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Central Bank Balance Sheet Policies and Crowding-Out Effect: Evidence from Lower-Middle Income Economies

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“Macroeconomic policy can never be devoid of politics: it involves fundamental trade-offs and affects different groups differently.”

– Joseph Stiglitz

Abstract

This study delves into the role that the central bank’s balance sheet policy might play in the crowding-out effect of government financing on private credit in lower-middle-income economies (LMIEs). The paper finds a negative relationship between banks’ credit to the private sector and their holdings of government securities. This crowding-out effect reflects a shift in banks’ portfolios toward more secure and liquid public assets during times of crisis. Furthermore, I find that the central bank’s balance sheet policy has a positive effect on banks’ holdings of government securities. This result can be explained by the weak credit market institutions prevalent in LMIEs.

Keywords: Central Bank Balance Sheet; Crowding-Out Effect; Government Securities; Private Credit; Lower-Middle Income Economies; Panel VAR.

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1 Introduction

In recent years, developing markets have been subject to various internal and external crises, which have led to high public debt, budget deficits, and rising borrowing costs. Fiscal deficits increased to about 5 percent of GDP in 2016 from around 1 percent of GDP in 2007 among emerging markets and developing economies, while public debt rose to 47 percent of GDP from 35 percent of GDP over the same period (IMF, 2017). Many lower-income economies (LIEs) are facing a high risk of, or are already in, debt distress. Median public debt in LIEs increased persistently beginning in 2011, with foreign currency being the fastest-growing source of financing for frontier LIEs, mainly in sub-Saharan Africa. Their issuance of Eurobonds rose almost threefold, from an average of \$6 billion per year in 2012-2016 to about \$16 billion per year throughout 2017-2018 (IMF, 2020).

In the last decade, a vast amount of literature has been dedicated to studying the impacts of higher debt on economic growth (Reinhart and Rogoff, 2010; Baum et al., 2013). When a country with a high level of sovereign debt faces a crisis, its ability to respond is severely impeded (Jordà et al., 2014). Besides, higher levels of debt can lead to lower growth. The more the government taps into the finite pool of financial resources (loanable funds), the less capital is available to private firms, which pushes up their borrowing cost, primarily crowding out private investment (Spencer and Yohe, 1970). The public sector can claim private savings which could otherwise have been employed in the private credit market (Hanson, 2007; Borensztein et al., 2008; Presbitero, 2012).

In theory, the relationship between public borrowing and private credit has been debated for a long time. It has been argued that domestic debt market development can be beneficial only if a stable macroeconomic environment, political certainty, and a developed financial system exist (Presbitero, 2012). In most countries, it is difficult to issue long-term debt at reasonable prices. A second major concern about domestic debt growth is the crowding-out effect it can have on private sector borrowing. Bua et al. (2014) argue that the crowding-out effect will be greater in low-income countries, where the investor base is concentrated in commercial banks and central banks.

Domestic government borrowing may affect the private sector by crowding out credit, both directly and indirectly through higher interest rates. Abbas and Christensen (2007) argue that when governments borrow domestically, they tend to use domestic private savings that would have been available for loans to the private sector; this can decrease loanable funds and raise the cost of capital for private borrowers. Domestic borrowing by governments is common in both developed and developing economies (Zaheer et al., 2019). Guidotti and Kumar (1991) show that the domestic public debt-to-GDP ratio in 15 emerging market countries increased from 10 percent to 16 percent between 1981 and 1988. The increase in domestic debt is mainly due to new borrowing, while the rise in external debt is related to the accumulation of arrears. Christensen (2005) shows that low-income sub-Saharan African countries have a tradition of

domestic borrowing. According to Abbas and Christensen (2007), bank ownership of public debt in emerging nations climbed from 7.8% of GDP in 1975-1985 to 14.3% in 1996-2004. In low-income nations, bank holdings of public debt increased from 5.5 percent of GDP to 8.4 percent of GDP. Most observers find that banks are the primary holders of government bonds in emerging market countries. This is regarded as a source of vulnerability and a warning that government debt drives out private-sector financing. Bouis (2019) investigates this relationship and finds that higher bank holdings of public debt are connected with both higher returns on banking sector assets and lower private sector loan growth.

The central bank's balance sheet policy has played an eminent role in financial history, especially during crises. From very early on, central banks were given the role of lender of last resort. During times of financial difficulty, their ability to create monetary liabilities is often exploited to provide liquid assets to the banking system. This was particularly the case during the various recent crises in lower-middle-income economies (LMIEs), when central banks used their balance sheet policy to provide banks with more liquidity, attempting to stimulate economic activity. This policy consists of increasing the size of the central bank's balance sheet through the monetary base while keeping constant the liquidity and the average risk of its assets. The objective is to provide banks with more liquidity and encourage lending and investment. In Issaoui and Nabi (2020), the impacts of central banks' liquidity injections on banks' credit supply are examined in LMIEs over the period 1975 until 2017. The empirical results show that liquidity injections had a negative impact on credit while they had a persistent positive impact on banks' liquid reserves.

The aim of the present study is to analyze whether the central bank's balance sheet policy influences the crowding-out effect of public finance on credit to the private sector. This might occur through the portfolio rebalancing of banks towards safer, more liquid public assets in stress times at the detriment of private credit. To do this, I first estimate the relationship between banks' holdings of sovereign debt and private credit growth using a panel data equation. Secondly, I analyze the dynamic interactions between the central bank's balance sheet policy and banks' holdings of government securities using a panel VAR framework. The ultimate objective is to respond to the following question:

Does the central bank's balance sheet policy intensify the crowding-out effect of public investment on private credit in LMIEs?

This paper contributes to the literature on several fronts. First, besides analyzing the relationship between banks' holdings of domestic sovereign securities and credit growth to the private sector, I evaluate the impact of the central bank's balance sheet policy on the crowding-out effect. To our knowledge, this relationship has not been studied before in the context of LMIEs. Second, I cover a large scope of LMIE economies as long as data are available. This allows us to utilize available information for most LMIE economies and ensure that the results are consistent across countries. The rest of the paper is organized as follows. Section 2 provides

a literature review. Section 3 describes the data. Then, in Section 4, I present the empirical approach and the results. Finally, Section 5 provides policy recommendations and concludes.

2 Literature Review

The impact of government domestic borrowing on private sector credit has long been a topic of study. According to Becker and Ivashina (2018), the government employs financial repression policies to shift domestic financial intermediaries' savings toward the financing of public debt. This can be accomplished through regulation, direct bank control, or moral persuasion. Broner et al. (2014) argue that the purchase of domestic sovereign bonds crowds out bank credit to the private sector. Indeed, domestic banks find it difficult to obtain credit from abroad at times of sovereign stress while, in addition, they absorb a larger share of sovereign issuances.

Popov and van Horen (2015) discovered that banks exposed to stressed eurozone sovereign bonds increased syndicated loan lending substantially less than non-exposed banks. According to ?, lenders' exposure to government debt has a major impact on their lending to the private sector in troubled eurozone countries. In compliance with ?, bank holdings of sovereign bonds are connected with a decrease in lending after sovereign defaults. In Egypt, Fayed (2013) studies the impact of public borrowing on crowding out private investment. He discovers that government financing from domestic banks crowds out private lending due to the high-risk diversification effect of the banks' portfolios' availability of secure public assets. Khan and Gill (2009) use a vector error correction model (VECM) to study the possibility of crowding out of public borrowing. The findings underscore the crowding-in effect, which explains why public expenditure is being directed toward the private sector via entrepreneurs, legislators, and bureaucrats rather than public enterprises.

Bounader (2016) investigates the crowding-out effect in Morocco, focusing on the relationship between interest rates and government spending. The vector autoregression (VAR) model's impulse response analysis results demonstrate that such an effect does not exist. Infrastructure, communication, and welfare spending appear to be laying the groundwork for a modern economy that will attract private investment, and the result will not be achieved in the immediate short term. Christensen (2005) documents the existence of a crowding-out effect on private sector borrowing for 27 sub-Saharan countries over the period 1980–2000. The author also shows that government debt with short maturity is a source of rollover risk and macroeconomic instability. Aguilar et al. (2008) study the interplay between public debt and the corporate bond market in Colombia. Their evidence suggests that the larger the treasury bond market, the lower the probability that a firm will demand financing in the market, indicating that crowding-out effects dominate in this country. Other studies have looked at the relationship between public and private bonds in the international bond markets. Ağca and Celasun (2012) document that corporations face higher borrowing costs when the external debt of the public sector is higher. Dittmar and Yuan (2008) also pay attention to how corporate bond prices may be impacted

by sovereign bond prices. Their results, controlling for the indigeneity of market-timing decisions, show that the issuance of sovereign bonds reduces corporate yield and bid-ask spreads and acts as a benchmark. Becker and Ivashina (2018) find that many European firms issuing debt switched away from banks' loans into bond financing as European banks were expanding their holdings of domestic sovereign debt between 2007 and 2015.

3 Data and Stylized Facts

Our dataset is comprised of yearly macroeconomic and financial variables for 31 LMIEs (Appendix 2.A) and covers the period from 1990 to 2019. The central bank's balance sheet policy is calculated by the ratio of central bank assets to GDP. I also employ the ratio of domestic credit to the private sector (% of GDP) to control for credit. Finally, I use commercial banks' claims on the domestic government to control for banks' holdings of domestic government securities. The data used in this paper are drawn from the World Bank database and from the International Financial Statistics of the IMF. Figures (Appendix 2.B) show a clear negative relationship between the growth of private sector credit and the growth of banks' holdings of government securities for lower-middle-income countries.

In recent years, banks' claims on governments have increased in several economies, probably reflecting lower buffers and more limited external financing options of the governments in these countries. While government debt may be an important factor in banks' holdings of government securities, the relationship between the two variables is not particularly robust. In the following section, I first estimate the relationship between banks' holdings of government securities and private credit growth using a panel data equation. Secondly, I analyze the dynamic interactions between the central bank's balance sheet policy and banks' holdings of government securities using a panel VAR framework.

4 Empirical Analysis

4.1 The Relationship Between Banks' Holdings of Sovereign Debt and Private Credit Growth

This section presents the empirical methodology and results to examine the effect of banks' holdings of sovereign debt on private credit. I use the following dynamic panel data equation, controlling for traditional determinants of credit to the private sector. Following Guo and Stepanyan (2011), to address reverse causality issues and the lag effects on credit growth of some variables, I use one-year lagged variables:

$$\begin{aligned}
\text{Credit}_{it} = & \beta_0 + \beta_1 \text{Credit}_{it-1} + \beta_2 \text{BClaims}_{it} + \beta_3 \text{Gdp}_{it-1} + \beta_4 \text{DR}_{it-1} + \beta_5 \text{CreditD}_{it-1} \\
& + \beta_6 \text{BNPL}_{it-1} + \beta_7 \text{PubInv}_{it-1} + \beta_8 \text{PubDebt}_{it-1} + \beta_9 \text{LiquidR}_{it} \\
& + \beta_{10} \text{Inf}_{it} + \varepsilon_{it}
\end{aligned} \tag{1}$$

where $\varepsilon_{it} = \mu_i + \lambda_t + \nu_{it}$, $i = 1, \dots, N$, $t = 1, \dots, T_i$. Here ε_{it} is a general disturbance, including a country-specific unobservable effect μ_i , a time-specific factor λ_t , and an idiosyncratic disturbance ν_{it} .

Table 1: Variable Definitions

Variable	Definition	Sources
Credit	Domestic credit to private sector by banks: financial resources provided to the private sector by other depository corporations (deposit taking corporations except central banks)	World Bank Global Financial Development database
BClaims	Commercial banks' net claims on the domestic government	IFS databases
Gdp	Annual growth rate of real GDP	World Bank Global Financial Development database
DR	Interest rate on deposits	World Bank Global Financial Development database
CreditD	Credit-to-total deposits: measures bank liquidity by dividing total loans disbursed by total deposits received	World Bank Global Financial Development database
BNPL	Non-performing loans as a share of total loans	World Bank Global Financial Development database
PubInv	Public gross fixed capital formation in percent of GDP	World Bank database and author's estimations
PubDebt	General government gross debt as a share of GDP	IMF Global Debt Database; World Bank
Inf	Growth rate of the average consumer price index	World Bank Global Financial Development database
LiquidR	Bank liquid reserves to bank assets ratio (%): ratio of domestic currency holdings and deposits with the monetary authorities to claims on other governments, nonfinancial public enterprises, the private sector, and other banking institutions	WEO database; United Nations National Accounts

Using different specifications and estimation techniques, I aim to empirically examine the relationship between credit and banks' holdings of sovereign debt for a sample of LMICs. I apply the difference GMM estimator proposed by Arellano and Bond (1991) (two-step estimator), on the first difference transform of equation (1):

$$\begin{aligned} \Delta \text{Credit}_{it} = & \beta_1' \text{Credit}_{it-1} + \beta_2' \text{BClaims}_{it} + \beta_3' \text{Gdp}_{it-1} + \beta_4' \Delta \text{DR}_{it-1} + \beta_5' \text{CreditD}_{it-1} \\ & + \beta_6' \Delta \text{BNPL}_{it-1} + \beta_7' \Delta \text{PubInv}_{it-1} + \beta_8' \Delta \text{PubDebt}_{it-1} \\ & + \beta_9' \Delta \text{LiquidR}_{it} + \beta_{10}' \text{Inf}_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

Results of the regressions are reported in Table 2. Using different specifications, the estimates indicate that banks' claims on the government, public debt-to-GDP ratio, nonperforming loans, and the interest rate (proxied by the deposit rate) are negatively and significantly related to private credit growth. Across various specifications, results are broadly similar.

According to the literature, the negative relationship between banks' holdings of government securities and private sector credit growth can be explained by a traditional crowding-out effect of private investment by public investment, or a portfolio rebalancing of banks towards safer and more liquid public assets as the quality of private sector loans deteriorates in stress times.

Table 2: Growth of Banks' Claims on Government and Growth of Credit to Private Sector

	Lower Middle-Income Countries			Upper Middle-Income Countries		
	(1)	(2)	(3)	(1)	(2)	(3)
BClaims	-0.013*** (-4.04)	-0.031*** (-3.22)	-0.033*** (-5.16)	-0.021*** (-7.40)	-0.031*** (-4.20)	-0.023*** (-3.16)
DR, lagged	-0.08*** (3.98)	-0.07*** (3.44)	-0.08*** (4.66)	-0.091*** (3.97)	-0.07*** (3.44)	-0.09*** (4.35)
BNPL, lagged	-0.002*** (-2.85)	-0.03*** (-3.53)	-0.06*** (-3.93)	-0.01*** (-3.44)	-0.05*** (-4.32)	-0.03*** (-3.91)
GDP, lagged	0.027*** (3.77)	0.02 (1.33)	0.078 (1.44)	0.055*** (3.09)	0.021*** (4.26)	0.039*** (3.90)
Credit, lagged	0.002*** (3.50)	0.06*** (3.67)	0.01*** (4.42)	0.01*** (3.30)	0.07*** (3.37)	0.11*** (4.94)
Inf, lagged	-0.002 (-0.04)	-0.03 (-1.22)	-0.031* (-1.78)	-0.02*** (-8.04)	-0.13*** (-8.72)	-0.12*** (-4.16)
PubInv	0.0063 (0.98)	0.044 (1.54)	0.034 (1.45)	0.0056 (0.98)	0.078 (1.12)	0.066 (0.45)
PubDebt, lagged	-0.002*** (-4.91)			-0.003*** (-3.91)		
BDeposits, lagged		0.0067*** (4.97)			0.083*** (3.96)	
LiquidR			0.0088*** (2.98)			0.073*** (3.98)
Wald test	666.12	77.11	86.13	456.23	99.12	675.14
M2 test	0.412	0.512	0.611	0.612	0.655	0.443
Sargan test	0.043	0.051	0.412	0.043	0.052	0.430
Hansen test	0.553	0.665	0.565	0.641	0.660	0.672
Observations	805	805	770	735	790	770
Number of countries	23	23	23	24	24	24

Note: t-Statistics are reported in parentheses. ***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively. For the M2 test for autocorrelation, the null hypothesis is that the errors in the first-difference regression exhibit no second-order serial correlation. For the Sargan test, the null hypothesis is that the instruments used are not correlated with the residuals. For the Wald test, M2 test, Sargan test, and Hansen test, the p-values are reported.

The estimated coefficient of the public investment ratio (row 7) is never significant, while the coefficient on banks' holdings of government securities remains significant. An explanation based on a traditional crowding-out effect is thus ruled out. The negative effect of non-performing loans is significant and robust across various specifications, which may reflect a portfolio rebalancing of banks towards safer and more liquid public assets as the quality of private sector loans deteriorates in stress times. To investigate the relevance of the portfolio rebalancing hypothesis, I analyze in Model (2) the determinants of banks' claims on the government. Using different specifications, I apply the difference GMM estimator proposed by Arellano and Bond (1991) (two-step estimator, Estimation (2)):

$$\begin{aligned} \text{BClaims}_{it} = & \gamma_0 + \gamma_1 \text{BClaims}_{it-1} + \gamma_2 \text{Gdp}_{it-1} + \gamma_3 \text{DR}_{it-1} + \gamma_4 \text{CreditD}_{it-1} + \gamma_5 \text{BNPL}_{it-1} \\ & + \gamma_6 \text{PubInv}_{it-1} + \gamma_7 \text{PubDebt}_{it-1} + \gamma_8 \text{LiquidR}_{it} + \gamma_9 \text{Inf}_{it} + \varepsilon_{it} \end{aligned} \quad (3)$$

where $i = 1, \dots, N$, $t = 1, \dots, T_i$.

Table 3: Determinants of Banks' Holdings of Government Debt

	Lower Middle-Income Countries			Upper Middle-Income Countries		
	(1)	(2)	(3)	(1)	(2)	(3)
BClaims, lagged	-0.003*** (-4.34)	-0.021*** (-5.82)	-0.013*** (-6.11)	-0.031*** (-3.40)	-0.061*** (-5.20)	-0.073*** (-3.33)
DR, lagged	-0.03*** (-4.18)	-0.33*** (-4.14)	-0.12*** (-3.65)	-0.081*** (-3.77)	-0.09*** (-3.34)	-0.08*** (-4.45)
BNPL, lagged	0.002*** (2.85)	0.03*** (3.53)	0.06*** (3.93)	-0.01 (-0.40)	0.05*** (4.32)	0.03*** (3.91)
GDP, lagged	0.033*** (3.44)	0.28 (0.98)	0.028 (1.11)	0.035*** (3.77)	0.051*** (5.46)	0.044*** (4.45)
Credit, lagged	0.011*** (3.46)	0.013*** (4.89)	0.21*** (5.46)	0.14*** (3.34)	0.33*** (4.65)	0.24*** (5.67)
Inf, lagged	-0.011 (-0.01)	-0.34 (-1.12)	-0.31* (-1.78)	-0.033*** (-5.02)	-0.43*** (-4.12)	-0.42*** (-7.16)
PubDebt, lagged	-0.011*** (-4.33)			-0.021*** (-4.23)		
BDeposits, lagged		0.0067*** (4.97)			0.045*** (4.34)	
LiquidR			0.0023*** (3.87)			0.023*** (6.12)
Wald test	543.12	87.41	98.14	546.45	78.18	777.14
M2 test	0.612	0.412	0.512	0.634	0.645	0.456
Sargan test	0.056	0.067	0.345	0.045	0.034	0.045
Hansen test	0.454	0.546	0.347	0.671	0.745	0.543
Observations	700	689	700	600	600	600
Number of countries	23	23	23	24	24	24

Note: Constant term included but not reported. t-Statistics based on robust standard errors clustered by country appear in parentheses. ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

The level of the NPL ratio explains positively the growth rate of banks' holdings, and the results are broadly similar across various specifications. On the other hand, the assumption

of portfolio rebalancing predicts that banks' holdings of government securities are expected to depend primarily on the quality of loans to the private sector, as captured by the NPLs. As a result, the negative relationship between banks' credit to private sector and holdings of government securities in LMICs reflects, in part, a portfolio rebalancing of banks to safer and more liquid government assets during a crisis.

4.2 Impact of the Central Bank's Balance Sheet Policy on Banks' Holdings of Government Securities

In this section, I assess the dynamic interactions between central bank's balance sheet policy (calculated by the ratio of central bank assets to GDP, World Bank data) and banks' holdings of government securities, by using a panel VAR approach over the period 1990 until 2019. Using different specifications and estimation techniques, the panel VAR model that I consider has the following representation:

$$Y_{i,t} = a_i + A(L)_i Y_{i,t-1} + X_{it} + \varepsilon_{i,t} \quad (4)$$

where $Y_{i,t}$ is a vector of endogenous variables, a_i a vector of fixed effects, $A(L)_i$ a matrix polynomial in the lag operator L , for economies $i = 1, 2, \dots, N$. The VAR model estimator is developed by Abrio and Love (2016). The method allows us to examine the dynamic relationship between our variables of interest; the PVAR estimator uses the lagged values of regressors as instruments and estimates the coefficients by the generalized method of moments (GMM). To check the robustness of this estimation, I used a panel vector autoregression by employing a least square dummy variable estimator (LSDV), following Cagala and Glogowsky (2014).

The reason for using the VAR is that it allows drawing the impulse response function (IRF) and the variance decomposition of the error (FEVD) to identify the shocks. The table of the model selection criteria (Appendix 2.C) shows that the preferred model in our cases is the first-order Panel VAR because the first-order lag has the smallest MBIC, MAIC and MQIC. The results confirm that the estimates are stable (see Appendix 2.B). Figure 1 presents the variance decomposition from the panel VAR. Each of these IRFs is generated by Monte Carlo simulations with 200 repetitions. Areas between the upper and lower lines have a 95% confidence interval for IRFs over the next 10 years. Our primary interest is the interaction between the monetary policy shock and the banks' holdings of government securities.

The impulse response functions represented by Figure 1 show that a shock in central bank's balance sheet policy has a positive effect on banks' holdings of government securities for the first 5 years, and after that it approaches zero. Monetary policy is assumed to be formulated by an independent or quasi-independent central bank in pursuit of broad macroeconomic objectives, rather than with the objective of meeting the government's financing needs. This result confirms the results of studies on the effectiveness of monetary transmission in low-income countries, which have found that monetary policy effects are counterintuitive and weak, in

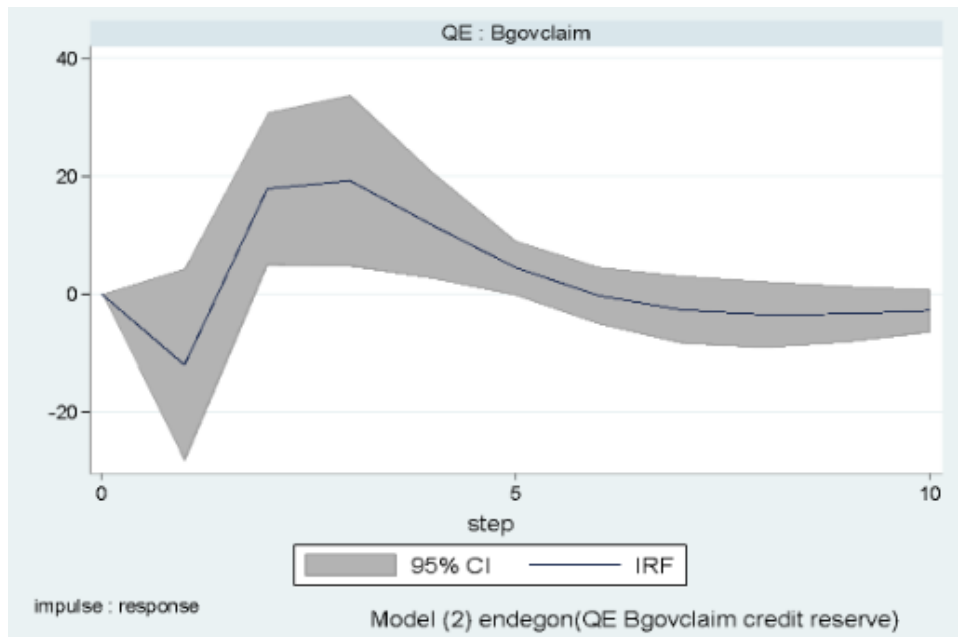


Figure 1: Impulse Response to Shock in Central Bank Assets on Banks' Holdings of Government Securities (GMM Estimation)

Source: Author's estimation.

contrast with results for high-income countries (Mishra and Montiel, 2013).

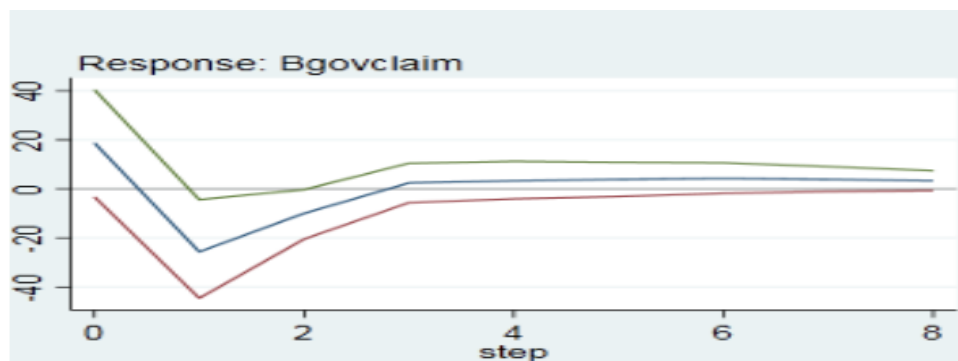


Figure 2: Impulse Response to Shock in Central Bank Assets on Banks' Holdings of Government Securities (XTVAR Estimation)

Source: Author's estimation.

The impulse response functions represented by Figure 2 show that a shock in central bank's balance sheet policy has a positive effect on banks' holdings of government securities for the first period; however, this effect is not significant for the rest of the period. As a result, the evidence for the robustness of our findings is weak.

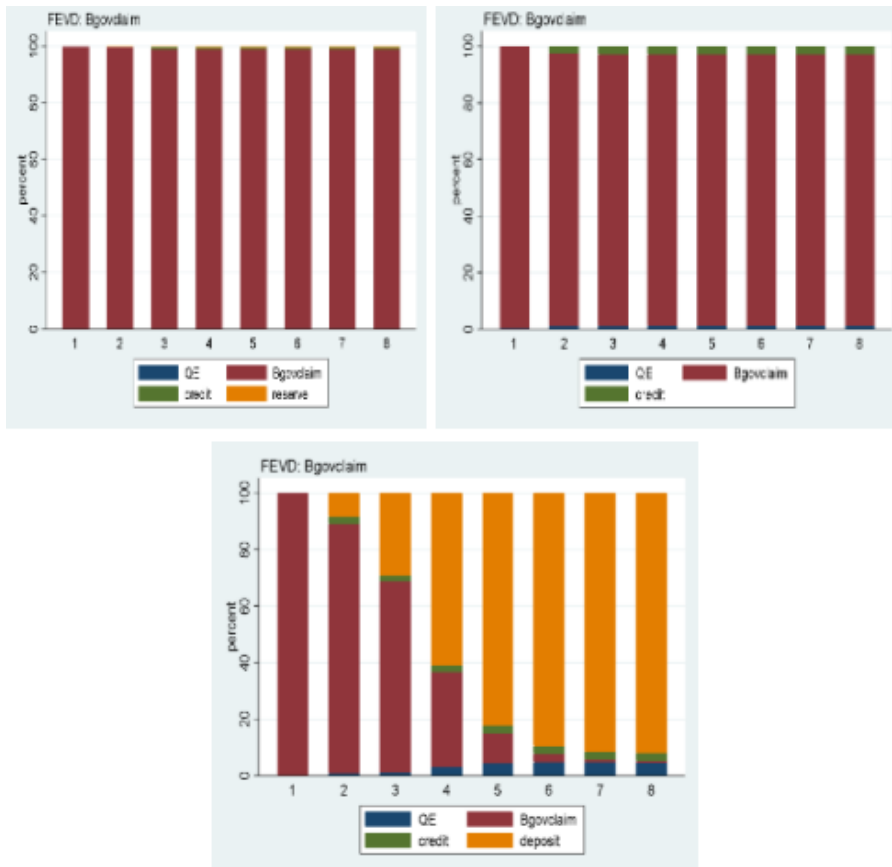


Figure 3: Variance Decomposition

Source: Author's estimation.

5 Conclusion

This study provides compelling empirical evidence that the negative relationship between banks' credit to the private sector and their holdings of government securities in Lower-Middle Income Economies (LMIEs) constitutes a significant crowding-out effect. This phenomenon is driven by portfolio rebalancing behavior, wherein banks systematically shift toward safer and more liquid public assets during periods of economic stress and financial uncertainty. These findings substantiate and extend the work of Bouis (2019), who documented similar dynamics in emerging market and developing economies, while offering novel insights into the unique institutional context of LMIEs.

The impulse response functions derived from our panel VAR analysis reveal a crucial transmission mechanism: shocks to Central Bank Balance Sheet Policy (CBBSP) exert a statistically significant positive effect on Banks' Holdings of Government Securities (BHGS). This counter-intuitive result—wherein expansionary monetary policy intended to stimulate private lending instead reinforces banks' preference for sovereign debt—is fundamentally attributable to the weak credit market institutions characteristic of LMIEs. As Arnone et al. (2006) demonstrate, central banks in both emerging and low-income economies exhibit substantially less independence than their advanced-economy counterparts. This institutional deficiency critically constrains the scope and effectiveness of monetary policy by undermining market confidence in the sustainability and credibility of policy actions.

The policy implications of these findings are profound and multifaceted. First, they challenge the conventional application of balance sheet policies in institutional environments where transmission mechanisms are structurally impaired. Second, they highlight the urgent need for complementary institutional reforms alongside monetary interventions. To enhance the resilience and effectiveness of credit provision to the private sector, policymakers must prioritize comprehensive reforms of credit market institutions. As advocated by Djankov et al. (2007), such reforms should particularly focus on strengthening credit reporting systems and enhancing the effectiveness of collateral and bankruptcy laws. These institutional improvements would not only mitigate the crowding-out effect documented herein but also create a more conducive environment for monetary policy transmission and sustainable financial intermediation.

In conclusion, this research makes a substantive contribution to the literature on monetary policy in developing economies by elucidating the complex interplay between central bank balance sheet operations, bank portfolio behavior, and institutional constraints. The findings underscore that in LMIEs, the effectiveness of monetary policy is critically contingent upon the quality of supporting institutions. Future research should explore the heterogeneity within LMIEs and investigate how country-specific institutional configurations moderate these relationships. Moreover, examining the distributional consequences of these dynamics—particularly their impact on small and medium enterprises—represents a promising avenue for further inquiry.

APPENDIX

A Country List

Table 4: Lower-Middle and Upper-Middle Income Countries in the Sample

Lower-Middle Income Countries	Upper-Middle Income Countries
Algeria	Albania
Angola	Argentina
Bangladesh	Armenia
Belize	Azerbaijan
Benin	Belarus
Bhutan	Brazil
Bolivia	China
Cabo Verde	Colombia
Cambodia	Dominica
Cameroon	Georgia
Cote d'Ivoire	Jordan
Egypt, Arab Rep.	Kazakhstan
Eswatini	Malaysia
Ghana	Maldives
India	Panama
Indonesia	Romania
Kenya	Russian Federation
Morocco	South Africa
Pakistan	St. Lucia
Philippines	St. Vincent and the Grenadines
Senegal	Suriname
Sri Lanka	Thailand
Tajikistan	Turkey
Togo	
Tanzania	
Tunisia	
Ukraine	

B PVAR Stability Test

The stability condition of the panel vector autoregression (PVAR) model is a crucial diagnostic for the validity of impulse response functions. The estimated PVAR model satisfies the eigenvalue stability condition, as all eigenvalues lie within the unit circle. This confirms that the estimated model is stationary and suitable for dynamic analysis.

Eigenvalue stability condition

Eigenvalue		Modulus
Real	Imaginary	
.8560994	0	.8560994
.6504473	0	.6504473
-.151923	0	.151923
.1351565	0	.1351565

All the eigenvalues lie inside the unit circle.
pVAR satisfies stability condition.

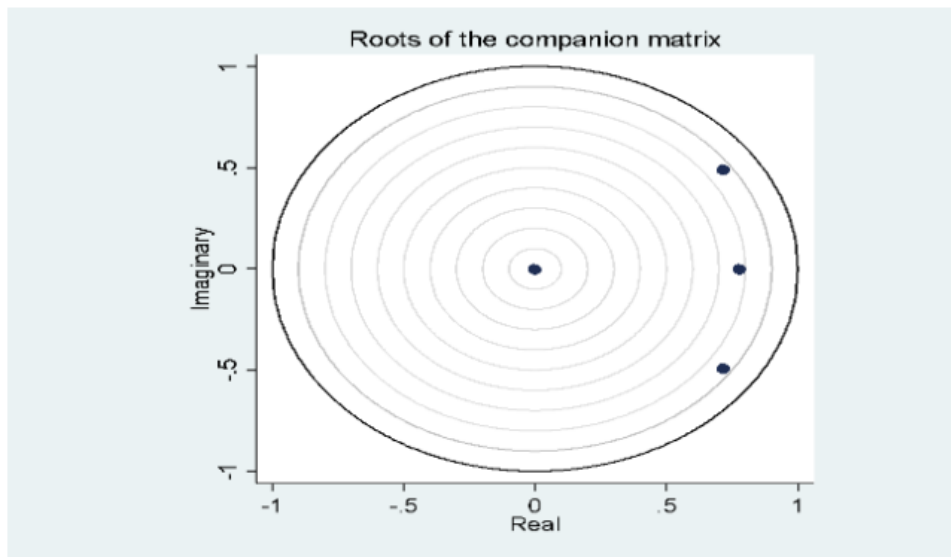


Figure 4: Eigenvalue Stability Test for Panel VAR

Note: The figure plots the eigenvalues of the companion matrix. All eigenvalues lie within the unit circle (represented by the dashed line), confirming that the estimated PVAR satisfies the stability condition.

Table 5: Panel VAR Lag Selection Criteria

Lag	CD	J-statistic	J p-value	MBIC	MAIC	MQIC
1	0.9999424	78.07983	0.0204543	-296.114	-28.92017	-133.8451
2	0.9999519	23.28277	0.744174	-182.1798	-35.71723	-83.35985
3	0.999352	12.05131	0.7704401	-97.67998	-17.94869	-49.00000

Note: The table presents lag selection criteria for the panel VAR model. The first-order lag specification is preferred based on the minimization of information criteria (MBIC, MAIC, MQIC) while maintaining the Hansen J-test validity (p-value ζ 0.1). CD denotes the cross-sectional dependence test statistic.

C Model Selection Criteria

D Additional Robustness Checks

Response variable and Forecast horizon	QE	Impulse claim	variable credit	reserve
QE	0	0	0	0
1	0	0	0	0
2	.8369184	-.022738	.1398579	-.0804858
3	-.6685626	-.05343	-.2549366	-.0230707
4	-.5404417	-.0762034	-.2764319	-.106923
5	-.4501542	-.084861	-.243117	-.2218678
6	-.3918944	-.0830243	-.2077023	-.317379
7	-.3588198	-.0778311	-.1950327	-.3603163
8	-.3430173	-.0742943	-.2013553	-.3813331
9	-.3368523	-.0734887	-.2115767	-.3780824
10	-.3346021	-.0739004	-.215873	-.3756245
claim	0	0	0	0
1	-.000467	-.9995329	0	0
2	-.002584	-.8662279	-.0666154	-.0645727
3	-.0040179	-.8102183	-.1236783	-.0620854
4	-.0041855	-.7798231	-.1450224	-.070969
5	-.0040544	-.753217	-.1419931	-.1007354
6	-.0045091	-.7291941	-.1394847	-.1268121
7	-.0054197	-.7122612	-.1468898	-.1354293
8	-.0061651	-.7026348	-.1572315	-.1339687
9	-.0064335	-.6965702	-.1623155	-.1368009
10	-.006402	-.6909683	-.1619021	-.1407275
credit	0	0	0	0
1	-.020085	-.151922	-.027993	0
2	-.013217	-.1525484	-.6506051	-.1836294
3	-.0105688	-.1320293	-.4769384	-.3804635
4	-.0130644	-.1094175	-.4176295	-.4598887
5	-.0170179	-.0989118	-.4372748	-.4467955
6	-.0192987	-.0993569	-.4654103	-.4159341
7	-.0193235	-.1022966	-.4651294	-.4132506
8	-.0184858	-.1019864	-.446334	-.4331938
9	-.0180947	-.0991308	-.4333847	-.4493899
10	-.0182817	-.0969038	-.4340811	-.4507334
reserve	0	0	0	0
1	-.002502	-.0435456	-.0005213	-.9534311
2	-.0105683	-.0266135	-.084459	-.8783591
3	-.017689	-.0254822	-.2096699	-.7471588
4	-.0206495	-.0369463	-.2900394	-.6523647
5	-.0199192	-.0476877	-.3000838	-.6323092
6	-.0184068	-.0504544	-.278647	-.6524919
7	-.0180278	-.0482991	-.2691855	-.6644876
8	-.0185637	-.0468096	-.2791237	-.655503
9	-.019022	-.047818	-.2923955	-.6407644
10	-.0189682	-.0496423	-.2964293	-.6349602

Figure 5: Eigenvalue Stability Test for Panel VAR

Note: Forecast error variance decomposition.

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