.83 and $1721.31.

Of these four variables considered as shown in Table 2, three of them show similar average values: the growth rate of productive credit per capita (TCCPPC), the growth rate of M2/P per capita (TCDMPC), and the growth rate of total deposits per capita (TCDTPC), which oscillate between 2.01 and 2.16%. This is not the case for the growth rate of real GDP per capita (TCPIBRPC), which exhibits an average value of 0.59%. This is much lower than the rest of the variables analyzed, whose deviation levels oscillate ±1.68% concerning their average, with a maximum amount of 4.41% and a minimum of −3.34%, which is the explained variable for this study.

The explanatory variable in the case of the TCCPPC is the one that shows the greatest volatility between −17.88% (minimum) and 26.82% (maximum) with a standard deviation of ±6.44%. Conversely, TCDMPC and TCDTPC oscillate in a very similar way to their average with 2.86 and 3.60%, with maximum rates of 9.52 and 10.27%, and minimum rates of −6.75% and −8.99%. Table 3 shows significant degrees of linear association at both 1 and 5% bilateral significance, both in absolute terms and in their growth rates, between the explained variable, real GDP per capita, and the explanatory variables.

The selected period coincides with significant changes in the Ecuadorian political and institutional context, beginning with the substitution of President Lucio Gutiérrez for an almost 11-month interim term of Dr Alfredo Palacio González, the electoral triumph of Rafael Correa Delgado—who governed between January 15, 2007 and May 24, 2017—and the electoral triumph of Lenín Moreno Garcés, who ruled until May 2021. In that period, the country sanctioned and put into effect the new Constitution of the Republic in 2008, which was reformed in 2013 after a series of major institutional changes took place and the country experienced a period of increased income from exports of its main productive items, followed by a sustained drop in the same products after 2008, among other reasons, due to the crisis in the financial markets in the Western world.

In the second stage, we proceeded to (1) carry out a sensitivity and covariance analysis between the explanatory and explained variables of the VAR model to determine the

	N	Min	Max	Mean	SD
Real GDP per capita	60.00	3133.35	5165.67	4408.79	586.28
Real productive credit per capita	60.00	405.57	1161.40	814.18	218.22
Money demand per capita M2/P	60.00	11579.56	39948.38	23096.00	8000.07
Total deposits per real capita	60.00	620.90	2089.32	1307.57	413.74

Source(s): Central bank of Ecuador

Table 1.
Descriptive statistics

	N	Min	Max	Mean	SD
Real GDP per capita growth rate	59	−3.34%	4.41%	0.59%	1.68%
Growth rate of productive credit per capita	59	−17.88%	26.82%	2.01%	6.44%
Growth rate of M2/P per capita	59	−6.75%	9.52%	2.16%	2.86%
Growth rate of total deposits per capita	59	−8.99%	10.27%	2.14%	3.60%

Source(s): Central bank of Ecuador

Table 2.
Descriptive statistics of growth rate variables

		GDP per capita (real)	Productive credit per capita	Money demand per capita M2/P	Total deposits per real capita
GDP per capita (real)	Pearson Correlation	1	0.882**	0.780**	0.873**
	N	60	60	60	60
		Real GDP per capita growth rate	Growth rate of productive credit per capita	Growth rate of M2/P per capita	Growth rate of total deposits per capita
Real GDP per capita growth rate	Pearson Correlation	1	0.263*	0.334**	0.429**
	N	59	59	59	59

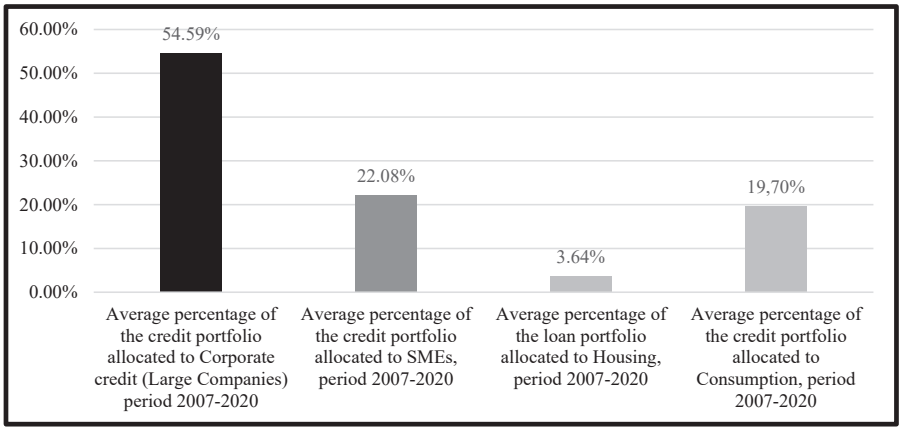
Note(s): *p-value <0.05
**p-value <0.01
Source(s): Central bank of Ecuador

Table 3.
Bivariate correlations between the variables considered as well as their growth rates

existence of any long-term relationship between them using the Johansen (1995) co-integration test; and (2) through the filter of Hodrick and Prescott (1997) each variable subject to study was evaluated by the cyclical components of the time series considered. In a third stage: (1) tests were carried out on the impulse response function and decomposition of the variance to assess the response of real GDP per capita to the impulse caused by real productive credit per capita directed to the private sector, total deposits per capita, and the demand for money per capita on a logarithmic basis; and (2) it was necessary to calculate the percentage of the estimation error of the real GDP per capita that is explained by the error of the remaining endogenous variables of the VAR model.

4. Results and discussion

On average in the study period, 54.59% of the credit portfolio of Ecuadorian banking (Figure 1) has been destined, on the one hand, to (1) productive credit operations granted to natural persons obliged to keep accounts, or persons or legal entities that register annual



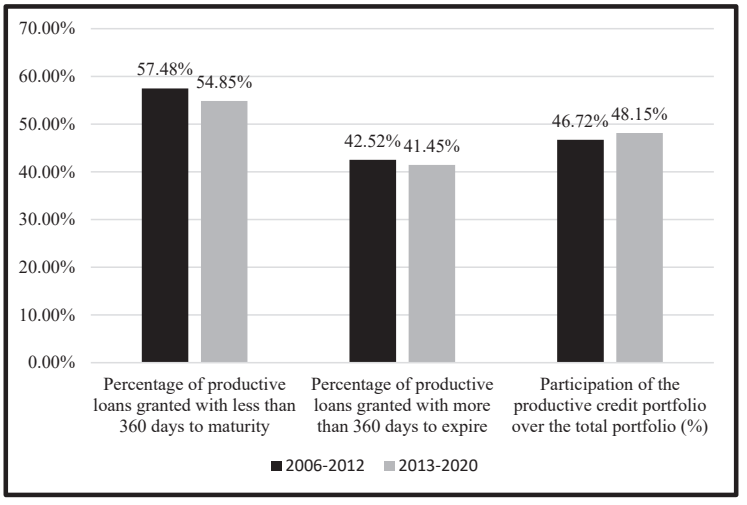
Source(s): Central Bank of Ecuador

Figure 1.
Structure of the credit portfolio in the Ecuadorian bank for the period 2007–2020

sales greater than $5,000,000.00; (2) priority productive and commercial credit operations granted to natural persons obliged to keep accounts or legal entities that register annual sales greater than $1,000,000.00 and up to $5,000,000.00; and (3) commercial credit operations granted to natural persons obliged to keep accounts or to legal entities that register annual sales greater than $1,000,000.00, intended for the acquisition or commercialization of light vehicles, including those for productive and commercial purposes.

On the other hand, 22.08% of the credit portfolio was allocated to (1) productive and commercial credit operations granted to natural persons obliged to keep accounts or to legal entities that register annual sales of more than $100,000.00 and up to $1,000,000.00; (2) operations granted to credit applicants whose balance owed in microcredits to the entity of the National Financial System is less than or equal to $1,000.00, including the amount of the requested operation; (3) operations granted to credit applicants whose balance owed in microcredits to the entity of the National Financial System is greater than $1,000.00 and up to $10,000.00, including the amount of the requested operation; (4) operations granted to credit applicants whose balance owed in microcredits to the entity of the National Financial System is greater than $10,000.00, including the amount of the requested operation and productive credit operations granted to natural persons obliged to keep accounts or legal entities that record annual sales of more than $100,000.00 to finance agricultural and livestock farming activities (BCE, 2020).

In Figure 2, all the indicators show very similar behavior throughout the entire period under study, but what stands out is that most of the productive credits mature in less than 360 days, between 57.48 and 54.85% on average in the two periods analyzed, revealing that most of the financing is short-term. Conversely, between 42.52% for the 2006–2012 period and 45.15% for the 2013–2020 seven-year period of total productive credits granted to natural persons obliged to keep accounts or legal persons for a period of more than one year to finance productive projects whose amount, at least 90%, is destined for the acquisition of capital goods, land, infrastructure construction and purchase of industrial property rights. However, the participation of these loans in the total loan portfolio ranged between 46.27 and 48.25% for the seven years analyzed.



Source(s): Superintendency of Banks

Figure 2.
Structure of the maturing credit portfolio and participation of productive credits in the total portfolio of the Ecuadorian bank for the period 2006–2020

To develop the VAR model, coefficients of elasticity and covariances were estimated (Table 4) and unit root tests (Augmented Dickey–Fuller test or ADF) were conducted on all variables (Table 5). Initially, they were logarithmically transformed and then differenced (into growth rates) as they all turned out to exhibit non-stationary stochastic processes at the Enders level (2015). This approach solved the non-stationarity problem.

Table 4 shows, in the case of covariances, a positive dependency relationship between the explained variable and the explanatory variables of the model. However, in the sensitivity analysis, conditions of inelasticity are shown between the variables productive credit per capita, money demand per capita M2/P, and total deposits per real capita and real GDP per capita, demonstrating the low sensitivity of the deposit rate. The effect of GDP growth on the growth rate of monetary aggregates is evident only in the short term.

Regarding the unit root tests shown in Table 5, all the variables of the model are the growth rate of productive credit per capita (TCCPPC), the growth rate of M2/P per capita (TCDMPC), the growth rate of total deposits per capita (TCDTPC) and the growth rate of real GDP per capita (TCPIBRPC). When taking them to the first difference of the logarithm (growth rate), all are stationary at 1%, 5 and 10% of the critical values. To build a VAR that starts from the assumption that an economy where economic dynamics facilitate access to productive credit, which increases the demand for money and, at the same time, the deposits received by banks, these have more or less significant effects, both in the short term and in the long term.

Subsequently, the exogeneity test was carried out in a block of precedence in the sense of Granger. The essential element of this type of chance is the flow of information between the two variables under analysis. For this reason, the Granger informative causality test tries to contrast the marginal contribution of the past information of the causative variable on the caused variable once the corresponding lags of this last variable are incorporated as regressors. If the β coefficients are null, it could be affirmed that the causal variable does not produce a significant informative effect on the variable caused in equations 1 and 2.

$$y_t = \alpha_{+0}\alpha_1 y_{t-1} + \ldots + \alpha_j y_{t-j} + \beta_1 x_{t-1} + \ldots + \beta_j x_{t-j} + \varepsilon_t \quad (1)$$

$$x_t = \alpha_{+0}\alpha_1 x_{t-1} + \ldots + \alpha_j x_{t-j} + \beta_1 y_{t-1} + \ldots + \beta_j y_{t-j} + \varepsilon_t \quad (2)$$

Table 4. Covariances and elasticities between variables

Real GDP per capita	Covariance	112786.78	3658302.15	211797.46
	Elasticity coefficient	0.44	0.34	0.37
	N	60.00	60.00	60.00

Source(s): Central bank of Ecuador

Table 5. Dickey–Fuller unit root test augmented (DFA)

	GDP per capita growth rate		Growth rate of total deposits per capita		Growth rate of money demand (M2/P) per capita		Growth rate of productive credit per capita	
Test critical values	*t*-stat	Prob*	*t*-stat	Prob*	*t*-stat	Prob*	*t*-stat	Prob*
	−4.5022	0.0036***	−5.846	0.0000***	−4.5158	0.0035***	−8.2828	0.0000***
1% level	−4.1372		−4.1242		−4.1408		−4.1242	
5% level	−3.4952		−3.4892		−3.4969		−3.4892	
10% level	−3.1766		−3.1731		−3.1775		−3.1731	

Note(s): Includes 57 observations. **p-value <0.05, ***p-value <0.01
Source(s): Prepared by the authors

Regarding this study, Table 6 shows that the probability (Prob. = 0.6945 ˃ 0.05) for the variable causing the growth rate of real productive credit per capita to the variable caused by the growth rate of Real GDP per capita shows that there is no causal precedence relationship, so the VAR (Vector Autoregressive) model assumes the variable growth rate of real productive credit per capita as an exogenous variable to the model; however, the result of the block test returns a probability (Prob. = 0.0000 ˂ 0.05). As can be seen in the final part, when using only 2 lags for the model variables, a bidirectional or simultaneous endogeneity relationship is established between the growth rates of real GDP per capita, total real deposits per capita, and per capita money demand.

The VAR lags were determined by the VAR lag order selection criteria test, assuming the criteria of SC: Schwarz information criteria and HQ: Hannan-Quinn information criteria, see Table 7.

Finally, Table 8 presents the autoregressive vector composed of four integrated endogenous variables of order 1, where $R2 = 0.6839$ (Determination Coefficient) for the variable real GDP per capita growth rate, indicating that the SVAR model explains 68.39% of its total variance, and an $R = 0.83$, representing a degree of linear association of 82.70% whose equation is:

$$TCPIBRPC_t = 0,70(TCPIBRPC_{t-1}) + 0,32(TCDTPPC_{t-1}) - 0,44(TCDMPC_{t-1}) - -0,03(TCCPPC_{t-1}) - 0.004294 \quad (3)$$

At the same time, the inverse roots of the characteristic polynomial shown in Figure 3 illustrate that the estimated SVAR is stable (stationary) if all the roots have a module less than

Dependent variable: TCPIBRPC

Excluded	Chi-square	df	Prob.
TCDMPC	19.4010	2	0.0001
TCDTPC	9.07479	2	0.0107
TCCPPC	0.7292	2	0.6945
All	37.3733	6	0.0000
TCDMPC	18.4628	2	0.0001
TCDTPC	8.8343	2	0.0121
All	33.6015	4	0.0000

Note(s): Includes 57 observations
Source(s): Prepared by the authors

Table 6. Block exogeneity test of precedence in the granger sense

Endogenous variables: TCPIBRPC TCDTPPC TCDMPC TCPPC
Exogenous variables: C
N: 54

Lags	LogL	LR	FPE	AIC	SC	HQ
0	4.785.440	NA	2.74e−13	−1.757.570	−1.742.837	−1.751.888
1	5.246.990	8.376.273	8.97e−14	−1.869.255	−17.95589**	−18.40845**
2	5.380.919	2.232.158	9.99e−14	−1.859.600	−1.727.001	−1.808.462
3	5.593.033	3.220.992	8.45e−14	−1.878.901	−1.687.369	−1.805.035
4	5.795.451	27.73870**	7.59e−14**	−18.94611**	−1.644.147	−1.798.017
5	5.889.985	1.155.422	1.05e−13	−1.870.365	−1.560.967	−1.751.043

Note(s): Includes 57 observations. ***p*-value <0.05; ****p*-value <0.01
Source(s): Prepared by the authors

Table 7. VAR lag order selection criteria

	TCPIBRPC	TCDTPPC	TCDMPC	TCCPPC
TCPIBRPC(−1)	0.6983	−0.1571	−0.0098	0.2840
	−0.0925	−0.3269	−0.2614	−0.6110
	[7.5428]	[−0.4808]	[−0.0377]	[0.4648]
TCDTPPC(−1)	0.3175	0.8512	0.5433	0.6136
	−0.0769	−0.2717	−0.2173	−0.5079
	[4.1256]	[3.1324]	[2.5000]	[1.2081]
TCDMPC(−1)	−0.4398	−0.9122	−0.7593	−1.250.966
	−0.0908	−0.3207	−0.2565	−0.5996
	[−4.8416]	[−2.8436]	[−2.9598]	[−2.0863]
TCCPPC(−1)	−0.0262	0.799	0.979	−0.0389
	−0.0210	−0.0742	−0.0593	−0.1387
	[−1.2496]	[1.0773]	[1.6497]	[−0.2807]
C	0.042	0.223	0.244	0.323
	−0.0016	−0.0056	−0.0045	−0.0105
	[2.6761]	[3.9376]	[5.3977]	[3.0565]
R-square	0.6839	0.1744	0.1668	0.1016
Adj, *R*-square	0.6600	0.1121	0.1039	0.0338
F-stat	2.867.278	2.800.499	2.653.035	1.498.642
log probability	1.894.030	1.162.329	1.291.916	7.995.643
Akaike AIC	−6.358.724	−3.835.619	−4.282.469	−2.584.704
Schwarz SC	−6.181.100	−3.657.995	−4.104.845	−2.407.080
average dependent	0.0054	0.0210	0.0214	0.0196
S, D, dependent	0.0165	0.0362	0.0288	0.0648

Table 8.
Estimation of the autoregressive vector

Note(s): Includes 57 observations. **. *p*-value <0.05; ***. *p*-value <0.01
Source(s): Prepared by the authors

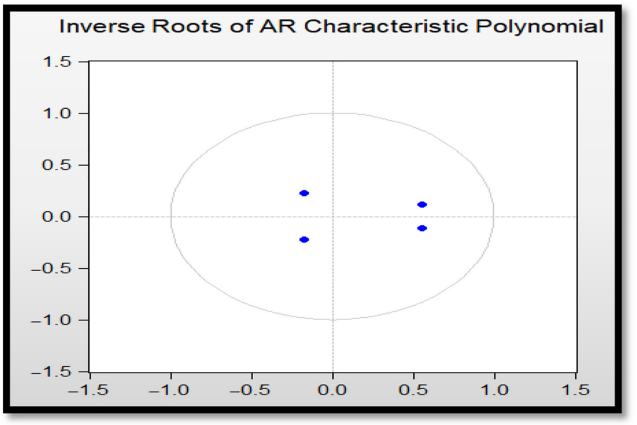
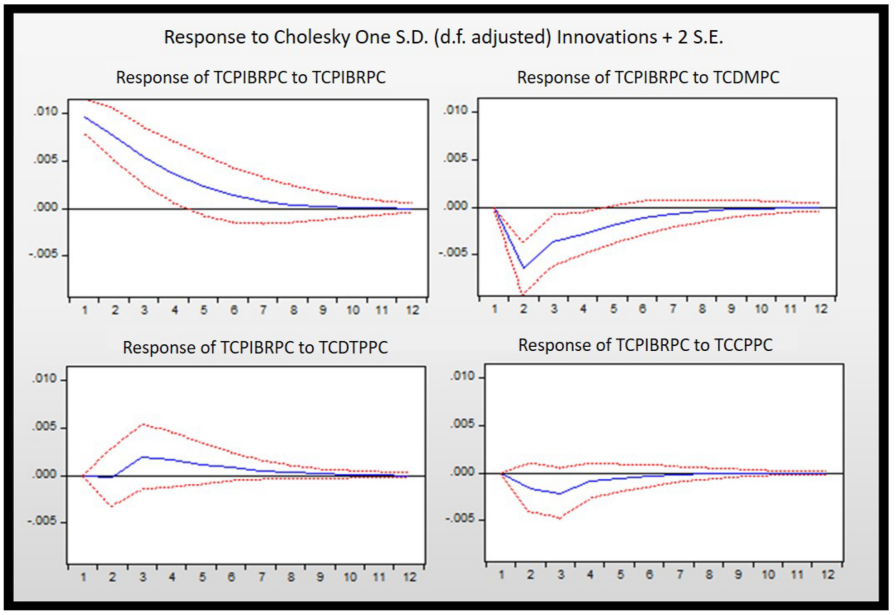


Figure 3.
Inverse root of the autoregressive characteristic polynomial

Source(s): Prepared by the authors; includes 57 observations

one and lie inside the unit circle. This does not denote explosive behavior of the IRF (impulse response function) in the face of innovations in the model variables. The presence of unit roots in its moving average representation is also ruled out, and therefore, the possibility that some component of the model (endogenous variables) is not cointegrable in the long term.

The impulse response function shown in Figure 4 indicates that the variable real GDP per capita growth rate only responds positively in the short term, for no more than four-quarters, to innovations or prior shocks of itself (Figure 4), which ends up disappearing in time. This does



Source(s): Prepared by the authors; includes 57 observations

Figure 4.
Impulse response function

not occur with the rest of the endogenous variables. For instance, the growth rate of money demand (M2/P) per capita whose effect is negative and lasts only two-quarters ends up diluting over time (Figure 4). Additionally, innovations in the endogenous variables real total deposits per capita and productive credit per capita have a null effect on the growth rate of real GDP per capita (Figure 4). This analysis is exposed according to what was indicated by Cavaliere (2004).

In Table 9, for the variance decomposition test, it can be seen that 100% of the forecast error of the real GDP per capita growth rate is explained by its errors at the beginning of the series. However, after the tenth period, the growth rate of total deposits per capita, money demand (M2/P) per capita and productive credit per capita explain 3.24% with their forecast errors; 23 and 2.85% of the forecast errors in the real GDP per capita growth rate, i.e. 29.09%. This indicates that uncertainty in predicting real GDP per capita growth rate comes essentially from their shocks. This result suggests that the aforementioned variable is the least endogenous compared to the others. This does not mean that the SVARs are poorly modeled or identified, since it is common for some variables to be less endogenous than others (Hamilton, 1994).

When applying the Johansen (1995) co-integration test, as shown in Table 10, several co-integration equations are evidenced by both the trace method and the maximum eigenvalues method, with a significance level of 5% and an interval of 1–2 lags. Using the Akaike Information Criteria by Rank (rows) and Model (columns) criteria, the model of equation 4 was selected, which is linear without intercept and trend, and the presence of 4 co-integration equations is indicated. Both using the method of the traces and by the method of maximum eigenvalues, this interpretation is carried out. So, the co-integration vector is:

$$TCPIBRPC = 4,14(TCDPTPC) - 4,11(TCDMPPC) - 0,06(TCCPPC) \quad (4)$$

Most time series are non-stationary, and conventional regression techniques based on non-stationary data tend to produce spurious results. However, non-stationary series can be co-integrated if some linear combination of the series becomes stationary. That is, in the long

Period	S.E.	TCPIBRPC	TCDTPPC	TCDMPC	TCCPPC
1	0.0096	100	0	0	0
2	0.0139	77.9972	0.0168	20.6853	1.3005
3	0.0157	73.9872	1.5812	21.5635	2.8680
4	0.0164	72.3208	2.4391	22.3831	2.8568
5	0.0168	71.4679	2.8782	22.7931	2.8606
6	0.0169	71.1173	3.0982	22.9274	2.8569
7	0.0169	70.9817	3.1877	22.9782	2.8522
8	0.0169	70.9334	3.2212	22.9949	2.8503
9	0.0169	70.9177	3.2327	22.9998	2.8496
10	0.0169	70.9131	3.2363	23.0011	2.8493

Note(s): Includes 57 observations
Source(s): Prepared by the authors

Table 9.
Variance decomposition

Series: TCPIBRPC TCDTPC TCDMPC TCCPPC					
Data trend	None	None	Linear	Linear	Square
Type of test	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Trazas	4	4	4	4	4
Max-Eig	4	4	4	4	4

Note(s): *Breakpoints based on MacKinnon *et al.* (1999) includes 57 observations
Source(s): Prepared by the authors

Table 10.
Johansen co-integration test

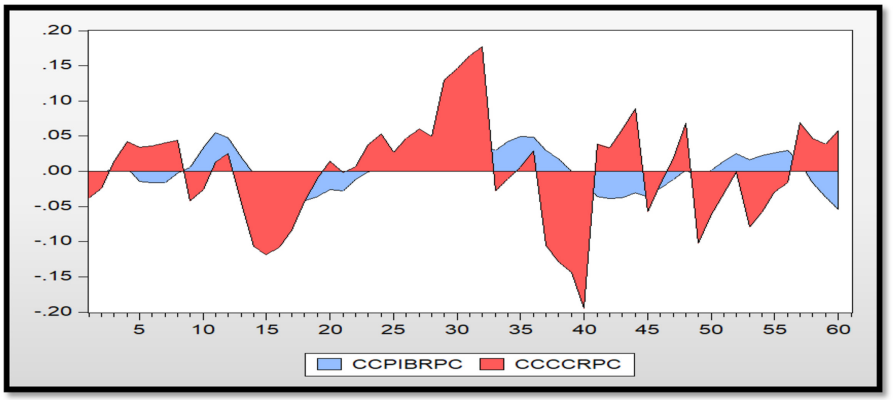
term, there are economic forces that tend to stimulate it to an equilibrium. Therefore, the co-integrated series will not be far apart from each other because they are related in the long run (Johansen, 1995).

Johansen (1995) points out that two or more series are co-integrated if they oscillate together over time and the differences between them are stable (that is, stationary), even when each particular series contains a stochastic trend and is therefore not stationary. Hence, co-integration reflects the presence of a long-run equilibrium toward which the economic system converges over time. The differences (or error term) in the co-integration equation are interpreted as the imbalance error for each point in time. The foregoing allows us to conclude, for this study, that productive credit, money demand, deposits, and GDP in per capita terms are co-integrated in the long term, that is, they oscillate together over time in a balanced manner.

Figure 5 shows the cyclical component of the variables real GDP per capita and real productive credit per capita, whose purpose is to show the covariation of both variables, for which the Hodrick-Prescott filter was applied. The measurements made allowed us to conclude the nature—procyclical in some cases and countercyclical in others—of the cyclical components of productive credit per capita (CCCPPC) with respect to the cyclical component of real GDP per capita (CCPIBRPC) in the long term. Thus, it shows that expansionary cycles in the economy do not necessarily obey expansionary credit cycles.

5. Conclusions

The existing banking system in Ecuador, through its credit policy, does not turn out to be a determining factor in the growth rate of real GDP per capita, as revealed in Figure 2, because



Source(s): Prepared by the authors; includes 57 observations

Figure 5.
Cyclical components of capita productive credit and per capita GDP

most of the productive credit portfolio matures in the short term, in less than 360 days. The causality test in the Granger sense, at the individual level, shows that there is no simultaneity relationship between productive credit per capita and GDP per capita, but not with the rest of the model variables. In the VAR model and the long-term co-integration equation, it shows a negative relationship between productive credit and per capita money demand with per capita GDP. Finally, Figure 5 shows that expansionary cycles in the economy do not necessarily obey expansionary credit cycles.

The aforementioned behavior is based on the following: family savings are not enough to leverage large-scale investments; profitable productive activities are very limited; the vast majority of the companies organized in the country correspond to the tertiary sector of the economy; although they require investments, these are mainly to address their intermediation activities and their growth is subject to the greater demand for the intermediated good.

On the other hand, the Ecuadorian banking system, as in the vast majority of Latin American countries, is not an environment with a large presence of investment banking (Ramírez, 2016), with a primary and secondary market for incipient securities, since the investment of productive capital is initially generated in the primary securities market and continues its path in the secondary market (the so-called stock market). Commercial banking, as it is commonly known, is subject to legislation that obliges it to collect money in the short term—current accounts, savings accounts, and term deposits—called sight deposits, including deposits made by customers. For example, money withdrawal is a random variable, and the bank must have sufficient liquidity to meet the demand at the counter.

This means that the composition of its mass of deposits used to generate financial income is not sufficient to lend it in the long term, since doing so would compromise both the liquidity and the solvency of the financial intermediary. Consequently, the bank is constrained to lend in the short term. The results seem to suggest that if there is an increase in credit for gross domestic product, it can be attributed more to the component related to working capital than to net investment or what Lehotzkty (2021) calls non-productive credits (finance, insurance, and real estate).

Another relevant result is how the growth rate of money demand (M2/P) per capita and the growth rate of total real deposits per capita do show a bidirectional causal relationship with gross domestic product. That is, both the money supply and public deposits per capita affect gross domestic product, and gross domestic product affects both money demand and public deposits per capita. By the above, the problem of the "causality dilemma" could be presented in this circular argument.

Thus, in a first line of reasoning in which the growth of M2 per capita affects the growth of GDP, then the growth of GDP affects the growth of deposits per capita, and it is concluded that the growth of M2 per capita affects the growth of deposits per capita. In a second line of reasoning, we have that the growth of M2 per capita affects the growth of deposits per capita; a second premise would be that the growth of deposits affects the growth of GDP, and it is concluded that the growth of M2 per capita affects GDP growth.

The Ecuadorian State should encourage the financial system to promote legislation that allows the entry of foreign banks that increases competitiveness with local banks to stimulate productive credits (credits in non-financial businesses and consumer credit) (Bezemer *et al.*, 2017). In addition, the new law should allow the organization of banks or public funds for long-term investment so that they can work with foreign investment banks in the so-called pools of funds for large investments in productive facilities. Finally, commercial legislation should adopt expeditious practices in the resolution of conflicts of a commercial-financial nature; the promotion of a primary capital market should be adapted to the needs of the national economy.

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