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Article

The Effect of Financial Inclusion and Competitiveness on Financial Stability: Why Financial Regulation Matters in Developing Countries?

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Abstract: This study aims to assess the effect of financial inclusion and competitiveness on banks' financial stability, considering the moderating role of financial regulation. To do so, we compare the effects of these variables in Sub-Saharan African (SSA) and Latin American and Caribbean (LAC) countries. Our results suggest that inclusion enhances bank stability in SSA and LAC countries, and financial regulation contributes to increasing financial stability in LAC countries, while we find no statistical significance in the effect of financial regulation on financial stability in SSA countries. Moreover, competitiveness negatively impacts financial stability, and financial regulation moderates the negative effect of competitiveness on financial stability in SSA and LAC countries. We also find that financial inclusion reduces credit risk in SSA countries, and for LAC countries financial inclusion increases credit risk and reduces bank profitability. Regarding the practical implications, this study shows that fostering financial inclusion in the countries under study contributes significantly to improving the welfare of households and especially to the stability of the financial system. The present study allows expanding of the scarce literature by examining the effect of financial inclusion and market structure on financial stability in two different samples, consisting of 41 countries in the SSA region and 31 countries in the LAC region, throughout 2005–2018.

Keywords: financial inclusion; financial stability; competitiveness; financial regulation



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1. Introduction

Financial inclusion is an important component of financial development (Emara and Said 2021; Musau et al. 2018; Zulkhibri 2016). However, it plays a relevant role in reducing poverty and inequality through the easy and safe availability of financial products and services, such as savings, bank credit, insurance, and payments (Huang and Zhang 2020; Jungo et al. 2021). These provide great advantages in improving households' living conditions when used rationally (Owen and Pereira 2018; Zins and Weill 2016). Financial inclusion is a strong manifestation of the interest of public authorities in reducing poverty and promoting inclusive economic growth through access to finance for all segments of society. It should be noted that, in economies where large numbers of people outside the financial system prevail, as is the case in certain Sub-Saharan African (SSA) countries and some Latin American and Caribbean (LAC) countries, the financing of entrepreneurial activities is conditioned by individual or family wealth.

Aware of the great advantages of financial inclusion for households, and in general for financial development, the World Bank and the G-20 have been leading initiatives to expand financial inclusion in developing and emerging countries. Moreover, financial inclusion is an integral part of the four pillars of development support defined by the United Nations, which are summarized as: (1) formulating an employment-oriented growth strategy; (2) strength-

ening financial inclusion; (3) investing in human development priorities; and (4) delivering high-impact win-win strategies, i.e., multidimensional interventions (Vo et al. 2021).

More stable banks are more able to offer financial products and services and contribute significantly to increasing financial inclusion (Musau et al. 2018). Therefore, regulatory pressure to mitigate credit risk and increase bank stability may contribute to the unintended exclusion of the most disadvantaged customers (Ackah and Asiamah 2016; Anarfo et al. 2020; Musau et al. 2018). Besides, banks play a key role in connecting the financial system to the real economy, yet financial inclusion makes monetary policy more effective in controlling inflation by expanding its effect to a larger proportion of the population (Jungo et al. 2021).

Gaganis et al. (2021) state that financial regulation can have ambiguous impacts on banking efficiency, and can increase or reduce efficiency depending on context. In these terms, Atellu et al. (2021) and Oduor et al. (2017) evidenced that the financial crisis showed that financial regulation alone is not able to promote financial stability; therefore, it is necessary to cumulatively use other measures. Financial inclusion is pointed out as one of these measures. Anarfo et al. (2020) argue that financial stability strengthens the relationship between financial regulation and financial inclusion.

Financial inclusion is characterized by an increase in new customers, new products, and new infrastructures, which serve as a basis for achieving all the dimensions of financial inclusion, which can be summarized as the demographic and geographic expansion of financial products and services. The increase in new customers implies an increase in the volume of small-value transactions for banks. Besides, the fact that these customers have no banking history and often no mastery in the use of financial products and services may pose threats to banking stability in two main ways: (1) increased operational and infrastructure costs and (2) credit risk (Musau et al. 2018). Still, financial inclusion can produce positive effects on banking stability through the expansion of the deposit and loan portfolio, specifically increasing risk diversification for banks (Musau et al. 2018).

The variable reforms implemented in LAC countries have made financial systems more diversified and complex, as well as less dependent on banks, with equity and bond markets playing a more important role, where savings are channeled directly to the market through retailers or financial intermediaries, such as pension funds, mutual funds, and insurance companies. In return, firms can raise capital directly, allowing them to make riskier, long-term investments (Didier and Schmukler 2013). In SSA countries, several reforms have also been made in the financial sector, highlighting financial liberalization and the emergence of foreign banks. However, the financial systems of this group of countries remain underdeveloped and dependent on banks (Allen et al. 2014).

The selection of Sub-Saharan Africa and Latin America and Caribbean regions for our study is justified in several ways. First, although these groups of countries are located in different geographic regions, many of them have similar economic and social characteristics, namely strong heterogeneity in economic growth, excess natural resources, low levels of economic development, strong population growth, high rates of poverty, and unemployment (Jungo et al. 2021; De la Torre et al. 2018). Second, in both regions, a considerable number of adults remain without access to financial services and products (Demirgüç-Kunt et al. 2018; Mukherjee and Sood 2020). Third, the economic organization system in the two regions is rather dualistic and there is a strong interaction between the informal and the formal system (Durango-Gutiérrez et al. 2021; Fromentin 2018; Gries et al. 2011). Finally, banks are the main financial institutions and deposits and loans are the main instruments of financial intermediation in SSA countries (Allen et al. 2014), while for LAC countries the emergence of capital markets has made the financial system more comprehensive and complex (Durango-Gutiérrez et al. 2021; Fromentin 2018; Gries et al. 2011; De la Torre et al. 2018). Additionally, the financial systems of SSA countries are fundamentally dependent on banks, while the financial systems of LAC countries are more extensive and complex, due to the emergence of capital markets. Besides, the levels of financial inclusion in both

regions are still very low, with only 43% of adults in SSA countries and 55% of adults in LAC countries having a bank account.

Financial inclusion is a policy goal present on almost every agenda, especially in emerging economies and developing countries (Demirgüç-Kunt et al. 2018; Mukherjee and Sood 2020). Access to a bank account is the main way forward in achieving financial inclusion (Demirgüç-Kunt et al. 2018). Technological innovation, specifically the use of the cell phone in the financial system, has revolutionized financial access almost worldwide, reducing by about 35% the total number of adults (1.7 billion) without access to a bank account in the year 2017. From this perspective, the levels of financial inclusion in SSA countries evolved from 25% in 2011, to 34% in the year 2014, and to 43% in the year 2017. For LAC countries, technological innovation allowed growth of financial inclusion levels by 39%, 52%, and 55% in the years 2011, 2014, and 2017, respectively (Demirgüç-Kunt et al. 2018). However, the great disparity in the levels of financial inclusion in the two regions constitutes another motivation for conducting the present study. Although the authors are aware of technological innovation's importance in the current setting, there was not enough data on this matter for the period of analysis, justifying its removal from the data to be analyzed about financial inclusion proxies.

We aim with this study to assess the effect of financial inclusion and competitiveness on banks' financial stability, considering the moderating role of financial regulation. Additionally, we compare the effects of these variables in SSA and LAC countries. Although studies assessing the effect of financial inclusion on financial stability have been growing, they are still rather inconclusive, and few studies consider the role of competitiveness and the moderating capacity of financial regulation. Moreover, we are unaware of any study that uses a comparative approach to assess the effect of financial inclusion on financial stability in realities with completely different stages of financial development (SSA and LAC). It becomes interesting to compare the results in different contexts, based on two fundamental assumptions: (1) different models may result in different responses (Allen and Gale 2004); (2) banks act differently in different institutional and regulatory settings, implying that the results obtained for developed countries may not be applicable in developing or emerging countries (Agoraki et al. 2011). Our results suggest that financial inclusion improves banks' financial stability, higher competitiveness makes banks less stable, and financial regulation reduces the negative effect of competitiveness on financial stability. As for the practical implication of this study, we find that the use of a broad measure of financial inclusion to gauge the effect on financial stability in SSA countries is inaccurate and without any impact, while for LAC countries this measure produces positive and significant effects on financial stability. Regarding the policy implications, our results allow us to know and understand the relationship between financial inclusion, financial stability, and competitiveness in the banking sector, facilitating the implementation of financial inclusion programs, without compromising the stability of banks, since each context studied has its specific characteristics and needs. For example, for the SSA countries, financial inclusion related to the increase in credit and savings produces positive and significant effects on financial stability. On the contrary, in LAC countries the concern should be related to the geographic and demographic expansion of financial products and services in general, and to direct special attention to bank deposits, since reductions in bank deposits can contribute to bank fragility. This research suggests the application of measures that promote financial inclusion to foster financial stability in SSA and LAC countries.

This study contributes to the scarce empirical literature on economics and finance by considering the role of market structure in the relationship between financial inclusion and financial stability in two different samples, consisting of 46 countries from the SSA region and 31 countries from the LAC region, for the period 2005–2018.

The rest of the paper is organized as follows: a literature review follows in the next section, in the third section we describe the data and specify the models, in the fourth section we present and discuss the, and in the last section we conclude the study.

2. Literature Review

Feghali et al. (2021) used an international sample consisting of over 140 countries and concluded that using a broad measure of financial inclusion is inaccurate in measuring the effect of inclusion on financial stability. In the same study, the authors found that financial inclusion measured as access to payment and savings accounts cause neutral or positive effects on financial stability, while credit expansion weakens stability. These results support the findings of the studies conducted by Ahamed and Mallick (2019) and Han and Melecky (2013) on different international samples and that of Canlas et al. (2018) on a sample from the Philippines. These authors concluded that financial inclusion through increased deposits contributes significantly to increased financial stability.

Morgan and Pontines (2014) evidenced that increasing bank credit to small and medium-sized firms has positive effects on financial stability in an international sample. Contrary to this result, Cihák et al. (2016) evidenced that there is a negative correlation between financial inclusion and financial stability and concluded that there is a high possibility of a trade-off between financial inclusion and financial stability. However, the authors note that the impact of financial inclusion on stability is negative when it is related to credit expansion and positive when it is related to the expansion of deposits and savings. For the Asian region, Vo et al. (2021) used banking data and employed the Generalized Method of Moments (GMM) to estimate the effect of financial inclusion on financial stability, and showed that financial inclusion contributes positively to the increase of financial stability in the banking sector. They concluded that financial inclusion can help banks increase revenues, reduce costs and expand their market share. Analogous results for the Asian region were found earlier, in the study conducted by Pham and Doan (2020), when they employed the feasible generalized least squares (FGLS) estimator on the data of 42 countries in three separate years: 2011, 2014, and 2017. Al-Smadi (2018) also found that there are positive effects of financial inclusion on financial stability.

Regarding application in the modern banking industry, Danisman and Tarazi (2020), studied how financial inclusion affects financial stability in the financial system of the European Union and the results indicated that the advances of financial inclusion through digital accounts produce a stabilizing effect on the banking system. The scarce studies on the effect of financial inclusion on bank stability applied to the African continent by Kouki (2020) and Musau et al. (2018) also confirm the positive effects of financial inclusion on financial stability.

Competitiveness in the banking sector defines how financial services and products are diffused to customers; moreover, increased competitiveness improves the options available to customers and may induce banks to take more risks (Feghali et al. 2021). Barriers to financial inclusion tend to be lower in countries with more competitive financial markets (Zulkhibri 2016). It is no coincidence that authors such as Mengistu and Saiz (2018) and Pham et al. (2019) converge in the results of their studies when they found that competitiveness increases financial inclusion, through reduced financial costs and increased availability of financial products and services. Contrarily, the strong solidification of the bank in the market causes monopoly power, allowing high-interest rates to be set and consequently poor access to credit (Albaity et al. 2019). Regarding the relationship between competitiveness and the financial stability of banks, Albaity et al. (2019) and Goetz (2018) showed in their studies that competitiveness is not responsible for the fragility of banks, whereas competitiveness reduces the risk behavior of banks and contributes to increased stability. While Ahamed and Mallick (2019), Owen and Pereira (2018), and Petersen and Rajan (2015) maintain in their studies that less competition in the banking sector can be favorable for financial inclusion and banking stability, when considering larger banks it is reported that these have the best capacity for credit availability and loan portfolio diversification, in addition to benefiting from economies of scale. Homogeneously, Agoraki et al. (2011) proffered that banks with market power tend to take lower credit risk and are more stable. Even so, we can note that the relationship between competitiveness and financial stability is inconclusive, highlighting Allen and Gale's (2004) statement

that the relationship between competitiveness and financial stability is complex. For the authors, sometimes competition increases competitiveness, and sometimes it does not, allowing them to conclude that there are contexts where concentration may be preferable. Regarding financial regulation, [Batuo et al. \(2018\)](#) confirmed that it can increase stability. Subsequently, authors such as [Anarfo et al. \(2020\)](#), [Damjanovic et al. \(2020\)](#), [Gupta and Kashiramka \(2020\)](#), and [Igan and Mirzaei \(2020\)](#) converge in their studies when they proffer that financial regulation increases bank resilience by improving asset quality, as well as inhibiting unsustainable bank credit growth and preventing financial instability. Contrarily, [Anarfo et al. \(2020\)](#) evidenced that financial regulation reduces financial inclusion in Sub-Saharan African countries.

Although the study of financial inclusion and its effect on bank stability has been growing, studies applied to SSA countries are still quite scarce and inconclusive. Besides, we are unaware of any study with this approach applied to LAC countries. Furthermore, in our study, we compared the behavior of bank-specific and macroeconomic variables in two different contexts and similar periods. Previous studies have not taken into consideration the role of market structure in the relationship between financial inclusion and financial stability. Specifically, competitiveness can enhance financial inclusion as well as increase the risk-taking behavior of banks, thus posing a threat to financial stability, hence the need to include financial regulation in the study as a measure to weigh the negative effects of competitiveness.

3. Data and Methodology

3.1. Data Description

Previous studies using this approach have used three main data sources: bank reports, the World Bank Global Financial Development (GFD) and the World Development Indicators (WDI) databases, as well as the International Monetary Fund-Financial Access Survey (FAS) data source (see the studies conducted by [Ahamed and Mallick 2019](#); [Anarfo et al. 2020](#); [Feghali et al. 2021](#); [Mengistu and Saiz 2018](#); [Pham and Doan 2020](#)). In our study, we favor the World Bank and IMF databases for data collection. To obtain a larger amount of data, despite being unbalanced, as occurred in the studies of [Dunne and Kasekende \(2018\)](#) and [Kebede et al. \(2021\)](#), we limited the period of our analysis to 2005–2018 and collected data from 46 SSA countries and 31 LACs (See Appendix A).

To measure financial inclusion, we use the principal component analysis (PCA) technique to include aspects related to geographic and demographic penetration and to represent the supply and demand-side dimensions of financial products and services, specifically, access and use of financial products and services. This complies with the suggestions of other scientific studies that substantiate that using a single variable to measure financial inclusion such as bank account ownership, access to bank credit, total bank branch, ATM per adult or Km², bank deposit and savings may produce biased results and no practical application ([Feghali et al. 2021](#); [Jungo et al. 2021](#); [Pham et al. 2019](#); [Sarma 2008](#)). Additionally, the construction of the financial inclusion index prevented us from using all financial inclusion indicators simultaneously in the estimation, avoiding the multicollinearity problem ([Batuo et al. 2018](#)). The variables used to calculate the financial inclusion index are shown in Table 1. The empirical literature on financial stability has used the Z-Score as a proxy to represent financial stability in banking (see, for example, the studies by [Ahamed and Mallick 2019](#); [Fang et al. 2014](#); [Feghali et al. 2021](#); [Han and Melecky 2013](#); [Pham and Doan 2020](#)). The Z-Score indicates the probability of bankruptcy of a bank and is interpreted as the number of standard deviations by which profits or returns can reduce before a bank's assets deplete or declare bankruptcy ([Goetz 2018](#); [Kamran et al. 2019](#); [MacHdar 2020](#); [Toader et al. 2018](#)).

To represent financial regulation, we use the capital adequacy ratio, which is a measure used by regulators to assess how protected a bank is against risk. Therefore, financial regulation, namely capital adequacy requirement, is a measure used to ensure the financial stability of banks, which reduces unsustainable bank credit growth. Several scientific

studies state that financial regulation is a strong barrier to financial inclusion (Anarfo et al. 2020; Gupta and Kashiramka 2020; Igan and Mirzaei 2020).

Table 1. Indicators of financial inclusion.

Acronym	Description	Source
bankm	Bank branch per 1000 km	World Bank (WDI)
bankad	Bank branch per 100,000 Adults	
atmskm	ATMs per 1000 km	International Monetary Found
atgmsad	ATMs per 100,000 Adults	(FAS)
cobank	Bank account per 100,000 Adults	
deposit	Bank deposits at commercial banks (% GDP)	
credit	Bank credit granted by the financial system (% GDP)	
borrowers	Borrowers in commercial banks per 100,000 adults	
saving	Savings in commercial banks (% GDP)	

Note: Own elaboration.

Scientific studies often use indicators such as the concentration of the top five banks (C5), Panzar-Rosse H-statistic, Lerner Index, and Boone Index, to measure competitiveness (Albaity et al. 2019; Goetz 2018; Owen and Pereira 2018). In the present study, we use the Boone index to measure competitiveness in the banking sector, the data for which is available for a considerable number of the countries that make up our samples. The Boone index (2008) measures competition through the efficiency channel, that is, it relates the elasticity of profits and the respective marginal costs. This index considers that competition improves the performance of more efficient firms and weakens inefficient ones (Albaity et al. 2019; Boone 2008). Having a negative Boone's indicator suggests competition, and the higher the absolute value of the index the stronger the competitiveness, indicating that, as competitiveness increases, the steeper the slope of the regression should be (Boone 2008). Competitiveness drives banks to take more risks and increases the availability of financial resources in the economy (Albaity et al. 2019). Authors such as Albaity et al. (2019), Jenkins et al. (2021), and Klapper and Lusardi (2020) use banks' defaulter loans divided by total loans in their studies to measure credit risk and point out bad credit loans as the main factor for bank instability. We will use the same variable to represent credit risk.

As for banks' profitability, we use return on equity (ROE) as an indicator, due to the greater availability of data. The return on capital indicates a bank's ability to generate profits from its resources, and it is expected that the most profitable banks will have more resources to use in financial inclusion programs, as well as the ability to better risk assessment techniques (Jenkins et al. 2021; Song et al. 2021).

We use bank overhead costs to represent bank efficiency, as excess costs represent the mismanagement and inefficiency of the organization when costs are higher than revenues (Jenkins et al. 2021; Liu et al. 2020). The use of this variable is based on the expectation that banks that mismanage their resources are likely to take on more risk.

The various theoretical and empirical studies use, as a proxy for bank size, the logarithm of bank assets (Albaity et al. 2019; Feghali et al. 2021; Jenkins et al. 2021), so in this study, we follow the same logic. The size of the bank can cause positive or negative effects on credit risk and consequently on its ability to offer financial services and products, through two routes. The first is relative to the greater availability of resources to evaluate and monitor borrowing customers and, with this, to mitigate risk exposure. The other route is relative to a greater risk assumption, because they understand that they are too big to fail (Albaity et al. 2019; Feghali et al. 2021; Jenkins et al. 2021; Son et al. 2020).

Spread characterizes the banking environment and is measured by the difference between deposit rates and lending rates. This variable shows the bank's profit margin and can affect banks' decisions regarding credit availability (Anarfo et al. 2020; Ugwuanyi 2015), as well as the ability of customers to repay bank loans.

We use macroeconomic variables such as inflation rate and gross domestic product per capita (GDP per capita) as control variables to assess the effect of countries' economic conditions on the banking sector. Inflation considerably reduces the agents' abilities to meet

their financial commitments, while the increase in GDP per capita can cause the opposite effect (Mengistu and Saiz 2018; Song et al. 2021). The remaining variables used in the study and their abbreviations are shown in Table 2.

Table 2. Bank-specific variables and macroeconomic variables.

Acronym	Description	Source
stabfin	Financial stability	World Bank (WDI & GDF)
roe	Profitability (Returns on capital)	
npl	Credit risk	IMF-FAS
compet	Competitiveness (Boone index)	
regfin	Financial regulation	
size	Bank size	
efficienc	Efficiency	
inflat	Inflation rate	
GDP	Domestic product growth rate per capita	
spread	Bank spread	

Note: Own elaboration.

3.2. Model Specification

To construct the financial inclusion index we follow the suggestion of the studies conducted by Lenka and Bairwa (2016), applying principal component analysis (PCA). Respecting the multidimensionality of financial inclusion, we aggregate the dimensions of the supply and demand side of financial products and services. According to Carillo et al. (2019), Carvalho (2013), Jungo et al. (2021), and Sarma (2008) the construction technique of the financial inclusion index is specified as in Equation (1).

$$ifi_p = W_{p1}atmskm_1 + W_{p2}atmsad_2 + W_{p3}credfs_3 + W_{p4}borrowers_4 + W_{p5}debca_5 + W_{p6}depib_6 + W_{p7}bankad_7 + W_{p8}bankm_8 + W_{p9}contbank_9 \tag{1}$$

where *ifi* is the financial inclusion index and the W_p 's represent the weights of the respective coefficients for country *p* considered in the sample. The meaning of each W_p variable used to construct the financial inclusion index is presented in Table 1. To infer the appropriate use of the financial inclusion index, we performed the Kaiser-Meyer-Olkin test (KMO)¹, as suggested by Carillo et al. (2019). The specification of the KMO test is as presented in Equation (2).

$$KMO = \frac{\sum \sum_{j \neq k} r_{jk}^2}{\sum \sum_{j \neq k} r_{jk}^2 + \sum \sum_{j \neq k} q_{jk}^2} \tag{2}$$

where r_{jk}^2 represents the square of the correlation matrix of the original variables outside the diagonal and q_{jk}^2 is the square of the partial correlations between the variables.

To estimate the effect of financial inclusion on financial stability, we used the Feasible Generalized Least Squares (FGLS) model, based on the fact that the results are free of the problems of autocorrelation and heteroscedasticity (Jungo et al. 2021; Miller 2017; Pham and Doan 2020). The model is specified as in Equation (3).

$$Y_{it} = X_{it}\beta_{it} + u \tag{3}$$

where Y_{it} is the vector of *k* dependent variables such as financial stability, credit risk, and profitability; X_{it} is the matrix of the explanatory variables of the model for each country (see Table 2). The β_{it} are the parameters of the vectors of the explanatory variables to be estimated and *u* is the vector of random errors.

4. Results and Discussion

4.1. Descriptive Statistics

For the elaboration of descriptive statistics, we fragmented the variables under study into two groups. In Table 3 we present the descriptive statistics of the indicators of financial inclusion and in Table 4 we present the descriptive statistics of the bank's specific variables

and macroeconomic variables. We can see that, as for geographic penetration, there are on average 6.52 commercial banks and 11.02 ATMs per 1000 Km² in SSA countries and only 1.96 commercial banks and 2.76 ATMs in LAC countries. Regarding demographic penetration, it is noted that for every 100,000 adults there are on average 6.27 banks and 11.78 ATMs in SSA countries, and for LAC countries there are on average only 2.71 commercial banks for every 100,000 adults and 3.54 ATMs.

Table 3. Descriptive statistics of financial inclusion indicators.

Variable	Sample of SSA					Sample of LAC				
	Count	Mean	Sd	Min	Max	Count	Mean	Sd	Min	Max
bankm	629	6.517	18.321	0.011	111.823	430	1.958	1.560	−1.915	4.715
bankad	629	6.268	8.776	0.264	53.348	431	2.717	0.659	0.000	4.092
atmskm	555	11.017	34.558	0.003	228.571	416	2.760	1.591	−2.251	5.439
atgmsad	555	11.787	16.820	0.005	82.554	416	3.541	0.718	0.077	5.705
cobank	621	319.676	429.430	0.785	2153.144	185	6.416	0.530	5.244	7.525
deposit	639	29.584	58.851	1.917	972.186	295	6.654	0.801	4.222	7.948
credit	610	23.776	33.342	0.429	257.181	421	44.882	22.082	9.683	112.351
borrowers	638	64.861	58.566	−19.912	318.165	232	9.635	20.056	−2.223	94.225
saving	629	13.209	21.664	−141.974	83.287	324	17.025	11.839	−10.199	53.058

Note: Own elaboration. See variables acronym description in Table 1.

Table 4. Descriptive statistics of bank-specific and macroeconomic variables.

Variable	Sample of SSA					Sample of LAC				
	Count	Mean	Sd	Min	Max	Count	Mean	Sd	Min	Max
stabfin	595	10.731	5.718	1.071	44.413	425	15.888	8.460	2.644	48.517
roe	638	2.009	1.929	−15.047	13.842	423	15.252	10.377	−93.934	56.773
npl	636	7.601	6.890	0.174	89.423	423	4.111	2.494	0.662	14.630
compet	462	−0.033	0.221	−2.541	0.481	378	0.028	0.257	−0.346	1.633
regfin	350	18.132	6.856	1.201	44.476	237	15.842	2.471	11.700	25.140
size	616	6.342	16.307	0.003	210.331	237	10.364	2.094	5.769	16.195
efficienc	593	60.976	15.994	19.895	150.000	423	4.476	2.566	0.093	28.011
spread	629	7.355	6.972	−3.602	114.248	418	8.979	6.415	1.391	39.654
inflat	635	119.450	2104.56	−8.975	51294.00	430	6.178	10.796	−27.632	174.858
GDP	635	115.123	2595.32	−47.591	65069.00	430	2.006	3.361	−13.332	12.938

Note: Own elaboration. See variables acronym description in Table 2.

Descriptive statistics’ results also show that on average 320 adults in SSA countries have access to a bank account and in LAC countries only six adults have access to a bank account per 100,000 adults. During the period under review, users of banking services in SSA countries deposited in commercial banks on average 29.58% and saved on average about 13.21% of gross domestic product. In terms of access to credit, the financial system granted on average about 23.78% of gross domestic product. For LAC countries, adults deposited 6.65% and saved about 17.02% of the gross domestic product on average.

It can be concluded that the financial system of the SSA countries used, with greater relevance as a strategy for financial inclusion programs, the expansion of infrastructure, such as banks and ATMs. However, the financial system of LAC countries, to comply with financial inclusion programs, prioritize access to credit. Besides, on average, users of financial services in SSA countries save more than users in LAC countries.

On average, banks in LAC countries are more stable (15.89%), more profitable (15.25%), and assume less credit risk (4.11%), compared to SSA countries, though, the banking systems of SSA countries are on average more competitive than LAC’s banking systems. The regulation is on average stricter in the SSA countries compared to LAC countries. As for macroeconomic variables, the average inflation rate and the GDP per capita rate are higher in SSA countries.

4.2. Kaiser Factor Adequacy Test

The results of the Kaiser tests presented in Table 5 suggest the use of the financial inclusion index in the analysis, since it presents a KMO value equal to 60% for the sample of SSA countries and approximately 60% for the sample of LAC countries. For more details see Carillo et al. (2019) and Carvalho (2013).

Table 5. KMO test for financial inclusion index (ifi).

	SSA	LAC
Determinant of correlation matrix	0.001	0.000
Chi2	4004.26 ***	910.68 ***
KMO	0.60	0.595

Notes: *** significance level of 1%.

4.3. Correlation Matrix

The result of estimating the correlation of all variables under study, as well as only the main variables for samples from the SSA and LAC countries, are presented in Appendix B, Appendix C, Appendix D, and Appendix E, respectively. Table 6 summarizes the correlation of our main variables of interest. The results suggest that there is a positive and weak correlation between financial inclusion and financial stability for the two samples. We can see that there is a weak and negative correlation between the financial inclusion and profitability of banks in LAC countries and nothing can be inferred for these variables in the SSA countries because there is no statistical significance. Moreover, we found a negative and weak correlation between financial inclusion and credit risk in the sample of SSA countries and there was no statistical significance among these variables in the LAC sample.

Table 6. Summary of correlations of the main variables of interest.

Variables	SSA			LAC		
	Stabfin	Roe	Npl	Stabfin	Roe	Npl
ifi	0.20 ***	−0.02	−0.13 ***	0.33 ***	−0.30	0.03
compet	−0.12 **	0.14 ***	−0.17 ***	−0.08	−0.27 ***	0.05
regfin	0.14 **	0.08	0.25 ***	0.14 **	−0.18 ***	0.14 **

Notes: ***, ** significance levels of 1% and 5%, respectively.

Regarding competitiveness, we found that there is a significant but negative correlation between competitiveness and financial stability, and competitiveness and credit risk, as well as a positive and significant correlation between competitiveness and profitability in the sample of SSA countries, whereas for the sample of LAC countries we only observe the negative correlation between competitiveness and profitability.

Financial regulation showed similar behavior in terms of correlation for the two samples, regarding its correlation with financial stability and credit risk, i.e., we found that there is a positive and significant weak correlation between financial regulation and financial stability, financial regulation, and credit risk. Similarly, we note the existence of a weak and negative correlation between financial regulation and the profitability of banks.

4.4. Unit Root Tests

To estimate the unit root we made use of the Fisher-Augmented Dickey-Fuller (Fisher-ADF) and Fisher-Phillip Perron (Fisher-PP) tests, which allow the measuring of stationarity in unbalanced panel data². The results of the unit root tests are presented in Table 7.

Table 7. Panel unit root test.

Variables	SSA		LAC	
	Fisher-ADF	Fisher-PP	Fisher-ADF	Fisher-PP
ifi	4.49 ***	4.92 ***	17.96 ***	19.42 ***
stabfin	11.89 ***	12.17 ***	2.57 ***	2.78 ***
roe	21.57 ***	21.53 ***	9.76 ***	12.30 ***
npl	13.86 ***	13.06 ***	23.74 ***	20.30 ***
compet	7.77 ***	8.68 ***	9.92 ***	11.52 ***
regfin	6.99 ***	9.60 ***	3.72 ***	3.41 ***
size	11.11 ***	22.48 ***	3.58 ***	4.49 ***
efficienc	11.06 ***	11.54 ***	10.24 ***	10.98 ***
spread	12.81 ***	13.77 ***	7.48 ***	6.66 ***
inflat	15.99 ***	16.31 ***	13.28 ***	13.51 ***
GDP	18.49 ***	18.75 ***	17.78 ***	17.95 ***

Notes: *** significance level of 1%.

When using panel data it is important to perform the stationarity test among the variables to avoid spurious regressions (Breitung and Pesaran 2005; Levin et al. 2002). The results suggest that all variables included in the study are zero-order integrated I(0), i.e., they are stationary.

4.5. Estimation of the Effect of Financial Inclusion on Financial Stability

This study aims to evaluate the effect of financial inclusion and competitiveness on financial stability, considering the moderating role of financial regulation, as well as to compare the achievements of these variables in the SSA and LAC countries. Tables 8 and 9 show the results of estimating the effect of financial inclusion on financial stability in the SSA and LAC countries, respectively.

Table 8. Effect of financial inclusion on financial stability in SSA countries.

	Stabfin		Stabfin		Stabfin		Stabfin
ifi	0.341 (0.347)	deposit	0.0132 (0.548)	credit	0.0358 *** (0.000)	saving	0.0607 *** (0.001)
compet	-2.712 ** (0.047)	compet	-2.516 * (0.066)	compet	-2.358 * (0.068)	compet	-2.663 ** (0.048)
regfin	0.0615 (0.267)	regfin	0.0718 (0.155)	regfin	0.0570 (0.236)	regfin	0.0644 (0.227)
size	0.285 *** (0.003)	size	0.133 (0.115)	size	0.153 * (0.055)	size	0.250 *** (0.008)
efficienc	0.0645 ** (0.023)	efficienc	0.0312 (0.272)	efficienc	0.0645 ** (0.011)	efficienc	0.0434 * (0.094)
spread	-0.682 *** (0.000)	spread	-0.646 *** (0.000)	spread	-0.477 *** (0.000)	spread	-0.629 *** (0.000)
inflat	-0.0585 (0.214)	inflat	-0.00270 (0.952)	inflat	-0.0251 (0.565)	inflat	-0.0268 (0.552)
GDP	0.0895 * (0.075)	GDP	0.0634 (0.198)	GDP	0.0618 (0.197)	GDP	0.0643 (0.183)
_cons	9.832 *** (0.000)	_cons	11.02 *** (0.000)	_cons	7.814 *** (0.000)	_cons	9.531 *** (0.000)

Notes: p-values in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01.

For SSA countries, the results suggest that the use of a broad measure of financial inclusion to measure its effect on stability is imprecise, as was the case in the study conducted by Feghali et al. (2021). However, financial inclusion related to the expansion of credit and savings has positive effects on financial stability. Similar results were found in the study conducted by Morgan and Pontines (2014) when they found that expanding credit to small businesses has positive effects on the stability of banks.

Contrarily, in LAC countries, the use of a broad measure of financial inclusion to assess its effect on stability is appropriate, as can be seen in Table 9, i.e., the results suggest that financial inclusion improves financial stability. These results support the results found

by Al-Smadi (2018), Danisman and Tarazi (2020), Kouki (2020), and Pham and Doan (2020). Interestingly, in LAC countries, when financial inclusion relates to the expansion of bank deposits, it produces negative effects on financial stability, results contrary to those presented by Ahamed and Mallick (2019), Canlas et al. (2018), and Han and Melecky (2013), which found that financial inclusion related to increased bank deposits increases the stability of banks.

Table 9. Effect of financial inclusion on financial stability in LAC countries.

	Stabfin		Stabfin		Stabfin		Stabfin
ifi	4.686 *** (0.000)	deposit	−9.374 *** (0.000)	credit	0.0454 (0.154)	saving	−0.0568 (0.500)
compet	−8.479 *** (0.006)	compet	1.500 (0.704)	compet	−4.071 * (0.078)	compet	−3.910 (0.116)
regfin	0.197 (0.594)	regfin	2.296 *** (0.000)	regfin	0.594 * (0.053)	regfin	0.162 (0.680)
size	−0.168 (0.661)	size	−1.209 *** (0.000)	size	−0.116 (0.751)	size	−0.0617 (0.871)
efficienc	−0.00225 (0.993)	efficienc	−1.097 *** (0.000)	efficienc	−0.110 (0.713)	efficienc	−0.250 (0.385)
spread	0.0531 (0.529)	spread	−0.130 * (0.073)	spread	−0.0700 (0.390)	spread	−0.0476 (0.581)
inflat	−0.158 * (0.056)	inflat	−0.167 ** (0.034)	inflat	−0.262 *** (0.002)	inflat	−0.311 *** (0.000)
GDP	0.541 *** (0.007)	GDP	−0.0107 (0.952)	GDP	0.257 (0.185)	GDP	0.310 (0.198)
_cons	13.83 *** (0.006)	_cons	65.08 *** (0.000)	_cons	9.009 * (0.079)	_cons	18.85 *** (0.001)

Notes: *p*-values in parentheses; * *p* < 0.10, ** *p* < 0.05, *** *p* < 0.01.

Regarding competitiveness, the results suggest that it produces negative effects on financial stability and we cannot assess the effect of regulation on financial stability in SSA countries. However, financial regulation has positive effects on financial stability in LAC countries when we consider bank bank deposits as an indicator of financial inclusion. In addition, we show that the bank spread indicates that the high rate of bank loans and the low deposit rate is a factor that contributes significantly to the instability of SSA banks. This result is justified by the reduction of the financial capacity of users and especially when inflationary levels are high, therefore it is not by mere chance that the inflation rate negatively influences financial stability.

Furthermore, Anarfo et al. (2020) emphasize that the financial sector of African countries is characterized by high lending rates. Following these arguments, it is easy to conclude that in these countries spread is an important barrier to financial inclusion, high lending rates prevent agents from obtaining loans and low deposit rates prevent agents from depositing their savings.

Among the macroeconomic variables included in the study, inflation is the only one with a significant effect and has negative effects on financial stability in LAC countries. This result is justified by the fact that inflation represents an additional cost that reduces the purchasing power of agents and also reduces the ability of agents to honor their credit obligations (Mengistu and Saiz 2018; Song et al. 2021).

4.5.1. The Moderating Role of Financial Regulation

To measure the moderating role of financial regulation in the relationship between financial inclusion and competitiveness, we created the term of interaction between competitiveness and financial regulation (compreg). Afterward, we repeated the same estimates, introducing the new variable created, whose results are presented in Tables 10 and 11, for SSA and LAC countries, respectively.

Table 10. The moderating role of financial regulation in SSA countries.

	Stabfin		Stabfin		Stabfin		Stabfin
ifi	0.304 (0.402)	deposit	0.00553 (0.802)	credit	0.0347 *** (0.000)	saving	0.0554 *** (0.001)
compet	−5.592 ** (0.021)	compet	−6.29 *** (0.009)	compet	−5.765 ** (0.013)	compet	−5.296 ** (0.026)
regfin	0.0889 (0.150)	regfin	0.107 * (0.052)	regfin	0.0916 * (0.085)	regfin	0.0809 (0.170)
size	0.287 *** (0.005)	size	0.148 * (0.090)	size	0.140 * (0.094)	size	0.296 *** (0.003)
efficienc	0.0650 ** (0.029)	efficienc	0.0350 (0.231)	efficienc	0.0659 ** (0.013)	efficienc	0.0527 * (0.050)
spread	−0.723 *** (0.000)	spread	−0.712 *** (0.000)	spread	−0.495 *** (0.000)	spread	−0.711 *** (0.000)
inflat	−0.0135 (0.789)	inflat	0.0305 (0.526)	inflat	0.0110 (0.815)	inflat	0.00892 (0.852)
GDP	0.0798 (0.114)	GDP	0.0728 (0.141)	GDP	0.0545 (0.258)	GDP	0.0725 (0.134)
compreg	0.239 (0.155)	compreg	0.317 * (0.056)	compreg	0.285* (0.073)	compreg	0.218 (0.188)
_cons	9.431 *** (0.000)	_cons	10.71 *** (0.000)	_cons	7.212 *** (0.000)	_cons	9.079 *** (0.000)

Notes: *p*-values in parentheses; * *p* < 0.10, ** *p* < 0.05, *** *p* < 0.01.

Table 11. The moderating role of financial regulation in LAC countries.

	Stabfin		Stabfin		Stabfin		Stabfin
ifi	4.708 *** (0.000)	deposit	−9.35 *** (0.000)	credit	0.0484 (0.123)	saving	−0.0322 (0.701)
compet	−9.752 (0.551)	compet	−4.316 (0.875)	compet	27.36 ** (0.022)	compet	24.59 * (0.062)
regfin	0.188 (0.628)	regfin	2.315 *** (0.000)	regfin	0.773 ** (0.012)	regfin	0.391 (0.331)
size	−0.164 (0.670)	size	−1.216 *** (0.000)	size	−0.229 (0.528)	size	−0.145 (0.699)
efficienc	0.000897 (0.997)	efficienc	−1.107 *** (0.000)	efficienc	−0.0872 (0.766)	efficienc	−0.255 (0.369)
spread	0.0541 (0.526)	spread	−0.129 * (0.075)	spread	−0.0786 (0.325)	spread	−0.0631 (0.460)
inflat	−0.157 * (0.062)	inflat	−0.164 ** (0.039)	inflat	−0.263 *** (0.001)	inflat	−0.323 *** (0.000)
GDP	0.543 *** (0.007)	GDP	−0.00375 (0.983)	GDP	0.252 (0.185)	GDP	0.291 (0.220)
compreg	0.0710 (0.937)	compreg	0.365 (0.830)	compreg	1.903 *** (0.007)	compreg	1.717 ** (0.027)
_cons	13.88 *** (0.006)	_cons	64.72 *** (0.000)	_cons	7.335 (0.148)	_cons	16.12 *** (0.004)

Notes: *p*-values in parentheses; * *p* < 0.10, ** *p* < 0.05, *** *p* < 0.01.

The results presented in the previous section confirm the negative effect of competitiveness on financial stability in the SSA and LAC countries, a result that contradicts the studies conducted by [Albaity et al. \(2019\)](#), and [Goetz \(2018\)](#), who showed that competitiveness reduces banks’ risk behavior and contributes to greater stability. Our results coincide with the exposures exhibited at [Allen and Gale \(2004\)](#), [Musau et al. \(2018\)](#), and [Owen and Pereira \(2018\)](#), who argue that competitiveness has negative effects on financial stability, by influencing banks to be keener to take risk, in order to obtain greater profit margin in the market.

The results presented in this section show that financial regulation moderates the effect of competitiveness on financial stability, i.e., the interaction between competitiveness and financial regulation has positive effects on financial stability, both in SSA countries and in LAC countries. This result can be based on the assumption that competition forces banks to share existing profits in the markets, and to obtain extra profits they have to increase the quality and quantity of financial services, as well as, less rigorously, in assessing the

creditworthiness of customers, facts which can increase financial inclusion, as well as increase credit risk and instability (Albaity et al. 2019; Feghali et al. 2021; Mengistu and Saiz 2018; Pham and Doan 2020; Pham et al. 2019; Zulkhibri 2016).

However, financial regulation puts pressure on credit risk control and preservation of bank deposits, despite causing involuntary financial exclusion of customers with few guarantees of compliance. Financial regulation obliges banks to rationalize scarce resources by limiting the supply of loans only to customers who go through a rigorous credit assessment process, as well as influencing the increase in lending rates, given the scarcity of financial resources in the market. Thus, it can reduce competition and credit availability (Anarfo et al. 2020; Musau et al. 2018).

4.5.2. The Effect of Financial Inclusion on the Credit Risk and Profitability of Banks

Table 12 presents the results of estimating the effect of financial inclusion on credit risk and bank profitability in SSA and LAC countries, which suggest that financial inclusion produces different effects on credit risk and profitability in the two groups of countries, namely, financial inclusion significantly reduces credit risk in SSA countries and has a contrary effect on credit risk in LAC countries. Thus, we can make no conclusion regarding the effect of financial inclusion on profitability in SSA countries, since this variable did not present statistical significance. For LAC countries, the financial inclusion coefficient reveals a negative effect on banks' profitability, which can be justified through the positive effect of financial inclusion on credit risk. Previous studies confirm that financial inclusion can have positive effects on credit risk if customers are well selected, or if they adapt loans according to customer needs (Vo et al. 2021). On the contrary, Kouki (2020), Kumar et al. (2021), and Musau et al. (2018) showed that banks that offer more services and financial products have higher profitability and are more stable.

Competitiveness reduces credit risk and increases profitability in SSA countries, and for LAC countries competitiveness increases credit risk and significantly reduces bank profitability. Financial regulation increases credit risk in SSA countries and reduces credit risk in LAC countries. Financial regulation moderates the effect of competitiveness on credit risk and profitability in SSA countries. Therefore, for LAC countries financial regulation moderates only the effect of competitiveness on profitability. Authors such as Ahamed and Mallick (2019), Albaity et al. (2019), Goetz (2018), and Igan and Mirzaei (2020) confirmed in their studies that competitiveness increases banking stability. Unlike these results, Feghali et al. (2021), Mengistu and Saiz (2018), and Pham and Doan (2020) showed that competitiveness increases banks' risky behavior. Associated with these results, Anarfo et al. (2020), Batuo et al. (2018), and Gupta and Kashiramka (2020) confirm that financial regulation reduces competitiveness in the banking sector, thus justifying the moderating role of financial regulation in the impact of competitiveness on credit risk and profitability of banks.

The size of the bank positively influences credit risk and reduces the profitability of banks in SSA and LAC countries. Larger banks are considered to be too big to fail and engage in very risky transactions, thus becoming too vulnerable to shocks (Mohamad and Jenkins 2020; Petersen and Rajan 2015).

The most inefficient banks assume greater credit risk and consequently their profits reduce, as is the case of banks in SSA countries, while for LAC countries bank inefficiency also drives greater assumption of credit risks and this has influenced the increase in the profits of these banks. These results are in line with those presented by Liu et al. (2020) and Yang and Zhang (2020).

Even so, there is nothing we can measure concerning the effect of macroeconomic variables on credit risk and bank profitability for these two groups of countries.

Table 12. Effect of financial inclusion on credit risk and profitability.

	SSA		LAC	
	Npl	Roe	Npl	Roe
ifi	−1.043 ** (0.026)	0.0391 (0.653)	0.631 *** (0.004)	−1.555 ** (0.022)
compet	−7.711 *** (0.000)	2.755 *** (0.000)	2.866 *** (0.000)	−6.236 *** (0.009)
regfin	0.247 *** (0.001)	0.00387 (0.771)	−0.415 *** (0.000)	−0.237 (0.401)
size	0.582 *** (0.000)	−0.0691 *** (0.003)	0.328 *** (0.001)	−0.678 ** (0.021)
efficienc	0.129 *** (0.000)	−0.0457 *** (0.000)	0.199 *** (0.003)	0.722 *** (0.001)
spread	0.169 (0.240)	0.245 *** (0.000)	0.0676 *** (0.001)	0.0414 (0.519)
compreg	0.706 *** (0.001)	−0.312 *** (0.000)	0.000345 (0.999)	1.285 * (0.057)
inflat	−0.0862 (0.157)	0.0253 ** (0.026)	−0.0307 (0.136)	0.294 *** (0.000)
GDP	0.00807 (0.901)	−0.000474 (0.969)	0.0482 (0.332)	−0.0542 (0.722)
_cons	−7.121 *** (0.007)	3.443 *** (0.000)	4.654 *** (0.000)	21.06 *** (0.000)

Notes: *p*-values in parentheses; * *p* < 0.10, ** *p* < 0.05, *** *p* < 0.01.

5. Conclusions and Policy Implications

Banks play a very relevant role in the effectiveness of financial inclusion programs, mainly because they are the main providers of financial services and products in any economy (Anarfo et al. 2020; Musau et al. 2018). For banks to efficiently perform their role as a financial intermediary, they must be financially stable (Musau et al. 2018). Thus, policymakers in developing countries have privileged in their agendas measures that contribute to increased financial stability and financial development (Beck 2008; Emará and Said 2021; Zulkhibri 2016). Certainly, financial inclusion is one of these measures. Any economy that aims to achieve financial development and inclusive economic growth must strike a balance between financial inclusion and stability, as a higher priority given to only one component can stifle the other (Musau et al. 2018). This study aimed to assess the effect of financial inclusion and competitiveness on banks’ financial stability, considering the moderating role of financial regulation. To do so, we compared the effects of these variables in Sub-Saharan African (SSA) and Latin American and Caribbean (LAC) countries. Our results suggest that inclusion enhances bank stability in SSA and LAC countries, financial regulation contributes to increasing financial stability in LAC countries, while we find no statistical significance in the effect of financial regulation on financial stability in SSA countries. Moreover, competitiveness negatively affects financial stability, and financial regulation moderates the negative effect of competitiveness on financial stability in SSA and LAC countries. We also found that financial inclusion reduces credit risk in SSA countries, and for LAC countries financial inclusion increases credit risk and reduces bank profitability.

The use of a broad measure of financial inclusion constructed through principal component analysis in the context of African countries does not produce any effect on financial stability in SSA countries, so financial inclusion related to bank credit expansion and savings produces positive effects on stability. For LAC countries, the financial inclusion index has positive impacts on financial stability, suggesting that all aspects related to financial inclusion, emphasizing geographic and demographic penetration, should be considered for the financial inclusion measure to convey positive effects on financial stability. As well, a reduction in bank deposits may weaken financial stability.

Regarding the practical and policy implications of this study, the results suggest that increases in the levels of financial inclusion in the SSA and LAC regions will be favorable for households, who will have equitable opportunities to obtain financing, and that increased

financial inclusion is a relevant factor in achieving financial stability for banks. These results allow policymakers designing financial inclusion implementation strategies to know and understand the effect of inclusion on financial stability and to apply it according to the specific needs of each region.

Notwithstanding, this study has some limitations, which may be transformed into valuable suggestions for future work. First, the study should include all the countries of these regions and others to present a comparative study and to allow a broader range of applications. For this, more data has to be available, which is not the case at the present moment. Second, the period of analysis should be expanded, which was also not possible considering data availability. Finally, other financial inclusion measures such as cell phone use to access bank services could be included in the created index as more data becomes available, which was not possible at the present due to missing data and unavailability, although the authors recognize this to be an important variable to be included in future.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Countries Included in the Study

Table A1. Sub-Saharan African and Latin American and Caribbean Countries.

SSA		LAC	
Angola	Liberia	Antigua and Barbuda	St. Kitts and Nevis
Benin	Madagascar	Argentina	St. Lucia
Botswana	Malawi	The Bahamas	St. Vincent and the Grenadines
Burkina Faso	Mali	Barbados	Suriname
Burundi	Mauritania	Belize	Trinidad and Tobago
Cabo Verde	Mauritius	Bolivia	Uruguay
Cameroon	Mozambique	Brazil	Venezuela, RB
The Central African Republic	Namibia	Chile	
Chad	Niger	Colombia	
Comoros	Nigeria	Costa Rica	
Congo, Dem. Rep.	Rwanda	Dominica	
Congo, Rep.	São Tomé and Príncipe	Dominican Republic	

Table A1. Cont.

SSA		LAC
Cote d'Ivoire	Senegal	El Salvador
Equatorial Guinea	Seychelles	Grenada
Eswatini	Sierra Leone	Guatemala
Ethiopia	South Africa	Guyana
Gabon	South Sudan	Haiti
Gambia	Sudan	Honduras
Ghana	Tanzania	Jamaica
Guinea	Togo	Mexico
Guinea-Bissau	Uganda	Nicaragua
Kenya	Zambia	Panama
Lesotho	Zimbabwe	Paraguay

Appendix B. Correlation Matrix of Variables in the Sample Study of the SSA Countries

Table A2. Correlation matrix for all variables included in the study sample of SSA countries.

	Ifi	Stabfin	Roe	Npl	Compet	Regfin	Size	Efficienc	Spread	Inflat	GDP
ifi	1.00										
stabfin	0.20 *** (0.00)	1.00									
roe	-0.02 (0.66)	-0.01 (0.78)	1.00								
npl	-0.13 *** (0.00)	-0.03 (0.50)	-0.09 ** (0.03)	1.00							
compet	-0.09 * (0.06)	-0.12 ** (0.01)	0.14 *** (0.00)	-0.17 *** (0.00)	1.00						
regfin	0.07 (0.18)	0.14 ** (0.01)	0.08 (0.16)	0.25 *** (0.00)	0.06 (0.29)	1.00					
size	-0.02 (0.70)	-0.06 (0.18)	0.06 (0.13)	0.09 ** (0.03)	0.24 *** (0.00)	0.26 *** (0.00)	1.00				
efficienc	-0.14 *** (0.00)	-0.07 * (0.08)	-0.45 *** (0.00)	0.18 *** (0.00)	0.08 (0.10)	-0.08 (0.13)	0.09 ** (0.04)	1.00			
spread	-0.04 (0.33)	-0.15 *** (0.00)	0.16 *** (0.00)	0.36 *** (0.00)	-0.06 (0.17)	-0.05 (0.36)	0.09 ** (0.03)	-0.06 (0.15)	1.00		
inflat	-0.02 (0.56)	0.18 *** (0.00)	-0.04 (0.35)	-0.03 (0.41)	0.00 (0.96)	-0.03 (0.60)	0.03 (0.46)	-0.04 (0.31)	-0.05 (0.26)	1.00	
GDP	-0.02 (0.63)	0.14 *** (0.00)	-0.04 (0.31)	-0.03 (0.46)	0.00 (0.94)	0.07 (0.17)	0.02 (0.57)	-0.04 (0.39)	-0.03 (0.47)	1.00 *** (0.00)	1.00

Notes: *p*-values in parentheses; * *p* < 0.10, ** *p* < 0.05, *** *p* < 0.01.

Appendix C. Correlation Matrix of the Main Variables under Study, the Sample of SSA Countries

Table A3. Correlation matrix for main variables, SSA sample only.

	Ifi	Stabfin	Roe	Npl	Compet	Regfin
ifi	1.00					
stabfin	0.20 *** (0.00)	1.00				
roe	-0.02 (0.66)	-0.01 (0.78)	1.00			
npl	-0.13 *** (0.00)	-0.03 (0.50)	-0.09 ** (0.03)	1.00		
compet	-0.09 * (0.06)	-0.12 ** (0.01)	0.14 *** (0.00)	-0.17 *** (0.00)	1.00	
regfin	0.07 (0.18)	0.14 ** (0.01)	0.08 (0.16)	0.25 *** (0.00)	0.06 (0.29)	1.00

Notes: *p*-values in parentheses; * *p* < 0.10, ** *p* < 0.05, *** *p* < 0.01.

Appendix D. Correlation Matrix of the Main Variables and in the Study, the Sample of LAC Countries

Table A4. Correlation matrix for main variables, LAC sample only.

	Ifi	Stabfin	Roe	Npl	Compet	Regfin
ifi	1.00					
stabfin	0.33 *** (0.00)	1.00				
roe	-0.30 *** (0.00)	-0.05 (0.34)	1.00			
npl	0.03 (0.64)	-0.14 *** (0.01)	0.03 (0.48)	1.00		
compet	0.06 (0.28)	-0.08 (0.14)	-0.27 *** (0.00)	0.05 (0.37)	1.00	
regfin	-0.06 (0.38)	0.14 ** (0.04)	-0.18 *** (0.01)	0.14 ** (0.04)	0.14 ** (0.05)	1.00

Note: *p*-values in parentheses; ** *p* < 0.05, *** *p* < 0.01.

Appendix E. Correlation Matrix of Variables in the Sample Study of LAC Countries

Table A5. Correlation matrix for all variables included in the study sample of LAC countries.

	Ifi	Stabfin	Roe	Npl	Compet	Regfin	Size	Efficienc	Spread	Inflat	GDP
ifi	1.00										
stabfin	0.33 *** (0.00)	1.00									
roe	-0.30 *** (0.00)	-0.05 (0.34)	1.00								
npl	0.03 (0.64)	-0.14 *** (0.01)	0.03 (0.48)	1.00							
compet	0.06 (0.28)	-0.08 (0.14)	-0.27 *** (0.00)	0.05 (0.37)	1.00						
regfin	-0.06 (0.38)	0.14 ** (0.04)	-0.18 *** (0.01)	0.14 ** (0.04)	0.14 ** (0.05)	1.00					
size	0.08 (0.28)	0.18 *** (0.01)	-0.18 *** (0.01)	0.06 (0.35)	-0.20 *** (0.00)	0.42 *** (0.00)	1.00				
efficienc	-0.10 * (0.06)	-0.04 (0.38)	0.21 *** (0.00)	0.15 *** (0.00)	-0.00 (0.93)	0.13 * (0.05)	-0.03 (0.65)	1.00			
spread	-0.20 *** (0.00)	-0.01 (0.85)	0.11 ** (0.02)	0.14 *** (0.01)	-0.07 (0.18)	0.17 ** (0.01)	-0.11 * (0.09)	0.31 *** (0.00)	1.00		
inflat	-0.23 *** (0.00)	-0.18 *** (0.00)	0.17 *** (0.00)	-0.04 (0.44)	-0.11 ** (0.03)	-0.11 * (0.09)	0.09 (0.16)	0.09 * (0.06)	-0.00 (0.94)	1.00	
GDP	-0.17 *** (0.00)	0.08 * (0.09)	0.10 ** (0.00)	-0.07 (0.18)	-0.03 (0.52)	-0.09 (0.17)	-0.07 (0.29)	0.21 *** (0.00)	0.13 *** (0.01)	0.04 (0.46)	1.00

Notes: *p*-values in parentheses; * *p* < 0.10, ** *p* < 0.05, *** *p* < 0.01.

Notes

- ¹ The Kaiser-Meyer-Olkin test (KMO) comcant scans with the partial correlations, in which the values of this statistic range from 0 to 1; values close to 0 (zero) indicate that the use of the index may not be adequate and values close to 1 (one), indicate a better adequacy in the use of the index (Carillo et al. 2019; Carvalho 2013).
- ² Additional information can be found at <https://www.stata.com/manuals13/xtxtunitroot.pdf>, (accessed on 1 December 2020).

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