www.cya.unam.mx/index.php/cya

Contaduría y Administración
Accounting & Management

Contaduría y Administración 66 (1), 2021,1-20

The interaction of economic growth, stability, and financial inclusion: International empirical evidence

Interacción entre crecimiento económico, estabilidad e inclusión financiera: evidencia empírica internacional

Tomás Gómez Rodríguez[1*], Humberto Ríos Bolívar[2], Adriana Zambrano Reyes[1]

[1]Universidad Autónoma del Estado de Hidalgo, México
[2]Instituto Politécnico Nacional, México

Received March 14, 2019; accepted December 3, 2019
Available online August 14, 2023

Abstract

Using a sample of 71 countries and a period that covers from 2007 to 2016. The relationship between financial inclusion and economic growth is analyzed, as well as the relationship between financial stability and economic growth using the Ordinary Least Squares (OLS) method with two-way fixed effects. Likewise, the Generalized Method of Moments (GMM) with two-way fixed effects is used as a robustness test. In addition, the Granger causality test is performed with the stacked data method developed by Dumitrescu y Hurlin (2012). The results suggest the existence of a negative link both for the relationship between financial inclusion and economic growth, as well as for the relationship between financial stability and economic growth. The results of the causality test show that the relationship extends from the variables of financial inclusion to economic growth. While the relationship for stability variables extends from economic growth to these variables.

JEL Code: C23, E44, O40
Keywords: : panel data; financial markets; economic growth

*Corresponding author.
E-mail address: yalmx@yahoo.com.mx (T. Gómez Rodríguez).
Peer Review under the responsibility of Universidad Nacional Autónoma de México.

http://dx.doi.org/10.22201/fca.24488410e.2021.2498

Resumen

Empleando una muestra de 71 países y un período que abarca desde 2007 al 2016. Se analiza la relación entre inclusión financiera y crecimiento económico, así como la relación entre estabilidad financiera y crecimiento económico empleando el método de Mínimos Cuadrados Ordinarios (MCO) con efectos fijos de dos vías. Así mismo, como prueba de robustez se emplea el Método Generalizado de Momentos (GMM) con efectos fijos de dos vías. Además, se realiza la prueba de causalidad de Granger con el método de datos apilados desarrollado por Dumitrescu y Hurlin (2012). Los resultados sugieren la existencia de un nexo negativo tanto para la relación entre inclusión financiera y crecimiento económico, así como para la relación entre estabilidad financiera y crecimiento económico. Los resultados de la prueba de causalidad exhiben que la relación se extiende desde las variables de inclusión financiera hacia el crecimiento económico. Mientras que la relación para las variables de estabilidad se extiende desde el crecimiento económico hacia estas variables.

Código JEL: D23, E44, O40
Palabras clave: panel de datos; mercados financieros; crecimiento económico

Introduction

The literature on the relationship between financial system development and economic growth is extensive. However, research on the effect of different dimensions of financial development on economic growth is in its early stages. Among these dimensions of the financial system are financial stability and inclusion. Financial inclusion implies that adults have access to and can make effective use of a range of appropriate financial services such as credit, insurance, and savings. These services must be provided in a fair, equitable and transparent manner at an affordable cost for all segments of the population. At its most basic level, financial inclusion means having a transaction or deposit account at a bank or other financial institution or through a mobile money service provider (Sethi & Acharya, 2018). In 2014, 2 billion or 38 percent of adults did not have access to such an account, according to Demirguc-Kunt, Klapper, Singer, and van Oudheusden (2015).

The potential benefits of financial inclusion are: promoting economic growth, helping to decrease poverty, and reduce income inequality, helping people invest in the future, smoothing their consumption, and managing financial risks (Demirguc-Kunt, Klapper, & Singer, 2017). Specifically, access to financial services fosters economic growth by encouraging the use of bank accounts as an alternative to cash payments, making transactions more efficient, transparent, and secure. It also helps people in poverty to overcome this situation by making it possible to invest in education and business. Financial inclusion can also prevent people from falling into poverty by facilitating ways to manage income shocks, such as unemployment or the loss of a household provider. This is especially relevant for people coming from lower-income households (Demirguc-Kunt, Klapper, & Singer, 2017). In societies

with low levels of inclusion, people face greater economic problems due to the lack of financial services. The lack of access to financial services in particular can negatively affect economic growth due to a deficient financial infrastructure, according to Gurley and Shaw (1955), Goldsmith (1969), Diamond and Dybvig (1983), Greenwood and Jovanovic (1990), and Angadi, (2003). Moreover, a lack of inclusion can lead to a lack of financial literacy and the emergence of an informal and unorganized financial sector (Sharma, 2016).

Financial inclusion has benefits such as generating growth, creating jobs, reducing poverty, reducing income inequality, and improving life quality. In contrast, rapid and deregulated access to services can have adverse effects on economic growth. This situation occurs when financial inclusion is achieved through a too-rapid increase in credit growth through unregulated intermediaries, which may affect financial stability and as a consequence may result in a negative correlation between financial inclusion and economic growth (Mehrotra & Yetman, 2015).

Moreover, financial crises may be one of the main consequences of low stability levels. These crises can have a damaging effect on economic growth and social welfare. Likewise, they can affect even the most advanced economies, but the damage they can cause in low-income countries can be even more severe. Since people living in these countries have no room for maneuver to hedge against the risk of poor economic performance and their way of life may be affected by financial instability. In contrast, financial stability can positively contribute to economic growth in such countries (Neaime & Gaysset, 2018). In order to avoid the occurrence of these financial crises, a stable and inclusive financial system that is beneficial to society is necessary. Financial stability can affect growth positively through three channels: lower uncertainty, lower volatility, and lower financing costs (Carbó & Pedagua, 2013). Three variables are considered to measure the effects of stability on economic growth, which focus on the measurement of uncertainty: the ratio of non-performing loans to gross loans in the banking sector, the ratio of bank credit to bank deposits, and the ratio of liquid assets to deposits and short-term funding in the banking sector.

On the other hand, in the literature on financial inclusion measurement, three different dimensions have been considered to assess financial inclusion: credit outreach, deposit outreach, and branch outreach. These indicators are used both in cross-sectional studies for several countries and at the individual level (Sethi & Acharya, 2018). Some examples of these works are those of Sarma (2008), Arora (2010), Sarma and Pais (2010), Chattopadhyay (2011), Ghosh (2011), Sarma (2012), Sethy (2015), Sharma (2016), Sethi and Sethy (2019), Sethi and Acharya (2018) and Kim, Yu, and Hassan (2018).

Inclusion and financial stability, together, are dimensions of the financial system of utmost importance for its proper functioning. Therefore, studying the relation between financial inclusion and economic growth and the financial stability-economic growth nexus is of utmost importance. This study

analyzes these relationships under two hypotheses: the first is that financial inclusion has a positive effect on economic growth, and the second is that financial stability has a positive effect on economic growth. A sample of 71 countries from 2006-2017 is used to test these conjectures. Two methods are used for estimation: Ordinary Least Squares (OLS) with two-way fixed effects and the Generalized Method of Moments (GMM) with two-way fixed effects. The Ordinary Least Squares method with two-way fixed effects was chosen to consider the unobservable country-specific effects in the sample, as well as the unobservable effects over time. Unlike other works such as Sethi and Sethy (2019), Sethi and Acharya (2018), and Kim, Yu, and Hassan (2018) that use Gross Domestic Product per capita as a measure of economic performance, the present research uses the annual growth rate as a percentage of Gross Domestic Product.

The rest of the study is organized as follows: section two contains the literature review and theoretical framework, section three includes the descriptive analysis of the data used, and sections four and five explain the methodology and results. Finally, section six discusses conclusions and possible future research.

Review of the literature

Recent empirical evidence of the financial development-growth nexus supports McKinnon's (1973) hypothesis, which suggests that a flow of funds channeled through an efficient financial system helps accelerate economic growth. Accordingly, banks are the institutions that are in the best position to help strengthen an economy's financial system. However, the scenario changes when a significant part of the population does not have access to the financial system since this part of the population—with no access to the formal or informal financial system—cannot access services such as deposits and credit (Sharma, 2016). Financial inclusion can contribute to economic growth in two ways. The first way is through providing affordable access to financial services for the most disadvantaged sectors of society, which reduces their vulnerability and also improves their living standards (Rajan, 2009). This is achieved with low-cost credit to low-income and vulnerable groups, thereby promoting the start-up of organized activities, which increases production. This addition in value promotes economic growth at the state and national levels (Sethi & Acharya, 2018), which means better living standards for these vulnerable groups by increasing their income levels.

Similarly, this situation decreases poverty in rural areas while promoting economic growth. Second, universal access to financial products such as deposits and insurance for the excluded has the following benefits: it increases funds in financial markets, allows people to save in the institutions of the formal financial system—and these financial markets ensure the efficient placement of these funds in

long-term investment projects—, and helps individuals hedge against liquidity risk, which is caused by the scarcity of funds in the market. When individuals can hedge against liquidity risk, this results in higher production and more jobs, leading to an improvement in income distribution and higher income for the lowest-income sector of the population (Claessens & Perotti, 2007).

On the other hand, it has been noted that there are three different channels through which financial stability can affect economic growth. The first channel suggests that uncertainty decreases when there is stability in the fundamental value of assets, which makes investors more prone to higher levels of investment when there is financial stability. The second channel is that when there is stability, asset price volatility is low, which causes companies to invest more in these periods. A third channel occurs when financial stability improves lending conditions, allowing people to have easier access to credit, with a positive effect on economic growth. Likewise, when there is financial stability, the cost of financing decreases, which means lower financial expenses for households and companies. This decrease in financial costs causes households and companies to spend more, which results in higher economic growth (Carbó & Pedauga, 2013).

In the literature, the term financial inclusion has received greater attention since the late 1990s and research in this period focused mainly on the type of people excluded from the financial system. In the early 2000s, studies mainly addressed the definition of financial inclusion and the characteristics of the financially excluded. Since 2005, research has focused on measuring financial inclusion and its relationship to economic development (Kim, Yu, & Hassan, 2018). Among the most recent works dealing with the measurement of financial inclusion are those of Sarma (2008), Arora (2010), Demirguc-kunt and Klapper (2012), Yorulmaz (2013), Park and Mercado (2018), and Sethi and Sethy (2019).

Sarma (2008) proposes a multidimensional index to analyze financial inclusion comprehensively. Following Sarma's (2008) methodology for measuring access to financial services, Arora's (2010) work calculates the financial inclusion index for developed and developing countries. At the same time, the work of Demirguc-kunt and Klapper (2012) provides the first analysis using the Global Financial Inclusion database. This database measures how people apply for credit, save, and manage risk. They analyzed the behavior of the use of financial services in 148 countries.

Yorulmaz (2013) develops a financial inclusion index that uses three dimensions to measure the coverage of financial services for the case of Turkey. This study uses Sarma's (2008) method to create financial inclusion indices and finds that high-income regions tend to show higher levels of financial inclusion and vice versa. Following on from this, Park and Mercado (2018) present a new financial inclusion index. They use the principal components method to calculate the weights of the nine indicators that comprise their index. These are classified into indicators of access, availability, and use. In addition, they analyze the impact of financial inclusion on poverty, income inequality, entrepreneurship, and

women's empowerment. Moreover, they find robust evidence that countries with high levels of financial inclusion have lower poverty rates, more entrepreneurship, and greater empowerment of women. Finally, the work of Sethi and Sethy (2019) also uses Sarma's (2008) methodology to create a financial inclusion index. The above is to perform a linear and nonlinear cointegration analysis between financial inclusion and economic growth for the case of India. They use the autoregressive distributed lag (ARDL) approach and perform the Granger causality test using the Toda-Yamamoto approach. The linear cointegration test confirms a long-run relationship between financial inclusion and economic growth. Nonetheless, no evidence of nonlinear cointegration is found. Likewise, the results of the causality test show that financial inclusion causes economic growth in the Granger sense.

On the other hand, for the relationship between financial inclusion and economic growth, some studies provide empirical evidence in favor of a positive correlation between financial inclusion and economic growth, such as Acharya, Amanulla, and Joy (2009), Prasad (2010), Ellis, Lemma, and Rudd (2010), Ghosh (2011), Diniz, Birochi, and Pozzebon (2012), Dupas and Robinson (2013), Sharma (2016), Pradhan, Arvin, Hall, and Nair (2016), Kim, Yu, and Hassan (2018), and Sethi and Acharya (2018). The work of Acharya, Amanulla, and Joy (2009) confirms a long-run cointegration relationship between credit growth and output growth across Indian states; the study analyzes states considered economically advanced and economically backward in India from 1981 to 2002. Similarly, Prasad (2010) points out that the lack of access to the formal financial system tends to diminish economic growth and people's well-being. In fact, the lack of adequate access to credit by companies and entrepreneurs in the service sector has an adverse effect on the level of employment since companies in this sector tend to be labor-intensive in their operations. Likewise, Ellis, Lemma, and Rudd (2010) find that access to the financial system encourages household investment, leading to higher economic growth.

In a state-level analysis, Ghosh (2011) observes that greater financial inclusion translates into higher Gross Domestic Product per capita in India. Moreover, Diniz, Birochi, and Pozzebon (2012) note that providing banking services by mail has brought about social and economic change at the local level in the Amazon region. The work of Dupas and Robinson (2013) demonstrates that providing individuals with savings instruments increases productive investment in the economy. In a more recent study, Sharma (2016) finds that indicators such as the number of accounts for loans and deposits and the demographic outreach of ATMs have unidirectional causality with economic growth. Pradhan, Arvin, Hall, and Nair's (2016) paper studies the relationship between insurance market penetration and financial inclusion. In addition, they study the interaction of causality between insurance market penetration, money, stock market capitalization, and economic growth, focusing on the Association of Southeast Asian Nations. The results reveal that the variables are cointegrated and mutually causal. They conclude that there is a short-run bidirectional causality between the insurance market and economic growth. Using a sample of 55

countries belonging to the Organization of Islamic Cooperation, Kim, Yu, and Hassan (2018) examine the relationship between financial inclusion and growth. They use two estimation methods for panel data, GMM and the Vector Autoregressive (VAR) method, and their results show that financial inclusion has a significant effect on economic growth, in addition to the fact that Granger causality analysis yields mutual causality between financial inclusion and economic growth. Sethi and Acharya (2018) use different panel data econometric techniques to analyze the dynamic impact of financial inclusion on economic growth, such as fixed effects models, panel cointegration, random effects models, and causality tests. The sample consists of 31 countries. They find a positive long-run relationship between financial inclusion and economic growth, and the causality test shows a bilateral relationship between financial inclusion and economic growth.

On the contrary, according to the work of Mehrotra and Yetman (2015), the positive nexus between financial inclusion and economic growth may not exist, as they claim that when financial inclusion is achieved through a rapid increase in credit growth or through unregulated financial intermediaries, this may affect financial stability and as a consequence may result in a negative nexus between financial inclusion and economic growth.

The financial stability of the financial system is crucial because it allows the flow of money between individuals. This situation allows individuals to consume and invest, promoting further economic growth (Alsamara, Mrabet, Jarallah, & Barkat, 2018). Therefore, financial stability is defined as the characteristic of the financial system that ensures an efficient allocation of financial resources in a permanent and unaltered manner, according to Mishkin (1992).

Batuo, Mlambo and Asongu (2018) study the relationship between financial instability, financial liberalization, financial development, and economic growth for 41 African countries. Their results suggest that the development of the financial system and financial liberalization have a positive effect on instability. They also find that economic growth reduces financial instability. Aboura and van Roye (2017) develop a financial stress index to measure the state of financial stability in real time. They use the Markov-switching Bayesian Vector Auto Regressions (MS-BVAR) method to show that high levels of financial stress are associated with lower economic activity. Similarly, Duprey, Klaus, and Peltonen (2017) also develop a financial stress index for 27 countries in the European Union. Their results show that episodes of financial stress are associated with a substantial negative economic impact. Creel, Hubert, and Labondance (2015) use the GMM method considering the period 1988-2011 to analyze the nexus between financial stability and economic performance in the European Union. Their results suggest that financial instability negatively affects economic growth.

Studying the interaction between competition in the banking sector, financial stability, and economic growth, the work of Jayakumar, Pradhan, Dash, Maradana, and Gaurav (2018) focuses on the

direction of Granger causality. The econometric method used is the Vector Error-Correction Model (VECM). The empirical results show that both banking competition and financial stability are significant indicators that drive economic growth in European Union member countries. For the case of Qatar from 1980-2013, Alsamara, Mrabet, Jarallah, and Barkat (2018) investigate the relationship between financial stability and economic growth. They estimate the short-run and long-run impact of economic growth on loan provisioning using the Vector Error-Correction Model with structural changes. They find that economic growth has a negative long-run relationship on the supply of loans and a positive short-run relationship on the supply of loans.

Data

This study explores the relationship between financial inclusion and economic growth for a sample of 71 countries from 2007-2016. The data for the variables measuring financial inclusion and stability are taken from the World Bank's Global Financial Development database, while the control variables are taken from the World Bank's World Development Indicators database.

Two variables are used to measure the degree of financial inclusion: the number of ATMs per 100,000 inhabitants and the number of bank branches per 100,000 adults. The number of ATMs per 100,000 inhabitants measures account ownership; account ownership is assumed to indicate how many individuals or firms have accounts in formal financial institutions. Although the best way to measure this key factor is to count the number of people or firms with accounts, these data are unavailable. Therefore, the number of ATMs is used as an approximation of account ownership because financial institutions generally issue a debit card when an account is opened, so the ATM penetration rate will indirectly represent the bank account penetration rate. The second measure is the number of bank branches per 100,000 adults as a proxy for the penetration rate of financial institutions. This variable is chosen because it is possible to infer the degree of dominance of financial institutions through the number of branches in a country (Kim, Yu, & Hassan 2018). The variable used to measure economic performance is the annual percentage increase in Gross Domestic Product.

On the other hand, the ratio of non-performing loans to gross loans in the banking sector is used to analyze the relationship between economic growth and financial stability. This variable measures the proportion of loans on which the scheduled payment has not been made at a specific time for the total loans granted. An increase in this variable means an increase in the probability of bankruptcy, indicating financial instability. Similarly, the ratio of bank credit to bank deposits is used to evaluate the liquidity of the banking sector. Furthermore, it consists of the ratio of the amount of deposits that have been mobilized to loans. If this ratio is too high, the banking sector may not have sufficient liquidity to cover any

unforeseen funding requirements. On the other hand, if the ratio is too low, banks are not making as much profit as they should. Higher levels for credit deposits and non performing variables mean higher uncertainty, while lower levels of these variables mean lower uncertainty.

Finally, the ratio of liquid assets to deposits and short-term funding indicates the extent to which equity and short-term loans support banks' available liquidity. It measures how vulnerable a bank is if these funding sources decrease. A high percentage of this variable suggests a low vulnerability to liquidity risk, i.e., a lower probability of bankruptcy. Conversely, a low percentage of this variable suggests a high level of liquidity risk, which implies a higher probability of bankruptcy and greater uncertainty.

Table 1
Summary of variables and sources

Variable	Definition	Source
growth	Annual growth rate as a percentage of Gross Domestic Product	Global Financial Development Database
atm	Number of ATMs per 100,000 inhabitants	Global Financial Development Database
branches	Number of bank branches per 100,000 adults	Global Financial Development Database
non performing	Non-performing loans to gross loans ratio	Global Financial Development Database
credit deposits	Bank credit to bank deposits ratio	Global Financial Development Database
liquid assets	Ratio of liquid assets to deposits and short-term funding in the banking sector	Global Financial Development Database
trade	The sum of exports and imports, measured as a proportion of Gross Domestic Product	World Development Indicators
inflation	Consumer price index for December	Global Financial Development Database
gross capital formation	Consists of disbursements for additions to the economy's fixed assets plus net changes in the level of inventories	World Development Indicators
regulatory quality	Reflects perceptions of the government's ability to formulate and implement sound policies and regulations that enable and promote private sector development	Worldwide Governance Indicators
rule of law	Reflects perceptions about the extent to which agents trust and respect the rules of society	Worldwide Governance Indicators

Source: created by the authors

Similarly, two types of control variables are considered: macroeconomic and regulatory environment. The macroeconomic control variables are as follows: trade measures international trade, its sign is expected to be positive; inflation is the consumer price index, its sign is expected to be negative; gross capital formation is the gross capital formation, its sign is expected to be positive. The control

variables of the regulatory environment are: regulatory quality is the regulatory quality, its sign is expected to be positive, and rule of law is the rule of law, its sign is expected to be positive. Both regulatory quality and rule of law have a range of values from -2.5 to 2.5, with higher values implying better performance.

Table 2
Descriptive statistics

Variable	Obs.	Unit of Measurement	Mean	Standard deviation	Minimum	Maximum
growth	710	%	5	12.48	-33	48
atm	710	Number	63.65	46.16	0.29	299.77
branches	710	Number	24.04	24.22	0.48	257.7
credit deposits	710	%	122.03	85.80	18.34	879.66
non performing	710	%	5.76	6.23	0.06	48.68
liquid assets	710	%	29.92	14.15	5.27	127.97
trade	710	%	100.12	64.16	22.11	441.60
inflation	710	%	107.83	25.40	63.01	432.91
gross capital formation	710	%	23.92	6.15	9.82	55.36
regulatory quality	710	Number	0.5	0.79	-1.43	2.26
rule of law	710	Number	0.32	0.94	-1.37	2.10

Source: created by the authors

Methodology

A panel data regression model is first established to examine the relationship between financial inclusion and economic growth, as well as the possible link between financial stability and economic growth. This uses the economic growth variable as the dependent variable and the financial inclusion and financial stability variables as independent variables. In addition, control variables are included. Therefore, the model is specified as follows:

$$growth_{i,t} = c + financial\ inclusion_{i,t} + financial\ stability_{i,t} + control\ variables_{i,t} + \epsilon_{i,t} \quad (1)$$

Where i represents the country and t represents time. The sample used considers 71 countries in a period ranging from 2006 to 2017. For these countries, there are specific characteristics that cannot be observed directly. There are also certain factors that occur over time, such as strikes and natural disasters, that cannot be observed directly. For these reasons, a two-way fixed effects model is considered, which considers the inclusion of two dummy variables, one for country-specific characteristics and the other for the effects of time. The model is expressed as follows:

$$y_{i,t} = \theta_i + \tau_t + \beta_1 x_{i,t} + \beta_2 C_{i,t} + \varepsilon_{it} \tag{2}$$

Where θ_i and τ_t are the country-specific characteristics and time effects respectively, $x_{i,t}$ includes the inclusion and financial stability variables, $C_{i,t}$ are the control variables. Therefore, the model to be estimated is as follows:

$$\begin{aligned} growth_{i,t} = {} & atm_{i,t} + branches_{i,t} + credit\ deposits_{i,t} + non\ performing_{i,t} + liquid\ assets_{i,t} \\ & + trade_{i,t} + inflation_{i,t} + gross\ capital\ formation_{i,t} + regulatory\ quality_{i,t} \\ & + rule\ of\ law_{i,t} + \theta_i + \tau_t + \varepsilon_{it} \end{aligned} \tag{3}$$

Where $\epsilon_{i,t}$ is the error term.

The specification test used to determine whether fixed or random effects should be considered is the Hausman Correlated Random Effects test. In addition, as a robustness test, Equation (3) is estimated using the Generalized Method of Moments (GMM) proposed by Arellano and Bond (1991). The GMM estimator is described in the following equation:

$$y_{i,t} = \beta y_{i,t-1} + \gamma x_{i,t} + \delta z_{i,t} + \vartheta w_{i,t} + \varepsilon_{it} \tag{4}$$

Where $x_{i,t}$ are the control variables, $z_{i,t}$ are the financial stability explanatory variables, $w_{i,t}$ are the financial inclusion explanatory variables, $y_{i,t}$ is the economic performance variable, and $\beta y_{i,t-1}$ represents its lagged value. Arellano and Bond (1991) recommend using lagged explanatory variables as instrumental variables. The consistency of this estimator depends on the validity of the instruments. To address this situation, the Hansen-Sargan specification test of over-identifying constraints is used. It examines the overall validity of the instruments by analyzing the analog sample of moment conditions used in the estimation process. This estimator is used with a modification that consists of not considering the term $\beta y_{i,t-1}$, making the model non-dynamic.

Similarly, the Granger causality test is estimated to examine the direction of causality between the variables in the equation. The Granger causality test for panel data can be estimated in two ways. The first method is to treat the panel as a stacked data set, where all coefficients are assumed to be common across all cross-sections. This method assumes that all coefficients are equal without considering cross-sectional differences, and the panel data are taken as an ordinary time series. The second method consists of estimating the Granger test under the assumption that the coefficients are not equal in all cross sections. This method was proposed by Dumitresu and Hurlin (2012), who developed an extended test to detect causality in panel data. This method calculates the standard Granger causality test for each panel and a zbar statistic from the average of the statistical tests. The Granger causality test developed by Dumitrescu and Hurlin (2012) is performed with this method because there are not enough data in the sample to perform the test with the first method. The underlying regression of this test is expressed as follows:

$$y_{i,t} = \alpha_i + \sum_{k=1}^{K} \beta_{ik} y_{i,t-k} + \sum_{k=1}^{K} \gamma_{ik} x_{i,t-k} + \varepsilon_{i,t} \quad (5)$$

Where $y_{i,t}$ and $x_{i,t}$ are the observations of two stationary variables for individual i in period t. The coefficients are allowed to vary between individuals but are assumed not to vary over time. The lag order K is assumed to be identical for all individuals, and the panel must be balanced. As in Granger (1969), the procedure for determining the existence of causality is to test for significant effects of past values of x on present values of y.

Results

The results of the estimation using the Ordinary Least Squares method with two-way fixed effects are shown in Table 3. For the variables measuring financial inclusion, the following results were obtained: the sign of the coefficient of the atm variable is negative and is statistically significant at 5%, meaning that a 1% increase in the number of ATMs per 100,000 adults translates into a decrease in growth of 0.06%. The branches variable has a negative sign and is statistically significant at 1%; an increase in this variable means a decrease in growth of 0.07%. On the other hand, the results for the variables that evaluate financial stability show that the credit deposits variable exhibits a negative sign and is statistically significant at 5%; a 1% increase in this variable means a 0.03% decrease in economic growth. Meanwhile, the non performing and liquid assets variables are not statistically significant. The control variables show the following results: inflation has the expected sign, and the variable is statistically significant at 1%.

On the other hand, the gross capital formation variable shows a positive sign, which is expected and is statistically significant at 1%. Meanwhile, the variables trade, regulatory quality, and rule of law are not statistically significant. The results for the Hausman Random Effects test reject the null hypothesis of no misspecification; therefore, fixed effects are used.

Table 3
Results of the estimation with the two-way fixed effects method and the Generalized Method of Moments with two-way fixed effects

Coefficients	OLS with two-way fixed effects (1)	GMM with two-way fixed effects. (2)
Dependent variable		
growth		
Independent variable		
c	0.171593***	-0.052585
atm	-0.000680*	-0.000466
branches	-0.000753***	-0.00057*
credit deposits	-0.000334*	-0.000711*
non performing	-0.001503	0.003270**
liquid assets	.0000643	0.000144
Control variable		
trade	-0.000146	0.002262***
inflation	-0.000673***	-0.000527*
gross capital formation	0.003910***	-0.000251
regulatory quality	-0.021904	-0.003296
rule of law	-0.014704	0.063938
Statistics		
Observations	710	
$R-$ squared	0.656326	568
Durbin $-$ Watson	2.043500	0.560150
Statistic J	----------	2.034556
Probability Statistic J	----------	0.300819
Probability Effects		0.583369
Random Correlated	.0000	

Source: created by the authors

The results of the estimation using the Generalized Method of Moments (GMM) with two-way fixed effects show that the atm variable is not statistically significant. The coefficient of the branches variable exhibits a negative sign and is statistically significant at 10%. As for the variables that analyze financial stability, the results are as follows: the coefficient of the credit deposits variable has a negative sign, which means that a 1% increase in the credit deposits variable is reflected in a 0.07% decrease in economic growth; the non performing variable has a positive sign and is statistically significant at 5%. The liquid assets variable is not statistically significant. The control variables gross capital formation, regulatory quality, and rule of law are not statistically significant. As for the trade and inflation

variables, both have the expected sign: positive for trade, and negative for inflation. In addition, both are statistically significant: trade is statistically significant at 1%, while inflation is statistically significant at 5%. The results of the Hansen-Sargan test validate the instrumental variables used.

The results of both estimates suggest evidence of a negative relationship between financial inclusion and economic growth. Likewise, there is evidence of a negative relationship between financial stability and economic growth when considering the credit deposits variable. Meanwhile, the non performing variable exhibits evidence of a positive relationship with the economic growth variable for the model estimated with the GMM method.

Table 4
Granger Causality Stacked Test Results

Granger pairwise causality test Delays: 2 Observations: 588 Null Hypothesis	Statistic F	Probability	Observations
atm does not cause Granger growth	13.5533	2.E-06***	Unidirectional
growth does not cause Granger atm	3.18474	0.0421	
branches does not cause Granger growth	11.0636	2.E-05***	Unidirectional
growth does not cause Granger branches	1.38772	0.2505	
credit deposits does not cause Granger growth	1.84047	0.1597	Unidirectional
growth does not cause Granger credit deposits	0.1597	0.0122**	
non performing does not cause Granger growth	1.61864	0.1991	Unidirectional
growth does not cause Granger non performing	8.43163	0.0002***	
liquid assets does not cause Granger growth	0.17643	0.8383	No causal
growth does not cause Granger liquid assets	0.73135	0.4817	relationship

Source: created by the authors

The Granger causality test was also performed using the stacked data method with two lags developed by Dumitrescu and Hurlin (2012). For the variables measuring financial inclusion, causality extends from the number of ATMs per 100,000 adults to the GDP growth rate in a unidirectional manner, while the causal relationship for the number of bank branches per 100,000 adults extends from the number of bank branches per 100,000 adults to the GDP growth rate in a unidirectional manner. As for the financial stability variables, for the credit deposits variable the direction of the causal relationship extends from growth to credit deposits in a unidirectional manner; likewise, the results of the stacked Granger causality test for the non performing variable show that the causal relationship is unidirectional and extends from growth to non performing. Finally, the growth and liquid assets variables have no causal relationship in the Granger sense according to the results obtained in the test.

Conclusions

Two estimations were made, the first using the two-way fixed effects method and the second using the GMM method with two-way fixed effects. The sample employed consisted of 71 countries over a period spanning from 2007 to 2016. The results show that the variables atm and branches exhibit negative signs in both estimations and are statistically significant.

These results indicate the existence of evidence supporting a negative relationship between access to the financial system and economic growth. This contradicts the initial hypothesis of this study regarding the existence of a positive relationship between financial inclusion and economic growth.

The results obtained in the present investigation do not agree with those obtained in the works of Sethi and Acharya (2018), Kim, Yu, and Hassan (2018), Sharma (2016), and Sethi and Sethy (2019). In contrast to these studies, which use GDP per capita as the dependent variable, this analysis uses the annual growth rate as a percentage of each country's Gross Domestic Product. On the other hand, the results of the Granger causality test show that causality extends from the atm and branches variables to growth, and these results are consistent with the work of Sharma (2016), Sethi and Acharya (2018), Kim, Yu, and Hassan (2018), and Sethi and Sethy (2019).

On the other hand, to analyze the relationship between financial sector stability and growth, the ratio of non-performing loans to gross loans and the ratio of bank credit to bank deposits are used as measures of instability. In addition, the ratio of liquid assets to deposits and short-term funding in the banking sector is used as a measure of stability.

The results show that the credit deposits variable is statistically significant in both models and shows a negative sign. This result indicates that greater uncertainty in the financial system is related to lower economic growth. Therefore, it coincides with the initial hypothesis that greater stability in the financial system would be related to greater economic growth.

The liquid assets variable is not statistically significant for any of the models. The non performing variable is statistically significant in model 2, and shows a positive sign. This means that greater uncertainty in the financial system is related to greater economic growth. This result provides evidence against the hypothesis of a positive relationship between financial stability and economic growth.

The results of the works of Aboura and van Roye (2017), Duprey, Klaus, and Peltonen (2017), and Creel, Hubert, and Labondance (2015) are in agreement with the results obtained in this research.

The existence of a positive relationship between the increase in the non performing variable and the increase in growth may originate at the moment when individuals stop paying their loans, and use the money destined to those payments for consumption, which stimulates economic growth. This result could suggest the creation of a temporary suspension of payments policy by the government. This policy

would allow individuals with non-performing loans during an economic recession to temporarily suspend repayment of the loans received, with the government paying the interest for the duration of the economic recession in order to stimulate growth. Alternatively, the creation of a recession insurance policy by the financial system to cover interest payments on a loan during a recession could be incentivized to encourage individuals to increase their spending during such times. This policy is also supported by the results of the Granger causality test since the causal relationship goes from economic growth to the non performing variable.

On the other hand, the creation of a program that conditions access to the financial system to attending and passing a basic finance course is suggested, with two objectives: the first is to condition access to the financial system and the second is that individuals who do have access to the system can take advantage of its benefits.

In addition, two suggestions for future research are proposed. The first is to analyze the impact of digital banking on financial inclusion. The second is to investigate whether the relationship with financial inclusion is sensitive to the income level of the countries.

References

Acharya, D. Amanulla, S. & Joy, S. (2009), Financial development and economic growth in Indian states: an examination, International Research Journal of Finance and Economics, Vol. 24 (2), 117-130. (Disponible en: https://www.researchgate.net/publication/258117867_Financial_development_and_economie_growth_in_Indian_states_an_examination) (Consultado: 7/01/2019)

Aboura, S. & van Roye, B. (2017). Financial stress and economic dynamics: The case of France. International Economics, 149, 57–73. http://dx.doi.org/10.1016/j.inteco.2016.11.001.

Alsamara, M., Mrabet, Z., Jarallah, S. & Barkat, K. (2018). The switching impact of financial stability and economic growth in Qatar: Evidence from an oil-rich country. The Quarterly Review of Economics and Finance. http:// dx.doi.org/10.1016/j.qref.2018.05.008.

Angadi, V.B. (2003), Financial infrastructure and economic development: theory, evidence and experience. RBI Occasional Papers, 24 (1), pp. 191-223. (Disponible en: https://rbi.org.in/scripts/PublicationsView.aspx?Id=5908) (Consultado: 6/01/2019)

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. The Review of Economic Studies, 58(2), 277. http://dx.doi. org/10.2307/2297968.

Arora, R. (2010), Measuring Financial Access, Discussion Papers in Economics. (Disponible en: https://www120. secure.griffith.edu.au/research/file/fd0408e2-75c5-c430-ea2d-2fe7274a467f/1/2010-07-measuring-financial-access.pdf) (Consultado: 24/01/2019)

Batuo, M., Mlambo, K., & Asongu, S. (2018). Linkages between financial development, financial instability, financial liberalisation and economic growth in Africa. Research in International Business and Finance, 45, 168–179. http://dx.doi.org/10.1016/j.ribaf.2017.07.148.

Carbó, S. & Pedagua, L. (2013). Financial Stability and Economic Growth. Crisis, Risk and Stability in Financial Markets, 8–23. http://dx.doi.org/10.1057/9781137001832_2.

Chattopadhyay, S. (2011) Financial Inclusion in India: A case-study of West Bengal. MPRA Paper 34269. (Disponible en: https://mpra.ub.unimuenchen.de/34269/1/MPRA_paper_34269.pdf) (Consultado: 23/01/2019)

Claessens, S. & Perotti, E. (2007). Finance and inequality: Channels and evidence. Journal of Comparative Economics, 35(4), 748–773. http://dx.doi.org/10.1016/j.jce.2007.07.002.

Creel, J., Hubert, P. & Labondance, F. (2015). Financial stability and economic performance. Economic Modelling, 48, 25–40. http://dx.doi.org/10.1016/j.econmod.2014.10.025.

Demirguc-Kunt, A. & Klapper, L. (2012). Measuring Financial Inclusion: The Global Findex Database. Policy Research Working Papers. http://dx.doi.org/10.1596/1813-9450-6025.

Demirguc-Kunt, A., Klapper, L. & Singer, D. (2017). Financial inclusion and inclusive growth : a review of recent empirical evidence. Policy Research working paper 8040. https://doi.org/10.1596/978-1-4648-1259-0

Demirguc-Kunt, A., Klapper, L. Singer D. & Van Oudheusden. P. (2015). The Global Findex Database 2014: Measuring Financial Inclusion Around the World. World Bank Group. Policy Research Working Paper 7255. https:// doi.org/10.1596/1813-9450-7255

Diamond, D. & Dybvig, P. (1983). Bank Runs, Deposit Insurance, and Liquidity. Journal of Political Economy, 91(3), 401–419. http://dx.doi.org/10.1086/261155.

Diniz, E., Birochi, R., & Pozzebon, M. (2012). Triggers and barriers to financial inclusion: The use of ICT-based branchless banking in an Amazon county. Electronic Commerce Research and Applications, 11(5), 484–494. http://dx.doi.org/10.1016/j.elerap.2011.07.006.

Dumitrescu, E.-I., & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. Economic Modelling, 29(4), 1450–1460. http://dx.doi.org/10.1016/j.econmod.2012.02.014

Dupas, P. & Robinson, J. (2013). Savings Constraints and Microenterprise Development: Evidence from a Field Experiment in Kenya. American Economic Journal: Applied Economics, 5(1), 163–192. http://dx.doi. org/10.1257/app.5.1.163.

Duprey, T., Klaus, B. & Peltonen, T. (2017). Dating systemic financial stress episodes in the EU countries. Journal of Financial Stability, 32, 30–56. http://dx.doi.org/10.1016/j.jfs.2017.07.004.

Ellis, K., Lemma, A. & Rudd, J. (2010). Financial inclusion, household investment and growth in Kenya and Tanzania. Project Briefing, 43, septiembre. (Disponible en: https://www.odi.org/sites/odi.org.uk/files/odi-assets/ publications-opinion-files/5776.pdf) (Consultado: 20/01/2019)

Ghosh, S. (2011). Does financial outreach engender economic growth? Evidence from Indian states. Journal of Indian Business Research, 3(2), 74–99. http://dx.doi.org/10.1108/17554191111132206.

Goldsmith, R.W. (1969), Financial Structure and Development. (1ª ed). New Haven: Yale University Press.

Granger, C. W. J. (1969). Investigating Causal Relations by Econometric Models and Cross-spectral Methods. Econometrica, 37(3), 424. http://dx.doi.org/10.2307/1912791.

Greenwood, J. & Jovanovic, B. (1990). Financial Development, Growth, and the Distribution of Income. Journal of Political Economy, 98(5). http://dx.doi.org/10.1086/261720.

Gurley, J. & Shaw, E. (1955). Financial Aspects of Economic Development. The American Economic Review, 45(4), 515-538. (Disponible en: http://www.jstor.org/stable/1811632) (Consultado: 18/01/2019)

Jayakumar, M., Pradhan, R. P., Dash, S., Maradana, R. P. & Gaurav, K. (2018). Banking competition, banking stability, and economic growth: Are feedback effects at work? Journal of Economics and Business, 96, 15–41. http://dx.doi.org/10.1016/j.jeconbus.2017.12.004.

Kim, D.-W., Yu, J.-S., & Hassan, M. K. (2018). Financial inclusion and economic growth in OIC countries. Research in International Business and Finance, 43, 1–14. http://dx.doi.org/10.1016/j.ribaf.2017.07.178.

Mckinnon, R. I. (1973). Money and Capital in Economic Development. (1ª ed). Washington,DC Brookings Institution Press.

Mehrotra, A. & Yetman, J. (2015). Financial inclusion-issues for central Banks. BISQuarterly Review, marzo. (Disponible en: https://www.bis.org/publ/qtrpdf/r_qt1503h.htm) (Consultado: 11/12/2018)

Mishkin, F. S. (1992). Anatomy of a financial crisis. Journal of Evolutionary Economics, 2(2), 115–130. http:// dx.doi.org/10.1007/bf01193536.

Neaime, S. & Gaysset, I. (2018). Financial inclusion and stability in MENA: Evidence from poverty and inequality. Finance Research Letters, 24, 230–237. http://dx.doi.org/10.1016/j.frl.2017.09.007.

Pradhan, R. P., Arvin, M. B., Hall, J. H. & Nair, M. (2016). Innovation, financial development and economic growth in Eurozone countries. Applied Economics Letters, 23(16), 1141–1144. http://dx.doi.org/10.1080/13504851.2 016.1139668.

Park, C.-Y. & Mercado, R. (2018). Financial Inclusion: New Measurement and Cross-Country Impact Assessment. SSRN Electronic Journal. http://dx.doi.org/10.2139/ssrn.3199427.

Prasad, E. (2010). Financial Sector Regulation and Reforms in Emerging Markets: An Overview. http://dx.doi. org/10.3386/w16428.

Rajan, R.G. (2009). (1ª ed). A Hundred Small Steps – Report of the Committee on Financial Sector Reforms, New Delhi Planning Commission, Government of India, New Delhi. (Disponible en: http://planningcommission.nic. in/reports/genrep/rep_fr/cfsr_all.pdf) (Consultado: 12/01/2019)

Sarma, M. (2008). Index of Financial Inclusion, New Delhi Working Papers No. 215. (Disponible en: http://www. icrier.org/pdf/Working_Paper_215.pdf) (Consultado: 10/01/2019)

Sarma, M. (2012). Index of Financial Inclusion - a measure of financial sector inclusiveness. Competence Centre on Money, Trade, Finance and Development 1207. (Disponible en:https://finance-and-trade.htw
berlin.de/fileadmin/HTW/Forschung/Money_Finance_Trade_Development/working_paper_series/wp_07_2012_Sarma_Index-of-Financial-Inclusion.pdf) (Consultado: 15/12/2018)

Sarma, M. & Pais, J. (2010). Financial Inclusion and Development. Journal of International Development, 23(5), 613–628. http://dx.doi.org/10.1002/jid.1698.

Sethi, D. & Acharya, D. (2018). Financial inclusion and economic growth linkage: some cross country evidence. Journal of Financial Economic Policy, 10(3), 369–385. http://dx.doi.org/10.1108/jfep-11-2016-0073.

Sethy, S. K. (2015). Developing a Financial Inclusion Index and Inclusive Growth in India. The Indian Economic Journal, 63(2), 283–311. http://dx.doi.org/10.1177/0019466220150210.

Sethi, D. & Sethy, S. K. (2019). Financial inclusion matters for economic growth in India. International Journal of Social Economics, 46(1), 132–151. http://dx.doi.org/10.1108/ijse-10-2017-0444.

Sharma, D. (2016). Nexus between financial inclusion and economic growth. Journal of Financial Economic Policy, 8(1), 13–36. http://dx.doi.org/10.1108/jfep-01-2015-0004.

Yorulmaz, R. (2013), "Construction of a regional financial inclusion index in Turkey", Journal of BRSA Banking and Financial Markets, 7 (1). 79-101. (Disponible en: http://www.bddk.org.tr/ContentBddk/BddkDergi/dergi_0013_06.pdf) (Consultado: 15/01/2019)

Annex

Table A5

Countries		
Argentina	Germany	Netherlands
Armenia	Greece	Norway
Australia	Guatemala	Panama
Austria	Honduras	Paraguay
Belarus	Hungary	Peru
Belgium	Indonesia	Philippines
Bolivia	Ireland	Poland
Bosnia and Herzegovina	Israel	Portugal
Brazil	Italy	Republic of Korea
Bulgaria	Japan	Russian Federation
Chile	Jordan	Rwanda
Colombia	Kazakhstan	Serbia
Costa Rica	Kyrgyz Republic	Singapore
Croatia	Latvia	Slovak Republic
Cyprus	Lithuania	Slovenia
Czech Republic	Luxembourg	Spain
Denmark	Macedonia	South Africa
Dominican Republic	Malaysia	Sweden
Ecuador	Malta	Tanzania
Egypt	Mexico	Turkey
El Salvador	Moldova	Ukraine
Estonia	Morocco	Uruguay
France	Mozambique	Vietnam
Georgia	Namibia	

Source: created by the authors