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Working Paper 052-2026

CONSORTIUM POUR LA RECHERCHE ÉCONOMIQUE EN AFRIQUE

Bringing Rigour and Evidence to Economic Policy Making in Africa

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AERC Research Paper 052-2026
African Economic Research Consortium, Nairobi
February 2026

Published by: The African Economic Research Consortium
P.O. Box 62882 - City Square
Nairobi 00200, Kenya

Abstract
Banking globalization's effects on financial development in Africa are challenging to define, even without considering financial crises. By utilizing panel data and threshold regression techniques on a comprehensive database covering 47 Sub-Saharan African countries and 429 commercial banks from 1996 to 2020, we examine the non-linear impact between banking globalization and financial development, mainly to detect at what level a country should accept cross-border banking phenomenon. The statistical analysis reveals a non-linear impact of banking globalization on financial development, which remains consistent across different proxies and estimation methods. This fundamental finding enabled us to identify the threshold point and distinguish various regimes using panel threshold regression techniques. The findings confirm a U-shaped relationship, where the negative impact of cross-border banking activity is present but becomes positive after surpassing a threshold of -28.15. Subpar levels of banking globalization yield unfavorable outcomes in terms of consumption smoothing, volatility reduction, and overall financial sector development. To benefit from banking globalization, each country should ensure that cross-border banking activity exceeds the threshold of -28.15. Additional recommendations are discussed in the main text.

Key Words: Banking globalization, Cross-border banking, Panel data econometrics, Africa, Financial development

Introduction

The banking services industry's internationalization, also known as cross-border banking[1], has become synonymous with the process of globalization. Over the past two decades, cross-border capital flows have increased by ten times, and financial institutions now rank among the largest multinational companies globally. In an economic context, globalization refers to the dismantling of barriers between national borders to facilitate the movement of goods, capital, services, and labor. Bourguinat (1987) has identified three key factors, known as the "three Ds," that have driven banking globalization: deregulation, decompartmentalization, and disintermediation. As a result of globalization, the way banking business activities are conducted worldwide has been significantly impacted (Berger et al., 2000). Banking globalization can be defined as the establishment of a regional market that integrates external banking activities. Thus, a trend that developed during the second half of the 20th century and even more so from the beginning of the 1970s in the context of second globalization.

The phenomenon being observed is affecting various African nations. From 1995 to 2009, the presence of cross-border bank branches or subsidiaries in Africa nearly doubled, going from 120 to 227 (Claessens and Van Horen, 2014). Despite this increase, the overall number of banks remained relatively stable, going from 421 to 442. Consequently, the proportion of foreign banks rose significantly, from 29% to 51%. These cross-border banks are assuming greater economic and systemic significance within their host economies, bringing in an average of $376 million in investment to their subsidiaries each year. Furthermore, they hold over 10% of total deposits in 31 sub-Saharan African countries (Raga & Tyson, 2021).

There is a growing literature that examines the interrelationship between banking globalization and financial development. The existing empirical literature has mostly analysed the implication of banking globalisation in terms of financial crises[2]. From a theoretical standpoint, it is possible to make the argument, as Garcia (2011) suggests, that banking globalization plays a role in fostering financial development. This is because it diminishes the influence of interest groups that oppose the growth of the financial system, allows for the adaptation of institutional structures to embrace best practices and financial innovations, and facilitates the provision of optimal fundamental financial functions through improved employment opportunities. Through the process of integrating into global financial markets, countries have access to a wide array of instruments and mechanisms for risk allocation, financing institutions, and risk management. Consequently, this leads to an expansion in the depth and breadth of domestic financial systems (Gregorio, 1996). It is worth noting that indicators measuring the degree of financial integration demonstrate that African nations exhibit lower levels of integration into international markets, both regionally and globally. Additionally, this weak integration is accompanied by limited financial depth. Meanwhile, developed countries with strong national and international integration (e.g., the European Union) have deeper banking sectors than those of underdeveloped countries in general and Africa in particular.

Despite the benefits of banking globalization, it is likely to weaken and destabilize the orderly functioning of financial markets. Banking globalization is linked to financial development through the following main channel: its impact on the ability of the financial system to perform its essential functions efficiently, especially during periods of stress. The recent financial crisis has reignited a heated debate on the merits of banking globalization and its impact on financial development in African countries. In essence, the global financial crisis exposed the drawbacks of banking globalization, as many developing and emerging economies experienced a surge in capital flows at the beginning of the last decade, only to see a reversal of capital flows

[1] In this paper, cross-border banking refers to both cross-border capital flows as well cross-border entry in banking.

[2] There is an emerging perspective among scholars that perceives cross border banking and unrestricted capital flows as a significant obstacle to global financial stability. This viewpoint has led to suggestions for implementing capital controls and introducing barriers, such as 'Tobin taxes,' on international asset trading. Various authors, including Rodrik (1998), Bhagwati (1998), Stiglitz (2000), Kleimeier et al. (2013), and Tonzer (2015), have advocated for these measures. On the other hand, another group of authors, including Fischer (1998) and Summers (2000), argue that embracing cross border banking and capital flows is crucial for countries aspiring to achieve higher-income status. They also emphasize that this openness contributes to stability among industrialized nations.

now (Kose et al., 2017). Accordingly, the global financial turmoil and economic recession have also reignited the debate on the impact of banking globalization on growth and volatility in developing countries.

Banking globalization implies the increasing availability of more capital opportunities for developing countries. Which certainly comes along with risk, especially in the short run, when these countries eliminate barriers by opening up to banking globalization. A few pertinent examples are the crises in Asia and Russia in 1997–98, Brazil in 1999, Ecuador in 2000, Turkey in 2001, Argentina in 2001, and Uruguay in 2002 that capture the world's attention. The relationship between globalization and crises is multifaceted. Inadequate or absent financial infrastructure, coupled with the absence of necessary measures during the process of integration, can weaken the stability of the local financial system when liberalization is followed by an influx of capital. If market fundamentals deteriorate, speculative attacks will occur with capital outflows from both domestic and foreign investors. Thus, the need for strong fundamentals is key since, other things being equal, banking globalization tends to intensify a country's sensitivities to foreign shocks.

When economies are opened up and there are implicit government guarantees, moral hazard can result in excessive borrowing. This, as discussed by McKinnon and Pill (1997), raises the probability of crises occurring. The assertion that market imperfections are the root cause of crises during financial integration emphasizes the greater prevalence of imperfections in international markets compared to domestic ones. Even in closed economies, imperfections in financial markets can still exist, particularly if they are more significant domestically than in foreign markets.

Even in nations with strong foundations and without flaws in global capital markets, the significance of external influences can potentially trigger crises due to globalization. When a country relies heavily on foreign capital, abrupt changes in the inflow of foreign funds can give rise to economic downturns and financial challenges. These shifts do not necessarily depend on country fundamentals.

The costliness of financial crises is well-documented in various studies (Popov & Udell, 2012; Batuman et al., 2022). However, the question remains: does the connection between globalization, crises, and contagion outweigh the advantages of globalization? Despite this ongoing debate, there is still a lack of definitive evidence regarding whether open economies are more susceptible to volatility and suffer greater consequences during times of crisis. The evidence suggests that, in the long run, volatility tends to decrease following liberalization and integration with world markets, probably thanks to the development of the financial sector. The evidence holds even when including crisis episodes, which might be considered particular events. Thus, too much capital account liberalization may lead to more exposure to financial crisis and hence have a negative impact on financial development; hence, pinpointing a certain degree of threshold effect between both.

Accordingly, this paper focuses on addressing the following issues: *How does banking globalization phenomenon affect financial development in depth, efficiency, activity and size in Africa?* And *to what level a country should open up for cross-border banking*? To this end, we have precisely undertaken a quantitatively assess the nonlinear impact of banking globalization on finance in Africa development to benchmark by verifying and estimating if there is a threshold effect and determining to what level a country should accept cross border banking phenomenon, along with opening its capital account. The empirical model construction in light of the theoretical predictions, along with preliminary statistical analysis has highlighted the possibility of a non-linear relation between both phenomena.

This investigation is of great interest for several reasons. Firstly, it utilizes current data to shed light on the consequences of current policies and provide more relevant recommendations. Additionally, it addresses a unique methodological perspective by examining the determinants and dynamics of financial deepening, which has not been extensively studied in Africa. There is a lack of studies applying the same methodology to this specific context, making this research particularly valuable. As a result, this study makes a significant contribution to the existing literature on this subject. Also, on the positive side, this analysis can be the basis for African countries of legitimation or not, implementation and/or revision of financial policies by governments and IFIs. Carrying out such a study in the context of Africa will therefore help policymakers to

better develop financial policies that will better serve these countries. It is to this extreme that this piece gain grounds. Moreover, on the logical side, since the context of Africa is generally characterized by relatively stable but low economic growth and mainly growing economies, coupled with the fact that they are cohabited with an underdeveloped financial system several years after an increasing banking globalization phenomenon, this study seeks to reawaken the awareness of such an important aspect of the economy like banking globalisation; thus, an exciting thing to do as it reinforces the importance of this work.

We mainly found that there is a non-linear relation between banking globalization and financial development independent of the indices and the estimation method.

The remaining sections of the paper are structured as follows: Section 1 addresses the contentious literature review, while Section 2 delves into the presentation of the theoretical model and stylized fact. Following this, section 3 presents the data, empirical model, and methodology, while section 4 focuses on the discussion of the results. Finally, section 5 concludes the paper.

1) Financial development benefit of banking globalization: a literature review

From a theoretical point of view, the main debate on banking globalization and financial development is related to the historical opposition between the classical and Keynesian schools. Moreover, this opposition between the "*laisser faire*" and the public intervention has been renewed with the recent school of thought. We have on one hand the New classical school which affirms the benefits, and on the other hand, the New Keynesian School which highlight some bad aspects of globalization and the need for the government to intervene.

From an empirical point of view, the links between banking globalization and economic growth are attested to by numerous studies (Levine, 1999); although there is still a lack of knowledge about the empirical impact of banking globalization on financial development, both about quantification and meaning of this link. Overall, the existing literature discusses more financial globalization than banking globalization[3]. Banking globalization is also accompanied by instability that feeds recurrent financial crises (the Asian crisis in 1997, the Russian crisis and the bankruptcy in 1998, the bursting of the Internet bubble in 2001, the American real estate and financial crisis in 2007), which can have negative impacts in terms of financial development. While these crises respond to specific logics and mechanisms, it is clear that the global banking system is more exposed to shocks today than in the past, especially since the intensity of cross-border and trans-market links favours the transmission of these shocks from one place to another (De Boissieu, 2006).

First, there is growing economic interdependence between regions of the world. Indeed, an abundance of global savings can discourage savings in some countries, particularly the United States (Ferguson and Frenkel, 2006), which amplifies the trade and capital balance imbalances of these countries, which are increasingly dependent on financing from the rest of the world (the USA has to receive more than $2 billion a day from the rest of the world to finance its external deficit).

Banking globalization also increases the dependence of one economy on all others (Brender and Pisani, 2007). Massive monetary creation resulting from a monetary policy in one country can thus have an impact on asset prices in another country, encouraging the formation of bubbles. Asset prices may therefore no longer correspond to economic fundamentals, leading to a non-optimal allocation of capital. In this sense, globalization accentuates the externalities of one country's monetary policy on others. The determination of a monetary policy can therefore no longer dispense with the need to take into account elements of the international context, without running the risk of creating local imbalances that could have global consequences. Indeed, interest rate differentials between countries are not immediately compensated by exchange rate adjustments. Carry trade opportunities, therefore, arise when a country unilaterally decides to

[3] Nasreen et al. (2020) present a comprehensive literature review on the impact of financial globalization on financial development.

make a substantial change in its exchange rate. These “one-way” speculative positions can only accentuate global imbalances and reduce the likelihood of an orderly unwinding of them.

However, almost all existing literature is focused on financial globalization rather than banking globalization impact on financial development. Research on the determinants and implications of cross-border capital flows in terms of cost and benefits of the wave of foreign entry in banking systems is growing. In particular, a growing number of papers, using cross-country, individual and country bank evidence, have investigated the effects of foreign banks' entry on local banking systems (Claessens, 2006). The majority of these authors have indexed financial globalization with foreign direct investment, while it is clear that banking globalization in Africa is a more closed indicator given the ongoing context, such as cross-border banking activity, banking integration, capital account liberalization and to a lesser extend private capital flows[4].

Additionally, a majority of empirical works have been done for other countries and sub-regions, considering a linear relation. The method used cannot permit answering the question of whether there is a threshold effect, and to what level a country should open up its capital account. Thus, this paper is contributing to the existing literature with the following three points: firstly, we index the banking globalization by cross-border banking, banking integration and capital account liberalization which is an innovative approach that is implicitly taking into account banking crises. Secondly, the empirical investigation of the main hypothesis is relatively new and needed especially in the African context; and thirdly, the implementation of both dynamic panel and panel threshold regression technics consistent with the endogeneity robustness.

2) Banking globalization & financial development in Africa: Theoretical and background framework

Banking globalization & financial development in Africa: Theoretical framework

The role of cross-border banking in Africa's financial landscape has been of utmost importance, dating back to the colonial era. Following the wave of nationalization that swept across the continent after gaining independence, numerous colonial banks made their exit. However, this trend took a turn in the 1980s when financial liberalization took hold, leading to a reversal. Failing state-owned and private banks were predominantly acquired by global investors or multinational banks. This wave of international and regional economic integration, along with deregulation, further bolstered the presence of foreign banks. As a result, by the mid-2000s, foreign banks once again held significant sway over many African banking systems.

Cross-border banking, under the umbrella of banking globalization, involves a bank's establishment of a commercial presence in foreign countries or through foreign direct investment (FDI). Excluding any cross-border bank flows between nations or direct service provision without a commercial presence, we can observe that in the year 2013, there were a total of 104 cross-border banks that were actively operating in Africa, with at least one branch or subsidiary outside of their home country. Interestingly, one-third of these cross-border banks were actually of non-African origin. Out of these institutions, the majority (71) had a limited presence in only one to four African jurisdictions. On the other hand, the remaining 33 institutions had a more extensive reach, as they were represented through their home country operations and had branches or subsidiaries in five or more African countries. In order to focus on the key players, our analysis will primarily concentrate on the cross-border banks that have a larger geographic and operational footprint in Africa.

The integration of financial markets and the development of the global economy have been significantly influenced by cross-border banking. As Claessens (2006) suggests, the movement of capital across borders has played a crucial role in driving financial integration. Particularly in the form of cross-border entry, cross-border banking has increased sharply in the last decade and has affected countries’ financial systems in many ways and dimensions.

The diversification hypothesis and market risk hypothesis put forth by Berger et al. (2010) provide an explanation for the advantages and drawbacks of cross-border banking. Through expansion into different

[4] Private capital flows consist not only of net foreign direct investment but also of portfolio investment.

markets and access to global capital markets, international banks can mitigate risk by diversifying their portfolios. However, they also face increased risk due to factors specific to each market, such as local competition, cultural differences, regulatory complexities, and economic and political instability. This is referred to as the market risk hypothesis. Beck et al. (2014) further emphasized the need for a discussion on the implications of cross-border banking in academia and policy. As a result, cross-border banking entails both benefits and costs, leading to the existence of two regimes with positive and negative impacts.

a. **With regards to the benefits of Cross-border Banking**, and in line with the standard portfolio theory, a key benefit of Cross-border banking is that such banks enjoy the "diversification impact" because their nature reduces their exposure to a single domestic shock, foreign shock, local business cycle, or credit market conditions (Schoenmaker & Wagner, 2011; Vennet et al., 2004). The presence of cross-border banking has the potential to decrease lending volatility and allow economies to distribute their risks more effectively among other nations. According to Lee (1999), cross-border banking also enables banks to diversify their sources of income and improve their profit margins. Additionally, cross-border banking leads to increased flows of funds between banks across borders, as depicted in Figure 3. This type of banking also contributes to the propagation of global liquidity, fosters competition among banks, promotes credit growth, reduces volatility, and facilitates the implementation of best practices in terms of supervision and regulation from the banks' home countries (Claessens & van Horen, 2013; Bruno & Shin, 2014; Allen et al., 2011). Moreover, cross-border banking has played a role in the establishment of large pan-European banks and pan-African banks (PABs) (Goodhart & Schoenmaker, 2009). The financing provided by these banks from their home countries has helped stabilize the supply of credit and deposits in the host countries (Arena et al., 2010).

b. **Concerning the cost of Cross-border Banking**, Berger, et al. (2010) also found that when banks go international, they are more open to market risk (market risk hypothesis). The hypothesis mentioned earlier, known as the home-field advantage hypothesis, is supported by the authors through various factors such as local market competition, cultural influences, regulatory complexity, economic and political instability, and the disadvantage of being a foreign entity. Among these market risk factors, the complexity of regulations and the resulting regulatory arbitrage play a significant role (regulatory arbitrage hypothesis). These market risk factors ultimately contribute to an increase in the overall systemic risk faced by cross-border banks. According to Berger et al. (2000), systemic risk refers to the potential for credit or liquidity issues experienced by one or more financial market participants to have a significant impact on participants in other parts of the financial system. De Bandt et al. (2012) further emphasize that contagion lies at the core of systemic risk. Just as cross-border banking provides a country with a "diversification effect", it also exposes a country to foreign shocks (Goodhart & Schoenmaker, 2009). Cross-border banking can increase the systemic risk of banks by exploiting regulatory arbitrage (Alverz et al., 2016). The authors found that this means that cross-border banks are taking advantage of differences in laws and regulations between different countries to circumvent stricter supervision. When regulatory arbitrage exists, cross-border banks may transfer risks to other countries to absorb losses caused by their risky activities. Lee (1999) supports this by revealing that cross-border banking increases cross-border fraud. Therefore, the availability of regulatory arbitrage is a concept that some global banks consider when analyzing which countries to expand to (Alverz et al., 2016). Therefore, regulatory arbitrage has become a concern as it increases the fragility of the global financial system (Carbo-Valverde et al., 2012). Alfoz et al. (2016) therefore pointed out that if countries are to be deprived of their comparative advantages, regulatory coordination needs to be emphasized. The circumstances that cause regulatory arbitrage include regulatory gaps caused by insufficient staffing of regulatory agencies, limitations of national regulatory systems and information assets (Kane, 2006; Mayes, 2005), and immature and ineffective coordination mechanisms (Hardy & Nieto, 2011). Moskow (2003) added that regulatory issues related to cross-border banking operations mainly arise in times of crisis. According to Eisenbeis & Kaufman (2008), the presence of cross-border banking has a

negative impact on the stability of the banking system, potentially affecting deposit insurance, regulatory effectiveness, and market discipline. This instability can even pose a systemic risk, as it contributes to the spread of credit or liquidity issues among financial market participants (Berger et al., 2000). Lee (1999) shares a similar perspective. Furthermore, based on Schoenmaker & Wagner (2011), this study reveals another cost associated with cross-border banking: during adverse events in a domestic economy, foreign banks may choose to withdraw their support, particularly if they have established themselves as subsidiaries. According to Lee (1999), the presence of cross-border banking gives rise to concerns regarding extraterritoriality, creating uncertainty for countries in terms of applying their own regulations to govern foreign individuals or transactions. The monitoring of cross-border banks has become a crucial regulatory matter, particularly due to their significant size and interconnectedness, as observed in the Nordic and Baltic regions (Allen et al., 2011).

The impact of cross-border banking on economic growth is twofold, with both positive and negative implications. On the positive side, foreign banks play a crucial role in promoting financial development in host countries. They bring in valuable resources such as scale, capital, expertise, and new technologies, including credit scoring systems and digital financial services. This infusion of resources enhances efficiency and competitiveness, leading to better capital allocation and improved access to financial services for households and businesses. As a result, economic growth is stimulated. However, it is important to note that the benefits of cross-border banking are contingent upon a strong regulatory and supervisory framework. In a weak regulatory environment, foreign banks can contribute to boom-and-bust credit cycles, which can have detrimental effects on economic growth. Additionally, there is a risk of increased domestic bank risk-taking when foreign banks operate in a lax regulatory environment. These factors can lead to inferior growth outcomes and pose risks to the stability of the domestic banking sector. Access to finance may be reduced when information infrastructures and competition are weak, leading foreign banks to focus on large corporations only, possibly driving domestic banks out of business who typically cater to SMEs and households.

The central idea conveyed is that there are inherent trade-offs when it comes to the advantages and disadvantages of financial integration via cross-border banking. These trade-offs are contingent upon various factors, such as the information infrastructure, market structure, monetary policy, regulation, supervision, and characteristics of the banking group in both the home and host countries. Consequently, we formulate a hypothesis that suggests a mixed impact of cross-border banking on financial development, depending on the specific regime being analyzed. This hypothesis is closely linked to the notion of a nonlinear relationship between these two phenomena.

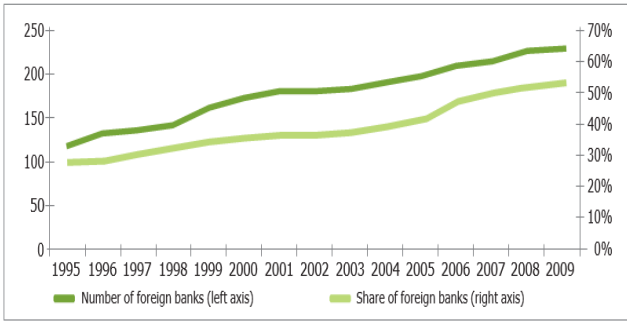
Banking globalization phenomenon in Africa: Stylized facts

In this section, we examine the evolving patterns of cross-border banking in Africa, focusing on the changing presence of foreign banks in the region. Additionally, we analyze the current landscape of cross-border banks operating in Africa, their expansion across the continent, and their significant role in the host countries.

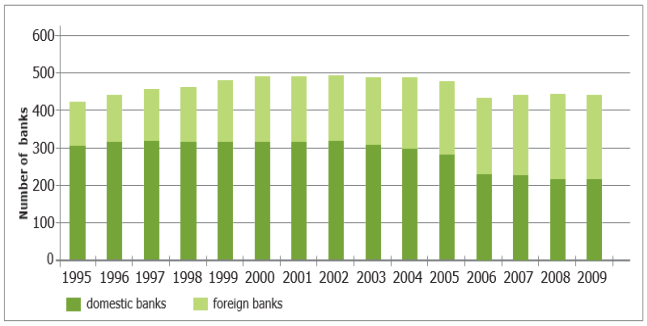
In the last twenty years, there has been a substantial rise in the presence of international banks throughout various African nations. From 1995 to 2009, the number of cross-border bank branches or subsidiaries operating in Africa nearly doubled, increasing from 120 to 227 (as shown in Figure 1). Interestingly, despite this surge, the overall number of banks remained relatively stable, going from 421 to 442. Consequently, the proportion of foreign banks experienced a significant boost, jumping from 29 percent to 51 percent.

Figure 1: Number and share of Foreign Banks in Africa, 1995-2009

Panel A: Number and share of foreign banks



Panel B: Total number of domestic and foreign banks

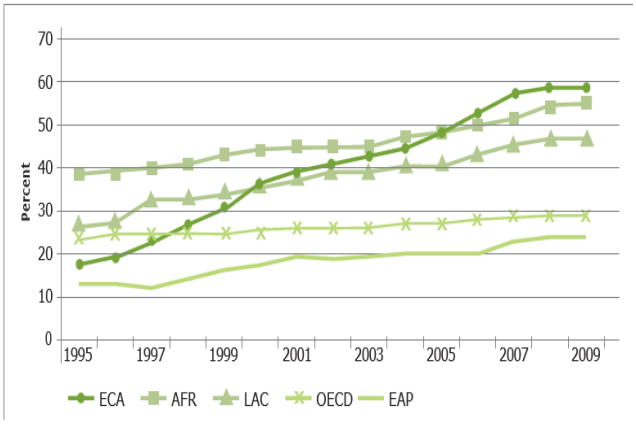


Source: **Claessens and Van Horen (2014) Bank ownership database.**
Notes: The total number of foreign and domestic banks is the total number of banks in each country across all countries in Africa. A cross-border bank is considered a domestic bank in its home country but a foreign bank in each country in which it operates a subsidiary of the branch.

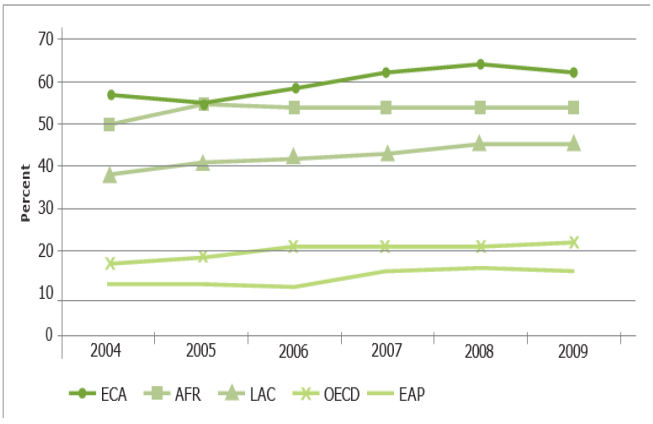
When examining the average share of foreign banks across countries in Africa, a noticeable rise can be seen from 39 percent in 1995 to 55 percent in 2009, as depicted in Figure 2, Panel A. As shown in Figure 2, we have an increase independent of the region concerned and the consideration of average asset share or average share of foreign banks. Directly after Eastern Europe and Central Asia sub-region, Africa presents the highest share in comparison with other regions, including Latin America, OECD and East Asia and Pacific. The significance of foreign bank presence can also be assessed by comparing the assets owned by foreign banks to the total assets in the banking sector. Unfortunately, there is a scarcity of readily accessible data on this measure, and it has only been available since 2004 for a larger group of developing nations, with a considerable delay in obtaining the information. According to data from 2009, banks with foreign ownership control slightly more than 50% of the total assets in the banking sector in African countries (see Figure 2, Panel B).

Figure 2: Foreign Bank Ownership by Region, 1995-2009

Panel A: Average share of foreign banks



Panel B: Average asset share of foreign banks



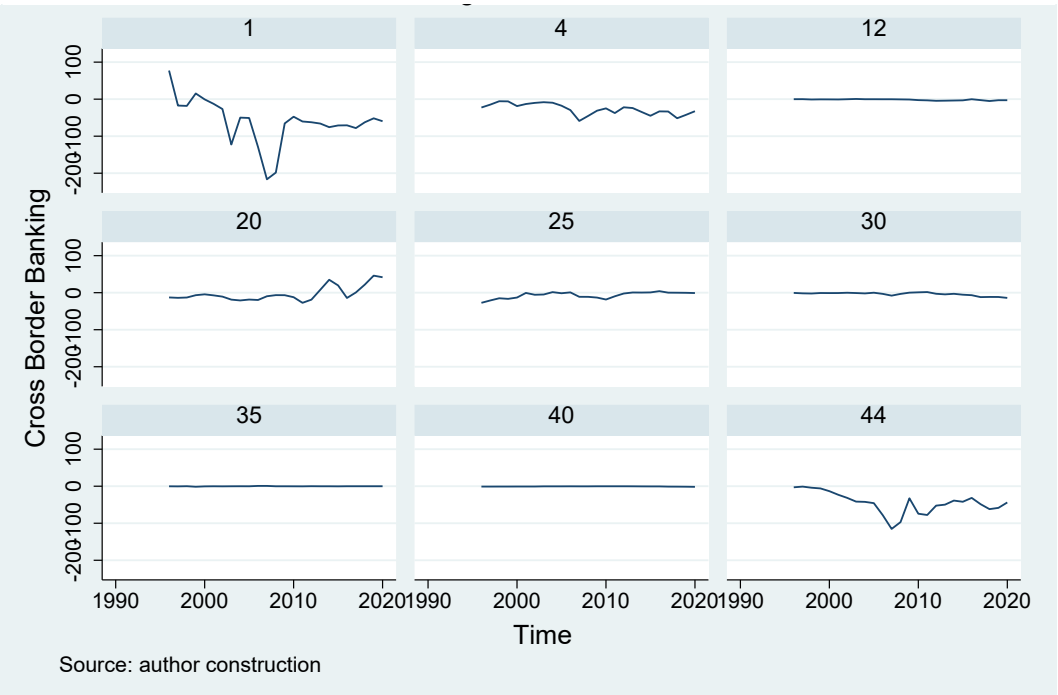
Source: **Claessens and Van Horen (2014) Bank ownership database.**
Notes: Regional groupings: EAP = East Asia & Pacific, ECA = Eastern Europe & Central Asia, LAC = Latin America & the Caribbean, OECD = Organization for Economic Co-operation & Development, AFR = Africa.

Within Africa, there are significant variations across countries that are not immediately apparent from a global perspective. Figure A1 presents a map that offers an overview of foreign bank ownership, specifically the proportion of total banking sector assets held by foreign financial groups in each host country. On one end of

the spectrum, countries like Ethiopia and Eritrea have completely closed their banking systems to foreign capital. Despite this, Ethiopia, which is the second-most populous country in Africa and boasts one of the continent's fastest-growing economies, has seen the opening of representative offices by several foreign banks in recent years. Commerzbank, a German bank, was the pioneer in establishing such an office in 2007. Additionally, in 2013, various African banks, including Ecobank, South African Standard Bank, and certain Kenyan banks, either established or expressed their intention to establish representative offices in Addis Ababa.

Take, for example, Ecobank, which is based in Togo and operates in 33 countries across sub-Saharan Africa, catering to a customer base of nearly 23 million individuals. These transnational banks are gaining greater significance in their respective host economies, contributing an average of $376 million in annual investments to their subsidiaries and holding more than 10% of total deposits in 31 sub-Saharan African nations (Raga & Tyson, 2021).

Figure 3: Cross-border positions of Banks in all Locational Banking Statistics reporting for selected countries.



Source: author construction

Figure 3 above confirms the fact that there has been an increase in cross-border bank flows net position after the years 2010.

3) Financial development benefit of banking globalization: Empirical investigation

The objective of this section is to present step by step: the database and preliminary statistical analysis, the empirical model and methodology construction.

Data

For our analysis, we investigate a group of 47 African nations spanning from 1996 to 2020. Our data is sourced from the African Development Indicators (ADI), the Financial Development and Structure Database (FDSD) provided by the World Bank, as well as the updated databases on financial openness by Lane & Milesi-Ferretti (2007) and Chin & Ito (2006). The inclusion of a 23-year observation period allows us to generate current findings that align with the second-generation financial reforms, thereby offering more relevant and targeted policy implications.

Dependent and independent variables

Indicators of financial development include measures of depth (money supply and liquid liabilities)[5], efficiency (at banking system and financial system levels)[6], activity (banking system and financial system perspectives)[7] and size[8]. It is interesting to note that these dimensions are all identified by the FDSD of the World Bank. For robustness, we use different measures of each financial development dimension and implement a principal component analysis; the principal component analysis then enables us to construct a unique indicator of financial development that takes into consideration all the above financial development dimensions.

The literature measures banking globalization with cross-border banking net position, de jure capital account liberalization (Chin & Ito, 2006) and de facto capital account liberalization (Lane & Milesi-Ferretti's, 2007) (Henry, 2007; Rodrik & Subramanian, 2009). Since the main focus of the paper is banking globalization, we employ in one hand cross-border banking net position which refers to the process of providing funding for business activities that occur outside a country's borders (Companies that seek cross-border financing want to compete globally and expand their business beyond their current domestic borders). On the other hand, we consider the impact of the convergence process (banking integration) on financial development. To measure the convergence process, we employ the variable integration of real interest rate (INTERI) calculated subtracting the interest rate of a country from the reference interest rate (average of the G7: United States, Canada, England, Italy, France, Japan, and Germany) in absolute terms; the closer to zero this difference is, the greater the integration and banking globalization. Finally, and for a robustness check, we used de jure capital and de facto capital account liberalization indices.

Control variables

According to Table A2 of our theoretical framework, the control variables would include: financial openness, trade openness, real interest rate, economic prosperity (at macroeconomic and microeconomic levels), institutional development, inflation, reserves, culture and regulation[9]. The empirical research conducted by Demetriades and Luintel (1997, 2001) shed light on the determinants of financial development in India. They found that financial liberalization, real interest rates, and economic development played crucial roles in this process. These findings have sparked a surge of interest in the topic among scholars in recent years. In a similar vein, Chinn and Ito (2006) examined a sample of 108 countries and discovered that capital account openness and the institutional environment significantly influenced the development of financial markets. Likewise,

[5] In accordance with the FDSD, this study aims to assess the extent of financial depth in developing countries from both an overall-economic and financial system perspective. This will be done by examining the indicators of broad money supply (M2/GDP) and financial system deposits. The former includes monetary base, demand, saving, and time deposits, while the latter represents liquid liabilities. It is worth noting the distinction between these two variables, as a significant portion of the monetary base in developing countries bypasses the banking sector. By calculating the ratios of GDP for both indicators, we can effectively cross-check their validity and ensure that they provide complementary information.

[6] The study will not be referring to the profitability-oriented concept nor to the production efficiency of decision-making units in the financial sector (through Data Envelopment Analysis: DEA). Instead, it will be seeking to highlight the ability of banks to effectively fulfill their fundamental role of transforming mobilised deposits into credit for economic operators (agents). We propose to use proxies for banking-system-efficiency and financial-system-efficiency (respectively 'bank credit on bank deposits' and 'financial system credit on financial system deposits'). As with the case of financial depth, these two financial allocation efficiency proxies could be considered as cross-checks, given that they represent a considerable percentage of variability in one another.

[7] The study will seek to highlight the ability of banks to grant credit to economic operators through their role as financial intermediaries. We propose to proxy for both banking intermediary activity and financial intermediary activity with "private domestic credit by deposit banks" and "private credit by domestic banks and other financial institutions" respectively. It is our view that the latter measure has a high degree of substitution with the former and would help in robustness checks.

[8] In accordance with the FDSD, our measurement of financial intermediary size will be determined by calculating the ratio of "deposit bank assets" to "total assets," specifically focusing on deposit bank assets in relation to both central bank assets and deposit bank assets.

[9] Voghouei et al. (2011) provides an extensive examination of the factors that influence financial development.

Baltagi et al. (2007) demonstrated that trade liberalization and economic institutions had an impact on financial development. Ang (2008) focused on the effect of financial sector policies on the financial system development in Malaysia from 1959 to 2005. His study revealed that economic development, control of interest rates, and liquid capital requirements all had a positive influence on financial development.

It would seem that greater trade openness, high reserve requirements and the presence of managed credit programmes may have an adverse effect on financial system development. Dehesa et al. (2007) found, in analysing the determinants of financial deepening, that firstly, a high ratio of credit to GDP is associated with stronger borrower rights and low inflation, and secondly, that the marginal effect of improving borrower rights is decreasing gradually as the inflation rate increases. In light of these findings, it seems prudent to suggest that in an environment characterised by high inflation, the control of inflation and the reduction of macroeconomic volatility should be a priority. Moboladji and Ndako (2008) explored the impact of globalisation on financial development in Nigeria from 1960 to 2005 and found a positive relationship between the two. Using a sample of 129 countries, Djankov et al. (2005) found that the credit/GDP ratio may be positively influenced by the level of protection of borrowers' rights and the availability of historical information on credit and GDP. Dutta et al. (2011) explored the potential impact of culture (in an informal institution) on the level of financial development of a country, applying their findings to a sample of 90 countries. They suggest that a country's cultural dimension may have an impact on its financial system. It is worth noting that the entire variable used in these different papers is the same as defined in Table 2. For your convenience, Tables 3 and 4 present the correlation matrix along with statistical descriptions of the data.

Table 1: Variable's definition and data source.

Group	Variables	Variable Definitions	Sources
Financial sector development	Financial System Depth	Liquid Liabilities (% of GDP)	World Bank (FDSD)
	Financial System Efficiency	Financial credit on financial deposits	World Bank (FDSD)
	Financial System Activity	Private domestic credit from financial institutions (% of GDP)	World Bank (FDSD)
	Financial Size	Deposit bank assets on Central bank plus Deposit bank assets	World Bank (FDSD)
Banking globalization	Cross-border banking	The net position of cross-border banking activity flows	BIS Statistics
	De Jure liberalization	Banking degree of openness	Chin & Ito (2006)
	De facto liberalization	The measure of external capital stock as a share of GDP	Lane & Milesi-Ferretti's (2007)
	Banking integration	Convergence of real interest rate	Author construction
Control variables (consistent with the existing literature and theory)	Trade openness	Imports plus Exports in commodities (% of GDP)	World Bank (WDI)
	Public Investment	Gross Public Investment (% of GDP)	World Bank (WDI)
	Inflation	Consumer Price Index (annual %)	World Bank (WDI)
	Economic growth	GDP Growth (annual %)	World Bank (WDI)
	Per Capita Economic growth	GDP per capita growth (annual %)	World Bank (WDI)
	Real interest rate	Real interest rate (annual %)	World Bank (WDI)
	Financial crisis	Dummy variable (1=crisis; 0=none)	Author construction

Source: Author construction. FDSD: Financial Development and Structure Database; BIS: Bank for International Settlements; WDI: World Development Indicators; GDP: Gross Domestic Product.

Table 3: Correlation matrix

	Financ~h	Tradeo~s	Public~t	Inflat~n	Econ~wth	PerCap~h	Realin~e	INTERI	CRBa	LIBdefact	kaopen	Banking~ty	Financial~ty	Financial~e
FinancialS~h	1.0000													
Tradeopenn~s	-0.0062	1.0000												
PublicInve~t	-0.0571	0.4065	1.0000											
Inflation	0.0166	-0.0447	0.0819	1.0000										
Economicgr~h	-0.0658	-0.0669	0.0972	-0.0873	1.0000									
PerCapitaE~h	-0.0548	-0.0325	0.1066	-0.0848	0.9912	1.0000								
Realintere~e	-0.0178	-0.0346	0.0448	-0.2308	-0.0011	-0.0159	1.0000							
INTERI	-0.0864	-0.0600	-0.0644	0.2272	-0.0381	-0.0606	0.1522	1.0000						
CRBa	-0.1455	-0.0845	0.0086	-0.0010	-0.0097	-0.0334	0.0842	0.0523	1.0000					
LIBdefacto	0.0531	0.0752	-0.0415	0.3456	-0.0137	0.0157	0.0165	-0.3442	-0.1917	1.0000				
kaopen	-0.0581	0.0058	0.0662	-0.0795	-0.0098	-0.0038	0.1749	0.1241	0.0009	0.1190	1.0000			
BankingSy~ty	0.1933	0.0121	0.0899	0.0240	-0.0338	-0.0326	0.0555	0.0346	0.0068	-0.0310	0.2347	1.0000		

Financial~ty |	0.6807	-0.0517	-0.0895	0.0145	-0.0293	-0.0303	-0.0041	-0.0404	0.0239	0.0323	0.0071	0.2967	1.0000
FinancialS~e |	0.1211	0.0492	0.1560	0.1023	-0.1087	-0.0990	0.1339	-0.1006	0.1053	0.0725	0.1557	0.4394	0.3709
1.0000													

Source: Authors construction.

Table 4: Data description.

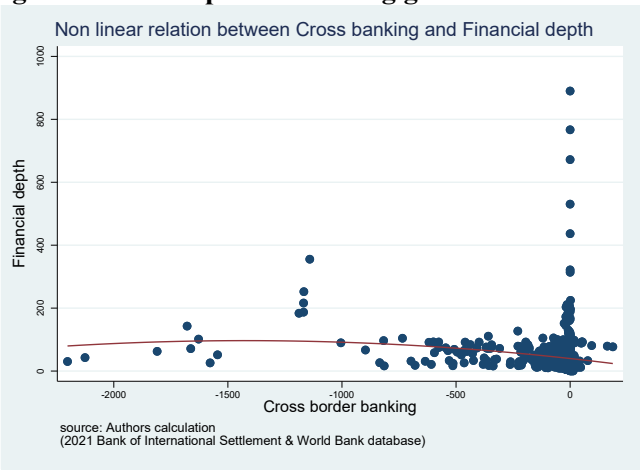
Variable	Obs	Mean	Std. Dev.	Min	Max
Financial System depth	1040	43.26858	58.59973	.3779916	889.9878
Financial effficiency	1026	33.59095	46.64538	.3964558	770.2585
Financial activity	1051	29.95989	66.49986	.261286	986.1168
Financial size	1027	78.28151	19.49421	9.799127	99.99993
Cross border banking	1175	-54.53066	200.0699	-2202.76	187.07
Liberalization de facto	324	-.7043348	.8111185	-3.072515	2.287696
Liberalization de jure	852	-.5039886	1.332173	-1.894798	2.389193
Banking integration	684	9.217156	10.35297	-1.308886	92.18046
Financial crisis	1175	.16	.3667622	0	1
Trade openness	1175	63.37892	42.22975	0	347.9965
Public Investment	1013	22.65392	10.12453	-.0984	79.40108
Inflation	1085	106.241	145.1023	.0297131	3364.82
Economic growh	1130	4.264089	8.348754	-62.07592	149.973
Per Capita Economic growth	1130	1.800857	8.008591	-62.37805	140.367
Real interest rate	684	7.378648	12.81127	-93.51346	52.43679

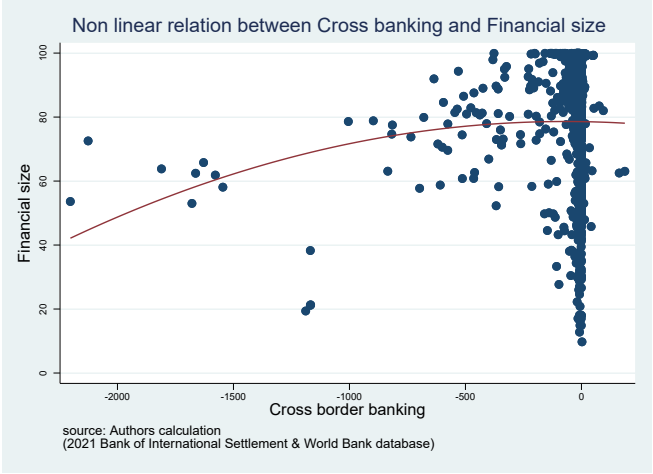
Source: Author construction.

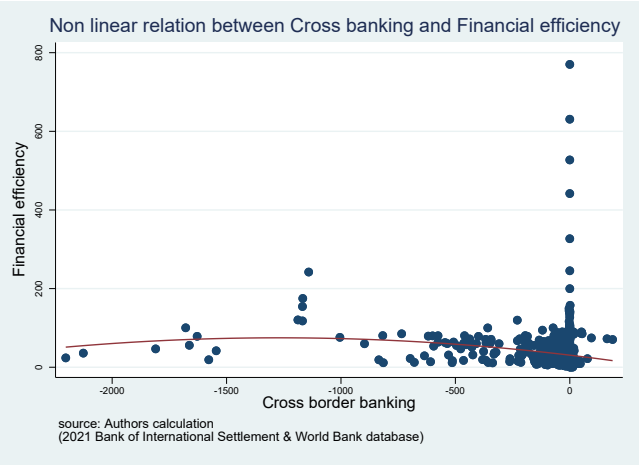
Statistical analysis results

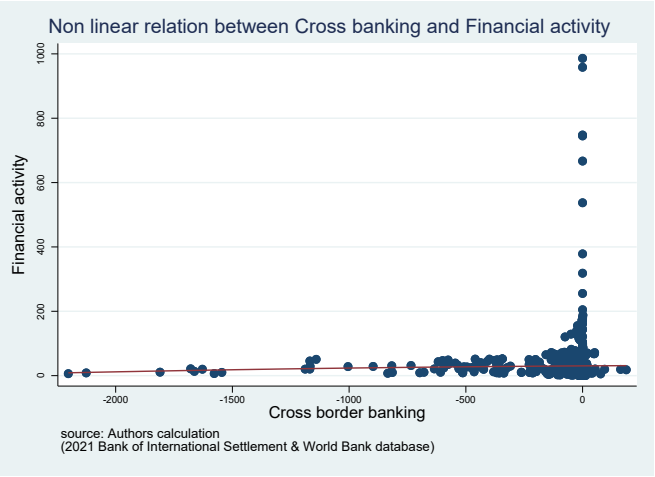
Figures 4 shows that the non-linear relation between banking globalization and financial development in Africa is possible. Independently of the proxy used, we have a polynomial correlation and, to a lesser extent, a positive correlation. Indeed, the non-linear curve is associated with a better R^2 in comparison with one of the linear lines.

Figure 4: Scatter plot of banking globalization indicators and financial development indicators





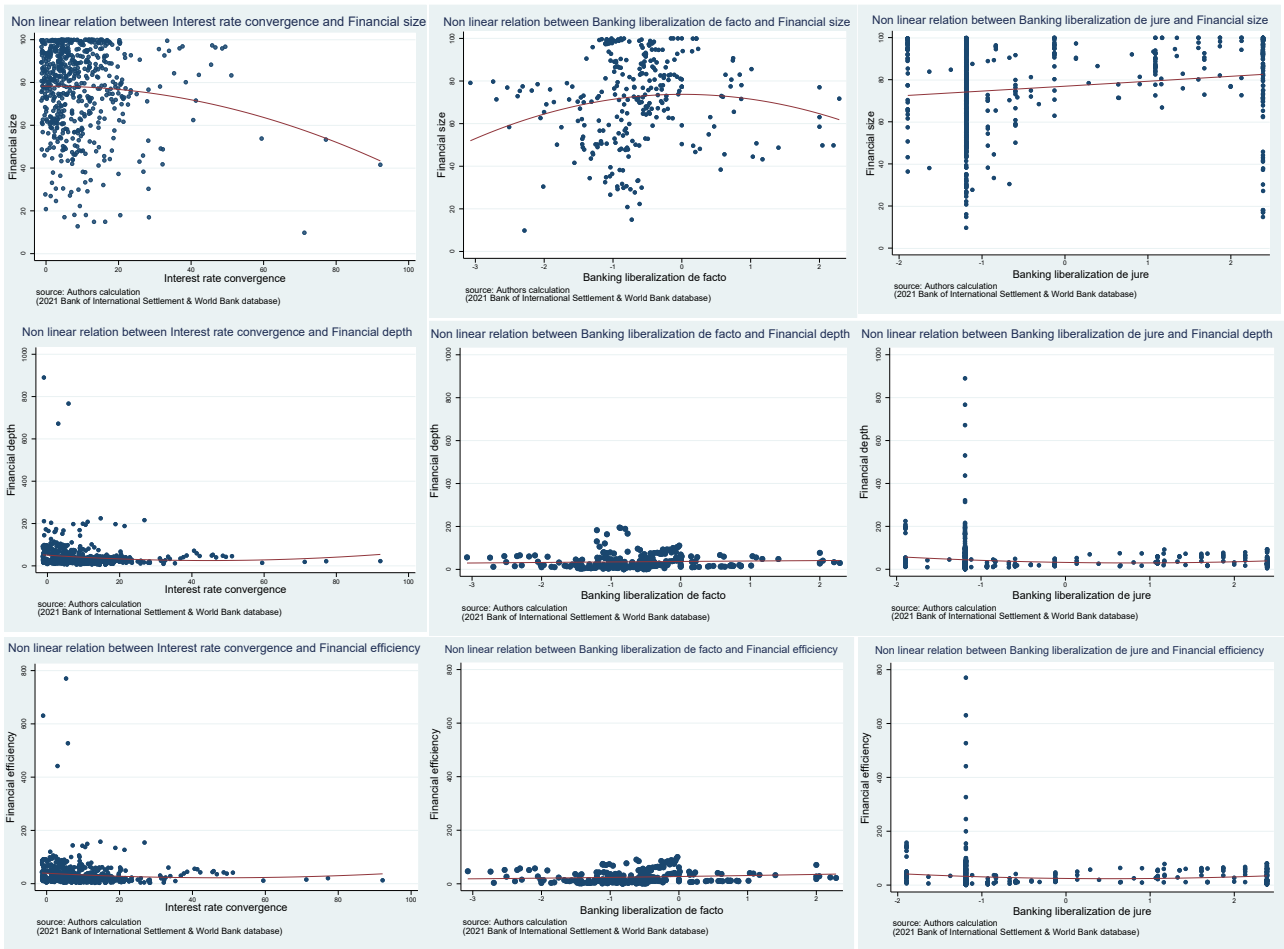


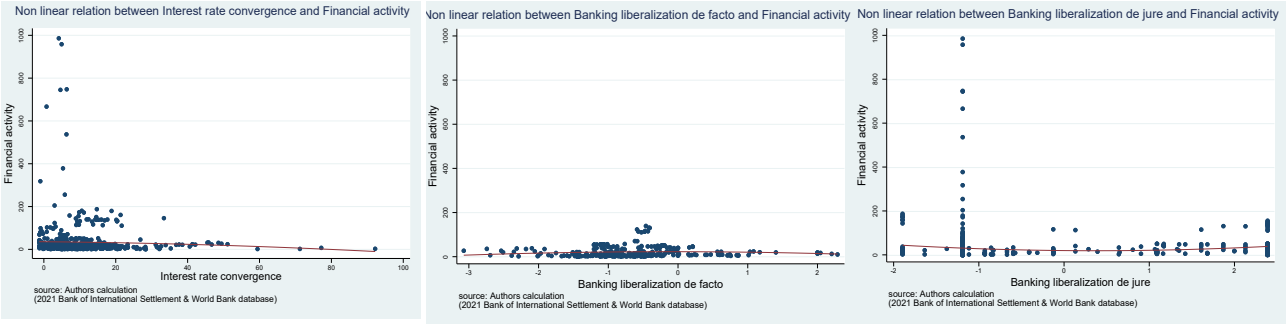


Source: Authors Constructions.

These trends in Figure 4 above indicate a non-linear relation between cross-border banks in the name of banking globalization contributions and financial development. However, empirical demonstration remains scarce. Moreover, for robustness purposes, the figure below shows the relation between financial development and an additional indicator of banking globalization.

Figure 5: Scatter plot of multidimensional index of banking globalization indicators and financial development indicators.





Source: Authors Constructions

As detected before, the majority of these graphs in the figure 5 above show that a non-linear relation is closer to reality than a linear relation.

Empirical model and methodology

We propose a two-stage estimation methodology to assess our main problem of verifying if there is a threshold impact:

(1) Preliminary investigation: We propose to use panel data estimation to test the linear specification of the relationship between banking globalisation and financial development. We propose the use of a threshold regression (TR) approach to examine and estimate the potential for a threshold effect and/or nonlinear impact of banking globalization on financial development.

(2) Main investigation: We propose the use of a threshold regression (TR) approach to examine and estimate whether there is a threshold effect and/or a nonlinear impact of banking globalization on financial development.

Furthermore, in addition to the necessity of confirming the presence of a threshold effect, the selection of a threshold model in preference to an alternative such as the quadratic function approach is primarily supported by the fact that we have a relatively higher number of observations (in excess of 540).

Usage of panel data:

- ✓ ***Model specification***

The baseline model is presented as follow:

$$Y_{i,t} = \alpha + \beta X_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (1)$$

For the model in Eq. (1), the dependent variable $Y_{i,t}$ is a financial development dimension whereas $X_{i,t}$ contains banking globalization index and its interaction with crisis[10], GDP growth, GDP per capita growth, public investment, population growth, inflation and development assistance; α is the constant term [11]. Considering those last information's, model (1) becomes:

$$Y_{i,t} = \alpha + \beta BG_{i,t} + \mu BG_{i,t} * CR_{i,t} + \partial CV_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (2)$$

Where $BG_{i,t}$ take into consideration our indicators of banking globalization; $CR_{i,t}$ the banking crisis dummy and $CV_{i,t}$ the control variables.

We are now going to introduce the interaction between our banking globalisation indicators (cross-border banking, de jure and de facto liberalisation, and private capital flows) and banking crises. If banking integration is beneficial for the more externally dependent financial sector in a period of stability but not during crisis

[10] According to Popov & Udell (2012), crisis can impact the financial development status through cross-border transmission of financial shocks.

[11] Due to issues of overparametization and multicolinearity, GDP growth and GDP per capita growth will be used in two different specifications.

periods, then the coefficients β should be positive and μ negative. This specification and argument differ from those of Kroszner et al. (2007), who introduce an interaction between banking crises and domestic financial development and hypothesise that financial development should be beneficial for the more externally dependent banking sector in tranquil times but should make them more vulnerable to setbacks in crisis periods. Eq. (2) provides unbiased estimates of our parameters of interest even if there is a causal link between banking globalisation and crises.

Following Popov & Udell (2012), we assume, for instance, that $CR_{i,t} = \omega BG_{i,t} + \vartheta_{i,t}$, we can then rewrite Eq. (2) as:

$$Y_{i,t} = \alpha + \beta BG_{i,t} + \mu BG_{i,t} * (\omega BG_{i,t} + \vartheta_{i,t}) + \partial CV_{i,t} + \mu_i + \varepsilon_{i,t}$$

$$\Rightarrow \quad Y_{i,t} = \alpha + \beta BG_{i,t} + \pi\, BG_{i,t}^2 + \partial CV_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (3)$$

In this section, we present the model to determine the form of the relationship between banking sector globalization and financial development as a prerequisite to verify if there is or not a threshold.

In a general point of view, the nonlinear hypothesis is empirically tested by estimating a general equation specified as follows:

$$Y_{i,t} = \beta_0 + \beta_1 x_t + \beta_2 x_t^2 + \beta_3 x_t^3 + \beta_4 z_t + \varepsilon_t$$

Where $Y_{i,t}$ represents the environmental variable, x_t represents per capita income and z_t denotes any other variables that may influence environmental degradation. The index *t* denotes time. β_0 is a constant and β_1 , β_2 , β_3 and β_4 are the coefficients of the explanatory variables. Equation (1) allows us to test all possible forms of the relationship between per capita income and pollution. Seven different forms of this relationship can be obtained depending on the values taken by the coefficients.

a) If $\beta_1 = \beta_2 = \beta_3 = 0$, then there is no relationship between the variable *x* and the variable *y*.
b) If $\beta_1 > 0$ and $\beta_2 = \beta_3 = 0$, then there is a positive linear relationship between *x* and *y*.
c) If $\beta_1 < 0$ and $\beta_2 = \beta_3 = 0$, then there is a negative linear relationship between *x* and *y*.
d) If $\beta_1 > 0$; $\beta_2 < 0$ and $\beta_3 = 0$, then the shape of the relationship between x and y is inverse U-shaped. The hypothesis of non-linearity is in this case verified.
e) If $\beta_1 < 0$; $\beta_2 > 0$ and $\beta_3 = 0$, then the relationship is "U-shaped" between *x* and *y*.
f) If $\beta_1 > 0$; $\beta_2 < 0$ and $\beta_3 < 0$, then the relationship between x and y has a cubic polynomial or "*N*" shape.
g) If $\beta_1 < 0$; $\beta_2 > 0$ and $\beta_3 < 0$, then the relationship takes the form of an inverse "*N*".

The non-linear hypothesis corresponds to case (d), we must have $\beta_1 > 0$ and $\beta_2 < 0$. If it is the case one can also calculate the turning point whose formula is:

$$x^* = e^{(-\beta_1/2\beta_2)}$$

Considering case d), we can specify the following model to estimate:

$$Y_{i,t} = \alpha + \beta BG_{i,t} + \pi\, BG_{i,t}^2 + \varphi\, BG_{i,t}^3 + \partial CV_{i,t} + \mu_i + \varepsilon_{i,t}$$

There are three key benefits to addressing non-linearity by introducing a quadratic term into the model. Firstly, this approach enables us to identify the shape of the relationship, whether it is U-shaped or inverted U-shaped. Secondly, it determines the threshold value endogenously through the first-order condition. Finally, it allows for a comparison of the effects produced by all explanatory variables across different regimes, whereas other methods (such as panel threshold regression) only report the impact of the transition variable from one regime to another. To confirm the robustness of the obtained results, it is simply necessary to re-estimate the model for the two different regimes and to check that the transition variable produces different effects on the dependent variable from one regime to another.

✓ ***Estimation approach***

With regard to the first approach, we initially assess the suitability of the choice between the application of the generalized least square (GLS) method to estimate the model with fixed effects and random effects. Subsequently, we proceed to estimate a dynamic panel by introducing lagged endogenous variables among the regressors.

The GMM estimation offers a potential solution to the issues of simultaneity bias, reverse causality and omitted variables. It offers a potential solution to the issue of endogenous variables, which can arise when examining the relationship between banking globalisation and financial development. There are two variants of the GMM estimator in a dynamic panel: the first difference GMM estimator and the system GMM estimator. It might be suggested that the first difference GMM estimator of Arellano and Bond (1991) could be taken for each period. One possible approach would be to estimate the first difference equation in order to eliminate the effects of specific countries. It might then be possible to instrument the explanatory variables in the equation in first difference with their lagged level values of one period or more. With regard to the GMM system estimator of Blundell and Bond (1998), it combines the equations in first difference with the level equations in which the variables are instrumented by their first differences. Blundell and Bond (1998) demonstrated, through Monte Carlo simulations, that the system GMM estimator is more powerful than the difference estimator. This latter approach may yield biased results in small samples when the instruments are weak.

3.3.2) Usage of a Threshold Regression (TR) approaches

✓ ***Model specification***

With regard to the second approach, which is in line with the findings of the literature (Hu et al., 2014), it seems that threshold regression may be a suitable method for determining how existing levels of financial development affect banking globalization. In light of the above, the research objective is to assess the nonlinear impact of banking globalization on financial development in order to verify and estimate whether there is a threshold effect that is compatible with the TR approach. This approach could be particularly beneficial in contexts where extremes are of significance, such as in financial development studies where upper or lower quantiles of banking globalisation levels may be of particular importance from a financial development perspective. We hope to contribute to the existing body of knowledge by complementing the linear regression with a TR. This will enable us to investigate the existence of a threshold level for banking globalization and how any such level affects the financial sector development of African economies. Based on this technique, we can carefully examine how banking globalization plays out in terms of financial development performance throughout the conditional distribution (with particular emphasis on countries with the highest and lowest levels of banking globalization).

Practically, we will estimate the following dynamic panel threshold model, which allows working with fixed effects and endogeneity issues (Ho, 2006; Cheng et al., 2009; Kremer et al., 2013; Vinayagathasan, 2013):

$$y_{i,t} = \mu_i + \alpha_1' x_{i,t} I(s_{i,t} \leq \gamma) + \alpha_2' x_{i,t} I(s_{i,t} > \gamma) + e_{i,t} \quad (2)$$

Equation (2) can be compacted as follow:

$$x_{i,t}(\gamma) = \begin{cases} x_{i,t} I(s_{i,t} \leq \gamma) \\ x_{i,t} I(s_{i,t} > \gamma) \end{cases} \quad (3)$$

Where *I* (.) is the indicator function; the subscript *i* indexes the individual and the subscript *t* index time. The dependant variable $y_{i,t}$ is a scalar; the threshold variable $s_{i,t}$ is a scalar and the regressor $x_{i,t}$ is a *k* vector. $e_{i,t}$ is the error term that is assumed to be independent and identically distributed.

✓ ***Estimation approach***

We apply new econometric techniques (Hansen, 1999; Gonzalo & Pitarakis, 2002) to estimate the value of threshold points and their coefficient, with a view to performing inference about whether or not this effect could be attributed to sampling error. From the literature review, it seems that the best estimation method for dynamic panel data models with individual-specific fixed effects and threshold effects simultaneously is least squares (LS) and GMM-based estimation (Chan, 1993; Hansen, 1997; Hu et al., 2014). It builds on an extension of Hansen's (Hansen, 1999) original setup to models including endogenous regressors, specifically lagged dependent variables. The orthogonality conditions proposed by Arellano & Bond (1991) are valid, which means this method can address the problem of endogeneity of these nonlinear dynamic panel data models. We would like to propose applying the procedures pioneered by Hansen (1999) to test for the presence of threshold effects and to obtain a confidence set for the threshold parameter. We will then estimate the threshold and slope parameters by GMM, and derive the asymptotic distribution of the slope parameters.

4) Financial development benefit of banking globalization: Result presentation and discussion

We present here the result of the non-linear investigation on one hand and the threshold estimation on the other hand.

Table 5: Dynamic analysis of the non-linear relation using GMM estimation method.

VARIABLES	(1) Financial Efficiency	(2) Financial Size	(3) Financial Depth	(4) Financial Activity
L.Financial System Efficiency	1.009***			
	(0.0122)			
L.Financial Size		0.429***		
		(0.0521)		
L.Financial System Depth			0.796***	
			(0.00901)	
L.Financial System Activity				1.009***
				(0.00114)
Cross border banking	-0.0185***	-0.0118*	-0.0194***	-0.00500
	(0.00461)	(0.00694)	(0.00423)	(0.00447)
Cross border banking ²	1.07e-05***	8.67e-06**	7.78e-06***	1.26e-07
	(2.23e-06)	(3.38e-06)	(1.72e-06)	(1.98e-06)
Trade openness	-0.0348	0.0267*	-0.0528*	0.115***
	(0.0325)	(0.0149)	(0.0309)	(0.0281)
Public Investment	0.180	0.0668	0.353**	-0.483***
	(0.121)	(0.103)	(0.163)	(0.114)
Inflation	-0.000257	0.0407***	0.0122**	0.0293***
	(0.00604)	(0.0119)	(0.00464)	(0.00635)
Per Capita Economic growth	-0.197**	0.254*	-0.0186	0.177**
	(0.0827)	(0.135)	(0.0830)	(0.0728)
Real interest rate	0.0581***	0.151***	0.0433**	0.110***
	(0.0164)	(0.0415)	(0.0177)	(0.0166)
Financial crisis	-0.0926	1.910***	-1.099**	2.153***
	(0.436)	(0.468)	(0.497)	(0.304)
Observations	469	467	473	484
Number of Paysid	30	30	31	31
AR(1)	0.00482	0.00328	0.00426	0.00410
AR(2)	0.457	0.283	0.328	0.3505
Instruments	12	11	14	16
Hansen(OIR)	0.294	0.171	0.147	0.445
Fisher	18419	1259	2048	17364

Standard errors in parentheses

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

Source: Author construction.

Using the generalized method of moments in Table 5 above, the lagged values of all dependent variables are positive and significant at 1%. Similarly, cross-border banking and its square present a positive and statistically significant impact on financial efficiency, size and depth indices. When we consider financial activity, this impact becomes non-significant. Conclusively, the non-linearity of the relation between both phenomena is validated. The positive coefficient implies that there are two regimes: the first with a negative relation and the second with a positive relation. Countries need to reach a certain threshold to unleash the benefits of cross-border banking in terms of financial development. Moreover, our results are convincing insofar as the Hansen test is good.

When it is significant, the impact of trade openness, public investment, per capita economic growth and financial crisis is ambiguous since those variables present either a positive or a negative impact depending on the financial development aspect considered. Inflation presents a positive impact even with a small magnitude. This can be explained by the fact that a small increase in the price is not bad for financial development.

Tableau 6: Static analysis of the non-linear relationship using the fixed effect method

VARIABLES	(FE) Financial Depth	(FE) Financial Efficiency	(FE) Financial Activity	(FE) Financial Size
Cross border banking	-0.0340***	-0.0528***	-0.0249***	-0.0196***
	(0.00494)	(0.00692)	(0.00371)	(0.00568)
Cross border banking ²	1.74e-05***	3.09e-05***	1.42e-05***	7.68e-06**
	(2.87e-06)	(4.00e-06)	(2.08e-06)	(3.29e-06)
Trade openness	-0.0798***	-0.0537	0.0733**	-1.99e-05
	(0.0275)	(0.0514)	(0.0295)	(0.0421)
Inflation	0.00657*	0.0247**	0.00500**	0.0572***
	(0.00340)	(0.0125)	(0.00244)	(0.00995)
Per Capita Economic growth	-0.800***	-0.111	-0.244***	0.241*
	(0.102)	(0.162)	(0.0814)	(0.130)
Real interest rate	0.126***	0.346***	0.194***	0.204***
	(0.0413)	(0.0627)	(0.0328)	(0.0483)
Public Investment	0.430***	0.307***	0.202***	0.0703
	(0.0684)	(0.102)	(0.0504)	(0.0826)
Financial crisis	-1.093	-1.640	-0.367	3.435***
	(0.911)	(1.325)	(0.693)	(1.091)
Constant	34.28	53.26	11.76	67.62
	(2.136)	(3.373)	(1.624)	(2.811)
Observations	567	524	494	522
R-squared	0.243	0.197	0.227	0.147
Number of Paysid	32	31	31	30
AR(1)	0.00323	0.00421	0.00539	0.00172
AR(2)	0.2351	0.5673	0.70867	0.3258
Instruments	11	10	09	10
Hansen(OIR)	0.144	0.207	0.882	0.802
Fisher	2688	4954	4501	31874

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source : Author's Construction

The fixed effect method was used in Table 6. From this table, we confirm that we still have a positive and significant impact of both cross-border banking and cross-border banking squared indices. The cross-border banking variable impacts on the dependent variables of our study are all positive and statistically significant at 1%. Also, the dependent variables all have coefficients that are positive and significant at 1% with the square of the cross-border banking variable.

Table 7: Static analysis of the non-linear relationship using the random effect method

VARIABLES	(RE) Financial Depth	(RE) Financial Efficiency	(RE) Financial Activity	(RE) Financial Size
Cross border banking	-0.0347***	-0.0509***	-0.0250***	-0.0194***
	(0.00497)	(0.00690)	(0.00368)	(0.00562)
Cross border banking ²	1.78e-05***	3.01e-05***	1.42e-05***	7.75e-06**
	(2.89e-06)	(4.00e-06)	(2.06e-06)	(3.26e-06)
Trade openness	-0.0594**	-0.0675	0.0663**	-0.00780
	(0.0271)	(0.0485)	(0.0290)	(0.0394)
Inflation	0.00629*	0.0246**	0.00506**	0.0571***
	(0.00343)	(0.0125)	(0.00243)	(0.00988)
Per Capita Economic growth	-0.809***	-0.0911	-0.241***	0.236*
	(0.103)	(0.162)	(0.0809)	(0.129)
Real interest rate	0.125***	0.345***	0.194***	0.205***
	(0.0416)	(0.0626)	(0.0326)	(0.0479)
Public Investment	0.428***	0.320***	0.205***	0.0852
	(0.0685)	(0.101)	(0.0499)	(0.0811)
Financial crisis	-1.234	-1.553	-0.349	3.467***
	(0.921)	(1.329)	(0.689)	(1.086)
Constant	30.97***	54.38***	11.04*	65.38***
	(4.001)	(5.480)	(5.775)	(4.479)
Observations	567	524	494	522
Number of Paysid	32	31	31	30
AR(1)	0.00166	0.00371	0.00322	0.00417
AR(2)	0.3822	0.2791	0.2296	0.3772
Instruments	10	09	11	13
Hansen(OIR)	0.801	0.138	0.167	0.139
Fisher	31619	26992	13918	21793

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source : Author's Construction

As illustrated in Table 7 above, the results obtained using the random-effects method appear to be consistent with those obtained using the fixed-effects method. This suggests that a 1% increase in the cross-border banking variable may be associated with an increase in each of the dependent variables, with the estimated coefficients being 0.0347 for financial depth, 0.0509 for financial system efficiency, 0.0250 for financial system activities and 0.0194 for financial size. Similarly, each of the dependent variables is also positive and significant with the square of the cross-border banking variable at the 1% level, except for the financial size variable, which is significant at the 5% level. This suggests that there may be a non-linear relationship between the dependent variables and the independent variable (cross-border banking).

It can be seen that banking globalisation has a positive and negative influence on financial development, depending on the regime. This allows us to identify the threshold and the different regimes of the relation between the banking globalisation index and financial development using the panel threshold estimation method. The table below presents the results of this investigation.

Table 8: Estimation of the threshold.

Estimating the threshold parameters: 3rd ..... Done
Boostrapping for threshold effect test: 2nd ..... 3rd ..... Done
Threshold estimator (level = 95):

model	Threshold	Lower	Upper
Th-1	-28.150	-28.649	-27.330
Th-21	-10.410	-10.500	-10.220
Th-22	-3.250	-3.359	-3.163
Th-3	-2.060	-2.070	-1.997

Threshold effect test (bootstrap = 0 300 300):

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	2.06e+06	1830.081	0.900	0.007	47.706	64.662	104.996
Double	2.05e+06	1822.725	4.540	0.747	40.311	51.300	79.307
Triple	2.05e+06	1819.919	1.730	0.960	39.365	47.652	93.948

Source : Authors calculation

The output of the panel threshold investigation is presented in parts 1 and 2 of the table above. The single threshold model estimator is -28.15 with a 95% confidence interval and an F-statistics highly significant. Therefore, the U-curve relationship is confirmed with the rejection of the linear model in favour of a double or triple-threshold model. Moreover, this conclusion is justified since the double-threshold investigation presented a non-significant result. This threshold makes economic sense because it is within the range (-2202.76 to 187.07) provided by the summary statistics. Thus, given the finding of the first step of our nonlinear investigation, we can observe that globally there is two regimes: before the threshold of -28.15, there is a negative relationship and after, there is a positive relationship. The main economic implication of this result is that there is a minimum threshold (-28.15) of cross-border banking activity to perform if we want to have a benefit in terms of financial development performance.

5) Robustness check

Tables 9 and 10 below present the result of the estimation of the linear model using generalized method of moment estimation method along with alternative indices of banking globalization such as banking integration, liberalization de facto and liberalization de jure.

Table 9: Estimation result of financial depth and activity with an alternative index of banking globalization using GMM.

VARIABLES	(1) Financial Depth			(2) Financial Activity		
L.FinancialSystemDepth	0.726***	0.524***	0.738***			
	(0.0290)	(0.0870)	(0.0330)			
L.FinancialSystemActivity				0.958***	0.273**	0.958***
				(0.0161)	(0.104)	(0.0196)
Banking integration	-0.0454			0.0849		
	(0.0700)			(0.129)		
Liberalization de facto		-2.480*			0.0913	
		(2.660)			(3.161)	
Liberalization de jure			-0.251			4.704
			(2.411)			(4.812)
Trade openness	-0.0191	0.0220	-0.0339	0.0711	-0.0358	0.156
	(0.0430)	(0.0479)	(0.0578)	(0.0808)	(0.0595)	(0.120)
Public Investment	0.0963	-0.0456	0.227	0.0155	-0.00198	-0.0208
	(0.113)	(0.203)	(0.166)	(0.215)	(0.248)	(0.354)
Inflation	0.0109	0.167**	0.0214	-0.000540	0.106	-0.0117
	(0.0101)	(0.0709)	(0.0214)	(0.0184)	(0.0775)	(0.0434)
Per Capita Economic growth	-0.214**	-0.131	-0.0489	0.0507	-0.130	0.201
	(0.101)	(0.115)	(0.130)	(0.183)	(0.140)	(0.259)
Real interest rate	0.0859**	0.0237	-0.000843	0.104	0.0126	0.136
	(0.0404)	(0.0394)	(0.0547)	(0.0739)	(0.0471)	(0.109)
Financial crisis	-0.323	0	-0.208	1.169	0	1.154
	(0.738)	(0)	(0.864)	(1.339)	(0)	(1.714)
Observations	473	77	330	484	80	340
Number of Paysid	31	14	30	31	14	30
AR(1)	0.00483	0.00492	0.00311	0.00582	0.00419	0.00465
AR(2)	0.5382	0.3881	0.2933	0.7032	0.4192	0.5519
Instruments	10	09	11	12	13	10

Hansen(OIR)	0.201	0.438	0.167	0.878	0.299	0.202
Fisher	4929	17702	1282	4522	18512	4982

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author construction.

Table 10: Estimation result of financial efficiency and size with alternative index of banking globalization using GMM.

VARIABLES	(3) Financial Efficiency			(4) Financial Size		
L.FinancialSystemEfficiency	1.024***	0.420***	1.044***			
	(0.0171)	(0.101)	(0.0173)			
L.FinancialSize				0.381***	0.0739	0.248***
				(0.0352)	(0.0961)	(0.0450)
Banking integration	0.0207			0.0230		
	(0.0472)			(0.0570)		
Liberalization de facto		-2.601*			3.824*	
		(2.486)			(4.559)	
Liberalization de jure			-2.627**			2.103***
			(1.296)			(1.931)
Trade openness	-0.00477	0.0598	-0.00221	0.0878**	0.191**	0.114***
	(0.0299)	(0.0458)	(0.0367)	(0.0354)	(0.0835)	(0.0423)
Public Investment	-0.0283	0.0947	0.0239	-0.0372	-0.610**	-0.291***
	(0.0792)	(0.201)	(0.104)	(0.0866)	(0.282)	(0.111)
Inflation	0.00102	0.212***	-0.00700	0.0110	0.293***	0.104***
	(0.00668)	(0.0699)	(0.0130)	(0.00830)	(0.107)	(0.0178)
Per Capita Economic growth	-0.227***	-0.109	-0.110	0.00110	-0.123	-0.0527
	(0.0693)	(0.106)	(0.0812)	(0.0845)	(0.200)	(0.0958)
Real interest rate	0.0880***	0.0250	0.0589*	0.140***	0.230***	0.157***
	(0.0277)	(0.0372)	(0.0337)	(0.0343)	(0.0664)	(0.0416)
Financial crisis	0.745	0	0.988*	1.301**	0	1.784***
	(0.513)	(0)	(0.540)	(0.625)	(0)	(0.645)
Observations	469	80	325	467	77	324
Number of Paysid	30	14	29	30	14	29
AR(1)	0.00399	0.00406	0.00382	0.00355	0.00132	0.00499
AR(2)	0.2356	0.3517	0.2359	0.298	0.3277	0.466
Instruments	11	13	12	11	10	13
Hansen(OIR)	0.151	0.479	0.152	0.168	0.809	0.278
Fisher	2577	17268	2577	1273	31782	18518

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author construction.

Observing the tables 9 and 10 above, we see that all lagged values present a positive and significant coefficient. For financial depth and efficiency, we have a negative and significant impact of liberalization de facto. Concerning financial size, liberalization de facto and liberalization de jure present a positive and significant impact. Moreover, we have repeated the estimations using alternative estimation methods for static panel data such as the fixed and random effect method. Table 11 bellow present the results.

Table 11: Estimation result of financial efficiency with an alternative index of banking globalization using fixed effect and random effect.

VARIABLES	(Fixed effect) Financial Efficiency	(Random Effect) Financial Efficiency

Banking integration	-0.150***			-0.162***		
	(0.0566)			(0.0570)		
Liberalization de facto		1.519**			1.525	
		(0.723)			(1.988)	
Liberalization de jure			1.476			1.663**
			(2.078)			(0.707)
Trade openness	-0.0684**	-0.0844***	-0.00767	-0.0465*	0.000444	-0.0642**
	(0.028 7)	(0.0281)	(0.0703)	(0.0282)	(0.0659)	(0.0277)
Inflation	0.0117***	0.0868***	0.459***	0.0117***	0.459***	0.0834***
	(0.00379)	(0.0147)	(0.0722)	(0.00384)	(0.0697)	(0.0148)
Per Capita Economic growth	-0.774***	-0.276**	-0.163	-0.782***	-0.168	-0.275**
	(0.106)	(0.107)	(0.150)	(0.107)	(0.147)	(0.109)
Real interestrate	0.148***	0.0540	-0.0833	0.149***	-0.0775	0.0556
	(0.0434)	(0.0427)	(0.0630)	(0.0438)	(0.0614)	(0.0431)
Financial crisis	-0.774	0.574		0.400***	0.391**	0.138*
	(0.942)	(0.861)		(0.0706)	(0.192)	(0.0715)
Public Investment	0.403***	0.133*	0.428**	-0.924		0.495
	(0.0705)	(0.0713)	(0.201)	(0.954)		(0.871)
Constant	36.36***	32.88***	9.229	32.66***	6.919	29.64***
	(2.178)	(2.290)	(6.961)	(4.012)	(9.395)	(4.245)
Observations	567	406	113	567	113	406
R-squared	0.186	0.163	0.353	0.186	0.163	0.353
Number of Paysid	32	31	15	32	15	31

Standard errors in parentheses

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

Source : Author construction.

Table 11 above presents the estimates of the dependent variable, financial efficiency, using the fixed-effects method. Banking integration has a negative but statistically significant at 1% impact financial efficiency. This means economically that a 1% increase in banking integration leads to a decrease in financial efficiency of -0.150 and -0.162, respectively for fixed effect and random effect estimation methods. On the other hand, de jure liberalization and de facto liberalization present a positive and statistically significant at 5% impact on financial efficiency. This means that a 1% increase in the de jure liberalization variable and de facto liberalization respectively, leads to a simultaneous increase of respectively 1.663 and 1.519 times this increase.

Moreover, trade openness and per capita GDP growth rate present a negative and statistically significant at 1% impact on financial efficiency. On the other hand, we have a positive and statistically significant at the 1% impact for inflation, financial crisis, real interest rate and public investment. As we can see in Table 12 below, using the alternative estimation method, we still have the same impact quality for banking integration and de jure liberalization. However, trade openness presents a positive and significant impact; public investment and financial crisis impact is now negative. While inflation and per capita GDP growth present the same impact regardless of the estimation method used.

Table 12: Estimation result of financial efficiency with an alternative index of banking globalization using FGLS estimation method

VARIABLES	(FGLS) Financial Efficiency		
Banking integration	-0.604***		
	(0.114)		
Liberalization de facto		1.039	
		(3.619)	
Liberalization de jure			4.519***
			(0.738)
Trade openness	0.290***	0.295***	0.268***
	(0.0309)	(0.0761)	(0.0339)

Inflation	0.0118	0.450***	0.000533
	(0.00948)	(0.151)	(0.0379)
Per Capita Economic growth	-0.832***	-0.311	-0.0786
	(0.261)	(0.525)	(0.290)
Real interest rate	0.130	0.242	-0.179*
	(0.0951)	(0.176)	(0.0984)
Financial crisis	-6.061**		-1.804
	(2.397)		(2.464)
Public Investment	0.0701	-0.612**	-0.189
	(0.113)	(0.266)	(0.135)
Constant	24.56***	10.59	25.25***
	(2.833)	(9.641)	(3.628)
Observations	567	113	406
Number of Paysid	32	15	31

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source : Author's construction.

Moreover, and for robustness purposes, we have repeated the estimation considering financial size instead of financial efficiency.

Table 13 : Estimation result of financial size with alternative index of banking globalization using fixed effect and random effect.

VARIABLES	(Fixed effect) Financial Size			(Random Effect) Financial Size		
Banking integration	-0.192***			-0.189***		
	(0.0641)			(0.0634)		
Liberalization de facto		-1.559			-2.367	
		(2.468)			(2.330)	
Liberalization de jure			2.739***			2.516***
			(0.892)			(0.851)
Trade openness	0.0342	0.209**	-0.00896	0.0202	0.228***	-0.0238
	(0.0428)	(0.0841)	(0.0488)	(0.0398)	(0.0756)	(0.0453)
Inflation	0.0655***	0.370***	0.145***	0.0651***	0.366***	0.145***
	(0.00996)	(0.0862)	(0.0178)	(0.00990)	(0.0831)	(0.0176)
Per Capita Economic growth	0.258**	0.0394	0.0315	0.255**	0.0241	0.0319
	(0.131)	(0.184)	(0.134)	(0.130)	(0.185)	(0.133)
Real interest rate	0.234***	0.261***	0.205***	0.234***	0.281***	0.203***
	(0.0494)	(0.0756)	(0.0516)	(0.0490)	(0.0749)	(0.0511)
Financial crisis	3.621***		2.750**	3.656***		2.787***
	(1.093)		(1.062)	(1.089)		(1.055)
Public Investment	0.0394	-0.287	-0.163*	0.0569	-0.241	-0.143
	(0.0826)	(0.242)	(0.0901)	(0.0812)	(0.228)	(0.0883)
Constant	67.80***	47.99***	67.20***	65.57***	42.39***	65.45***
	(2.796)	(8.319)	(3.015)	(4.401)	(9.031)	(5.120)
Observations	522	109	375	522	109	375
R-squared	0.139	0.284	0.272	0.186	0.163	0.353
Number of Paysid	30	15	29	30	15	29

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source : Author's construction.

Observing the table 13 above, we can see that banking integration has a negative and significant impact on financial size. This means that a 1% increase in banking integration leads to an increase of at least 0.189 times this increase in terms of financial size. Liberalization de jure presents a positive and statistically significant at 1% effect on financial size. In contrast to all of the above, de facto liberalization present an insignificant impact

on financial size.

Referring to the control variables, we can observe that trade openness, inflation, the real interest rate, financial crisis and the GDP growth rate have a positive and statistically significant impact on financial size. Only public investment presents now a non-significant impact. The dimension is positive but not significant with public investment. Table 14 bellow repeat the same model using the FGLS method. We still have the same impact for banking integration and de jure liberalization. However, the impact of de facto liberalization is now negative and statistically significant. Apart from Per Capita Economic growth, which presents now a negative and statistically significant impact, the rest of the control variables present the same impact quality and significance.

Table 14 : Estimation result of financial size with alternative index of banking globalization using FGLS

VARIABLES	(FGLS) Financial Size		
Banking integration	-0.200**		
	(0.0976)		
Liberalization de facto		-1.54***	
		(2.884)	
Liberalization de jure			1.229*
			(0.716)
Trade openness	-0.0360	0.382***	-0.0199
	(0.0293)	(0.0628)	(0.0381)
Inflation	0.0725***	0.626***	0.131***
	(0.0183)	(0.120)	(0.0379)
Per Capita Economic growth	0.0168	-0.861**	-0.0489
	(0.238)	(0.425)	(0.291)
Real interest rate	0.285***	0.775***	0.211**
	(0.0811)	(0.144)	(0.0971)
Public Investment	0.251**	-0.131	0.241*
	(0.102)	(0.218)	(0.139)
Financial crisis	3.623*		2.568
	(2.094)		(2.475)
Constant	67.11***	18.65**	60.28***
	(2.913)	(7.918)	(3.618)
Observations	522	109	375
Number of Paysid	30	15	29

Standard errors in parentheses

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

Source : Author's construction

6) Conclusion & policy recommendation

It would be fair to say that Sub-Saharan African countries are characterised by a number of factors, including the increasing cross-border activity of banks and the emergence of Pan-African banks. On the other hand, it is also true to say that the financial sector in these countries is relatively underdeveloped. However, from an international perspective, it is still challenging to fully assess the benefits of banking globalisation in terms of financial development in Africa, even when we exclude the impact of financial crises. In light of the relatively underdeveloped financial sector and the high level of openness in the banking sector in Africa, it seems that the benefits of banking globalisation in terms of financial development in Africa may not yet be fully evident. This question is particularly pertinent given the close relationship between financial development and economic growth. It may be the case that the level of banking globalisation at its current stage is not conducive to financial development.

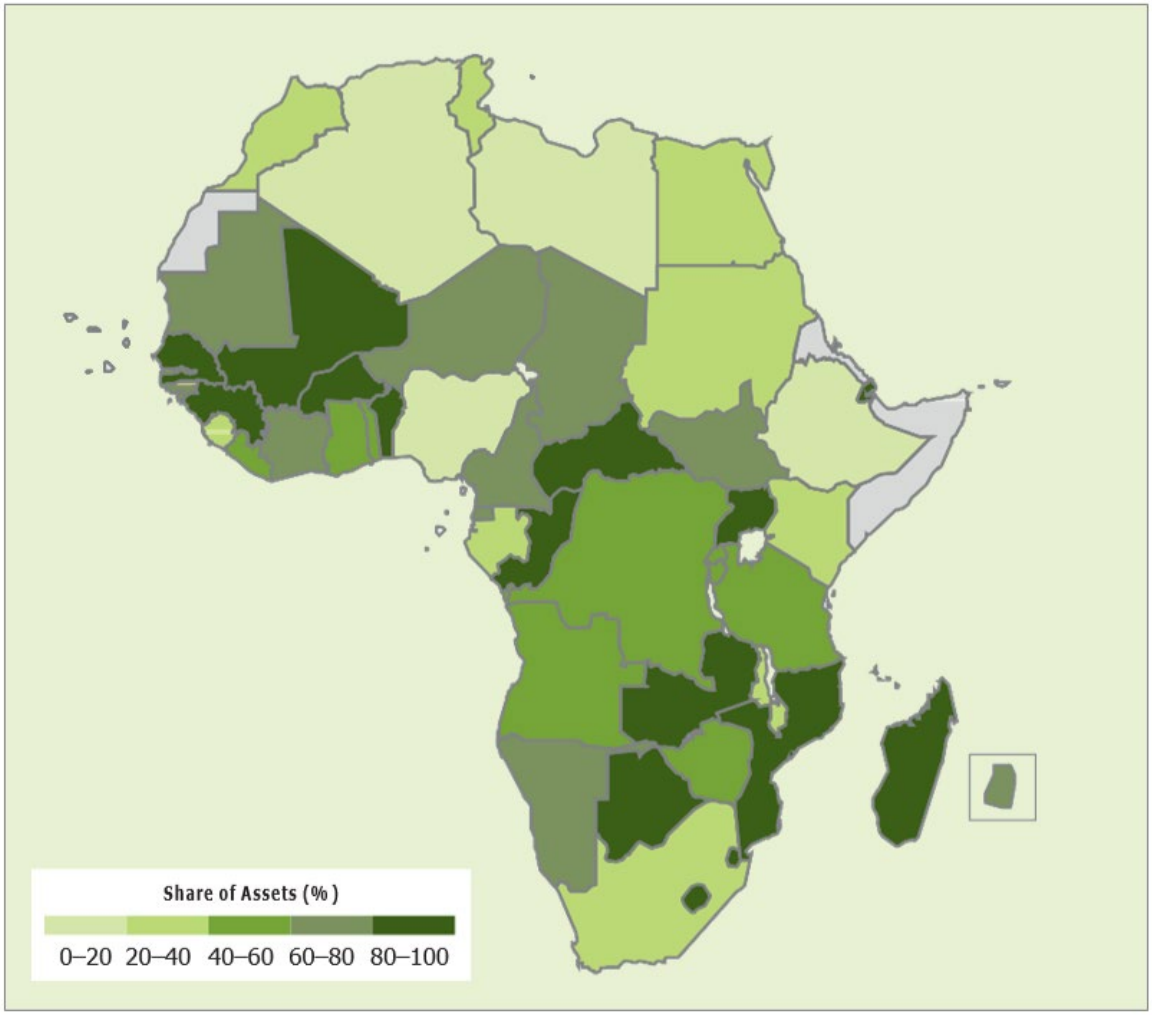
The analysis of the theory has allowed us to put forward the following hypothesis for consideration: it may be the case that, after a certain threshold, the relation between both phenomena could become positive. It is possible that low levels of banking globalisation may have some negative consequences in terms of smoothing consumption or reducing volatility. It would be remiss of us not to mention the last financial crisis, which has served to highlight the debate about the importance of banking globalisation and its implications for African countries' financial development. In essence, this paper aimed to shed light on the question of how banking globalisation affects financial development.

In order to gain a deeper understanding of the complex relationship between banking globalisation and financial development in Africa, we have conducted a thorough qualitative and quantitative analysis. By attending to these specific objectives, we were able to benchmark, verify and estimate a threshold effect and, to some extent, detect the extent a country should accept cross-border banking and open its capital account. In order to gain a deeper understanding of the subject matter, we employed both panel data and threshold regression techniques. We are grateful to have had the opportunity to work with a panel of 47 African countries, including 429 active commercial banks, over the course of the 1996-2020 period. The databases was constructed using the African Development Indicators (ADI) and the Financial Development and Structure Database (FDSD) of the World Bank, the Bank for International Settlements (BIS) statistics, the updated database on financial openness by Lane & Milesi-Ferretti (2007) and Chin & Ito (2006).

Preliminary statistical analysis confirmed the potential non-linear relation between both phenomena. Moreover, using the database constructed, analyzed and described, we have implemented an econometric analysis. The first results mainly showed that there is a nonlinear impact of banking globalization on financial development. The final step was to develop an estimation of the threshold point and different regimes using panel threshold regression techniques. The negative impact of cross-border banking activity was confirmed, but later relativised with a positive impact after a threshold of -28.15. Thus, given the finding of the first step of our nonlinear investigation, we observed that globally there are two regimes: before the threshold of -28.15, there is a negative relationship, and after, there is a positive relationship. The main economic implication of this result is that there is a minimum threshold of cross-border banking activity below which it may not be beneficial to pursue financial development. As a policy recommendation, it would be prudent for each country to ensure that the level of cross-border banking activity does not fall below the threshold of -28.15 to benefit from the resulting financial development. The implementation of this recommendation will certainly prove useful to the relevant authorities, managers and policymakers in the banking sector.

Appendix

Figure A1: Share of Assets Owned by Foreign Banks in Africa, 2011



Sources: Central Bank websites, annual reports of banking groups, Claessens and van Horen (2014) Bank Ownership Data Bank/IMF country reports, GIZ (2012a, 2012b, 2012c, 2012d).
Notes: No data available for countries marked grey. Foreign-owned bank refers to majority foreign-owned banks or to bank controlled by a foreign minority shareholder. The reference year is 2011; where 2011 data was not available, figures from 2(used instead.

Table A2: Principal determinants of financial development.

	Owusu et Camara (2013)	Teoria (2012)	Baltagi et al. (2007)	Ang (2008)	Dehesa (2007)	Mobo ladji (2008)	Dutta et al. (2011)	Demetrio et Garcia (2012)	Shahbaz et al. (2017)	Norlita et Nurnaddia (2017)
Financial openness		X		X		X				
Trade openness	X	X	X	X		X				X
Real interest rate	X			X						X
GDP per capita rate	X	X		X				X	X	X
Institutional Development			X							
Reserves	X			X						
Inflation	X	X			X				X	X
Culture							X			
Regulation										
Government borrowing	X									
population density per capita									X	
Globalization								X	X	

Source: Author construction based on literature review.

Note: A broad survey of financial development determinants can be found in Voghouei et al. (2011).

Authors declarations:

- **Availability of data and material**: Data is available upon responsible request.
- **Competing interests**: There is no competing interests.
- **Funding**: The authors received a research grant from AERC.
- **Authors' contributions**: Both authors have been responsible of the redaction of the entire article from its conception to the revision of the final draft.
- **Acknowledgements**: We thank the participants of meetings organized by the AERC and the dynamic Young Economists (DYE) and the two anonymous reviewers.

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