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Does financial inclusion enhance per capita income in the least developed countries? ☆

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ABSTRACT

Financial inclusion is a key factor for economic growth in most developing countries. This paper examines the relationship between financial inclusion and Gross Domestic Product (GDP) per capita in the Least Developed Countries (LDCs) using panel data for the period 1990–2021. The empirical evidence suggests that financial inclusion is indeed related to economic growth in the LDCs. We consider different dimensions of financial inclusion: usability (% of bank credit to bank deposits), accessibility (commercial bank branches), concentration (% of concentration of banks), and availability (depositors with commercial banks) to determine which has a greater effect on economic growth in the countries analyzed. Therefore, we assess which dimensions of financial inclusion are a better tool to improve the economic situation in the poorest countries in the world. While we conclude that all dimensions of financial inclusion have a positive effect on economic growth, in the expected direction, we find that not all dimensions affect economic growth similarly. The dimensions ‘accessibility’ and ‘concentration’ are robustly associated with economic growth, while ‘usability’ and ‘availability’ produce a significant but relatively lesser effect in the LDCs.

1. Introduction

In recent years, the topic of financial inclusion has become more relevant for researchers, policymakers, and other financial stakeholders, in the way that they have had to address problems relating to access, usage, quality and welfare in order to achieve financial inclusion, particularly for the most vulnerable, especially in countries with less resources. In this context, according to [Sawadogo and Semedo \(2021\)](#), an accessible and open financial system can improve economic and social prospects, especially in countries eager to develop. So, financial inclusion can be an effective tool to increase the poor’s access to financial services which can lead to prosperity of and economic situation of countries. Financial inclusion allows individuals and firms to take advantage of business opportunities, invest in education, save for retirement, and insure against risks ([Demirgüç-Kunt et al., 2008](#)). At the G20 Summit in

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2010 held in Seoul, South Korea, financial inclusion was recognized as one of the nine key pillars of the global development agenda (GPFI, 2011). Therefore, financial inclusion is a key pillar to country development since financial inclusion ensures that everyone benefits from banking services and help to eradicate poverty and reduce inequality. In this sense, financial inclusion should be understood as the coexistence of a variety of formal financial services, offered at a fair price, in the right place, in the form and time required, and without inequity to all agents of the economy, especially for at-risk groups such as unprotected segments and low-income families (see, for example, Agarwal, 2010; Hannig and Stefan, 2010; Sarma and Pais, 2011; Kumar, 2013; Ghosh and Dixit, 2014; Talledo, 2015; Aparicio et al., 2016; Schmied and Marr, 2016; among others). In addition, nowadays, financial inclusion is a key pillar to green finance since sustainable development is the path way to the future in the way that it offers a framework to increase the levels of per capita GDP. In this line, financial development and economic growth have received considerable attention across recent decades (Levine et al., 2000; Bruce et al., 2013), and there is consensus around the positive effect of financial variables on economic growth (Levine, 2005). Over time, the position of the financial sector in relation to economic growth has generated increasing research, with the literature generally focused on economic growth as associated with domestic savings, capital accumulation, technological innovation, income growth, and financial determination (Levine et al., 2000; Honohan, 2004; DFID, 2004; Levine, 2004; Andrianova and Demetriades, 2008). In this context, gaining an understanding of the links between financial inclusion and economic growth at country level has helped policymakers to design and implement programs that broaden access to financial services, thus leading to economic growth. Therefore, it seems crucial to deepen between the links between financial inclusion and economic growth for the most vulnerable countries because despite the overwhelming consensus on the role of financial inclusion on economic growth (Sarma and Pais, 2011; Karpowicz, 2016; Kim et al., 2018; Makina and Walle, 2019), the literature on the economic growth impact of financial inclusion is still scanty in the poorest countries in the world. So, with this work, we intend to go beyond the importance of prioritizing measures to strengthen financial development by analyzing various dimensions of financial inclusion in the poorest and weakest segment of the international community, particularly the Least Developed Countries.

In this context, governments in countries less developed of Africa and Asia have started promoting financial inclusion. Particularly, in those countries have adopted new mechanisms, strategies and policies aimed at achieving inclusive development and improve financial services to people and companies. In 2019 the African Development Bank launched the Africa Digital Financial Inclusion Facility, an innovative financing facility designed to accelerate digital financial inclusion across Africa and ensure access to the formal economy to millions of Africans. Similarly, the Government of India developed a system called “Aadhaar” made to increase access to formal financial services for consumers and reduces costs for providers (Banerjee, 2016). Despite the progress made, financial inclusion remains a key challenge in the poorest countries of Asia and Africa, in particular, in the LDCs, where the levels of development ongoing being nowadays the poorest in the world.

Thus, the relationship between financial inclusion and economic growth is today a significant concern in developing countries; according to Vo et al. (2021), financial inclusion policies are attracting sharp attention from scholars, policymakers, and regulators due to their theoretical positive effect on economic growth. Additionally, in this line, following the 2007-08 global financial crisis, many developing economies sought to increase financial inclusion in order to foster economic development and, then, economic growth. However, the empirical evidence appears to be limited, especially for emerging markets and LDCs and the need for inclusive financial systems in the poorest countries in the world motivate our study. This article has been prompted by an ongoing practical debate on the links between financial inclusion and GDP per capita in the LDCs, as well as by the lack of empirical studies. Here, we analyze the relationship between financial inclusion and GDP per capita in the LDCs during the period 1990–2021 through the use of panel data, and we complete the analysis with Instrumental Variables (IV) as well, in order to establish causality. Whereas the literature on developing countries tends to focus on country-specific studies, or on groups of countries from different income categories, this study examines the LDCs – a large group of countries with the lowest development levels in the world – to provide empirical evidence on the mechanisms behind the connections between financial inclusion and GDP per capita. We conclude that dimensions of financial inclusion have a positive effect on economic growth in the LDCs. In particular, ‘accessibility’ and ‘concentration’ are robustly associated with economic growth, while ‘usability’ and ‘availability’ produce a significant but relatively lesser effect in the LDCs. These new findings should stimulate policymakers and the banking sector in those countries with lesser resources to exert greater effort in increasing the level of financial inclusion by means of their dimensions in order to motivate sustainable economic growth.

The paper proceeds as follows. Section 2 reviews the literature and summarizes the main findings. Section 3 describes the data and methodology employed in analysis. Section 4 presents and discusses the results of analysis, and Section 5 concludes.

2. Literature review

The relationship between financial inclusion and economic growth has become a significant concern for developing countries, and most studies on this topic have shown that the former exerts a positive effect on the latter (Levine et al., 2000; Sarma and Pais, 2011; Demircug-Kunt and Klapper, 2012; Bruce et al., 2013; Jack and Suri, 2014; Babajide et al., 2015; Dabla-Norris et al., 2015; Karpowicz, 2016; Bertram et al., 2016; Demircug-Kunt et al., 2017; Kim et al., 2018; Makina and Walle, 2019; Erlando et al., 2020; Nizam et al., 2020; Vo et al., 2021).

Therefore, policymakers are increasingly concerned that the benefits produced by financial intermediation and markets are not being spread widely enough throughout the population and across economic sectors, with potential negative impacts on well-being and, therefore, on economic growth. In any case, there are several arguments which studies this relationship. The first one of the argument underline that several factor associated to financial inclusion such as private credit, commercial-central bank and liquid liabilities, influence to economic growth. In this line, Levine et al. (2000) investigate whether the exogenous components of financial intermediary development influence economic growth. Their analysis employs a generalized method of moments (GMM) dynamic

panel and cross-sectional instrumental variable estimator for 71 countries, and they find a strong link between the exogenous components of financial intermediary development and long-run economic growth in which each of the three financial intermediary development indicators is significantly correlated with economic growth. [Sarma and Pais \(2011\)](#) examine the relationship between financial inclusion and development by empirically identifying country-specific factors that are associated with the level of financial inclusion. They find that levels of human development and financial inclusion in a particular country move in close alignment with each other. Also, the health of the banking sector does not seem to have an unambiguous effect on financial inclusion whereas ownership pattern does seem to matter. [Demirguc-Kunt and Klapper \(2012\)](#) analyze savings, credit, payment methods, and risk management methods using the Global Financial Index in 148 countries. Their descriptive analysis reveals that 50 percent of adults worldwide have an account at a formal financial institution, though account penetration varies widely across regions, income groups and individual characteristics. In addition, 22 percent of adults report having saved at a formal financial institution in the past 12 months, and 9 percent report having taken out a new loan from a bank, credit union or microfinance institution in the past year. Although half of adults around the world remain unbanked, at least 35 percent of them report barriers to account use that might be addressed by public policy. Among the most commonly reported barriers are high cost, physical distance, and lack of proper documentation, though there are significant differences across regions and individual characteristics. [Bruce et al. \(2013\)](#) examine two primary treatments in a randomized experiment. The first treatment involves households holding ordinary accounts; the second involves a combination of households with ordinary and 'commitment' accounts. Commitment accounts allow customers to limit access to their funds until a preferred future date. The control group held no accounts but were monitored against the treatment groups, and the findings show a positive impact of financial inclusion on economic growth. Specifically, commitment accounts lead to increased deposits at the partner bank, increased use of agricultural inputs, and increased crop sales and household expenditures in the subsequent agricultural year. Furthermore, [Jack and Suri \(2014\)](#) investigate the impact of reduced transaction costs on risk sharing by estimating the effects of a mobile money innovation on consumption. They find that, while shocks reduce consumption by 7 percent for nonusers, the consumption of user households is unaffected. The mechanisms underlying these consumption effects are increases in remittances received and the diversity of senders. In addition, [Babajide et al. \(2015\)](#) investigate the effects of financial development on economic growth in Nigeria, highlighting the determinants of financial inclusion and its impact on economic growth. Through use of an ordinary least squared regression model, their results show that financial inclusion is a significant determinant of the total factor of production, as well as of capital per worker, which invariably determines the final level of production in the economy. Finally, [Kim et al. \(2018\)](#) examine the relationship between financial inclusion and economic growth in countries of the Organization of Islamic Cooperation (OIC). In order to draw multilateral results, they set up panel data for 55 OIC countries and estimate not only the dynamic panel estimation, but also the panel VAR, IRFs, and Granger causality tests. Based on the results of dynamic panel estimations, they conclude that financial inclusion has a positive effect on economic growth in OIC countries.

The second line of the argument focus on identifying the different dimensions of financial inclusion. For example, [Dabla-Norris et al. \(2015\)](#) develop a micro-founded general equilibrium model with heterogeneous agents to identify pertinent constraints to financial inclusion. They evaluate quantitatively the policy impacts on GDP and inequality of relaxing each of these constraints, both separately and in combination, focusing on three dimensions of financial inclusion: *access*, *depth*, and *intermediation efficiency*. They study six countries at varying degrees of economic development — three low-income countries (Uganda, Kenya, Mozambique) and three emerging-market countries (Malaysia, the Philippines, Egypt). Results suggest that the alleviation of different financial frictions has a differential impact across countries, with country-specific characteristics playing a central role in determining the linkages and tradeoffs between inclusion, GDP, inequality, and the distribution of gains and losses. In addition, [Vo et al. \(2021\)](#) provide comprehensive insight on financial inclusion and economic growth in emerging markets. First, a multidimensional index is constructed so that levels of financial inclusion can be measured at the international level. Second, based on this newly developed index, the panel econometric technique is utilized to estimate the impact of financial inclusion on economic growth. Their findings support a positive relationship between financial inclusion and economic growth. In this line, a stronger relationship is found for countries with low income and with a lower degree of financial inclusion. Thus, policy implications are that financial inclusion should be implemented for promoting economic growth and development in emerging markets such as Vietnam.

The third line analyses the inclusive growth. In this sense, [Demirguc-Kunt et al. \(2017\)](#) provide an overview of financial inclusion around the world and review recent empirical evidence on how the use of financial products (such as payments services, savings accounts, loans, and insurance) can contribute to inclusive growth and economic development.

Also, [Makina and Walle \(2019\)](#) study the relationship between financial inclusion and macroeconomic growth in spite of non-availability of long-term time-series data on indicators of financial inclusion. This study is unique in that it focuses solely on Africa, the continent with the lowest financial inclusion levels in the world. Despite the mentioned data constraints, the study finds that financial inclusion (as measured by the dimension of 'access') has a significantly positive effect on economic growth in Africa. This finding reinforces the need for greater pursuit of the financial inclusion agenda, which is among the most effective tools for realizing inclusive growth. Furthermore, [Nizam et al. \(2020\)](#) investigate the effect of financial inclusiveness on economic growth in 63 selected developed and developing countries for the years 2014 and 2017. The main findings show that there is a threshold effect of the financial inclusiveness-growth nexus, so that financial inclusiveness exhibits a non-monotonic positive relation with economic growth. The positive effect is more pronounced at the high level than at the low level of the financial inclusion index. Thus, the authors suggest that these findings should motivate policymakers and the banking sector in each country to exert greater efforts in raising the level of financial inclusion in order to stimulate sustainable economic growth.

Finally, the fourth line of argument analyses the contribution of financial inclusion on poverty and inequality reduction. In this line, [Karpowicz \(2016\)](#) analyses financial inclusion in Colombia as one of the key pillars of development strategy. Using simulations from a general equilibrium model, it is possible to identify the most binding financial-sector frictions that prevent the financial inclusion of

certain enterprises; this author studies the effects on growth and inequality of efforts made to remove these frictions. The study finds that lowering constraints on collateral promises higher growth, while inequality is better tackled through measures that lower the cost of financial participation. Also, [Bertram et al. \(2016\)](#) identify full financial inclusion as a prerequisite for inclusive economic development in Nigeria. Results reveal that financial inclusion is a bold step toward inclusive economic development, and the authors conclude that all initiatives that make formal financial services available, accessible, and affordable to all segments of the population should be encouraged to achieve inclusive economic development. Furthermore, [Erlando et al. \(2020\)](#) empirically analyze the contribution of financial inclusion to economic growth, poverty alleviation, and income inequality in Eastern Indonesia. The effect and relationship of financial inclusion on economic growth, poverty, inequality, and other factors are analyzed using PVAR and the Toda-Yamamoto VAR bivariate causality model. The results of the bivariate causality model indicate a high relationship level between financial inclusion, economic growth, poverty, and income distribution in Eastern Indonesia, thus showing that socio-economic growth has a positive impact on the level of financial inclusion and a negative impact on poverty.

As stated above, most existing studies focus on analyzing the relationship between financial inclusion and economic growth in a group of developing countries. To the best of our knowledge, the present paper is the first attempt to analyze the effects of different dimensions of financial inclusion on economic growth in a large and relatively homogeneous set of low-development countries — specifically 40 countries, all classified as LDCs, over a 31-year period (1990–2021).

3. Data and methodology

This section describes the database and discusses the methodological approach proposed to analyze the connection between financial inclusion and economic growth in the LDCs, which in 2023 comprised 46 countries.¹ These countries constitute the poorest and weakest segment of the international community, and although there are significant differences among them, they present the lowest human development index ratings of all countries in the world. Overall, their living conditions are very poor and highly vulnerable to economic shocks. The United Nations essentially uses three criteria to identify LDCs: i) low income, based on a three-year average estimate of the gross national income per capita; ii) weakness in human resources, as detected by a composite Human Assets Index based on indicators of nutrition, health, education, and adult literacy; and iii) a criterion of economic vulnerability, involving the percentage of population displaced by natural disasters and a composite Economic Vulnerability Index based on indicators such as the instability of agricultural production, the instability of exports of goods and services, the economic importance of non-traditional activities, merchandise export concentration, and the handicap of economic smallness.

3.1. Data

In this work, we take variables from the World Development Indicators ([World Bank, 2023a,b](#)) and from Global Financial Development ([World Bank, 2023a,b](#)). In order to perform our analysis, we work with an unbalanced panel for the 40 selected LDCs for the period 1990–2021, using the statistical information available. As noted by [Beck et al., 2007a](#), many countries do not have data for every year and therefore lack sufficient observations. We report in the Appendix the summary statistics, correlation matrix and variables sources for the variables used in the analysis.

As dependent variable we use the GDP per capita, which corresponds to real GDP per capita in constant 2017 international US dollars, adjusted for differences across countries at purchasing power parity (PPP). In general, the rate of growth of the GDP or GDP per capita is used as an indicator of economic growth (see, for example, [Levine et al., 2000](#); [Levine, 2003](#); [Afonso and Blanco-Arana, 2022](#); among others), despite ongoing broad debate over whether this is the best indicator of well-being in a country or whether other non-material aspects should be considered, as indicated by [Stiglitz et al. \(2009\)](#). So, the fact is that while GDP pc measures the level of economic development, GDP pc growth measures the economic situation or evolution of the economy. In this paper, we use the GDP pc because of we want to check whether financial inclusion increase the economic development of LDCs.

It is widely accepted in the literature that there are various dimensions to financial inclusion. According to [Nwankwo and Nwankwo \(2014\)](#), the traditional idea of inclusive finance is the provision of access and use of financial services that are diverse, easy to obtain, and affordable. [Goel and Sharma \(2017\)](#) also stated that access and use of financial services are among the key drivers of economic growth. Consequently, greater financial access will exert further impact on growth of the GDP. In this sense, inclusive finance indicates sustainable, relevant, cost-effective, and meaningful financial services for people with lower access. Thus, financial inclusiveness refers to the entire initiative that makes formal financial services more available, accessible, and affordable to all segments of the population ([Triki and Faye, 2012](#)). [Boitano and Abanto \(2020\)](#) studied the main determinants of financial inclusion in Peru from 2010 to 2017, aiming to analyze the challenges faced by financial-inclusion policies. A two-stage GMM method was used to estimate a panel data model where the endogenous variable was Sarma's financial inclusion index ([Sarma, 2008](#)). The results indicated that bank concentration was the main variable affecting financial inclusion.

Therefore, regarding financial inclusion, our model takes into consideration the following four dimensions.

- Dimension (1) *Usability*, measured through bank credit to bank deposits (%).

¹ See [Table A4](#) from Appendix to know the list of LDCs.

- Dimension (2) *Accessibility* measured as commercial bank branches per 100,000 adults. Commercial bank branches are retail locations of resident commercial banks (and other resident banks that function as commercial banks) that provide financial services to customers and that are physically separated from the main office but not organized as legally separated subsidiaries.
- Dimension (3) *Concentration*, measured through the concentration of banks (%), since a more competitive financial system could help reduce financial exclusion if banks seek to reach unattended population segments to increase their market share and position.
- Dimension (4) *Availability*, measured through depositors with commercial banks (per 1000 adults). Depositors with commercial banks are the reported number of deposit account holders at commercial banks (and at other resident banks functioning as commercial banks); and these account holders are either resident non-financial corporations (public and private) or households. For many countries, data cover the total number of deposit accounts due to a lack of specific information on account holders. The major types of deposits are checking accounts, savings accounts, and time deposits.

From the correlation table in the Appendix, it is possible to conclude that the four indicators significantly correlate with higher levels of economic growth in the expected direction.

Apart from financial inclusion, there are other macroeconomic variables of economic growth. The theoretical/empirical literature has shown a growing consensus around the significant impact that development of the financial system has on economic growth. In the most extensive stream of literature, the main result is that financial development positively influences economic growth (see, for example, King and Levine, 1993; Levine, 1997; Rajan and Zingales, 1998; Beck et al., 2000; Levine et al., 2000; Levine, 2003; Beck and Levine, 2004; Beck et al., 2007a, Shahbaz et al., 2015; Afonso and Blanco-Arana, 2022; Ho and Saadaoui, 2022). It is argued that a more developed financial system affects investment decisions and savings, improving the allocation of resources in the economy and therefore driving economic growth. Thus, we introduce financial system deposits to GDP (%) as a measure of financial development.

Moreover, inflation has been identified as one of the most important determinants of growth (Ghosh and Phillips, 1998). Beck et al. (2000) use inflation as determinant of the economic growth of countries. Babatunde and Shuaibu (2017) find a significant long-term relationship between inflation and economic growth between 1975 and 2008 in Nigeria. Thus, inflation is included as a control variable in this study, measured by the annual growth rate of the GDP-implicit deflator showing the rate of price change in the economy as a whole.

In its most basic form, Okun's law investigates the statistical relationship between a country's unemployment rate and the growth rate of its economy (Okun, 1962) by describing the observed relationship between changes in the unemployment rate and the growth rate of real GDP. Okun's law thus states that adjustment within the labour market over major economic cycles comes mainly through employment; hence, there is a strong association between changes in real GDP and changes in the employment rate. For this reason, we use the unemployment rate as determinant of economic growth, referring to the share of the labour force without work but available for (and seeking) employment.

Additionally, Sarma and Pais (2011) highlight that there are socio-economic factors strongly related to financial inclusion, such as income, inequality, literacy, urbanization factors. Thus, now we take into account the variable the rural population variable as percentage of total population. Regarding inequality and literacy variables, it is not possible include these factors because of we work with the LDCs and this information is limited for these countries. Fig. 1 provides an illustration of the determinants of economic growth.

3.2. Methodology

With the objective of analyzing the effects of the main dimensions of financial inclusion on economic growth in the LDCs during the period 1990–2021. Thus, we first estimate a model with panel data. Some of the advantages and disadvantages of the use of panel data are listed in the study carried out by Baltagi (2001). Among the advantages are mentioned the following: control over individual heterogeneity, greater variability, less collinearity between variables, more degrees of freedom, greater efficiency, better adaptation to the study of adjustment dynamics, better adequacy for identifying and measuring effects that are not detectable in pure cross-sectional or time-series data, and better analysis capacity in more complicated behaviors. As disadvantages, panel data presents the problem of data collection, distortions due to measurement errors, and the short time dimension that is generally found in the data sets. According to Hausman and Taylor (1981), one of the most noteworthy characteristics of the use of panel data is the ability to control specific individual effects that may be correlated with other variables. Firstly, we could consider the basic approach to regression analysis with panel data such as pooled regression. The advantage of estimation through Ordinary Least Squares (OLS) lies in the simplification that results from being able to determine the value of a certain endogenous variable through a linear relationship with all the exogenous variables that participate in the system. In contrast, the main drawback of this method lies precisely in the simplification of the model, where the correlation of individual errors with observations is not corrected and, therefore, the resulting estimates will be biased. In this direction, the null hypothesis of 'no country effects' is rejected,² implying that a pooled regression model is inappropriate, as estimates made with pooled OLS would be biased (Breusch and Pagan, 1980).

Therefore, the use of panel data seems fundamental since it allows for considering the existence of individual effects not controlled by the explanatory variables observed in the model and, in addition, it allows controlling for variables that change over time. Furthermore, the use of panel data offers more informative data and as stated, more variability, less collinearity, and a greater degree of freedom (Klevmarken, 1989; Hsiao, 2003). Thus, and because the considered series is sufficiently long, we opt for an estimation

² For a wider discussion of this test, see T.S. Breusch and Pagan (1980).

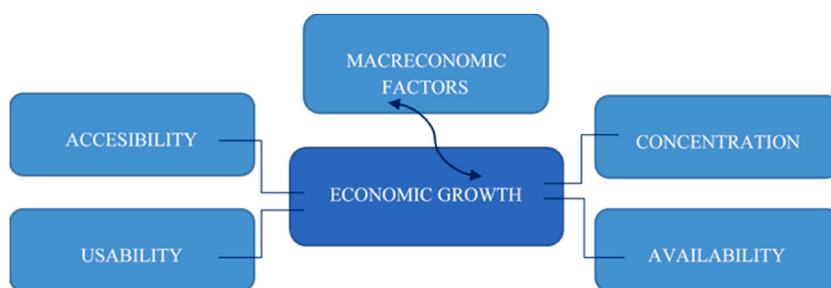


Fig. 1. Determinants of economic growth.

based on panel data. Thus, given the specification of the baseline model, we estimate a fixed effects model.³ The random effect model is rejected by the standard Hausman (1978) test in favor of the fixed effects model, which supports the choice of assuming a fixed effects regression method. The fixed effects estimator allows that differences between states are constant correlation. Thus, we estimate the panel data model conventionally with country fixed effects.

Thus, to examine the impact of financial inclusion on economic growth on the LDCs, the model is proposed as follows:

$$\text{LnGDP}_{it} = \beta_0 + \beta_1 \text{LnGDP}_{it-1} + \beta_2 \text{FIV}_{it} + \beta_3 \text{FD}_{it} + \beta_4 x_{it} + \zeta_i + \omega_{it} \quad [1]$$

where LnGDP_{it} refers to economic growth measured as the natural logarithm of GDP per capita, FIV_{it} denotes the respective dimension of financial inclusion, FD_{it} refers to the measure of financial development, x_{it} is the above-mentioned control variable, ζ_i is the intercept for each country, and ω_{it} are the individual level residuals. In all models, we include the 1-year lag of the dependent variable.

The relationship between economic growth and financial inclusion might be driven by causation in least developed countries. For instance, improvements in financial inclusion may stimulate demand for financial services for the whole population. Likewise, improvements in services accessibility may lead to promote inclusive development based on market equity. To control for potential biases, we use a dynamic panel estimator. In the fixed effect models, however, there could be a potential identification problem if economic growth and financial inclusion are jointly determined. In this sense, an IV approach is a methodology used to deal with possible endogeneity problems, since this method allows the use of exogenous variables, totally uncorrelated with the error term and partially correlated with the explanatory variables. Therefore, it solves the endogeneity problem and leads to a consistent estimator when there are omitted variables. The advantage is that, if those instrumental variables are not weak, they may very well satisfy the two properties mentioned above.

Thus, to avoid endogeneity, an instrumental variable (IV) approach is proposed such that exogenous variation in financial inclusion variables is introduced with no direct effect on growth. Consequently, the analysis uses a fixed effects model and introduces instrumental variables to overcome potential endogeneity of financial inclusion variables and the economic growth. Hence, the model include one-period lag independent variables for the instrumental variables.

In summary, we introduce a dynamic variant of the base model. We estimate using an IV approach which has the advantage of being able to adjust for all confounders including unobserved ones like propensity scores and unlike most other adjustment methods such as stratification, matching and multiple regression methods. This method estimates a system of equations in both first differences and levels, in which the instruments in the level equations are the lagged first differences of the variables. This dynamic approach allows the inclusion of lagged values of FIV as an explanatory variable, which controls for omitted variables that change over time, in contrast with fixed effects estimations, which control for country characteristics. Furthermore, IV are used to control for confounding and measurement error in observational studies. They allow for the possibility of making causal inferences with observational data. IV can adjust for both observed and unobserved confounding effects.

4. Results

4.1. Baseline

As derived through the methodology presented in the previous section, the results of the regression analysis of the fixed effects model for Least Developed Countries are reported in Table 1, as the baseline, and in Table 2, using instrumental variables to deal with possible endogeneity.

Therefore, to analyze the impact of various dimensions of financial inclusion on economic growth, we estimate a model with 5 specifications, in which the natural logarithm of GDP per capita is the dependent variable. Then, as explanatory variables of the dimensions of financial inclusion, we introduce the four dimensions in a sequential way (usability, accessibility, concentration and availability) for models (1) to (4), respectively. Ultimately, model (5) includes all the variables at the same time. In addition, adopting

³ We applied the Hausman test (Hausman, 1978) and the results suggest applying fixed effects estimation (see Table 1 for the results obtained from this test).

Table 1
Income estimation (FE models).

Variables	(1)	(2)	(3)	(4)	(5)
Lngdp_{t-1}	0.997*** [0.005]	0.925*** [0.016]	0.912*** [0.019]	0.950*** [0.013]	0.878*** [0.018]
Unemployment	-0.008 [0.006]	-0.062*** [0.016]	-0.017 [0.019]	-0.056*** [0.014]	-0.010 [0.015]
Inflation	0.000 [0.000]	0.000 [0.002]	-0.003 [0.002]	-0.000*** [0.000]	-0.004* [0.002]
FinancialDev	0.002* [0.001]	0.002* [0.001]	0.002 [0.003]	0.002* [0.001]	0.001 [0.002]
RuralPopulation	0.001 [0.002]	0.004 [0.009]	-0.004 [0.010]	-0.012* [0.007]	0.010 [0.008]
FIV Usability	0.001* [0.001]				0.004** [0.002]
Accessibility		0.030*** [0.011]			0.065*** [0.021]
Concentration			0.001** [0.000]		0.000 [0.000]
Availability				-0.006*** [0.002]	-0.003* [0.002]
Constant	0.427 [0.459]	6.026*** [1.543]	7.103*** [1.727]	4.063*** [1.273]	8.538*** [1.505]
Observations	1071	589	433	546	315
Number of countries	40	40	31	34	25
Hausman test	0.001	0.000	0.000	0.000	0.000

Note 1: Dependent variable is the natural logarithm of GDP per capita.

Note 2: standard errors are shown in brackets.

Level of significance: ***p < 0.01, **p < 0.05, *p < 0.1.

Table 2
Income estimation (IV estimation).

Variables	(1)	(2)	(3)	(4)	(5)
Lngdp_{t-1}	0.969*** [0.009]	0.925*** [0.018]	0.874*** [0.024]	0.944*** [0.015]	0.879*** [0.026]
Unemployment	-0.057*** [0.015]	-0.066*** [0.016]	-0.018 [0.020]	-0.061*** [0.014]	-0.020 [0.015]
Inflation	0.000 [0.000]	-0.002 [0.002]	-0.004* [0.002]	-0.002* [0.001]	-0.003 [0.002]
FinancialDev	0.000 [0.002]	-0.002 [0.001]	0.010** [0.005]	0.002* [0.001]	0.003 [0.005]
RuralPopulation	-0.019*** [0.005]	0.012 [0.009]	0.000 [0.012]	-0.016** [0.007]	0.010 [0.009]
FIV Usability	0.002* [0.001]				0.003 [0.003]
Accessibility		0.034** [0.013]			0.072** [0.030]
Concentration			0.001** [0.000]		0.000 [0.000]
Availability				-0.006** [0.003]	-0.000* [0.003]
Constant	-0.009 [0.034]	-0.059* [0.035]	-0.069 [0.058]	-0.064* [0.041]	0.016 [0.064]
Observations	1063	553	402	502	282
Number of countries	40	40	31	33	24

Note 1: Dependent variable is the natural logarithm of GDP per capita.

Note 2: standard errors are shown in brackets.

Level of significance: ***p < 0.01, **p < 0.05, *p < 0.1.

specifications similar to those used in previous studies, we add three control variables to our regressions in order to estimate according to the literature on economic growth: unemployment rate, inflation, and a financial development variable.

The empirical evidence suggests that financial inclusion is strongly related to economic growth. However, not all dimensions of financial inclusion affect economic growth similarly. Analyzing all models, accessibility is robustly associated with economic growth. In fact, in line with [Goel and Sharma \(2017\)](#), access to financial services is one of the key drivers of economic growth. In this line, accessibility in financial services is the crucial to serving everyone. Access to finance has embraced by policymakers as important tool

for promoting inclusive development and achieving long-run financial security. To a lesser degree, concentration and usability are linked to the level of economic development in the LDCs. As indicated by Boitano and Abanto (2020), bank concentration is the key variable affecting financial inclusion. In the cases of usability and concentration, although both produce significant effects on GDP per capita in LDCs, it must be noted in line with Goel and Sharma (2017) and Triki and Faye (2012) that the effects on economic growth are relatively minor, compared to the other two dimensions. Nevertheless, the availability indicator has a negative impact on the evolution of GDP per capita in the LDCs, maybe due to analyze the poorest countries in the world.

Turning briefly to control variables, there is a negative and statistically significant relationship between the unemployment rate and the GDP per capita in models (2) and (4), suggesting that those LDCs with higher unemployment rates tend to experience reduced economic growth. In models (1), (3) and (5) unemployment rate does not appear significant in favor of other dimensions of financial inclusion. Regarding the inflation rate, results show a negative and statistically significant influence on the evolution of GDP per capita in models (4) and (5). In the latter, which considers all dimensions of financial inclusion, the influence is such that an increase in the inflation rate tends to reduce economic growth in the LDCs. Financial development variable also appears have a positive influence on the evolution of the GDP per capita in the LDCs (see models (1), (2) and (4)). Nevertheless, the rural population variable has a negative and significant effect on GDP per capita in the model (4).

As the baseline, Table 2 presents results for IV method obtaining similar conclusions, the two dimensions of financial inclusion that most influence economic growth are: accessibility and availability. The first one, accessibility, is an important tool for promoting inclusive development and achieving long-run financial security and with regard to availability they may also be concerned with the potential negative consequences for macro stability when financial system assets are concentrated in relatively few individuals, firms, or sectors.

4.2. Robustness analysis

As a robustness analysis, we split the sample into 2 subsamples (above and below the average real GDP per capita of the whole sample), in order to analyze the influence of FIV in the models. We observe that, analyzing FI dimensions independently, regarding Table 3 (the subsample with real GDP per capita below the average real GDP per capita), the availability is the only one that affects negatively and significantly in the way that the poorest among the poor have lesser opportunities to deposit their accounts in commercial banks.

Furthermore, analyzing the whole model, with all dimensions of FI, we observe that such variables affect significantly in the expected direction. Turning to the subsample with real GDP per capita above the average real per capita GDP (see Table 4), we can check that usability and accessibility are the two dimensions statically significant and those that influence the increase of GDP per capita. This means that governments of the LDCs should foster facilities to access to the bank credit and to increase the commercial banks branches.

Table 3

Income estimation

(GDP below average real per capita GDP of the full sample).

Variables	(1)	(2)	(3)	(4)	(5)
$\ln gdp_{t-1}$	0.991*** [0.010]	1.011*** [0.027]	1.012*** [0.035]	0.972*** [0.026]	0.835*** [0.038]
Unemployment	-0.014** [0.006]	-0.039** [0.017]	0.001 [0.019]	-0.043*** [0.015]	0.009 [0.015]
Inflation	0.000** [0.000]	-0.005* [0.003]	-0.012*** [0.004]	0.000 [0.001]	-0.013*** [0.004]
FinancialDev	-0.000 [0.001]	-0.004*** [0.001]	-0.002 [0.002]	-0.003*** [0.001]	-0.000 [0.002]
RuralPopulation	-0.001 [0.003]	0.024** [0.012]	-0.001 [0.014]	0.033*** [0.010]	0.004 [0.010]
FIV					
Usability	-0.001 [0.001]				0.011*** [0.004]
Accessibility		-0.007 [0.013]			0.060** [0.025]
Concentration			-0.000 [0.000]		0.001* [0.000]
Availability				-0.008** [0.003]	-0.005* [0.003]
Constant	1.159 [0.926]	-1.606 [2.684]	-0.563 [3.145]	1.557 [2.453]	12.433*** [3.112]
Observations	370	249	174	208	113
Number of countries	21	20	14	17	10
Hausman test	0.000	0.000	0.000	0.000	0.000

Note 1: Dependent variable is the natural logarithm of GDP per capita.

Note 2: standard errors are shown in brackets.

Level of significance: ***p < 0.01, **p < 0.05, *p < 0.1.

Table 4
Income estimation
(GDP above average real per capita GDP of the full sample).

Variables	(1)	(2)	(3)	(4)	(5)
Lngdp _{t-1}	0.981*** [0.009]	0.840*** [0.026]	0.864*** [0.030]	0.944*** [0.020]	0.856*** [0.028]
Unemployment	-0.004 [0.009]	-0.047 [0.033]	-0.056 [0.040]	-0.060** [0.027]	-0.021 [0.031]
Inflation	-0.001** [0.000]	0.003 [0.002]	-0.002 [0.003]	-0.000*** [0.000]	-0.002 [0.002]
FinancialDev	0.006* [0.003]	0.003 [0.007]	0.019** [0.009]	0.001 [0.006]	0.019*** [0.007]
RuralPopulation	0.002 [0.003]	0.008 [0.016]	0.005 [0.018]	0.002 [0.012]	0.017 [0.013]
FIV					
Usability	0.002* [0.001]				0.004* [0.002]
Accessibility		0.109*** [0.034]			0.070** [0.036]
Concentration			0.001 [0.001]		0.000 [0.001]
Availability				-0.003 [0.002]	-0.003 [0.002]
Constant	1.415** [0.690]	11.134*** [2.264]	9.639*** [2.655]	4.620** [1.872]	8.950*** [2.250]
Observations	684	332	254	330	198
Number of countries	30	27	21	24	18
Hausman test	0.001	0.000	0.000	0.000	0.000

Note 1: Dependent variable is the natural logarithm of GDP per capita.

Note 2: standard errors are shown in brackets.

Level of significance: ***p < 0.01, **p < 0.05, *p < 0.1.

Moreover, we have split the sample into four quartiles by the average per capita income level and we have re-estimated equation (1). For each quartile we observe the same conclusions. First, for the first quartile (see Table 5), the dimension that improves the level of GDP per capita is usability, highlighting the difficulties of access to bank credit by people belonging to poorest countries. Second, for Q2 (see Table 6), from an independent analysis of dimensions, the accessibility is the more significant variable in increasing the growth

Table 5
Income estimation (FE models for Q1).

Variables	(1)	(2)	(3)	(4)	(5)
Lngdp _{t-1}	0.952*** [0.019]	0.853*** [0.066]	0.800*** [0.101]	0.984*** [0.041]	0.867*** [0.103]
Unemployment	-0.007 [0.015]	0.067 [0.129]	-0.116 [0.155]	-0.050 [0.060]	0.103 [0.069]
Inflation	-0.001** [0.000]	-0.007 [0.008]	-0.011 [0.011]	-0.001*** [0.000]	-0.003 [0.004]
FinancialDev	0.001 [0.005]	-0.014 [0.020]	-0.009 [0.071]	-0.012 [0.010]	0.014 [0.025]
RuralPopulation	-0.003 [0.004]	0.004 [0.066]	-0.155 [0.115]	-0.016 [0.036]	0.065 [0.051]
FIV					
Usability	0.003** [0.001]				0.003 [0.004]
Accessibility		0.207 [0.206]			0.062 [0.162]
Concentration			-0.008 [0.012]		0.009 [0.007]
Availability				0.000 [0.004]	0.002 [0.003]
Constant	3.903*** [1.347]	9.740 [7.613]	26.481** [12.557]	2.884 [4.662]	3.078 [9.395]
Observations	277	98	64	122	53
Number of countries	17	10	8	11	7
Hausman test	0.000	0.000	0.000	0.000	0.000

Note 1: Dependent variable is the natural logarithm of GDP per capita.

Note 2: standard errors are shown in brackets.

Level of significance: ***p < 0.01, **p < 0.05, *p < 0.1.

of these countries, while in the whole model this effect favor to the rest of variables, although in a lesser degree. Third, for Q3 (see Table 7), the accessibility remains the more relevant variable in fostering GDP and, at the same time, the concentration and availability do not affect it at all. Fourth, for the less poor of the sample, that is for Q4 (see Table 8), the most relevant dimensions in increasing growth for these countries are accessibility, together with, in a lesser degree, usability and concentration.

5. Conclusions

This paper examines the relationship between financial inclusion and economic growth in the Least Developed Countries using panel data for the period 1990–2021 and IV approach as well, and the empirical evidence suggests that financial inclusion is indeed strongly related to economic growth. We use various dimensions of financial inclusion (*usability*, *accessibility*, *availability*, *concentration*) in order to check which has a greater effect on economic growth in the countries analyzed. Thus, the main research question is to know on which financial inclusion instruments we need to work more in the poorest countries in the world in order to improve their well-being. We conclude that all dimensions have a positive effect on economic growth, in the expected direction, but that not all dimensions of financial inclusion affect economic growth similarly. *Accessibility* is robustly associated with economic growth, as is *availability*, while *usability* and *concentration* produce significant but relatively lesser effects in LDCs.

Analyzing all models, *accessibility* proves to be among the key drivers of economic growth. In this line, policies enacted in LDCs should encourage broader access to financial services in order to increase people's economic opportunities and improve their lives (and consequently their standard of living). Similarly, Kim et al. (2018) found that ease of accessibility to and the availability of formal financial services such as bank deposits, credit, and insurance should be augmented for all participants in an LDC economy. In this sense, financial inclusion is often considered as a critical element that makes growth inclusive and development of countries. With this paper, we corroborate that access to finance is a key pillar and governments should consider in the way that can enable economic agents to make longer-term consumption and investment decisions, participate in productive activities, and cope with unexpected short-term shocks.

Financial inclusion has continually gained recognition among policymakers, researchers, and development-oriented agencies. All around the world, and especially in developing countries, governments are being encouraged to develop strategies and regulatory frameworks to ensure that they reach all those people excluded from financial services. Improving dimensions of financial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way. Thus, the different dimensions of financial inclusion are perhaps among the most important challenges faced by authorities responsible for promoting economic growth in countries with lower levels of development. Four essential aspects can be proposed in this regard: *accessibility* of formal financial services for all participants in an economy; the *usability* of such services for all people; *availability* of financial services that shape an inclusive system; and *concentration*, given that a competitive financial system can help to reduce exclusion. In a less concentrated, more competitive scenario, banks would ostensibly try to reach unaffiliated segments of the population to increase

Table 6
Income estimation (FE models for Q2).

Variables	(1)	(2)	(3)	(4)	(5)
Lngdp _{t-1}	0.880*** [0.029]	0.896*** [0.049]	0.973*** [0.050]	0.929*** [0.064]	1.004*** [0.070]
Unemployment	-0.015 [0.014]	-0.122** [0.049]	-0.147*** [0.055]	-0.097* [0.063]	-0.144** [0.063]
Inflation	-0.001 [0.002]	0.003 [0.002]	0.000 [0.002]	0.001 [0.004]	-0.001 [0.004]
FinancialDev	0.008* [0.005]	0.013 [0.011]	0.017* [0.009]	0.015 [0.012]	0.012 [0.014]
RuralPopulation	0.005 [0.005]	-0.066*** [0.022]	-0.065*** [0.023]	0.037 [0.026]	-0.090*** [0.025]
FIV					
Usability	-0.001 [0.001]				-0.008** [0.004]
Accessibility		0.143** [0.059]			0.062 [0.080]
Concentration			0.002** [0.001]		0.002** [0.001]
Availability				-0.006 [0.004]	-0.010** [0.004]
Constant	8.711*** [2.220]	3.206 [4.189]	-2.256 [4.450]	3.445 [5.541]	-5.208 [5.591]
Observations	256	146	120	124	90
Number of countries	22	17	15	17	14
Hausman test	0.001	0.000	0.000	0.000	0.000

Note 1: Dependent variable is the natural logarithm of GDP per capita.

Note 2: standard errors are shown in brackets.

Level of significance: ***p < 0.01, **p < 0.05, *p < 0.1.

Table 7
Income estimation (FE models for Q3).

Variables	(1)	(2)	(3)	(4)	(5)
Lngdp _{t-1}	0.919*** [0.026]	0.855*** [0.049]	0.891*** [0.060]	0.868*** [0.043]	0.913*** [0.067]
Unemployment	-0.016* [0.011]	-0.046 [0.034]	-0.083* [0.046]	-0.012 [0.023]	-0.077* [0.043]
Inflation	0.001 [0.001]	0.007** [0.003]	0.011* [0.007]	0.007** [0.003]	0.004 [0.008]
FinancialDev	0.007** [0.003]	0.011 [0.008]	0.025** [0.010]	-0.000 [0.007]	-0.055*** [0.017]
RuralPopulation	0.003 [0.005]	0.021 [0.021]	0.013 [0.031]	0.002 [0.016]	-0.045 [0.039]
FIV Usability	-0.000 [0.001]				0.012** [0.005]
Accessibility		0.034 [0.024]			0.164** [0.065]
Concentration			-0.000 [0.000]		-0.001 [0.001]
Availability				-0.009*** [0.003]	-0.004 [0.004]
Constant	6.283*** [2.039]	9.864** [4.426]	7.675 [6.022]	11.037*** [3.846]	12.433* [6.687]
Observations	236	137	114	130	83
Number of countries	24	21	18	18	15
Hausman test	0.001	0.000	0.000	0.000	0.000

Note 1: Dependent variable is the natural logarithm of GDP per capita.

Note 2: standard errors are shown in brackets.

Level of significance: ***p < 0.01, **p < 0.05, *p < 0.1.

Table 8
Income estimation (FE models for Q4).

Variables	(1)	(2)	(3)	(4)	(5)
Lngdp _{t-1}	0.978*** [0.012]	1.024*** [0.036]	1.026*** [0.064]	0.975*** [0.035]	0.796*** [0.060]
Unemployment	-0.019** [0.007]	-0.057** [0.027]	-0.001 [0.047]	-0.060** [0.023]	0.001 [0.029]
Inflation	0.000* [0.000]	-0.004 [0.004]	-0.012** [0.005]	-0.001 [0.002]	-0.012** [0.005]
FinancialDev	-0.001 [0.001]	-0.006*** [0.002]	-0.002 [0.003]	-0.005*** [0.001]	0.000 [0.002]
RuralPopulation	-0.001 [0.003]	0.040** [0.017]	0.016 [0.023]	0.055*** [0.014]	0.007 [0.015]
FIV Usability	0.001 [0.001]				0.013*** [0.004]
Accessibility		-0.010 [0.017]			0.080** [0.032]
Concentration			0.000 [0.001]		0.001** [0.000]
Availability				-0.007* [0.004]	-0.004 [0.003]
Constant	2.229** [1.092]	-3.219 [3.683]	-2.638 [5.628]	0.403 [3.426]	15.236*** [5.125]
Observations	237	173	107	136	66
Number of countries	17	17	11	14	8
Hausman test	0.001	0.000	0.000	0.000	0.000

Note 1: Dependent variable is the natural logarithm of GDP per capita.

Note 2: standard errors are shown in brackets.

Level of significance: ***p < 0.01, **p < 0.05, *p < 0.1.

market share and position, at the same time improving financial services overall and reducing costs in favor of clients.

In a deeper analysis, we provide stronger evidence on how economies registering different income levels within the LDCs group are more or not affected by financial inclusion variables. So, we conclude that, in general, availability financial inclusion dimension is which that more affect in poorest countries in the way that in these countries people have lesser opportunities to deposit their accounts in commercial banks, while in countries with better income levels the accessibility is a key factor in fostering the economic situation.

So, countries with inadequate or scant banking services and bank branches should improve to encourage people in participating in the financial system and, therefore, fostering growth.

In political terms, it is worth pointing out some considerations to increase financial inclusion in the LDCs and, thereby, fostering economic growth. Here, we would stress the important role that financial policy measures can play in fostering economic growth, especially those focused on families living with scant economic resources such as people from LDCs. Therefore, policymakers would be advised to steer financial policies aimed at expanding financial access, as well as enhancing levels of availability.

Finally, our findings go beyond providing evidence on the relationship between financial inclusion and economic growth in LDCs to examine other macroeconomic factors that may affect economic growth. The results of the regression analysis performed show that, in order to foster sustained economic growth in LDCs by way of financial inclusion, financial development policies and anti-inflationary measures must be implemented, along with effective labor-market policies to reduce the high rates of unemployment seen in certain countries and to stimulate educational spending, all of which serve in the long term to nurture economic growth.

Declaration of competing interest

Regarding the submission of our paper “DOES FINANCIAL INCLUSION ENHANCE ECONOMIC GROWTH IN THE LEAST DEVELOPED COUNTRIES?” to be considering as publication in International Economics, we do not have any conflict of interest.

Appendix

Table A.1
Summary statistics

VARIABLES	Observations	Mean	SD	Min	Max
Dependent variable					
GDP per capita	1284	2355.969	1535.055	436.3764	11797.28
Independent Variables					
Unemployment	1362	6.610112	5.929678	0.14	29.887
Inflation	1329	49.30504	765.1288	-26.700	26765.86
FinancialDev	1163	21.50984	18.46056	1.22797	157.5577
RuralPopulation	1472	67.6909	14.34768	21.783	94.584
FIV Variables					
Usability	1183	68.4701	32.46669	7.618937	277.8355
Accessibility	655	4.156544	4.440388	0.1368348	32.24172
Concentration	494	177.2361	172.607	0	942.56
Availability	628	75.6554	19.56489	16.1444	100

Table A.2
Correlation matrix

VARIABLES	GDP per capita	Unemployment	Inflation	FinancialDev	Rural	Usability	Accessibility	Concentration	Availability
GDP per capita	1								
Unemployment	0.3606	1							
Inflation	-0.2043	-0.0219	1						
FinancialDev	0.5916	0.2949	-0.1821	1					
RuralPopulation	-0.5987	-0.3522	0.1274	-0.3316	1				
Usability	-0.0235	-0.3429	-0.2873	0.0198	0.2124	1			
Accessibility	0.7347	0.2873	-0.2089	0.6076	-0.3703	0.2921	1		
Concentration	0.6236	0.3168	-0.0491	0.5134	-0.1839	-0.0348	0.6501	1	
Availability	-0.2343	0.1479	0.0518	-0.1016	0.0661	-0.2518	-0.346	-0.3056	1

Table A.3
Data and variables sources

VARIABLES	ACRONYM	DEFINITION
Dependent variable		
GDP per capita	GDP	Real GDP per capita in constant 2017 international US dollars, adjusted for differences across countries at purchasing power parity (PPP).
Financial inclusion variables (FIV)		
Bank credit to bank deposits (%)	Usability	The financial resources provided to the private sector by domestic money banks as a share of total deposits. Domestic money banks comprise commercial banks and other financial institutions that accept transferable deposits, such as demand deposits. Total deposits include demand, time and saving deposits in deposit money banks.
Bank branches per 100,000 adults.	Accessibility	Denotes the number of branches of commercial banks for every 100,000 adults in the reporting country. Calculated as (number of institutions + number of branches)*100,000/adult population in the reporting country.

(continued on next page)

Table A.3 (continued)

VARIABLES	ACRONYM	DEFINITION
Bank concentration (%)	Concentration	Assets of three largest commercial banks as a share of total commercial banking assets. Total assets include total earning assets, cash and due from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax assets, discontinued operations and other assets.
Bank accounts per 1000 adults.	Availability	Denotes the total number of deposit accounts that are held by resident nonfinancial corporations (public and private) and households in commercial banks for every 1000 adults in the reporting country. For several countries, however, data cover the total deposit accounts by all clients. Calculated as: (number of deposit accounts*1000)/adult population in the reporting country.
Proxies variables		
Inflation rate	Inflation	Inflation, as measured by the annual growth rate of the GDP implicit deflator, showing the rate of price change in the economy as a whole.
Unemployment rate	Unemployment	The share of the labour force that is without work, but is available for, and is seeking employment.
Financial development	FinancialDev	Bank deposits to GDP (%)
Rural population (% of total population)	RuralPopulation	Rural population refers to people living in rural areas as defined by national statistical offices. It is calculated as the difference between total population and urban population.

Source: World Development Indicators (World Bank, 2023a,b)

Table A.4

List of LDCs

Countries				
Afghanistan	Djibouti	Malawi	Somalia	
Angola	Eritrea	Mali	South Sudan	
Bangladesh	Ethiopia	Mauritania	Sudan	
Benin	Gambia, The	Mozambique	Tanzania, Ud. Rep.	
Bhutan	Guinea	Myanmar	Timor-Leste	
Burkina Faso	Guinea-Bissau	Nepal	Togo	
Burundi	Haiti	Niger	Uganda	
Cambodia	Kiribati	Rwanda	Vanuatu	
Central Af. Rep	Lao PDR	S. Tome and Princ.	Yemen, Rep.	
Chad	Lesotho	Senegal	Zambia	
Comoros	Liberia	Sierra Leone		
Congo, Dem. Rep.	Madagascar	Solomon Islands		

Source: United Nations (2023)

References

- Agarwal, A., 2010. Financial Deepening, Financial Inclusion: Challenges and Opportunities. The 23rd Skoch Summit.
- Afonso, A., Blanco-Arana, M.C., 2022. Financial and economic development in the context of the global 2008-09 financial crisis. *International Economics* 169, 30–42.
- Andrianova, S., Demetriades, P., 2008. Sources and effectiveness of financial development: what we know and what we need to know. In: Guha-Khasnobis, B., Mavrotas, G. (Eds.), *Financial Development, Institutions, Growth and Poverty Reduction. UNU-WIDER Studies in Development Economics and Policy*.
- Aparicio, C., Huayta, K., Bohórquez, D., 2016. Access to financial services through retail agents and household expenditures: evidence from Peru. *Journal of Financial Issues* 12 (1), 1–26.
- Babajide, A.A., Adegboye, F.B., Omankhanlen, A.E., 2015. Financial inclusion and economic growth in Nigeria. *Int. J. Econ. Financ. Issues* 5 (3), 629–637.
- Babatunde, M.A., Shuaibu, M.I., 2017. An empirical analysis of bank Lending and inflation in Nigeria. *Indian Econ. J.* 59 (3), 127–137.
- Baltagi, B., 2001. *Econometric Analysis of Panel Data*, second ed. Wiley.
- Beck, T., Demirgüç-Kunt, A., Levine, R., 2007. Finance, inequality and the poor. *J. Econ. Growth* 12 (1), 27–49.
- Beck, T., Levine, R., 2004. Stock market, banks, and growth: panel evidence. *J. Bank. Finance* 28, 423–442.
- Beck, T., Demirgüç-Kunt, A., Levine, R., 2000. A new database on the structure and development of the financial sector. *World Bank Econ. Rev.* 14, 597–605.
- Banerjee, S., 2016. Aadhaar: Digital Inclusion and Public Services in India. *World Development Report*, pp. 81–92.
- Bertram, O.A., Nwankwo, S., Onwuka, I.O., 2016. Full financial inclusion (Pfi): a Pre-Requisite for inclusive economic development in Nigeria. *Advances in Social Sciences Research Journal* 3 (9), 65–78.
- Boitano, G., Abanto, D.F., 2020. Challenges of financial inclusion policies in Peru. *Revista Finanzas y Política Económica* 12 (1), 89–117.
- Breusch, T.S., Pagan, A.R., 1980. The Lagrange Multiplier test and its applications to model specification in econometrics. *Rev. Econ. Stud.* 47 (1), 239–253.
- Bruce, L., Gine, X., Goldberg, J., Yang, D., 2013. Commitments to Save: A Field Experiment in Rural Malawi. *World Bank eLibrary*.
- Dabla-Norris, E., Deng, Y., Ivanova, A., Karpowicz, I., Unsal, F., VanLeemput, E., Wong, J., 2015. *Financial Inclusion: Zooming in on Latin America*. IMF, Washington, DC. Working Paper 15/206.
- Demirgüç-Kunt, A., Beck, T., Honohan, P., 2008. *Finance for All? Policies and Pitfalls in Expanding Access*. World Bank, Washington, DC.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., 2017. *Financial Inclusion and Inclusive Growth: A Review of Recent Empirical Evidence*. The World Bank.
- Demirgüç-Kunt, A., Klapper, L., 2012. *Measuring financial inclusion: the global finindex database*. Policy Research Working Paper (6025) (World Bank).
- DFID, 2004. *Financial Sector Team*. Department for International Development, London, 2004. *The Importance of Financial Sector Development for Growth and Poverty Reduction*. Policy Division Working Paper.
- Erlando, A., Riyanto, F.D., Masakasu, S., 2020. Financial inclusion, economic growth, and poverty alleviation: evidence from eastern Indonesia. *Heliyon* 6, 1–13.
- Ghosh, A., Phillips, S., 1998. Warning: inflation may be harmful to your growth. *IMF Staff Pap.* 45 (4), 672–710.
- Ghosh, M., Dixit, R., 2014. Financial inclusion for inclusive growth of India: a study of Indian states. *Int. J. Bus. Manag. Res.* 3 (1), 147–156.
- Global Partnership for Financial Inclusion (GPFI), 2011. *The first G20 global partnership for financial inclusion (GPFI) forum*. Forum report published on October 01st, 2011. Retrieved on 18 September 2018. Available at: <https://www.gpfi.org/sites/gpfi/files/documents/GPFI%20Forum%20Report.pdf>.
- Goel, S., Sharma, R., 2017. Developing a financial inclusion index for India. *Procedia Comput. Sci.* 122, 949–956.
- Hannig, A., Stefan, J., 2010. Financial inclusion and financial stability: current policy issues. *SSRN Electronic Journal*, ADBI Working Paper 259, 1–30.
- Hausman, J., 1978. Specification test in econometrics. *Econometrica* 46 (6), 1251–1272.

- Hausman, J., Taylor, W.E., 1981. Panel data and unobservable individual effects. *Econometrica* 49 (6), 1377–1398.
- Honohan, P., 2004. Financial development, growth and poverty: how close are the links? World Bank Policy Research Working Paper 3203.
- Hsiao, C., 2003. *Analysis of Panel Data*. Cambridge University Press, Cambridge.
- Ho, S.H., Saadaoui, J., 2022. Bank credit and economic growth: a dynamic threshold panel model for ASEAN countries. *International Economics* 170, 115–128.
- Jack, W., Suri, T., 2014. Risk sharing and transactions costs: evidence from Kenya's mobile money revolution. *Am. Econ. Rev.* 104 (1), 183–223.
- Karpowicz, I., 2016. Financial inclusion, growth and inequality: a model application to Colombia. *Journal of Banking and Financial Economics* 2 (6), 68–89.
- Kim, D.W., Yu, J.S., Hassan, M.K., 2018. Financial inclusion and economic growth in OIC countries. *Res. Int. Bus. Finance* 43, 1–14.
- King, R.G., Levine, R., 1993. Finance and growth: schumpeter might be right. *Q. J. Econ.* 108, 717–737.
- Klevmårken, N.A., 1989. Panel studies: what can we learn from them? *Introduction. Eur. Econ. Rev.* 33, 523–529.
- Kumar, N., 2013. Financial inclusion and its determinants: evidence from India. *Journal of Financial Economic Policy* 5 (1), 4–19.
- Levine, R., 1997. Financial development and economic growth: views and agenda. *J. Econ. Lit.* 35, 688–726.
- Levine, R., 2003. Stock market liquidity and economic growth: theory and evidence. In: *Finance, Research, and Education, and Growth*. Palgrave MacMillan, New York.
- Levine, R., 2004. *Finance and Growth: Theory and Evidence*. NBER Working Paper 10766.
- Levine, R., 2005. Finance and growth: theory and evidence. In: *Aghion, P., Durlauf, S. (Eds.), Handbook of Economic Growth*. Elsevier Science, Amsterdam, The Netherlands.
- Levine, R., Loayza, N., Beck, T., 2000. Financial intermediation and growth: causality and causes. *J. Monetary Econ.* 46 (1), 31–77.
- Makina, D., Walle, Y., 2019. Financial inclusion and economic growth: evidence from a panel of selected african countries. In: *Daniel Makina, Extending Financial Inclusion in Africa*. Academic Press, pp. 193–210.
- Nizam, R., Karim, Z.A., Rahman, A.A., Sarmidi, T., 2020. Financial inclusiveness and economic growth: new evidence using a threshold regression analysis *Rosmah. Economic Research-Ekonomiska Istraživanja* 33 (1), 1465–1484.
- Nwankwo, O., Nwankwo, G., 2014. Sustainability of financial inclusion to rural dwellers in Nigeria: problems and way forward. *Res. J. Finance Account.* 5 (5), 24–31.
- Okun, A.M., 1962. Potential GNP: its Measurement and Significance. *Proceedings of the Business and Economic Statistics Section American Statistical Association*, pp. 98–104.
- Rajan, R.G., Zingales, L., 1998. Financial dependence and growth. *Am. Econ. Rev.* 88, 559–586.
- Sarma, M., 2008. *Index of Financial Inclusion*. ICRIER Working Paper No 215 (New Delhi, India).
- Sarma, M., Pais, J., 2011. Financial inclusion and development. *J. Int. Dev.* 23, 613–628.
- Sawadogo, R., Semedo, G., 2021. Financial inclusion, income inequality, and institutions in sub-Saharan Africa: identifying cross-country inequality regimes. *International Economics* 167, 15–28.
- Schmied, J., Marr, A., 2016. Financial inclusion and poverty: the case of Peru. *Reg. Sect. Econ. Stud.* 16 (2), 29–43.
- Shahbaz, M., Rehman, I.U., Muzaffar, A.T., 2015. Re-visiting financial development and economic growth nexus: the role of capitalization in Bangladesh. *S. Afr. J. Econ.* 83 (3), 452–471.
- Stiglitz, J.E., Sen, A., Fitoussi, J.P., 2009. *Report by the Commission on the Measurement of Economic Performance and Social Progress* (Paris).
- Talledo, J., 2015. Access to and use of financial services: evidence from Peru. *Journal of Financial Issues SBS* 11 (1), 1–49.
- Triki, T., Faye, I., 2012. *Financial Inclusion in Africa*. African Development Bank.
- United Nations (2023). Available from: < <https://www.un.org/>>(accessed September 2023).
- Vo, D.H., Nguyen, N.T., Van, L.T.-H., 2021. Financial inclusion and stability in the Asian region using bank-level data. *Borsa Istanbul Review* 21 (1), 36–43.
- World Bank, 2023. *Global Financial Development 2023*. World Bank, Washington DC.
- World Bank, 2023. *World Development Indicators 2023*. World Bank, Washington DC.