BANKS' EXPOSURE TO SOVEREIGN DEBT AND LOANS TO THE PRIVATE SECTOR IN WAEMU

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Abstract

This paper examines the relationship between banks' exposure to sovereign debt and their lending to the private sector. To do so, we use hand-collected bank-level data from all West African Economic and Monetary Union (WAEMU) countries over the period 2003-2022. The results show a negative relationship between banks' exposure to sovereign securities and their loans to the private sector. Our findings are robust to alternative estimation techniques and proxies for loans to the private sector and domestic public debt identification. The heterogeneity analysis uncovers that the effect is more pronounced in middle-income countries (LMICs) than in low-income countries (LICs). Additionally, we document that foreign banks, particularly Pan-African banks, reduce their loans more than domestic banks. However, larger and well-capitalized banks tend to mitigate the effect.

Keywords: Sovereign debt, loans, banks, WAEMU
JEL classification: G21; G28; H63

1. Introduction

Access to credit by the private sector is widely recognized as a key determinant of economic growth, especially in developing countries (King and Levine, 1993). Expanding credit availability can improve productivity and ultimately lead to economic growth. However, despite its critical role, many businesses in developing countries continue to face significant barriers to financing. In Africa, access to finance is one of the two most cited obstacles affecting business operations, with 19.6% of firms citing it as an obstacle after infrastructure (UNECA, 2020). Empirical evidence further highlights that access to finance is a key factor explaining Africa's disadvantage in firm performance relative to better-performing similar-income countries (Harrison et al., 2014). One threat to private sector financing in these countries is the domestic financing strategy of sovereign deficits. In recent years, many governments in developing countries have reduced their external indebtedness and increased their domestic financing. The share of domestic debt in the total debt of emerging and developing economies has increased from 31% to 46% from 2000 to 2020 (IMF, 2021).[1] Public domestic debt is heavily held by banks, which also represent the primary source of financing for firms and households in these countries. From 2008 to 2016, banks' exposure to sovereign debt increased from 8.2% to 11.8% of their total assets in emerging markets and developing economies (EMDEs) (Bouis, 2019). A new record was reached in 2021, with sovereign debt accounting for 17% of banking assets in emerging countries (Deghi et al., 2022). This paper aims to analyze how banks' exposure to sovereign debt affects their loans to the private sector within the West African Economic and Monetary Union (WAEMU) region.[2]

The issuance of sovereign securities in local currency has grown significantly in the franc zone, especially in the WAEMU region (Magnan-Marionnet, 2016). These securities are issued in the regional capital markets.[3] Since 2001, the WAEMU country members have been able to issue bills (with a maturity of up to two years) and treasury bonds (with a maturity of more than two years).[4] It should be noted that the regional financial market is highly integrated with sovereign debt. In the bond market, the share of government bonds

[1] Since 2007, domestic debt has doubled, from around 15% of GDP to 30% of GDP in Emerging Markets (EMs) and from slightly less than 10% of GDP to around 20% of GDP in Low-Income Countries (LICs) (IMF, 2021).

[2] The West African Economic and Monetary Union (WAEMU) is composed of eight (8) countries: Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. These countries share a single currency under the authority of a central bank (Banque Centrale des Etats d'Afrique de l'Ouest - BCEAO), which is responsible for monetary policy. The financial and banking systems are subject to the same regulations. In addition, they share a financial market in which more than 80% of securities issues are public.

[3] The regional financial market was created - Bourse Régionale des Valeurs Mobilières (BRVM), headquartered in Abidjan (Côte d'Ivoire) started its operations in 1998. It aimed to complement and strengthen the inter-bank and money markets - monetary policy effectiveness - and allow the financing of private and public investments.

[4] To revitalize the public security markets and assist the Member States in mobilizing resources on the capital markets to finance their economic development policies at reduced costs, a regional agency called "UMOA-Titres" was created on March 15, 2013, based on a decision taken by the Council of Ministers. It supports issuing and managing the WAEMU Member States' public securities. In collaboration with the Central Bank, the UMOA-Titres organizes auctions at the regional level.

was more than 94.38% of the total bonds issued in 2022 (see Figure A1).[5] This method of financing has been encouraged by stricter supervision and the cessation of direct advances by the central bank. After the regional central bank (BCEAO) ended the direct financing of fiscal deficits in 2010, which led to recourse by the public treasuries to public (firms and households) savings, the share of security holdings in banks' assets surged during this period, exceeding 10% of total assets (see Figure A2).

While reorienting budget deficit financing towards the domestic economy may seem beneficial for these governments by reducing, for example, their exposure to exchange rate risks and capital flight, it nevertheless entails risks for private sector financing by crowding it out of the loan markets. Figure A3 reports the dynamics of private and public debt in banks' total assets. Over the 2000-2022 period, there was a decrease in the ratio of credit to total assets and a significant increase in the share of public securities.

Two strands emerged from the literature on banks' exposure to sovereign debt on their credit to the private sector: the *lazy banks* view (Hauner, 2008) and the *safe assets* view (Kumhof and Tanner, 2005). According to the *lazy banks* view (Hauner, 2008; Emran and Farazi, 2009), high levels of government borrowing may cause banks to be lazier in seeking new profitable projects, so they will reduce their lending to the private sector, which represents a higher risk of default compared to government, which subsequently crowds out small and medium-sized enterprises from the market. On the other hand, according to the *safe assets* view, holding government securities by banks can improve financial development by increasing the credit supply, known as the crowding-in effect (Kumhof and Tanner, 2005). This view postulates that banks will have more room for risk activities (lending) given that they hold safe assets in their portfolios. Similar dichotomous conclusions have been found in the empirical literature. While there are studies that support the negative relationship between domestic debt financing and financial development (see De Bonis and Stacchini, 2013; Christensen, 2005; Bouis, 2019, among others), there are some studies that found domestic debt to be inversely related to private credit (IMF, 2005; Omodero et al., 2019), or not bonded (Takyi and Obeng, 2013).[6]

The WAEMU region is an interesting case study for several reasons. Firstly, the banks in the WAEMU region are subject to the same regulatory framework, and they can intervene in the different regional capital markets and subscribe to securities issued by the eight country members. Secondly, banks are highly exposed to sovereign debt; they are among the most exposed to sovereign debt worldwide compared to the global average of 9% of banks' total assets (Gennaioli et al., 2018). The average exposure in WAEMU is above the

[5] This share increases slightly when we add public enterprises. Indeed, in 2022, the share of Member States and state enterprises in the primary market was 95.67%.

[6] These studies on developing countries used macro-data and analyzed the domestic debt (held by banks and other investors) on private sector credit. We use micro-level data on banks' exposure to sovereign debt on their loans.

historical level reached in EMs (17%) in 2021. The share of public securities has more than tripled in banks' total assets from 2003 to 2022, increasing from 6% to more than 24% in this region (Figure A2) and across countries (Table A1).[7] For instance, the Benin banking system's exposure to sovereign debt increased from 5.8% in 2003 to 30.8% of total assets in 2022. Banks' appetite for sovereign debt may be explained by several advantages drained by the detention of it: (i) high return on sovereign securities with interest rates around 6-7% in a low inflation environment, (ii) tax-exempt, (iii) zero weighting of sovereign debt in the calculation of the regulatory capital, (iv) accept as collateral by the central bank in refinancing operations. However, this business strategy is not without risk for the development of the private sector in bank-based economies; i.e., banks are the predominant source of finance for businesses and households in this region (Léon, 2023). In such an economic environment, increasing banks' exposure to sovereign debt may deprive the private sector of banks' loans, notwithstanding the possible benefit of public sector domestic financing.[8]

Thirdly, we believe it is interesting to examine how the ownership structure shapes the relationship between banks' exposure and their loans in the WAEMU because of the diversification of the banking sector in this region regarding ownership structure. There is growing literature on the behaviors of foreign banks in Africa, more specifically on how they may behave differently (Beck et al., 2014; Kanga et al., 2019, 2020, 2021). Foreign banks represent a paramount share of banks operating in the WAEMU region, mainly Pan-African banks; therefore, it is interesting to conduct such an analysis. Finally, we believe this study is timely due to the increasing exposure of banks in developing countries, and the findings can be extrapolated (external validity) to other developing countries with similar characteristics. Our study is the first to analyze the effect of banks' exposure to sovereign debt based on exhaustive bank-level data on a set of developing countries.

This study contributes in three ways to the literature on the nexus between sovereign domestic debt and financial development. First, it examines the impact of banks' exposure to sovereign debt on private sector lending in the WAEMU region. Despite growing interest in how banks' government securities holdings affect their private sector lending, empirical studies in developing countries are limited (Bouis, 2019). Most research focuses on developed countries, such as the U.S. and Europe. The banking sector in developing regions, particularly the WAEMU, has received little attention. This analysis is crucial because the drainage of bank liquidity to sovereign debt can reduce the funds available for private sector lending,

[7] Domestic debt refers to funds raised internally by the government; it is measured here by securities held by banks in this region, and private credit refers to credit granted by banks to their non-financial customers.

[8] Private sector investment is the most crucial determinant of economic growth in the West African Economic and Monetary Union (WAEMU), according to Nubukpo (2007), who shows that the private investment variable appears, in the short and long term, to have the most significant impact on WAEMU economic growth.

adversely affecting private sector growth (Christensen, 2005). This is especially significant for small and medium-sized enterprises, which are often credit-constrained and lack alternative financing options (Beck and Demirguc-Kunt, 2006). Notwithstanding the high exposure of WAEMU banks to sovereign debt, there is no study on its impact on private sector lending in the region. Therefore, this paper responds to the above demand for additional knowledge for policymakers and fills the gap in the literature.

The second contribution is to examine whether the impact of sovereign debt on private credit in the WAEMU region is sensitive to country and bank characteristics. The regional banking sector is diversified across countries and within the sector. Firstly, income level and financial development within countries may influence the effect's direction and magnitude. Secondly, there is a blind spot in the literature regarding how bank characteristics shape the relationship between sovereign debt exposure and loans. Early studies have mainly ignored bank characteristics. The macroeconomic nature of their data can explain the lack of heterogeneity analyses in these studies. However, the banking literature emphasizes that bank characteristics matter in capturing the overall effect as they react differently. Ignoring their heterogeneities can lead to misguided policy recommendations. Such an analysis in the WAEMU context is essential as the banking system is diversified. One of the bank's characteristics of interest is its ownership.[9] For example, the arbitrage of banks in reallocating their assets between government securities and private sector credit may differ between domestic and foreign banks. In addition to ownership structure, banks operating in the region are disparate in size and capitalization levels. These characteristics may shape the relationship. We, therefore, contribute to the broad literature on bank heterogeneity analysis by examining the role of bank characteristics in shaping the link between sovereign debt exposure and loans.

The third contribution is the use of exhaustive bank-level data. Existing studies that use international databases like Bankscope or Fitchconnect, rather than being useful by covering a large sample of countries, miss many banks in Africa as small and local ones (Léon, 2023). More importantly, Banskscope data cover less than 75% of banks in the WAEMU region (Kanga et al., 2020). To address this gap, we use hand-collected data from all banks in the eight countries of the WAEMU region. This exhaustive dataset allows us to accurately assess the impact of banks' sovereign debt holdings on their lending activities, more than data from Bankscope or Fitchconnect.[10]

We use hand-collected data from 151 banks from the eight countries of the WAEMU region over the years

[9] Before the 2000s, public banks dominated the regional banking sector with a special connection with national governments. One of the leading causes of the banking crises between 1980 and 1995 was non-performing loans to public and para-public enterprises, mainly by public banks (Caprio and Klingebiel, 1996). Reforms following these crises reduced the number of state-owned banks. These policies have transformed the ownership structure of banks through the presence of foreign capital banks, especially Pan-African banks.

[10] Gennaioli et al. (2018) have used data from Bankscope to analyze the effect of sovereign default in 191 countries over the 1998-2012 period.

2003-2022. Using the system-GMM method to estimate the effect, our results suggest that banks' exposure to sovereign debt harms their lending to the private sector in the WAEMU region. This finding indicates that an increase in banks' government security holdings leads to a decline in loans extended to the private sector, suggesting a quantitative crowding out mechanism in the credit market in the WAEMU region. Our findings remain robust using an alternative measure of loans and sovereign debt and estimation techniques.

The heterogeneity analysis documents several results. Based on countries' income levels, the finding documents that the effect is stronger in middle-income countries (LMICs) than in low-income countries (LICs). Concerning banks' characteristics, the results show that the extent of crowding out is more significant for Pan-African banks, whereas the foreign banks from France mitigate the adverse effect of sovereign debt exposure on private sector loans. In addition, the crowding-out effect stems from small and less capitalized banks.

The rest of the paper is structured as follows. Section 2 presents the related literature on sovereign debt and credit to the private sector, following which we develop our research hypotheses. Section 3 introduces the econometric model and the empirical strategy. Section 4 is devoted to data presentation and descriptive statistics. Sections 5 and 6 report the results of our baseline model and robustness checks, respectively. Finally, Section 7 presents the effects of security holdings on private credit by considering banking heterogeneity. Section 8 concludes.

2. Related Literature and hypotheses development

2.1. Literature review

In many developing countries, banks' increasing exposure to sovereign debt has reignited the debate on its impact on private sector credit. While this debate is topical, it is not new. The crowding out of the private sector by the public sector is not a recent area of investigation by academicians (Diamond, 1965; Blinder et al., 1973; Friedman, 1978; Aschauer, 1989). Given the negative consequences of a decline in credit on production, several economic theories have been mobilized to understand the factors that can negatively affect the latter.

Two types of crowding-out are identified in the literature: the real and financial crowding out of the private sector by the government (Blinder et al., 1973; Friedman, 1978). The former refers to so-called direct crowding out. This is the effect of increasing public investment on private sector investment -gross fixed capital formation. This crowding out occurs when the government undertakes activities that the private sector could provide. The latter refers to the effect of government borrowing on private financing. In this case, the government competes with the private sector in the credit markets. More specifically, the financial or indirect crowding-out effect is that an increase in government borrowing may induce an increase in interest rates,

leading to lower demand for funds by the private sector or reducing the volume of private credit.[11]

This channel works through a rise in interest rates resulting from public borrowing. The resulting upward pressure on interest rates will reduce any private investments, which are interest rate elastic (Blinder et al., 1973). This mechanism is more likely to be functional in countries where the financial system is developed, and interest rates are not rigid to rise or fall. For instance, Baldacci and Kumar (2010), for a panel of 31 developed and emerging countries from 1980-2008, conclude that public debt significantly impacts long-term interest rates.[12] The finding of Baldacci and Kumar (2010) is corroborated by Aisen and Hauner (2013) using data on 60 advanced and emerging countries. These authors found evidence of a positive impact of the budget deficit on interest rates. Yet, they document that the effect is significant when public deficit or debt is high, mostly domestically financed and financial openness is low. In addition, they find that the effect is larger when interest rates are liberalized and when the domestic sector is less developed.

However, observing this transmission channel in developing countries can be challenging. According to Emran and Farazi (2009), this approach is more applicable when the banking sector is liberalized, and market forces determine interest rates. However, in developing countries, the banking system has often been subject to government interventions, and the central bank frequently sets interest rates administratively. Several studies examining the interest rate channel in developing and emerging market countries have found either no significant link or a weak relationship between sovereign debt and interest rates (Akinboade, 2004; Pandit et al., 2005; Mukhtar and Zakaria, 2008; Kelikume, 2016, among others).[13] For instance, Akinboade (2004) investigated the impact of budget deficits on interest rates in South Africa and concluded that budget deficits do not affect interest rates. Similarly, Kelikume (2016), analyzing a panel of 18 Sub-Saharan African countries, found that interest rates are insensitive to changes in budget deficits. These findings confirm that developing countries' interest rate channels are weak or non-functional.

Nevertheless, domestic government debt can significantly affect the volume of credit extended to the private sector even if interest rates are not determined by the market. When interest rates are rigid, the

[11] Several theories can explain the shift from private sector financing by banks to public securities. The tradeoff between sovereign securities and credit to the private sector can be explained by financial repression, where the government can take restrictive or encouraging measures to make banks hold their securities (Bouis, 2019), but also by the high credit risk of the private sector that could push banks to take refuge in safe assets. The purchase of government securities by banks could also result from a decrease in private sector demand for credit during periods of recession - crises or wars - (Becker and Ivashina, 2018; Bouis, 2019; De Bonis and Stacchini, 2013; Gennaioli et al., 2018), which leads to lower government tax revenues and, consequently, to increased financing needs and higher public debt.

[12] The magnitude of the impact depends on several institutional and structural conditions. More specifically, they found that economies with structurally high domestic savings and systems that rely on bank financing more than capital markets for funding investments can absorb an increase in public bond supply compared to countries with low saving ratios.

[13] Evidence from these studies, Pandit et al. (2005) in Nepal and Mukhtar and Zakaria (2008) in Pakistan, showed a positive but statistically insignificant relationship between budget deficits and interest rates.

effect of domestic public debt is transmitted through adjustments in the volume of credit (Emran and Farazi, 2009). Emran and Farazi (2009) argue that even if the banking system sector is liberalized, the impact of government borrowing can still pass through credit availability, especially in less developed credit markets where credit rationing may be more prevalent. This transmission mechanism, known as the credit or quantitative channel, depends on the endogenous response of banks, which may either reduce or limit new loan extensions.

The empirical literature on the quantitative channel of financial crowding out has yielded inconclusive results. In the case of Emerging Market and Developing Economies (EMDEs), some studies have found an inverse relationship between domestic public debt and private sector credit (Christensen, 2005; Emran and Farazi, 2009; Mbate, 2013; De Bonis and Stacchini, 2013; Shetta and Kamaly, 2014; Lidiema, 2017; Bouis, 2019). Christensen (2005) specifically identifies a significant negative effect of domestic debt on private credit. He documents that a 1% increase in domestic credit to the central government, as a percentage of money supply, leads to a 0.15% reduction in private credit. Based on a panel of 60 developing countries, Emran and Farazi (2009) document a negative relationship between banks' claims on the government and the credit to the private sector. More recently, Bouis (2019) shows that higher banks' holdings of government debt are associated with a lower credit growth to the private sector based on a large panel of EMDEs. On the contrary, several studies have challenged this hypothesis (IMF, 2005; Omodero et al., 2019; Benayed and Gabsi, 2020). For example, Omodero et al. (2019) find that domestic debt positively impacts private credit in Nigeria. Other studies have found no significant effect of domestic public borrowing on credit (Maana et al., 2008; Takyi and Obeng, 2013).

Our study stands out from the above extensive literature on the impact of domestic public debt on credit by employing bank-level data. These data offer the advantage of accurately quantifying the effect of banks' exposure to sovereign debt on their lending. The richness of our data allows us to extend the analysis by examining banks' characteristics that may influence the magnitude of the effect of sovereign debt holdings on loans.

2.2. Hypotheses development

Two views have been proposed in the literature. First, according to Hauner (2008), the *lazy banks* model assumes that a high level of government borrowing can make banks lazier in seeking new profitable projects, so they will reduce their lending to the private sector, which represents a higher risk of default. Second, banks can adopt the *safe assets* behavior, especially those with a high credit risk exposure; since sovereign debt allows them to neutralize or compensate for such exposure, they will, therefore, be more inclined to take more risk by maintaining or increasing lending (Kumhof and Tanner, 2005). The predominant finding in EMDEs is a negative impact of domestic debt on financial development (Hauner,

2008; Emran and Farazi, 2009; Bouis, 2019, among others). We argue that WAEMU region banks behave similarly to banks in other developing countries operating in comparable environments. In light of the literature and the advantages associated with these securities, banks may reduce their loans to private credit and increase their sovereign exposure.

However, the magnitude of the impact can vary between countries based on their financial development and income levels (Ismihan and Ozkan, 2012). These authors highlight that the effect of sovereign debt is less significant when the financial sector is developed. Aisen and Hauner (2013) have empirically demonstrated that the crowding-out effect of budget deficits is more meaningful when the financial sector is less developed. We therefore argue that the magnitude of sovereign debt held by banks on private credit can differ across countries, given the structure of the WAEMU region. Indeed, 6 out of 8 countries are low-income countries (LICs), according to the World Bank's classification. Additionally, these two middle-level income countries account for more than 40% of the banks in the region. Based on the literature and the country's characteristics, we argue that the financial development level will mitigate the crowding-out effect. Therefore, we postulate the following hypotheses:

H1a: Banks' exposure to sovereign debt harms private sector credit in WAEMU.

H1b: The negative effect of banks' security holdings on private credit is higher in LICs than in LMICs.

The magnitude and the effect (positive or negative) of banks' sovereign debt exposure on their lending activity may depend on their characteristics in terms of ownership, size, and capitalization structures. Hypotheses *H2*, *H3*, and *H4* consider these heterogeneities.

Ownership structure can be an important factor in banks' decisions to hold sovereign securities. According to Ongena et al. (2019), domestic banks hold more state securities than their foreign counterparts, especially state-owned ones, and those that receive central government support or have politicians on the board (De Marco and Macchiavelli, 2016). The incentives to hold domestic sovereign debt, beyond regulatory or risk-shifting, by those banks can also be due to "moral suasion".[14] Therefore, a domestic bank (mainly a state bank) may have other incentives than profit-seeking to hold government securities, which may reduce its lending activity (Gennaioli et al., 2018). Yet, we do not know any form of implicit or explicit repression in this region. Furthermore, domestic banks are less exposed to sovereign debt compared to foreign banks (see Table A8).

However, given these securities' relatively low default risk compared to private sector loans, the incentives

[14] *The term "moral suasion" refers to an appeal to "morality" or "patriotic duty" to induce behavior by the persuaded entity that is not necessary profit-maximizing for it* (Ongena et al., 2019).

of holding such debt may differ between foreign and domestic banks. The former can hold sovereign debt more than domestic banks because of their access to international capital markets.[15] The international banks may therefore operate on both markets (sovereign debt and loans). However, it should be noted that foreign banks are heterogeneous in terms of origin within the region. We have two main blocks: Pan-African and non-Pan-African banks (mainly French). We argue that the effect of their exposure to sovereign debt on private credit may be different depending on their origin. Firstly, Pan-African banks bear more risk and are less profitable (ROA) (see Kanga et al. (2021)) than their peers. We argue then that Pan-African banks may behave as lazy banks by acquiring sovereign debt to reduce their risk exposure on the one hand and improve profitability on the other hand. Conversely, we expect the opposite effect from international banks (French ones). Several studies on African countries have shown that foreign banks from developed countries engage in "cherry picking" by granting loans to large corporations (Beck et al., 2014; Kanga et al., 2019). As these loans bear less risk, we do not expect these banks to reduce their lending activities even if they hold sovereign bonds.[16] In contrast, these banks, by investing in sovereign debt, may take more risk. Consequently, we postulate that French banks mitigate the crowding-out effect in the region.

Given the high proportion of Pan-African banks among foreign banks, we initially expect that foreign banks will exacerbate the crowding-out effect. Pan-African banks will drive this effect. On the other hand, French banks mitigate this effect. Based on the literature and WAEMU context, we postulate the following hypotheses:

H2a: The negative effect of sovereign security holdings on private credit is higher for foreign banks than for domestic banks in WAEMU.

H2b: The negative effect of sovereign security holdings on private credit is mitigated by French banks.

Small banks experience more financial constraints than large banks in accessing external financial resources (Kashyap and Stein, 1994). Furthermore, unlike large banks (mainly foreign banks), small banks do not have the advantage of internal capital markets to obtain funding (Stein, 1997; Cetorelli and Goldberg, 2012). Consequently, the funds allocated for financial investments cannot be readily replaced in the financial markets due to their size. As a result, small banks are compelled to curtail their lending activities in this case. For example, a large bank may invest in government securities and maintain its lending activities. Based on these frictions and the comparative advantages of large banks, we postulate the hypothesis that:

H3: The effect of sovereign security holdings on private credit is lower for large banks.

[15] We define a bank as foreign if a foreign entity holds more than 50% of the bank's equity capital. The exact definition holds for all ownership structures.
[16] Also, French banks are well-entrenched and the oldest in the regional banking system due to colonial history.

The effect of banks' exposure to sovereign debt on lending activities can be shaped by their capitalization level. Specifically, well-capitalized banks tend to play the cautious card, so the better a bank is capitalized, the more it prefers to hold low-risk assets instead of banks with higher leverage (Delis and Kouretas, 2011). Therefore, well-capitalized banks "flight to quality", unlike undercapitalized banks, which may hold sovereign securities because of regulatory capital requirements (Rodrigues et al., 1993). However, the literature is inconclusive, as some postulate that well-capitalized banks tend to undertake risky activities for a higher return on investment. Gong et al. (2018) provide evidence that bank risk is positively associated with the capital ratio. In the context of WAEMU, Kanga et al. (2020) document a positive link between bank capitalization and profitability. They explain this result by the fact that well-capitalized banks have less need to borrow to develop the share of risky assets, such as loans, due to their capital serving as a cushion. We therefore argue that being a well-capitalized bank reduces the adverse effect of sovereign debt exposure on loans. Based on the literature and WAEMU context, we formulate the following hypothesis:

H4: The negative effect of security holdings on private credit is lower for well-capitalized banks.

3. Empirical model and Estimation strategy

3.1 Empirical specification

This paper analyzes the effect of banks' exposure to sovereign debt on loans to the private sector in the WAEMU region. To do so, we specify our baseline econometric model as in Gennaioli et al., 2018:

$$\begin{aligned}\Delta Loan_{ijt} = \quad & \alpha_0 + \beta Securities_{ijt-1} + \gamma Bankcharact'_{ijt-1} \\ & + \phi Macro'_{jt-1} + \theta QualityInst'_{jt} + \varepsilon_i + \zeta_t + \epsilon_{ijt}\end{aligned} \quad (1)$$

where $\Delta Loan_{ijt}$ stands for the change in the loans-to-assets ratio of bank *i*, in country *j*, between years *t-1* and *t*.[17] $Securities_{ijt-1}$ denotes the securities-to-assets ratio of bank *i*, in country *j*, in year *t-1*. The coefficient of interest is β. Based on the literature on the nexus between banks' sovereign security holdings and private sector loans, the expected effect is negative ($\beta < 0$) to assert *H1a*. The hypothesis *H1a* suggests that when banks invest more in sovereign securities, it reduces the amount of funds available for the private sector, all other things being equal. This hypothesis could be verified in the WAEMU region, as shown in Figure A3 on the dynamics of private credit and securities in the banks' balance sheets.

[17] Loans refers to credit to the non-financial private sector.

Bankcharact is a vector of bank-level control variables that may explain our dependent variable. Specifically, we include the bank's loan-to-asset ratio that controls for the initial level of lending ($Loans_{t-1}$) with other bank-level variables (size, capitalization, LLPs, etc.). Macroeconomic (*Macro*) and institutional quality (*QualityInst*) may also affect bank lending and, therefore, are included in the model. It is important to account for unobservable bank characteristics that may also explain their lending; failure to control these unobservables may result in biased estimations. Therefore, we introduce bank fixed effects as well as the time effects, ε_i and ζ_t, respectively. The variable ϵ_{ijt} defines the idiosyncratic error term. We cluster the standard errors at the bank level.[18]

When focusing on the differential impact of sovereign debt holding on private sector credit based on country income level and groups of banks in terms of ownership structure, size, and capitalization, interaction terms represented by $\beta_2 Securities_{ijt-1} \times Z'_{c/i,t-1}$ are introduced in Equation (2). Interaction terms have some advantages, such as the gain of degrees of freedom in contrast to estimating the effect by sub-samples.

$$\begin{aligned}\Delta Loan_{ijt} = \quad & \alpha_0 + \beta_1 Securities_{ijt-1} + \beta_2 Securities_{ijt-1} \times Z'_{c/it-1} \\ & + \gamma Bankcharact'_{ijt-1} + \phi Macro'_{jt-1} + \theta QualityInst'_{jt} \\ & + \varepsilon_i + \zeta_t + \epsilon_{ijt} \qquad (2)\end{aligned}$$

where $Z'_{c/i,t-1}$ stands for country (c) or bank (i) characteristic of interest at the year $t-1$. According to our hypotheses, we should observe negative β_1 ($\beta_1 < 0$) and negative β_2 ($\beta_2 < 0$) for banks located in LICs (*H1a*), foreign banks (*H2a*), and small (*H3*) and poorly capitalized (*H4*) banks. This would mean that banks in LICs reduce their loans to the private sector when exposed to sovereign risk more than their peers in LMICs, which operate in a highly competitive banking system and an advanced stage of financial development (*H1b*). Foreign banks, composed essentially of Pan-African banks, will reduce their lending by becoming lazy (*H2a*). Conversely, positive β_2 will validate our *H2b,* according to which French banks will increase their loans because of having safe assets and more room for risk assets (loans). A positive β_2 will imply that small and under-capitalized banks are unable to maintain their lending activity to the private sector while holding sovereign debt in contrast to larger and well-capitalized ones as the latter can operate easily on both markets because of their assets and capitalization levels. Additionally, they are likely to mobilize resources easily and at lower costs.

3.1.1 Identification of banks' exposure to sovereign debt

One shortcoming of our database is that we cannot distinguish between private and public security shares in bank balance sheets before 2018. Only investments in securities are available from 2003 to 2017. The

[18] The results do not change while clustering errors at the country level.

breakdown data were not publicly available. We undertake two exercises to assess that the securities held by banks in this region over the study period are (mostly) sovereign securities. Firstly, we exploit the regional Banking Commission annual reports to quantify the importance of banks' exposure to sovereign securities. In all reports under the study period, they argue that the lion's share of banks' securities is public securities. The following sentence is employed: "*the securities held by banks are essentially public ones ...* ". These affirmations comfort our choice to use banks' securities as sovereign securities before 2018.

Secondly, we compare the outstanding securities held by banks and the claims of banks on governments (macro data) to determine whether they exhibit similar trends during the 2003-2017 period. Figure 1 shows the evolution of these two variables. We observe that both variables evolve concurrently, which leads us to conclude that the securities held by banks between 2003 and 2017 represent public debt. From 2018 to 2022, we can quantify sovereign debt in bank balance sheets.[19] Consequently, we assume that the outstanding securities held by financial institutions (banks) during the entire study period (2003-2022) are sovereign debt. In this paper, we refer to bank exposure to sovereign debt as the ratio of sovereign security holdings to total assets (*Securities*).

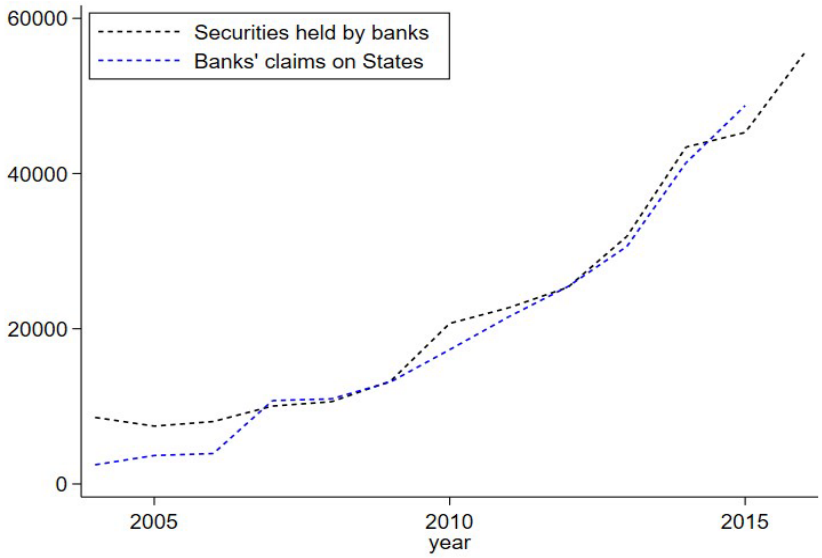
3.1.2 Bank, macroeconomic and institutional control variables

The control variables used are based on theoretical and empirical considerations. We use three sets of control variables: banking, macroeconomics, and institutional.

We introduce a bunch of bank characteristics that can affect bank lending activity. First, we control for bank size (Size), which is the natural logarithm of bank assets in millions of CFA francs. According to the literature on bank size, large banks, because of their size and diversification, can access better financing terms and grant more credit (Berger and Udell, 2006). If some empirical studies support this view (Allen and Paligorova, 2015; Rabab'ah, 2015), others find adverse effects between the two variables (Vo, 2018). We expect a negative impact of bank size on credit in the WAEMU region due to the lack of collateral combined with weak creditors' rights (Altunbas et al., 2009; Berger and Black, 2011; Fungáčová et al., 2014).

[19] From 2018 to 2022, the new structure of bank balance sheets identifies banks' exposure to sovereign debt through a balance-sheet item called 'Effets publics et valeurs assimilées'. This category includes sovereign securities (bonds and obligations) from both regional and foreign governments. However, we found no evidence of regional banks holding sovereign debt outside the WAEMU.

Figure 1. Evolution of securities held by banks and banks' claims on the States (in millions of CFA francs).



The figure reports the evolution of banks' securities and claims on Member States over the period 2003-2017. The data to compute securities were obtained from the banking commission of WAEMU and the BCEAO for the claims on the Member States.

Bank capitalization (CAP), measured as a share of total assets, matters in bank lending activity. Some argue that well-capitalized banks are more able to absorb shocks that degrade their portfolios without having to reduce the volume of their assets because they have access to unsecured financing (Allen and Paligorova, 2015) contrary to undercapitalized banks, which in the event of similar shocks will be forced to readjust their balance sheets on the asset side (Olokoyo, 2011), on the one hand. On the other hand, well-capitalized banks may be cautious in lending in an environment where creditors' rights are limited. They will lend a smaller amount of credit than the under-capitalized banks, whose owners have little to lose in the event of bankruptcy. However, Kanga et al. (2020) uncover the positive link between bank capitalization and its performance in the WAEMU region. We therefore expect a positive impact of bank capitalization on lending.

Banks often raise their liquidity by developing the asset side of their balance sheet, concerning the deposits they receive from non-financial customers, which have lower costs than other liabilities. Since this allows banks to increase lending volume (Olokoyo, 2011), a rise in liquidity (LIQ), proxied by the ratio of bank deposits to total assets as in Saidane et al. (2021), is expected to affect private credit positively.

Another bank variable that can explain fluctuations in the supply of private credit is non-performing loans (De Bonis and Stacchini, 2013). During episodes of high non-performing loans (NPLs), banks reduce their lending (Kim and Sohn, 2017), preferring to take refuge in safe assets such as sovereign debt (Ogawa and

Imai, 2014). Since data on non-performing loans are not publicly available, the loan loss provisions ratio is used as a proxy (Houston et al., 2010; Bougatef and Mgadmi, 2016; Chen et al., 2017; Bley et al., 2019). Loan loss provisions (LLPs, here and after LLP) represent the funds set aside by the bank to cover unexpected losses caused by impaired loans. An increase in the amount of impaired loans results in an increase in the amount of accrued allowances. We expect that an increase in banks' LLP will hurt bank credit.

The bank interest rate (INT) is the rate charged to non-financial customers. We have calculated this interest rate by dividing the interest income, generated by bank lending activity, by the outstanding bank credit to non-financial customers. This measure of the bank interest rate is commonly used in the banking literature when the average bank's interest rate is unknown (Delis and Kouretas, 2011). The interest rate is assumed to be negatively related to bank credit since the latter represents the cost of capital; the increase may lead to a decrease in the demand for credit by firms and households.

Finally, the ratio of loans to assets (Loans) is included to take into account the relative percentage of lending in the bank's activities and control for the initial level of lending (Léon, 2023) and variable profitability (Profitability) is included as in Gennaioli et al. (2018), it is measured by dividing operating income over total assets.

We consider the macroeconomic environment in which banks operate, and which is likely to influence their behavior in terms of lending; the vector *Macro* represents these variables.

The banking literature identifies banking competition within the banking sector as a determinant of bank lending. According to this literature, in a less competitive banking system, banks can use their market power to limit lending (Braggion et al., 2017). Thus, a less concentrated banking environment should allow for a greater allocation of resources (Dell'Ariccia and Marquez, 2006; Vo, 2018). Empirical evidence suggests that competition (lower bank concentration) alleviates credit constraints in developing countries (Léon, 2015), thereby enhancing financial inclusion (Fielding and Regasa, 2024). Therefore, we expect a negative impact of bank concentration on private credit. We use the Herfindahl-Hirschman Index (HHI), the sum of the squares of market shares of banks within the country's banking sector, to capture the effect of banking competition.

Economic growth is measured by the natural logarithm of real gross domestic product (GDP). According to Djankov et al. (2007), growing economies tend to have a growing demand and supply of credit. A positive relationship is expected between growth and loans. Inflation (INFLAT), the percentage change in the consumer price index, reflects the idea that an increase in the general price level reduces the return on loans and hence the supply of credit (Boyd et al., 2001). Inflation can also reduce the volume of credit by raising

the nominal interest rate and, therefore, borrowing costs. We expect an inverse relationship between inflation and loans.

The volume of bank credit responds to monetary policy (Bouis, 2019; Roulet, 2018). Indeed, during expansionary monetary conditions, banks increase their lending volume (Bernanke et al., 1988). Different variables are used in the literature to identify monetary policy impulses, notably the ratio of total central bank assets to nominal GDP (Brei et al., 2013), the interbank rate (Roulet, 2018), or central bank claims on banks relative to total banking system assets (Bouis, 2019), which indicates bank liquidity stress. We use the latter indicator to identify the monetary policy, as the two former variables can be problematic. Firstly, the ratio of central bank assets to nominal GDP may include exposure to other financial institutions besides deposit banks, thereby amplifying the effect. Secondly, because of the interbank market segmentation, the interbank rate may underestimate the actual exposure of banks to the central bank. The expected impact of central bank claims (CBclaims) on lending is positive.

The power of the regulator represents the quality of institutions. According to Levine (1997), the institutional framework, seen in terms of efficiency in contract enforcement and legal protection of creditors, affects financial development. The regulatory quality (RQ) measures perceptions of the government's ability to formulate and implement sound policies and regulations that enable and promote private sector development as defined by Kaufmann et al. (2011). According to the literature, this variable should positively affect private credit.[20] We, therefore, expect that a well-regulated legal framework will have a positive effect on the volume of bank credit. Additionally, we include an indicator of political stability (Po. Stability). Several countries in WAEMU have undergone political crises throughout the study period.[21] The data on the regulator quality (RQ) and political stability come from the World Bank's Worldwide Governance Indicators (Kaufmann et al., 2011).

3.2 Estimation strategy

Our choice of a static model over a dynamic model is justified because we did not find any persistence in lending. In other words, the lagged dependent variable is not significant. For transparency, we estimated the dynamic model using the GMM technique (Blundell and Bond, 1998; Arellano and Bover, 1995). The results are reported in Table A2. The lag of the dependent variable is never significant. Therefore, as Fungáčová et

[20] If banks have no recourse against defaulting borrowers, borrowers will have less incentive to repay their loans, which may make banks more cautious in their lending activity (Daumont et al., 2004).

[21] Other variables are used in the literature, such as the occurrence of banking crises or wars that can reduce both the demand and supply of credit. Since the 1990s, no period of the banking crisis has been detected in the WAEMU from the database constructed by Laeven and Valencia (2018), and periods of war, one of the criteria of which is 1,000 deaths per year, do not apply to the countries of the zone either.

al. (2014), we prefer a fixed effects panel regression on a static model over a dynamic specification.

To reduce the endogeneity bias concerning a possible reverse causality between loans and securities, we introduce our variable of interest (*Securities*) with one lag in the baseline model. It can be hard to argue that the actual amount of loans affected the securities held by banks in the last year. One can argue that bank-level variables can also be endogenous; therefore, we introduce all bank characteristics and macroeconomic variables with one lag, except institutional quality indicators. Our model includes bank fixed effects that account for all unobserved time-invariant bank characteristics. These effects may capture the bank's long-term strategy of bond holdings as their business model: profitability, lack of credit demand, safe assets, etc. We control for common shocks by including time effects.[22]

However, to check the robustness of our baseline estimation strategy, we additionally employ the Blundell and Bond (1998) system GMM panel estimator that corrects for endogeneity in the model. We prefer the system GMM over the first-difference GMM approach as the latter suffers from significant shortcomings when the explanatory variables are persistent over time and therefore their lagged levels are weak instruments for the regression equation expressed in difference, as highlighted by Blundell and Bond (1998). The problem of biased coefficients due to weak instruments is exacerbated in small samples. As our sample is small (151 banks), we prefer the system GMM estimator, and we will correct for the finite sample bias. This estimator combines the original equation and a transformed one. It allows us to correct for the three possible endogeneity issues: measurement error, reverse causality, and omitted variable bias. Technically, this method relies on first-differencing to remove the individual fixed effects and uses appropriate lags of the right-hand side variables as internal instruments. As suggested by Arellano and Bover (1995), we apply the forward orthogonal deviations transformation of the original equation to purge banks' fixed effects and use the two-step estimator, including the Windmeijer (2005) finite sample correction.

We use internal instruments in this study. The choice of internal instruments is based on the difficulty of finding exogenous instruments, in other words, finding variables that may affect banks' security holdings but are orthogonal to their loans. We use levels of regressors lagged twice and further as instruments in the first-difference equations, and the first-difference of this variable lagged once as additional instruments in the level equations. To limit the number of instruments, we restrict the lag range used in generating them at four.[23] The instrument matrix is collapsed as suggested by Roodman (2009a) to limit the number of instruments of these variables. We consider only one endogenous variable, which is the variable of interest: *Securities*. As control variables are introduced with one lag in the model (bank-level and macroeconomic

[22] We also include the interaction between bank-fixed effects and time dummies. The result is available upon request.

[23] In an unreported table, we restrict the lag range used in generating instruments at two and three. The results remained robust.

variables), reducing the endogeneity of these variables, they are therefore treated as exogenous in the GMM estimator. Endogenous variables are treated differently to avoid the problem of instrument proliferation. Applying GMM instruments to these variables may substantially increase the number of instruments. As pointed out by Roodman (2009b), many instruments may induce biased estimates.[24]

Two tests are conducted to verify the validity of our instrumental variable technique (system-GMM). Firstly, we test for overidentification restrictions using the Hansen test as we cluster at the bank-level. The Hansen test is asymptotically distributed as a chi-squared (χ^2) with degrees of freedom equal to the number of instruments minus the number of parameters to be estimated. Under the null hypothesis, the Hansen test is the instrument exogeneity. The second test checks for the first(AR1) and second(AR2)-order autocorrelation in the error term. The ARj with $j = 1,2$ is asymptotically distributed as a standard normal under the null hypothesis of no *jth*-order serial correlation and provides a further check on the model specification and the legitimacy of variables dated *t-j* as instruments.

4 Data

4.1 Sources

We use hand-collected bank-level data from all WAEMU countries from 2003 to 2022. These bank-level data come from the balance sheets and income statement statistics of banks and financial institutions published by the Banking Commission.[25] Macroeconomic data come from the BCEAO databases, the World Development Indicators (WDI), and the World Governance Indicators (WGI) of the World Bank (Kaufmann et al., 2011) for institutional quality. For data cleaning purposes, we only use monetary institutions, i.e., those that receive customer deposits and do the lending business. Therefore, we have eliminated other non-monetary institutions, including investment and leasing banks. We also include banks that have ceased operations to avoid selection bias (Delis and Kouretas, 2011). We winsorize each accounting variable at the top and bottom 1% to reduce the effects of outliers. We ended up with an unbalanced panel of 151 banks over the 2003-2022 period.

Table A3 reports the definitions and measures of variables used in the main regressions.

4.2 Descriptive statistics

The descriptive statistics presented in Table 1 provide an overview of the data used in this paper. The dependent variable (variation of loans to total assets) has less variability, with an average change of 0.6%.

[24] In the robustness checks, we treat all endogenous variables equally by using their lags as instruments. The number of instruments has more than doubled; however, the results remained robust.

[25] The banking commission was established in 1990 to supervise the banking sector activity and ensure its integration. The production of public data by this institution of banks' balance sheets began in 2000 and on the income statement in 2003.

However, the dispersion of SD≈ 10% indicates a significant heterogeneity among banks in this region with a maximum change of 38.2%. Despite this weak variability, banks allocate on average 53.7% of their assets in loans to the private sector, showing the intensity of lending activity in the banks' balance sheets in the WAEMU region. This heterogeneity is also found in their activity of purchasing marketable securities. The ratio of bank investment in securities represents 15.3% (SD=14.3%). It is worth noting that some banks are more implicated in security subscription by allocating more than 50% of their assets in sovereign securities (Max.=58%), and this heterogeneity is also found across countries (see Figure 2) and over time (see Table A1).

Table 1: Descriptive statistics.

	Obs.	Mean	SD.	Min.	Max.
Loan	1898	0.006	0.093	-0.232	0.383
Securities	1898	0.153	0.143	0.000	0.580
Size	1898	11.740	1.211	8.438	14.228
CAP	1898	0.104	0.127	0.000	0.757
LLP	1898	0.007	0.013	0.000	0.083
INT	1895	0.103	0.047	0.015	0.383
LIQ	1898	0.694	0.238	0.082	1.435
Loans	1898	0.537	0.148	0.017	0.845
Profitability	1897	-0.003	0.049	-0.299	0.061
HHI	1898	0.126	0.044	0.060	0.310
GDP	1898	4.727	2.607	-5.370	10.760
Inflation	1898	2.262	2.833	-3.100	11.305
CBclaims	1771	2.608	1.460	0.066	6.748
Unemployment	1898	3.005	1.631	0.317	7.223
Financial depth	1898	18.984	7.099	1.141	32.373
RQ	1898	-0.535	0.270	-1.276	-0.109
Po. Stability	1898	-0.696	0.705	-2.561	0.548

This table reports the number of observations, the mean, and the standard deviation of the variables. See Table A3 for variable definitions.

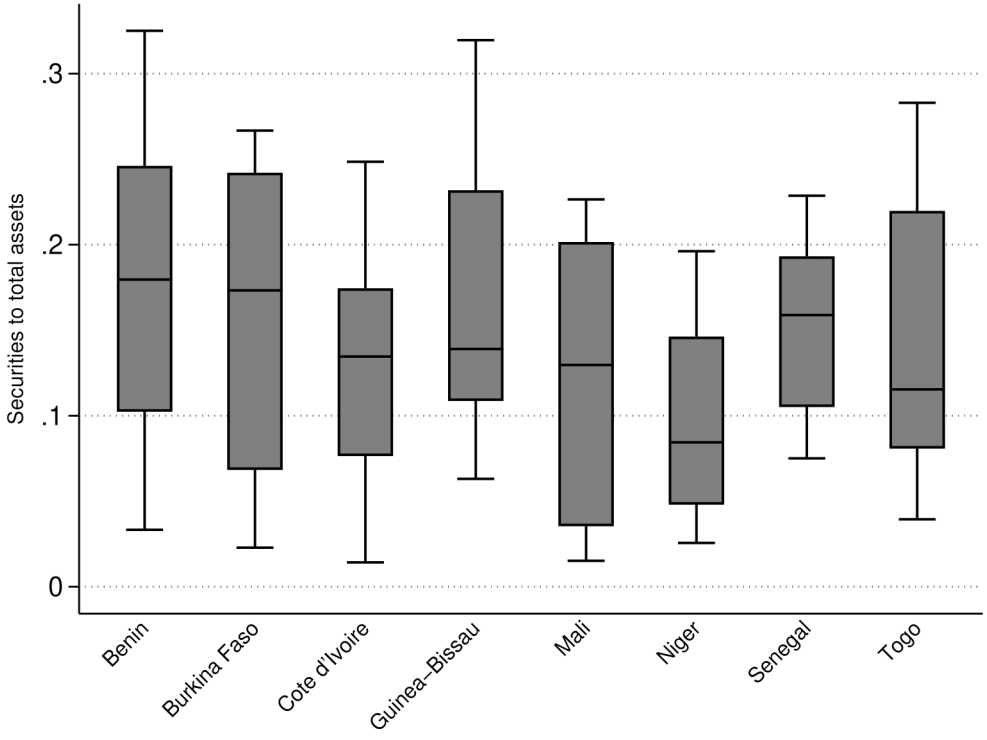
The correlation matrix in Table A4 illustrates a negative and statistically significant correlation between bank security holdings and private sector credit. However, it is important to emphasize that the interpretation of this relationship should be approached with caution due to the potential presence of reverse causality. For instance, an increase in government security holdings could be a result of either a bank portfolio

management choice or, conversely, a decline in demand for credit from the private sector, prompting banks to seek alternative investment options such as securities. Additionally, the correlation coefficients between the control variables are mostly low, indicating a low risk of multicollinearity among variables.

5 Main results

Table 2 presents the results of the estimates of Equation (1). We first estimate our model with fixed effects (FE) in columns 1 and 2. Column 1, which takes on only bank fixed effects, documents an adverse impact of sovereign security holdings on bank loans. By including the time effects in column 2, the result remains slightly the same as the model accounting only for bank individual effects. The estimates in columns 3 to 5 are from the GMM approach. This approach can overcome potential endogeneity bias, such as measurement error, reverse causality, as well as omitted variable bias. The estimate associated with model specification, including only country FE is slightly larger (column 4) than the specification considering only year dummies (column 3). Our preferred model includes both effects (year and country) in column 5, and the banks' fixed effects are purged by using forward orthogonal deviations. Before interpreting the estimate of our preferred specification, we will discuss the validity of our empirical strategy.

Figure 2. Summary of security holdings by country



The figure presents the average exposure to sovereign securities of the national banking systems in the eight Member States of the WAEMU region.

The consistency of the GMM technique requires the validity of some inference tests regarding the instruments used. First, we check whether the criterion of exclusion restriction is verified through an over-identification test. In all specifications, we failed to reject the null hypothesis of Hansen's over-identification test. All instruments are valid. Also, the p-value of the auto-correlation test of second-order (AR2) is above 10% in all specifications, indicating no serial correlation in our model.

The estimates in column 5 obtained by the GMM approach aligned with the estimates obtained by the FE method. The results document a negative relationship between sovereign securities and private sector credit. After controlling for time and bank fixed effects, the result is statistically significant at the 1% level. This result suggests that an increase in bank security holdings yields a decline in credit extended to the private sector, which may indicate the presence of a quantitative crowding out in the WAEMU region credit market. The result is far from being small. An increase of 10% of the securities to total assets will induce a decrease of 2.5% of the loans to total assets. This result validates the *H1a* of the presence of a crowding-out mechanism in the WAEMU region. Our findings are consistent with work in EMDEs (Bouis, 2019), which is based on macrodata. Furthermore, the estimate seems economically significant. One standard deviation increase in banks' security holdings induces a decrease of 0.036 in bank lending. In terms of percentage, one standard deviation increase in banks' exposure to sovereign debt leads to a decline in loans to total assets by 6.66%.[26]

6 Robustness checks

In this section, we conduct several robustness checks to ensure the validity of our findings. Firstly, we use an alternative metric of bank loans to the private sector to overcome a possible denominator effect. Secondly, we employ alternative proxies for government debt, specifically treasury bills and outstanding bonds. Thirdly, we employ alternative estimation techniques to strengthen the reliability of our results. The definition and descriptive statistics of additional variables used in the robustness checks (also in heterogeneity analysis) are reported in Tables A5 and A6, respectively.

6.1 Alternative measures of private credit

Loans and securities ratios represent two significant components of bank assets, so when total assets change, for example, securities, another component must change, leading to biased results. For robustness check and to demonstrate that our specification does not suffer from any mechanical relationship between the dependent variable and the variable of interest, we use alternative metrics of loans as in Gennaioli et al. (2018). We use the loan growth rate as the logarithm of the change in loans between year t and year t-1

[26] (−0.25) *0.143 = −0.03575
(−0.03575)/0.537 = −0.0666

($\Delta log(Loan)$).

Table 3 presents results using this metric with different estimators. Regardless of the methodological approach, the coefficient of banks' exposure to sovereign debt is statistically significant. We only interpret the result associated with the GMM estimator in column 5. The effect of sovereign debt exposure by banks is sizable on loan growth. If sovereign debt exposure increases by one standard deviation, then loan growth goes down by 25.3%.[27] This finding further supports our baseline result and provides robust evidence for our hypothesis (*H1a*) that loan growth is harmed by securities holdings in the previous period.

6.2 Does domestic financing of public deficit affect banks' loans?

We use alternative proxies for banks' exposure to sovereign debt to better understand the relationship between domestic debt and bank lending activity. Specifically, we employ the government securities outstanding for each country as a proxy for domestic public debt to account for measurement error. These variables are macroeconomic data in contrast to *Securities*, which is bank-level data. The lack of knowledge on the proportion of sovereign securities held by banks in the *Securities* variable before 2018 means that the results can only be interpreted as the effect of banks' security holdings on bank lending activity, even though we made analyses to demonstrate that securities in banks' balance sheets in WAEMU are primarily or exclusively public ones. Member States' securities are issued in the regional capital markets and are considered domestic securities. Regressing loans on the government securities outstanding, we aim to check whether domestic government borrowing does not deprive the private sector of funds in bank credit markets.

Results are presented in Table 4 in columns 1 and 4. They document an adverse effect of sovereign deficit financing on domestic loans to the private sector by the banking sector in the WAEMU and therefore support *H1a*. Additionally, we break down this variable into its components: treasury bills and bonds, in % of GDP. We seek to see which component affects bank loans more. The two sovereign financial instruments are negatively related to banks' loans to the private sector (columns 2, 3, 5, and 6). More specifically, these results reveal that the adverse effect of sovereign securities on bank credit to the private sector is driven by both short-term and long-term banks' exposure to this sovereign debt (columns 2, 3, 5, and 6). However, the magnitude of this effect is higher for long-term securities (column 6). This result should be treated with caution, as the FE method shows the opposite, with a higher crowding effect when the sovereign financial instrument is a short-term debt (column 2).

[27] −0.95 * 0.143 = −0.136
− 0.136/0.537 = −0.253

6.3 Alternative estimation strategies

We aim to check the sensitivity of our estimation strategy by using alternative identification strategies. Firstly, we test the sensitivity of the estimator by using the one-step GMM estimator instead of the two-step GMM estimator, secondly, using all available lags of the variable *Securities* as instruments and thirdly, horizontally treating all possible endogenous variables. Finally, the standard linear regression methods use the average relationship between a set of regressors, and the independent variable based on the conditional mean function $E(Y/X)$, and provides only a partial view of the relationship, as we might be interested in describing the relationship at different points in the conditional distribution of Y. We, therefore, use the quantile regression technique on panel data, which allows us to investigate whether the relationship between security holdings and private sector credit differs throughout the distribution of the latter (Koenker and Hallock, 2001).

Table 5 presents the estimates obtained with the GMM method. Our results remain robust by using the one-step system-GMM method (columns 1 to 3), exploiting all available lags (columns 4 to 6), and treating horizontally all possible endogenous variables (bank-level and macro-level variables). The last method to not only treat the lag of securities as endogenous but also bank-level and macro-level increases substantially the number of instruments (98 in the preferred model in column 9, including both effects: year and country) and also, we failed to reject the Hansen test of over-identification and the AR2 test suggests an absence of serial correlation of second-order.

Turning now to quantile analysis, the results are presented in Table 6. The estimates suggest that security holdings adversely affect the private sector credit of the three quartiles (25th, 50th, and 75th). These results are consistent with those reported in the mean regression models. These results suggest that banks with extensive lending activity tend to reduce their loans in response to their security holdings. One explanation of a higher effect on the upper quartile can come from the fact that these dynamic banks may be forced to reduce their main activity as they allocate part of their assets to sovereign debt. However, one can argue that dynamic banks face fewer liquidity constraints as they may attract larger deposits. Consequently, these banks can invest in sovereign debt, thereby mitigating their risk exposure while maintaining their lending activities.

Table 2: Effect of banks' sovereign debt exposure on private credit in WAEMU.

	FE				GMM					
	Coef.	Robust S.E.	Coef.	Robust S.E.	Coef.	Robust S.E.	Coef.	Robust S.E.	Coef.	Robust S.E.
	1		2		3		4		5	
$Securities_{t-1}$	-0.119***	(0.026)	-0.120***	(0.025)	-0.251***	(0.079)	-0.231**	(0.091)	-0.250***	(0.080)
$Size_{t-1}$	-0.003	(0.007)	0.003	(0.007)	0.002	(0.004)	-0.001	(0.005)	0.002	(0.005)
CAP_{t-1}	0.019	(0.054)	0.038	(0.056)	0.007	(0.036)	-0.007	(0.035)	0.003	(0.037)
LLP_{t-1}	-0.587*	(0.304)	-0.434	(0.317)	-0.473*	(0.258)	-0.510*	(0.260)	-0.473*	(0.268)
INT_{t-1}	0.048	(0.067)	0.083	(0.067)	0.098	(0.071)	0.060	(0.081)	0.123*	(0.074)
LIQ_{t-1}	-0.010	(0.020)	-0.017	(0.021)	-0.017	(0.015)	-0.018	(0.016)	-0.023	(0.016)
$Loans_{t-1}$	-0.478***	(0.028)	-0.475***	(0.027)	-0.389***	(0.036)	-0.390***	(0.040)	-0.385***	(0.037)
$Profitability_{t-1}$	0.111	(0.070)	0.107	(0.073)	0.093	(0.066)	0.092	(0.064)	0.097	(0.066)
HHI_{t-1}	0.324**	(0.131)	-0.104	(0.156)	-0.079	(0.091)	0.238*	(0.134)	-0.078	(0.150)
GDP_{t-1}	0.002**	(0.001)	0.001	(0.001)	0.002*	(0.001)	0.002***	(0.001)	0.002*	(0.001)
INF_{t-1}	0.001	(0.001)	0.002	(0.001)	0.001	(0.001)	0.000	(0.001)	0.001	(0.001)
$CBclaims_{t-1}$	0.001	(0.002)	0.001	(0.003)	-0.001	(0.002)	0.003*	(0.002)	0.001	(0.003)
$Unemployment_{t-1}$	0.002	(0.003)	-0.001	(0.003)	0.001	(0.002)	0.002	(0.002)	-0.001	(0.003)
$Financial\ depth_{t-1}$	0.000	(0.001)	0.003*	(0.001)	0.001	(0.001)	0.000	(0.001)	0.001	(0.001)
RQ	-0.006	(0.020)	-0.013	(0.023)	0.005	(0.014)	-0.003	(0.018)	-0.011	(0.020)
Po. Stability	-0.003	(0.005)	-0.004	(0.006)	-0.004	(0.004)	-0.007	(0.005)	-0.007	(0.005)
Obs.	1898		1898		1898		1898		1898	
# Banks	151		151		151		151		151	
Year FE	No		Yes		Yes		No		Yes	
Bank FE	Yes		Yes							
Country FE					No		Yes		Yes	
No. of instruments					39		28		46	
AR1 (p-value)					0.00		0.00		0.00	
AR2 (p-value)					0.76		0.99		0.80	
Hansen-J (p-value)					0.50		0.38		0.45	

Specifications in columns 1 and 2 were estimated using a fixed-effects estimator and from columns 3 to 5 using a system GMM estimator. The dependent variable is the change in loans, measured as loans outstanding in year t minus loans outstanding in year t-1, divided by total assets. The main explanatory variable is bank security holdings, computed as securities outstanding to total assets. The Hansen J test of over-identifying restrictions is distributed as $Chi-$ square under the null hypothesis of instrument validity. Ar(j) is a test of jth-order serial correlation in the first-differenced residuals, asymptotically as $N(0,1)$ under the null hypothesis of no serial correlation. We use forward orthogonal deviations with the GMM estimator to purge banks' fixed effects. Robust standard errors in parentheses are robust and clustered at the bank level. *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table 3: Effect of banks' sovereign debt exposure on private credit: using an alternative measure of sovereign debt.

	FE		GMM		
	(1)	(2)	(3)	(4)	(5)
$Securities_{t-1}$	-0.411**	-0.429**	-0.894**	-0.877*	-0.950**
	(0.175)	(0.177)	(0.411)	(0.496)	(0.439)
Obs.	1898	1898	1898	1898	1898
# Banks	151	151	151	151	151
Year FE	No	Yes	Yes	No	Yes
Bank FE	Yes	Yes			
Country FE			No	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
No. of instruments			39	28	46
AR1 (p-value)			0.00	0.00	0.00
AR2 (p-value)			0.46	0.40	0.39

Specifications in columns 1 and 2 were estimated using a fixed-effects estimator and from columns 3 to 5 using a system GMM estimator. The dependent variable is the loans' growth rate ($\Delta log(Loan_{itj})$). The main explanatory variable is bank security holdings, computed as securities outstanding to total assets. The Hansen *J* test of over-identifying restrictions is distributed as *Chi*−square under the null hypothesis of instrument validity. Ar(j) is a test of *j*th-order serial correlation in the first-differenced residuals, asymptotically as $N(0,1)$ under the null hypothesis of no serial correlation. We use forward orthogonal deviations with the GMM estimator to purge banks' fixed effects. Robust standard errors in parentheses are robust and clustered at the bank level. *** Statistical significance at the 1% level **Statistical significance at the 5% * Statistical significance at the 10% level.

Table 4: Effect of domestic sovereign debt outstanding on private credit: Treasury bills and government bonds

	FE			GMM		
	(1)	(2)	(3)	(4)	(5)	(6)
Gvt securities	-0.433***			-0.523***		
	(0.091)			(0.113)		
Tresory bills		-0.453***			-0.421***	
		(0.117)			(0.127)	
Gvt Bonds			-0.377***			-0.647***
			(0.131)			(0.185)
Obs.	1898	1819	1486	1898	1819	1486
# Banks	151	151	150	151	151	150
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes			
Country FE				Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
No. of instruments				43	43	40
AR1 (p-value)				0.00	0.00	0.00
AR2 (p-value)				0.42	0.12	0.19
Hansen-J (p-value)				0.51	0.31	0.89

Specifications in columns 1 to 3 were estimated using a fixed-effects estimator and from columns 4 to 6 using a system GMM estimator. The dependent variable is the change in loans, measured as loans outstanding in year t minus loans outstanding in year t-1, divided by total assets. The main independent variables are the government securities outstanding to GDP (Gvt securities), treasury bills outstanding to GDP (Treasury bills), and government bonds outstanding to GDP (Bonds). The Hansen J test of over-identifying restrictions is distributed as Chi−square under the null hypothesis of instrument validity. Ar(j) is a test of jth-order serial correlation in the first-differenced residuals, asymptotically as N(0,1) under the null hypothesis of no serial correlation. We use forward orthogonal deviations with the GMM estimator to purge banks' fixed effects. Robust standard errors in parentheses are robust and clustered at the bank level. *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table 5: Effect of banks' sovereign debt exposure on private credit using alternative estimators.

	One-setp GMM			Use all available lags (Two-step GMM)			Horizontal treatment of all possible endog. var. (Two-step GMM)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Securities_{t-1}$	-0.210**	-0.178*	-0.210**	-0.096**	-0.072*	-0.089**	-0.275***	-0.174**	-0.274***
	(0.083)	(0.091)	(0.084)	(0.040)	(0.040)	(0.040)	(0.079)	(0.076)	(0.071)
Obs.	1898	1898	1898	1898	1898	1898	1898	1898	1898
# Banks	151	151	151	151	151	151	151	151	151
Year FE	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Country FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of instruments	39	28	46	53	42	60	91	80	98
AR1 (p-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR2 (p-value)	0.68	0.90	0.71	0.57	0.76	0.56	0.66	0.94	0.41
Hansen-J (p-value)	0.50	0.38	0.45	0.20	0.26	0.17	0.29	0.11	0.50

This table presents estimates from the GMM technique. From columns 1 to 3, the estimates were obtained using the one-step system-GMM method. From columns 4 to 6, all available lags as valid instruments for variable Securities are exploited. In columns 7 to 9, all bank-level and macro-level variables are treated as endogenous and their lags are used as instruments. The dependent variable is the change in loans, measured as loans outstanding in year t minus loans outstanding in year t-1, divided by total assets. The main explanatory variable is bank security holdings, computed as securities outstanding to total assets. The Hansen J test of over-identifying restrictions is distributed as Chi−square under the null hypothesis of instrument validity. Ar(j) is a test of jth-order serial correlation in the first-differenced residuals, asymptotically as N(0,1) under the null hypothesis of no serial correlation. We use forward orthogonal deviations with the GMM estimator to purge banks' fixed effects. Robust standard errors in parentheses are robust and clustered at the bank level. *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table 6: Effect of banks' sovereign debt exposure on private credit using alternative estimators (Quantile regression).

	Quantile regression		
	Q(0.25)	Q(0.5)	Q(0.75)
	(1)	(2)	(3)
$Securities_{t-1}$	-0.083**	-0.106***	-0.128***
	(0.033)	(0.024)	(0.030)
Obs.	1910	1910	1910
# Banks	152	152	152
Year FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Covariates	Yes	Yes	Yes

Robust standard errors in parentheses are robust and clustered at the bank level. *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

7 Heterogeneity analyses

Because of the heterogeneity across countries and banks, the effect of sovereign debt on loans may differ. Firstly, countries in WAEMU are disparate regarding their income level and financial development. Secondly, banks are far from being homogeneous in the region. Thus, their exposure to sovereign debt can have differentiated effects according to their characteristics. These heterogeneity effects are analyzed by introducing interaction terms: *Securities* * *Z* (see Equation (2)). *Z* stands for country or bank characteristics that we are interested in. Our heterogeneity analyses focus on country and bank characteristics: income level, ownership structure, size, and capitalization. We aim to determine how these characteristics shape the relationship between banks' exposure to sovereign debt and private sector credit *(H1b-H4)*. The overall effect will be the sum of the *Securities* and the interaction term coefficient (*Securities* * *Z*). We interpret only the results from the GMM estimator, as this technique allows us to overcome several endogenous biases as aforementioned.

7.1 Country income level

The WAEMU Member States are categorized as developing and low- and middle-income countries, yet they are heterogeneous. Côte-d'Ivoire and Senegal belong to the category of low-middle income countries, unlike the other countries of the WAEMU zone. Additionally, these two countries are ahead in financial development. The two dominate the banking system in terms of the number of banks and market share. The LMICs account for 41% of banks in the sample. Out of 131 operating banks in the WAEMU region in 2022, 55 banks were in the two countries, with a market share of 52.7% of the regional banking sector (Banking Commission, 2022).

The t-test in Table A7 is based on bank and macroeconomic characteristics and reveals several interesting facts. Firstly, regarding bank-level variables, it appears that banks in LMICs are exposed to sovereign debt as much as LICs banks by holding on average 15.3% of their assets in sovereign securities. Yet, the t-test results reveal that banks in LMICs are larger and more competitive (both in interest rate and market share of assets). They mobilize, on average, more deposits. To estimate the effect of income level, we create a dummy equal to 1 if the country is a low-middle income country, 0 otherwise, and interact with the exposure of banks to sovereign debt. The result of the interaction term is presented in Table 7 (column 1 using the FE model and column 6 using the GMM method). Whereas the coefficient using the FE model suggests that sovereign debt exposure harms more bank loans in LMICs than in LICs therefore invalids our hypothesis *H1b*, however our preferred estimator found a statistically significant difference in the effect of sovereign debt holding between banks in LICS and LMICs. The net effect of sovereign debt exposure on loans is larger in LMICs than in LICs, which is −0.152. One standard deviation increase in security holdings leads to a reduction of loans in LMICs by 4.04% of loans.[28]

This finding may appear counter-intuitive as it could be expected that countries with a higher level of financial development would have the capacity to offset the adverse effects of holding sovereign securities on loans. Yet, this finding aligns with those of Demirci et al. (2019), who find that the crowding-out effect is more substantial for firms in countries with more liquid and large equity markets.

7.2 Ownership structure

The first bank characteristic that we look at is the ownership structure. The banking sector in the WAEMU region is dominated by foreign banks, representing on average 73.3% of the banks operating in the region. This indicates the importance of foreign banks in the provision of financial services in the WAEMU region. Foreign banks are mainly Pan-African (65.4%) and French banks (8.4%). We examine the relationship between bank ownership structure and security holdings on private credit based on ownership structure. Specifically, we hypothesize that the effect of security holdings on private credit will vary between domestic and foreign banks and between the different types of foreign ownership.

Firstly, we seek to examine whether there is a difference between foreign and domestic banks' lending when they are exposed to sovereign debt. Table A8 reports the t-test results of variable means between banks based on their ownership structure, i.e., domestic versus foreign. It highlights the superior lending activity of domestic banks (56.2%) compared to their foreign peers (52.9%). Nevertheless, foreign banks hold on average more securities in their portfolio (16.4%) than domestic banks (12.4%). This difference is

[28] (−0.152) * 0.143 = −0.0217
(−0.0217)/0.537 = −0.0404

statistically significant (see Table A8 in column 5). In contrast, domestic banks collect more deposits. Yet, they are exposed to more risk (higher LLP) and apply higher interest rates. To test our *H2a*, we interact a dummy variable, which takes on one if the bank is foreign and zero otherwise, with banks' exposure to sovereign securities (*Securities*Foreign*).[29] Table 7 reports the estimates of Equation (2). The coefficient of the interaction term (*Securities*Foreign*) is negative yet not statistically significant (column 7). Therefore, the effect is not different between foreign and domestic banks and invalidates our *H2a*. However, the net effect ($\beta_1 + \beta_2$) is negative and significant at the 1% level. This result suggests that the adverse effect of security holdings on lending activity to the private sector is higher for foreign than domestic banks. Still, it should be noted that the difference is not significantly different from that of domestic banks. Being a foreign bank and increasing the exposure to sovereign debt by one standard deviation decreases loans by 3.28%.[30]

Secondly, foreign banks are diverse in terms of origin and characteristics; therefore, we examine whether there is a heterogeneity in their behavior regarding their origin. Two main types of foreign banks are operating in the WAEMU region: Pan-African banks (PABs) and foreign banks from other regions (countries), mainly France. A foreign bank is defined as a Pan-African bank when at least 50% of its capital is held by an African entity. In contrast, a foreign bank whose capital (50% at least) is held by a non-African entity is considered a foreign bank other than PAB. Table A9 reports the difference in mean tests between PABs and other banks. The results indicate that PABs hold more securities in their balance sheets (17.4%) than their peers (11.4%). Other notable differences can also be observed regarding their other observable characteristics, such as LLP, liquidity, interest rate, deposit and lending. The estimate of the interaction between exposure to sovereign debt and being a PAB is presented in Table 7 in column 8, and it is statistically significant. The overall effect suggests that PABs reduce their loans to the private sector by 5.1% when their exposure to sovereign securities increases by one standard deviation.[31] This supports *H2b*. The literature on PABs documents that these banks are less profitable and exposed to more risk (Kanga et al., 2020). Therefore, this result suggests that they may willingly increase their safe assets by holding sovereign securities and improving their profitability. We found no evidence for a block of non-Pan-African ownership and security holdings on loans (column 9).

Finally, the last ownership type that we examine is French ownership. French banks refer to foreign banks whose capital is held mainly by French entities. Results from the t-test based on the comparison between French and non-French banks (domestic and foreign banks other than French) are in Table A10. French

[29] To avoid the multicollinearity problem, we introduce the ownership structure separately.
[30] −0.123 * 0.143 = −0.0176
0.0176/0.537 = −0.0328
[31] −0.192 * 0.143 = −0.0274
− 0.0274/0.537 = 0.051

banks are less exposed to securities than their peers; however, they are more involved in lending activities. We introduce an interaction term of security holdings with the French ownership status (*Securities*Foreign French*). Table 7 reports the estimate of the interaction term (columns 5 and 10). The result is positive and statistically significant. This finding suggests that French ownership of banks mitigates the crowding-out effect of bank exposure to securities on private credit. The net effect of banks' exposure to sovereign securities on private sector credit for French banks is 0.054, indicating a crowding-in of French banks. However, the effect is not statistically significant. One possible explanation of this finding is that French banks in developing countries lend to large corporations by practicing "cherry-picking" (Beck et al., 2014; Kanga et al., 2019), and their exposure to sovereign debt may not affect their loans to these corporations that also represent safe assets. In contrast, exposure to safer assets can incentivize them to take more risk by expanding their loans to SMEs.

7.3 Bank size

We seek to examine the nexus between bank size and security holdings on private credit. Specifically, we hypothesize that the impact of security holdings on private credit will vary between large and small banks. To test this hypothesis, we create three metrics to classify banks into large and small groups. The first metric is based on the Banking Commission classification. The WAEMU Banking Commission classifies banks into three categories: (i) large banks with total assets larger than 200 billion CFA francs, (ii) medium-sized banks with total assets between 100 billion CFA francs and 200 billion CFA francs, and (iii) small banks with total assets less than 100 billion CFA francs. We classify them into two groups instead of three: large and small banks.[32] Small banks are made up of banks with total assets of less than 100 billion CFA francs and large banks with more than 100 billion CFA francs. Based on the latter classification, we construct a dummy that takes on one if a bank has been classified as large at least 75% of the time and zero otherwise. This metric gives us a more accurate representation of large and small banks. Finally, we create a metric based on the median. It is constructed by taking banks above the median of the size variable as large banks and below the median as small banks.

Table A11 presents the results of the t-test analysis between large and small banks. The statistical results demonstrate significant differences between the two groups. On the one hand, small banks lend more to the private sector than their larger counterparts. On the other hand, large banks are more heavily involved in security subscriptions than their small-sized counterparts (more than 17% of their assets are allocated to sovereign debt), as indicated by the three classifications in Table A11 (Panels A, B and C). Additionally, the

[32]The choice of two subgroups instead of three is due to the low number of observations in each sample according to this classification.

large banks are not the well-capitalized ones, but they are less risky in terms of non-performing loans.

Turning now to the estimate of the interaction term (*Securities*Large bank*) presented in Table 8, it reveals a positive and significant effect using the three measures (columns 4 to 6). The net effect remains negative and statistically significant for all three metrics. This suggests that large banks help to mitigate the negative impact of banks' security holdings on loans in the WAEMU region. The economic significance difference between the two types of banks is paramount. Specifically, one standard deviation increase in large bank exposure to sovereign securities reduces loans by 3.35% against 10.35% for a small bank (column 4).[33] This result supports the *safe assets* view and *H3*, which posits that large banks may access to internal and external financial resources (Kashyap and Stein, 1994; Stein, 1997; Cetorelli and Goldberg, 2012) and be able to finance sovereign deficit and therefore hold more safe assets, which in turn helps them to mitigate the negative impact of securities holdings on loans.

7.4 Bank capitalization

To test our hypothesis that well-capitalized banks reduce their lending to the private sector less than their under-capitalized peers when holding sovereign debt, we use an interaction term with *Securities* and a dummy variable that identifies the status of the bank's capitalization level. As for bank size, we construct three dummies to classify banks into two groups: Well-capitalized and Under-capitalized. We create one dummy variable based on the bank's compliance with the minimum capital requirement set by the banking commission and two others based on the former and the amount of bank capital compared to the median value.

The first dummy is constructed by ranking banks based on their compliance with the capital regulations set by the Banking Commission of the WAEMU region. From 2000 to 2015, the minimum capital threshold for banks in the WAEMU region underwent two significant changes. Initially, the threshold was set at 1 billion CFA francs, but in 2008, it was raised to 8 billion CFA francs. Following the 2008 global financial crisis, there was renewed interest in the minimum capital requirement for banks and its impact on financial system stability. As a result, the WAEMU Council of Ministers decided to raise the minimum capital requirement to 10 billion CFA francs in 2015.

Therefore, for each period, the dummy variable takes one if a bank meets the minimum capital requirement set by the regulatory authority, zero otherwise. The second dummy is constructed based on the first dummy. It takes on one if a bank has been well-capitalized at least 75% of the time. The last identification of a well-

[33] Large bank: −0.126 * 0.143 = −0.018
− 0.018/0.537 = 0.0335
Small bank: (−0.389) * 0.143 = −0.0556
− 0.0556/0.537 = 0.1035

capitalized bank is to create a dummy, which takes on one if the bank's capitalization (Equity/Assets) is above the median within the banking sector. We can accurately identify and differentiate between well-capitalized and under-capitalized banks in our sample using these three metrics.

Table A12 displays the t-test results between well-capitalized and under-capitalized banks. The two categories exhibit significant statistical differences in their characteristics. Specifically, on average, under-capitalized banks tend to extend more credit than their well-capitalized counterparts. Additionally, well-capitalized banks have a higher ratio of securities to total assets, with a value of 16.5% as compared to 12.5% for under-capitalized banks. These preliminary results suggest that well-capitalized banks tend to adopt a more cautious approach, with low leverage, limiting their loans to the private sector, representing a higher risk, and lending to the best risk.

Turning to the combined effect, i.e., being well-capitalized and exposed to sovereign debt on loans. Results are presented in Table 9. The interaction terms based on the compliance metric with the minimum capital and compliance with the regulatory capital at least 75% of the time are statistically significant (columns 4 and 5). Therefore, holding capital above average does not matter in explaining the heterogeneity effect across banks (column 6). Furthermore, the results in columns 4 and 5 suggest that well-capitalized banks help mitigate the negative effect of security holdings on credit extended to the private sector and support hypothesis *H4*. The effect is economically significant as one standard deviation increase in security holdings by well-capitalized banks reduces loans by 4.34% (11.04% for under-capitalized).[34] This finding can be seen as a *flight to quality* by well-capitalized banks. Put differently, low-risk assets, such as sovereign debt, create room for more risk assets and increase their private sector financing activity. Consequently, they will increase their risk exposure by lending more to the private sector and holding low-risk assets to maintain their risk exposure level and, therefore, be more profitable (Kanga et al., 2020).

[34]Well-capitalized banks: −0.163*0.143 = −0.0233
− 0.0233/0.537 = −0.0434
Under-capitalized banks: −0.415*0.143 = −0.0593
− 0.0593/0.537 = −0.1104

Table 7: Effect of banks' sovereign debt exposure on private credit accounting for heterogeneities.

	FE					GMM				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Securities_{t-1}$	-0.0979***	-0.0980**	-0.0881*	-0.140***	-0.127***	-0.0258	0.0423	0.0819	-0.0660*	-0.0680*
	(0.026)	(0.048)	(0.048)	(0.025)	(0.025)	(0.053)	(0.112)	(0.102)	(0.038)	(0.040)
$Securities_{t-1}$*$Income\ level_{t-1}$	-0.0544					-0.0937*				
	(0.040)					(0.051)				
$Securities_{t-1}$*$Foreign_{t-1}$		-0.0247					-0.166			
		(0.048)					(0.102)			
$Securities_{t-1}$*PAB_{t-1}			-0.039							
			(0.047)					-0.192**		
$Securities_{t-1}$*Foreign (Non-Africa)$_{t-1}$				0.159***				(0.093)	0.0489	
				(0.058)					(0.048)	
$Securities_{t-1}$*Foreign French$_{t-1}$					0.127**					0.122**
					(0.063)					(0.055)
$\beta_1 + \beta_2$	-0.152***	-0.123***	-0.127***	0.019	0.0003	-0.120***	-0.123***	-0.110***	-0.017	0.054
	(0.038)	(0.026)	(0.025)	(0.058)	(0.065)	(0.031)	(0.026)	(0.024)	(0.060)	(0.052)
Obs.	1895	1895	1895	1895	1895	1895	1895	1895	1895	1895
# banks	151	151	151	151	151	151	151	151	151	151
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes					
Country FE						Yes	Yes	Yes	Yes	Yes
R2	0.38	0.38	0.38	0.38	0.38					
No. of instruments						47	48	48	48	48
AR1 (p-value)						0.00	0.00	0.00	0.00	0.00
AR2 (p-value)						0.50	0.57	0.48	0.54	0.54
Hansen-J (p-value)						0.39	0.1	0.13	0.45	0.32

Specifications from columns 1 and 5 were estimated using a fixed-effects estimator and from columns 6 to 10 using a system GMM estimator. The dependent variable is the change in loans, measured as loans outstanding in year t minus loans outstanding in year t-1, divided by total assets. The main explanatory variable is bank security holdings, computed as securities outstanding to total assets. The Hansen J test of over-identifying restrictions is distributed as Chi−square under the null hypothesis of instrument validity. Ar(j) is a test of jth-order serial correlation in the first-differenced residuals, asymptotically as N(0,1) under the null hypothesis of no serial correlation. We use forward orthogonal deviations with the GMM estimator to purge banks' fixed effects. Robust standard errors in parentheses are robust and clustered at the bank level. *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table 8: Effect of banks' sovereign debt exposure on private credit accounting for size heterogeneity: large and small banks.

	FE			GMM		
	(1)	(2)	(3)	(4)	(5)	(6)
$Securities_{t-1}$	-0.160***	-0.139***	-0.166***	-0.398**	-0.153***	-0.338***
	(0.034)	(0.030)	(0.030)	(0.183)	(0.025)	(0.117)
$Securities_{t-1}$*Category based Commission classification $_{t-1}$	0.0597			0.272*		
	(0.037)			(0.156)		
$Securities_{t-1}$*Large if a bank has been large in 75% of times $_{t-1}$		0.0458			0.0710**	
		(0.040)			(0.031)	
$Securities_{t-1}$*Large if bank' asset is below the median $_{t-1}$			0.0834**			0.223**
			(0.034)			(0.099)
$\beta_1 + \beta_2$	-0.101***	-0.093***	-0.082***	-0.126***	-0.082***	-0.115***
	(0.028)	(0.033)	(0.029)	(0.036)	(0.026)	(0.032)
Obs.	1898	1898	1898	1898	1898	1898
# banks	151	151	151	151	151	151
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes			
Country FE				Yes	Yes	Yes
R2	0.38	0.38	0.38			
No. of instruments				48	49	48
AR1 (p-value)				0.00	0.00	0.00
AR2 (p-value)				0.73	0.59	0.66
Hansen-J (p-value)				0.39	0.29	0.54

Specifications from columns 1 and 3 were estimated using a fixed-effects estimator and from columns 4 to 6 using a system GMM estimator. The dependent variable is the change in loans, measured as loans outstanding in year t minus loans outstanding in year t-1, divided by total assets. The main explanatory variable is bank security holdings, computed as securities outstanding to total assets. The Hansen J test of over-identifying restrictions is distributed as Chi−square under the null hypothesis of instrument validity. Ar(j) is a test of jth-order serial correlation in the first-differenced residuals, asymptotically as N(0,1) under the null hypothesis of no serial correlation. We use forward orthogonal deviations with the GMM estimator to purge banks' fixed effects. Robust standard errors in parentheses are robust and clustered at the bank level. *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table 9: Effect of banks' sovereign debt exposure on private credit accounting for capitalization heterogeneity: well-capitalized and under-capitalized.

	FE			GMM		
	(1)	(2)	(3)	(4)	(5)	(6)
Securities $_{t-1}$	-0.131***	-0.106***	-0.140***	-0.415***	-0.351***	-0.143***
	(0.033)	(0.028)	(0.031)	(0.144)	(0.124)	(0.024)
Securities $_{t-1}$*Category based Commission classification $_{t-1}$	0.015			0.252**		
	(0.035)			(0.120)		
Securities $_{t-1}$*if bank is well-capitalized in 75% of times $_{t-1}$		-0.023			0.184*	
		(0.035)			(0.101)	
Securities $_{t-1}$*Category based minimum capital compliance $_{t-1}$			0.046			0.042
			(0.033)			(0.031)
$\beta_1 + \beta_2$	-0.100***	-0.129***	-0.094***	-0.163***	-0.166***	-0.100***
	(0.027)	(0.031)	(0.029)	(0.034)	(0.037)	(0.027)
Obs.	1898	1898	1898	1898	1898	1898
# banks	151	151	151	151	151	151
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes			
Country FE				Yes	Yes	Yes
R2	0.38	0.38	0.38			
No. of instruments				48	48	49
AR1 (p-value)				0.00	0.00	0.00
AR2 (p-value)				0.94	0.87	0.58
Hansen-J (p-value)				0.76	0.55	0.29

Specifications from columns 1 and 3 were estimated using a fixed-effects estimator and from columns 4 to 6 using a system GMM estimator. The dependent variable is the change in loans, measured as loans outstanding in year t minus loans outstanding in year t-1, divided by total assets. The main explanatory variable is bank security holdings, computed as securities outstanding to total assets. The Hansen J test of over-identifying restrictions is distributed as Chi−square under the null hypothesis of instrument validity. Ar(j) is a test of jth-order serial correlation in the first-differenced residuals, asymptotically as N(0,1) under the null hypothesis of no serial correlation. We use forward orthogonal deviations with the GMM estimator to purge banks' fixed effects. Robust standard errors in parentheses are robust and clustered at the bank level. *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

8 Conclusion

In light of increasing deficits and the need for funding for development, many developing countries are turning to their national savings to meet these demands. The leading investors in sovereign debt issued in the domestic market are banks, who also represent the principal financial services providers to firms and households in these countries. This paper examines the effect of banks' exposure to sovereign debt on their loans to the private sector. To do so, we use an unbalanced panel of 151 banks from 2003 to 2022 from the eight countries of the WAEMU region.

The results showed that banks' exposure to public securities reduced their credit to the private sector. We document that a one standard deviation increase in banks' exposure to sovereign debt reduced by 6.66% loans to firms and households in the WAEMU region. For robustness checks, we used alternative measures of private credit to overcome the denominator effect between banks' securities and loans. We found that the exposure to sovereign debt affects not only the change in loans to assets but also the loans' growth. Additionally, using macroeconomic data as proxies for sovereign securities, represented by government securities (bonds and treasury bills), we uncovered that outstanding government securities harm private sector credit, and the effect is significant whether the debt is in treasury bills or bonds. Our results remained robust while applying another estimation strategy. Quantile regression showed that the effect is significant in each quartile. However, the effect is slightly higher in the upper quartile, suggesting that dynamic banks' loans are more affected by their exposure to sovereign debt than those of more risk-averse banks.

The heterogeneity analyses based on country and bank characteristics showed several findings. Firstly, we found that the magnitude of the effect depends on the income level of countries. The effect is stronger in LMICs than in LICs. Secondly, the results showed that the adverse effect is higher among foreign banks than their domestic peers. Thirdly, the PABs pick up the adverse effect of foreign ownership, while for French banks, we observe a slight crowding-in effect. Fourthly, the findings indicate that large and well-capitalized banks' exposure to sovereign securities harms the private sector credit less. These results can suggest the presence of a "safe-assets" view within the regional banking system and, therefore, mitigate the crowding-out effect.

These results have implications for regulating banks' government security holdings in the region. Banks' appetite for sovereign debt can be a source of concern despite the optimal response to a deteriorating quality of private sector credit. Indeed, higher exposure of banks to sovereign debt can harm credit to the private sector in the event of a government default. This risk is present in the region where some countries are

experiencing security crises (Burkina-Faso, Mali, and Niger).[35] Therefore, the supply of financial services can be hampered in the event of a sovereign default.

The policy implications are not easy in this context, as banks help the Member States to overcome the lack of external financing (higher interest and sometimes with conditionalities). Formulating policy to incentivize banks to reduce their sovereign debt will not ensure the reallocation of their assets to the private sector while depriving the governments of local financing. However, several policy recommendations can be made to reduce the crowding-out effect of public deficit domestic financing on the private sector credit. From the creditors' perspective, enhancing the investor base is necessary to satisfy the private and public financing needs. The number of investors can be expanded through financial education campaigns aimed at popularizing the operation of the financial market. This would mobilize households' and large enterprises' savings more effectively to finance public deficits and private sector financing needs. From the borrowers' perspective, firms should be encouraged to issue securities in the regional and international financial markets (primarily for large companies). It should be assisted by dissemination efforts to encourage firms to issue bonds or treasury bills on the regional financial market.

Moreover, regarding banks' public security holdings, the central bank could limit their exposure to sovereign debt. Banks could be prohibited from subscribing to sovereign debt if they reach a certain threshold. Because well-capitalized and larger banks mitigate the crowding-out effect, regulatory authorities should implement mechanisms to prioritize these banks and serve undercapitalized and small banks in the last position during public debt issuances in the regional financial market. The attractiveness of sovereign securities lies in their zero weight in capital adequacy calculations. Therefore, the central bank could increase the weight of sovereign debt to discourage banks from holding it. Another possibility for the central bank would be to resume direct financing of States. However, this option carries risks for the credibility and effectiveness of monetary policy. Monetary creation could intensify inflationary pressures in the region and hinder the objective of price stability, which is the primary goal of the central bank's monetary policy.

[35] The WAEMU Securities Agency has declared three defaults of payment of the Malian government since the beginning of 2022 due to the multidimensional crisis in the country.

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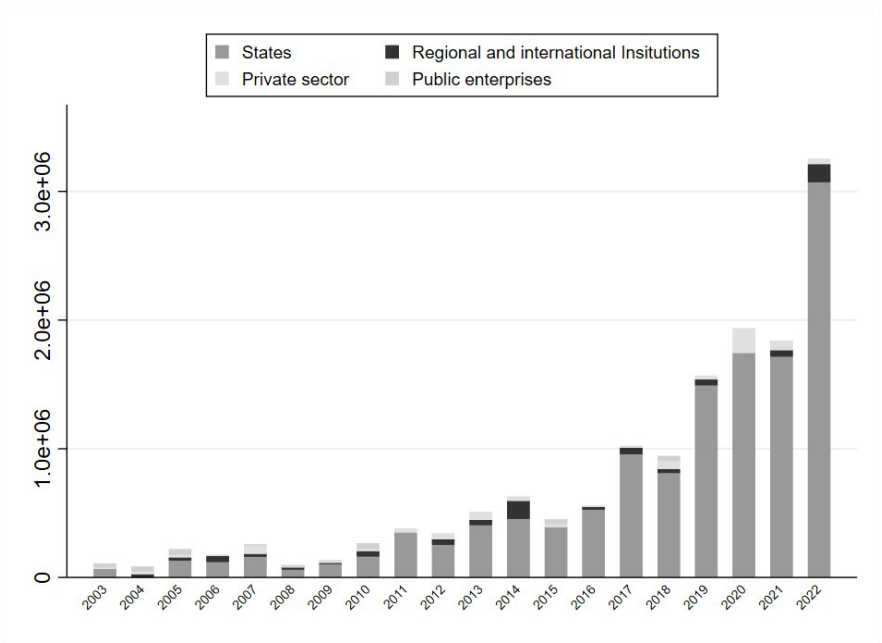
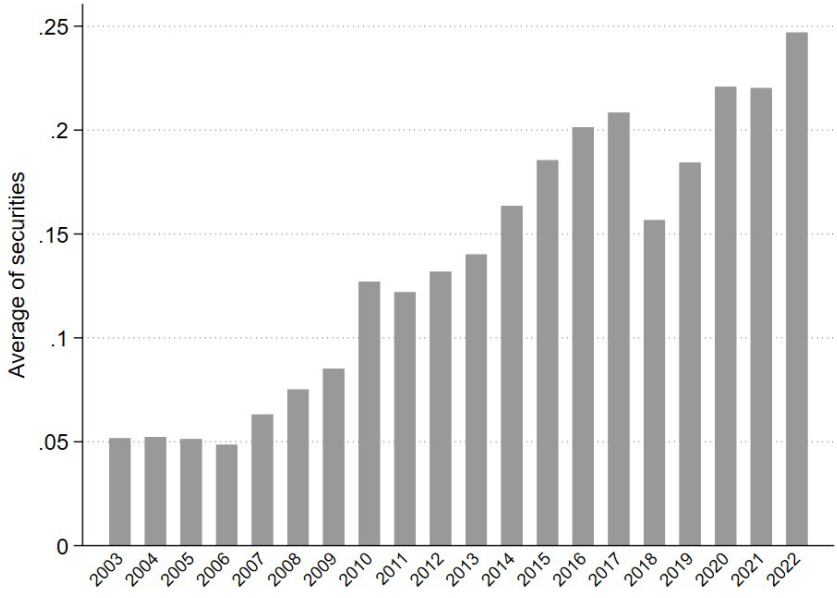
Figure A1. Breakdown by category of issuers on the bond market (in millions of CFA francs).



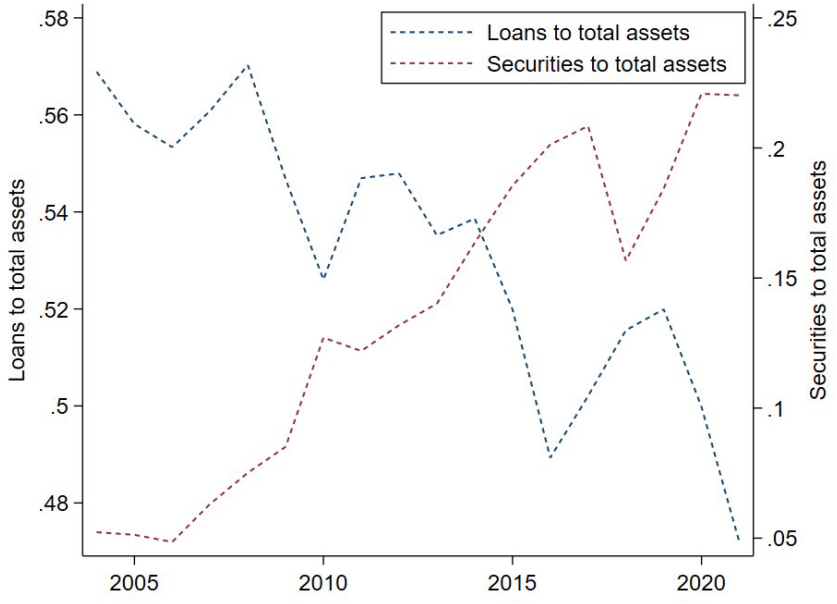
This figure reports the volume of funds raised by each category of issuers in the regional financial market. The data are from the CREPMF.

Figure A2. Dynamic of securities in the banks' balance sheets (as the ratio of total assets).



This figure reports the evolution of banks' securities (as the ratio of total assets) from 2003-2022. The data were obtained from WAEMU's banking commission.

Figure A3. Evolution of loans and securities by banks (as a percentage of total bank assets).



This figure reports the evolution of banks' loans and securities ratios from 2003 to 2022. The data for computing loans and securities ratios were obtained from WAEMU's banking commission.

Table A1: Evolution of security holdings in banks' total assets by country, 2003-2022.

Year	Benin	Burkina-Faso	Côte d'Ivoire	Guinea-Bissau	Mali	Niger	Senegal	Togo
2003	0.058	0.08	0.019	0.116	0.017	0.04	0.101	0.054
2004	0.033	0.068	0.014	0.132	0.016	0.049	0.101	0.115
2005	0.053	0.034	0.029	0.112	0.028	0.048	0.088	0.081
2006	0.041	0.023	0.076	0.109	0.015	0.03	0.075	0.039
2007	0.055	0.041	0.087	0.134	0.016	0.026	0.105	0.062
2008	0.102	0.052	0.072	0.121	0.035	0.032	0.097	0.113
2009	0.111	0.094	0.055	0.088	0.061	0.031	0.149	0.076
2010	0.142	0.153	0.131	0.139	0.096	0.084	0.168	0.078
2011	0.18	0.152	0.104	0.063	0.101	0.068	0.159	0.095
2012	0.175	0.173	0.135	0.075	0.117	0.053	0.158	0.101
2013	0.182	0.178	0.169	0.143	0.13	0.064	0.135	0.092
2014	0.178	0.192	0.151	0.186	0.171	0.107	0.181	0.15
2015	0.213	0.229	0.172	0.098	0.204	0.134	0.203	0.162
2016	0.186	0.261	0.175	0.174	0.221	0.128	0.226	0.22
2017	0.209	0.249	0.174	0.15	0.201	0.146	0.229	0.283
2018	0.246	0.167	0.109	0.232	0.158	0.168	0.156	0.133
2019	0.25	0.203	0.148	0.245	0.181	0.144	0.186	0.206
2020	0.325	0.242	0.193	0.32	0.195	0.154	0.193	0.273
2021	0.291	0.267	0.195	0.303	0.226	0.162	0.189	0.243
2022	0.308	0.264	0.248	0.31	0.226	0.196	0.222	0.265

This table reports the evolution of banks' securities to total assets over the 2003-2022 period by country. The data were obtained from WAEMU's banking commission.

Table A2: Effect of security holdings on loans: Dynamic model estimated by two-steps system-GMM

	Two-steps system-GMM			
	(1)	(2)	(3)	(4)
$Loan_{t-1}$	0.082	0.049	0.076	0.078
	(0.346)	(0.354)	(0.329)	(0.322)
$Securities_{t-1}$	-0.235**	-0.234***	-0.232**	-0.235***
	(0.090)	(0.076)	(0.089)	(0.077)
Obs.	1753	1753	1753	1753
Country FE	No	No	Yes	Yes
Year FE	No	Yes	No	Yes
Covariates	Yes	Yes	Yes	Yes
No. of instruments	26	43	33	50
AR1 (p-value)	0.12	0.14	0.11	0.10
AR2 (p-value)	0.77	0.80	0.78	0.72
Hansen-J (p-value)	0.67	0.61	0.66	0.59

This table presents estimates from the GMM technique. The dependent variable is the change in loans, measured as loans outstanding in year t minus loans outstanding in year t-1, divided by total assets. The main explanatory variable is bank security holdings, computed as securities outstanding to total assets. The Hansen J test of over-identifying restrictions is distributed as Chi−square under the null hypothesis of instrument validity. Ar(j) is a test of jth-order serial correlation in the first-differenced residuals, asymptotically as N(0,1) under the null hypothesis of no serial correlation. We use forward orthogonal deviations with the GMM estimator to purge banks' fixed effects. Robust standard errors in parentheses are robust and clustered at the bank level. *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table A3: Definition and sources of variables.

Variables	Definition	Signs	Sources
	Bank-level variables		
Securities	Government securities to total assets	-	BCEAO
Size	Logarithm of total assets	-	BCEAO
CAP	Equity to total assets	+/-	BCEAO
LIQ	Customer deposits to total assets	+	BCEAO
LLP	Loan loss reserves to total loan	-	BCEAO
INT	Interest income generated by bank lending activity divided by bank credit to customers	-	BCEAO
Loans	Loans to total assets	+	BCEAO
Profitability	Operating income to total assets	+	BCEAO
	Macroeconomic variables		
HHI	Sum of the squares of market shares of banks within the country banking sector:	-	BCEAO
GDP	Gross domestic product growth rate	+	BCEAO
Inflation	Growth rate of the consumer price index	-	BCEAO
CBclaims	Claims of the Central Bank on the private sector, in percentage of GDP	+	IFS
Unemployment	Growth rate of unemployment	-	WDI
Financial depth	Domestic credit to private sector to GDP	+	IFS
	Institutional quality variables		
RQ	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development	+	WGI
Po. Stability	Perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism	-	WGI

Table A4: Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Loan	1																
Securities	-0.128***	1															
Size	-0.152***	0.324***	1														
CAP	0.110***	-0.139***	-0.605***	1													
LLP	-0.0316	-0.119***	-0.133***	0.287***	1												
INT	-0.180***	0.251***	-0.108***	0.120***	0.118***	1											
LIQ	0.00569	-0.314***	-0.0654***	-0.0899***	0.0422*	-0.249***	1										
Loans	0.217***	-0.485***	0.0220	-0.165***	-0.0227	-0.389***	0.184***	1									
Profitability	0.0202	0.172***	0.422***	-0.462***	-0.319***	-0.0875***	-0.291***	0.0755***	1								
HHI	0.0636***	-0.173***	-0.391***	0.0647***	0.00190	0.0376	0.196***	-0.0462**	-0.0576**	1							
GDP	0.0134	0.0814***	0.0847***	0.0199	0.00562	-0.0385*	-0.0930***	-0.0452**	-0.00542	-0.152***	1						
Inflation	0.0408*	-0.0183	-0.0475**	-0.0140	-0.00310	0.105***	0.0303	-0.00419	-0.0256	0.0384*	-0.123***	1					
CBclaims	-0.0387	0.0419*	0.0287	0.0343	0.0290	0.0568**	0.0591**	-0.150***	0.00211	-0.0106	0.0127	0.0206	1				
Unemployment	-0.0344	0.00646	0.119***	-0.0881***	-0.0496**	-0.198***	0.241***	0.0801***	-0.0107	-0.269***	-0.130***	0.00669	0.0479**	1			
Financial depth	-0.0294	0.312***	0.340***	-0.0840***	-0.0145	0.102***	-0.386***	-0.0401*	0.125***	-0.567***	0.0271	-0.0310	-0.0928***	0.158***	1		
RQ	0.0220	0.0919***	0.237***	-0.0655***	-0.124***	-0.0882***	-0.124***	0.0340	0.0784***	-0.501***	0.155***	-0.0223	-0.358***	-0.0770***	0.424***	1	
Po. Stability	0.0734***	-0.0544**	-0.107***	0.00135	-0.121***	-0.239***	0.177***	-0.0354	-0.0378*	0.208***	0.101***	0.00492	-0.213***	-0.223***	0.00947	0.394***	1

*** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table A5: Definition and sources of additional variables (used in robustness and heterogeneity analysis).

Variables	Definition	Sources
	Bank-level variables	
Δlog(Loan)	Growth rate of loans in logarithm	BCEAO and author calculations
Income level	Dummy equal to 1 if a country is classified as a LMIC country and 0 if the country is a LIC	WDI
Domestic bank	Dummy equal to 1 if at least 50% of the capital is held by domestic entities, 0 otherwise	BCEAO and author calculations
Foreign bank	Dummy equal to 1 if bank domestic status = 0, 0 otherwise	BCEAO and author calculations
Pan-African banks	Dummy equal to 1 if cross-border Pan-African bank status = yes, 0 otherwise	BCEAO and author calculations
French bank	Dummy equal to 1 if at least 50% of the capital is held by a French individual or entity, 0 otherwise	BCEAO and author calculations
Large bank	Dummy equal to 1 if bank assets are greater than 100 billion CFA francs, 0 otherwise	BCEAO and author calculations
Large bank	Dummy equal 1 if bank has been large in 75% of time	BCEAO and author calculations
Large bank	Dummy equal 1 if bank assets are below the median	BCEAO and author calculations
Well-capitalized bank	Dummy equal to 1 if the bank has more capital than the minimum required by the regulator, 0 otherwise	BCEAO and author calculations
Well-capitalized bank	Dummy equal 1 if bank is well-capitalized in 75% of time	BCEAO and author calculations
Well-capitalized bank	Dummy equal 1 if bank equity is below the median	BCEAO and author calculations
	Macroeconomic variables	
Gvt securities	Government securities outstanding to GDP	BCEAO
Treasury bills	Treasury bills outstanding, in percentage of GDP	BCEAO
Bonds	Government bonds outstanding to GDP	BCEAO

Table A6: Summary statistics of additional variables (used in robustness and heterogeneity analysis).

	Obs.	Mean.	SD.	Min.	Max.
Δlog(Loan)	1898	0.25	0.592	-0.382	3.251
Gvt securities	1898	0.052	0.041	0	0.169
Treasury bills	1819	0.025	0.022	0	0.127
Bonds	1486	0.036	0.031	0	0.136
Foreign banks	1895	0.733	0.443	0	1
Panafrican banks	1895	0.654	0.476	0	1
Foreign bank (no Africa)	1895	0.169	0.375	0	1
French banks	1895	0.084	0.277	0	1

This table reports the summary statistics of additional variables used in robustness checks and heterogeneity analysis. These variables are as follows: Foreign banks (50% of capital is held by foreign entities); Pan-African banks (50% of capital is held by African entities); Foreign banks (no Africa) (50% of capital is held by no-African foreign entities); growth of loans (Δlog(Loan)). The macroeconomic data are the Gvt securities (government securities outstanding, in percentage of GDP), Treasury bills (Treasury bills outstanding, in percentage of GDP), and Bonds (government bonds outstanding, in percentage of GDP). *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table A7: T-test based on country income level: LICs versus LMICs.

	LICs		LMICs		Comparison test	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Securities	1135	0.153	763	0.153	0.000	0.967
Size	1135	11.524	763	12.061	-0.537***	0.000
CAP	1135	0.109	763	0.095	0.014**	0.013
LLP	1135	0.008	763	0.007	0.001**	0.017
INT	1135	0.112	760	0.088	0.024***	0.000
LIQ	1135	0.658	763	0.747	-0.089***	0.000
Loans	1135	0.533	763	0.543	-0.011	0.137
Profitability	1135	-0.003	762	-0.004	0.001	0.546
HHI	1135	0.149	763	0.093	0.055***	0.000
GDP	1135	4.689	763	4.783	-0.095	0.458
Inflation	1135	2.334	763	2.154	0.180	0.156
CBclaims	1062	2.456	709	2.835	-0.378***	0.000
Unemployment	1135	2.363	763	3.960	-1.597***	0.000
Financial depth	1135	17.958	763	20.509	-2.550***	0.000
RQ	1135	-0.605	763	-0.431	-0.174***	0.000
Po. Stability	1135	-0.689	763	-0.707	0.018	0.574

This table compares the mean values of variables in the subsamples, i.e., LICs versus LMICs. Comparison tests are performed using the t-test (with unequal variance). *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table A8: T-test based on subsamples of Domestic banks versus Foreign banks.

	Domestic banks		Foreign banks		**Comparison test**	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Securities	506	0.124	1389	0.164	-0.040***	0.000
Size	506	11.854	1389	11.702	0.152**	0.019
CAP	506	0.097	1389	0.106	-0.009	0.204
LLP	506	0.008	1389	0.007	0.001	0.130
INT	504	0.097	1388	0.104	-0.007***	0.002
LIQ	506	0.757	1389	0.671	0.086***	0.000
Loans	506	0.562	1389	0.529	0.033***	0.000
Profitability	506	-0.009	1388	-0.001	-0.008***	0.008

This table compares the mean values of variables in the subsamples of Domestic banks versus Foreign banks. Comparison tests are performed using the t-test (with unequal variance). *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table A9: T-test based on subsamples of Pan-African banks versus No Pan-African banks.

	No Pan-African banks		Pan-African banks		Comparison test	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Securities	656	0.114	1239	0.174	-0.060***	0.000
Size	656	11.726	1239	11.752	-0.026	0.650
CAP	656	0.103	1239	0.104	-0.000	0.935
LLP	656	0.008	1239	0.007	0.002**	0.013
INT	654	0.095	1238	0.106	-0.011***	0.000
LIQ	656	0.756	1239	0.661	0.095***	0.000
Loans	656	0.565	1239	0.523	0.042***	0.000
Profitability	656	-0.004	1238	-0.003	-0.002	0.469

This table compares the mean values of variables in the subsamples of Pan-African banks versus No Pan-African banks. Comparison tests are performed using the t-test (with unequal variance). *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table A10: T-test based on subsamples of French banks versus No French banks. No French banks

	No French banks		French banks		Comparison test	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Securities	1736	0.156	159	0.121	0.035***	0.000
Size	1736	11.666	159	12.577	-0.910***	0.000
CAP	1736	0.110	159	0.040	0.070***	0.000
LLP	1736	0.007	159	0.008	-0.001	0.171
INT	1733	0.104	159	0.087	0.017***	0.000
LIQ	1736	0.687	159	0.773	-0.087***	0.000
Loans	1736	0.530	159	0.622	-0.093***	0.000
Profitability	1735	-0.005	159	0.014	-0.019***	0.000

This table compares the mean values of variables in the subsamples of French banks versus those of non-French banks. Comparison tests are performed using the t-test (with unequal variance). *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table A11: T-test based on the sub-samples of large versus small banks.

Panel A						
	Small bank		Large bank		Comparison test	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Securities	754	0.099	1144	0.189	-0.091***	0.000
Size	754	10.551	1144	12.523	-1.973***	0.000
CAP	754	0.176	1144	0.056	0.120***	0.000
LLP	754	0.009	1144	0.006	0.003***	0.000
INT	752	0.104	1143	0.102	0.001	0.546
LIQ	754	0.741	1144	0.663	0.079***	0.000
Loans	754	0.545	1144	0.531	0.014*	0.056
Profitability	753	-0.023	1144	0.010	-0.032***	0.000
Panel B						
	Small bank		Large bank		Comparison test	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Securities	1137	0.142	761	0.171	-0.029***	0.000
Size	1137	11.129	761	12.652	-1.523***	0.000
CAP	1137	0.147	761	0.039	0.108***	0.000
LLP	1137	0.008	761	0.007	0.002***	0.007
INT	1135	0.106	760	0.098	0.008***	0.000
LIQ	1137	0.676	761	0.720	-0.044***	0.000
Loans	1137	0.532	761	0.544	-0.011*	0.087
Profitability	1136	-0.013	761	0.011	-0.023***	0.000
Panel C						
	Small bank		Large bank		Comparison test	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Securities	949	0.109	949	0.198	-0.089***	0.000
Size	949	10.782	949	12.697	-1.915***	0.000
CAP	949	0.160	949	0.047	0.113***	0.000
LLP	949	0.009	949	0.006	0.003***	0.000
INT	947	0.102	948	0.104	-0.002	0.431
LIQ	949	0.734	949	0.654	0.080***	0.000
Loans	949	0.542	949	0.531	0.011	0.101
Profitability	948	-0.018	949	0.012	-0.030***	0.000

This table compares the mean values of variables in the subsamples of large banks versus small banks. Comparison tests are performed using the t-test (with unequal variance). *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

Table A12: T-test based on subsamples of well-capitalized banks versus under-capitalized banks.

Panel A						
	Under-capitalized		Well-capitalized		Comparison test	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Securities	566	0.125	1332	0.165	-0.040***	0.000
Size	566	11.065	1332	12.026	-0.961***	0.000
CAP	566	0.099	1332	0.106	-0.006	0.324
LLP	566	0.008	1332	0.007	0.000	0.836
INT	565	0.104	1330	0.102	0.002	0.428
LIQ	566	0.704	1332	0.690	0.015	0.209
Loans	566	0.552	1332	0.530	0.022***	0.004
Profitability	565	-0.012	1332	0.000	-0.012***	0.000
Panel B						
	Under-capitalized		Well-capitalized		Comparison test	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Securities	844	0.146	1054	0.159	-0.014**	0.038
Size	844	11.261	1054	12.123	-0.862***	0.000
CAP	844	0.104	1054	0.103	0.001	0.858
LLP	844	0.008	1054	0.007	0.000	0.636
INT	843	0.108	1052	0.098	0.010***	0.000
LIQ	844	0.685	1054	0.701	-0.016	0.154
Loans	844	0.545	1054	0.530	0.015**	0.034
Profitability	843	-0.009	1054	0.001	-0.010***	0.000
Panel C						
	Under-capitalized		Well-capitalized		Comparison test	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Securities	1093	0.116	805	0.204	-0.088***	0.000
Size	1093	11.289	805	12.352	-1.063***	0.000
CAP	1093	0.095	805	0.116	-0.021***	0.000
LLP	1093	0.007	805	0.008	-0.001	0.211
INT	1092	0.098	803	0.109	-0.012***	0.000
LIQ	1093	0.746	805	0.624	0.122***	0.000
Loans	1093	0.559	805	0.507	0.052***	0.000
Profitability	1092	-0.007	805	0.001	-0.008***	0.000

This table compares the mean values of variables in the subsamples of well-capitalized banks versus under-capitalized banks. Comparison tests are performed using the t-test (with unequal variance). *** Statistical significance at the 1% level **Statistical significance at the 5% level * Statistical significance at the 10% level.

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To strengthen local capacity for conducting independent, rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

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