



The Impact of Financial Inclusion on Unemployment Rate in Developing Countries

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ABSTRACT

Financial inclusion has become the focus of economic policymaking worldwide. Increasing the accessibility of the weaker group of the society to formal financial services would not only serve at the individual level but will also benefit at the national level. This study aims to initially construct a new financial inclusion index for 43 developing countries based on a multidimensional approach, using Principal Component Analysis (PCA), using three dimensions; access to, usage of, and quality of financial services. Secondly, a dynamic two-step system, Generalized Method of Moments (GMM), is applied to empirically assess the impact of financial inclusion on the unemployment rate of 35 developing countries for the sample period from 2009 to 2018. The study established that financial inclusion has an impact on decreasing the unemployment rate in developing countries. The empirical findings suggest that an increase in the level of financial inclusion in developing countries decreases their unemployment rate. Moreover, the level of education, inflation rate, and economic growth have a significant negative impact on the unemployment rate. On the other hand, panel Granger Causality test was employed and indicated that there is a bi-directional causality between financial inclusion and unemployment rate.

Keywords: Financial Inclusion, Developing Countries, Unemployment Rate, Principal Component Analysis, System Generalized Method of Moments, Granger Causality Test

JEL Classifications: C33, E24, O11, O16

1. INTRODUCTION

Lately, the topic of financial inclusion has received excessive attention from researchers as well as policymakers of developing and developed countries. The concept of financial inclusion came into attention in the early 2000s, stemming from a study highlighting that financial exclusion leads to poverty. It is an ultimate universal goal, but unfortunately, the world today is still far from this financial utopia. In fact, according to Global Findex 2017, about 1.7 billion adults globally were considered as “unbanked,” in other words, not owning an account at a financial institution¹ (Demirguc-Kunt et al., 2018). Increasing the level of

financial inclusion is also more important to those who already have it because it means a more diverse marketplace with more financial service providers and a wider range of financial services. To guarantee that all adult members of the society can access a broad range of financial products easily, designed according to their needs, and provided at affordable costs is the main aim of financial inclusion. The range of financial products and services include remittance facilities, payments, insurance, savings, credit, and pensions (Babajide et al., 2015).

The well-functioned financial sector benefits and contributes to the overall growth of an economy. The role of financial intermediation is to transfer and allocate scarce resources (Beck et al., 2000; Levine, 2005). Moreover, the most crucial component of the markets in economies in transition is a well-developed financial

¹ According to the Global Findex 515 million adult accounts were opened from 2014 to 2017 worldwide.

system due to its role in allocating scarce resources (Ben Naceur and Zhang, 2016; Greenwood and Jovanovic, 1990). On the other contrary, opponents' point of view is that financial institutions are neither necessary nor sufficient for economic growth (Pyka and Andersen, 2013).

The advantages of financial inclusion in the economy can be listed to no end of extent. However, this paper focuses specifically on the impact of financial inclusion on the unemployment rate. This research, to the best of our knowledge, is likely to be one of very few in the literature that has endeavored to investigate the direct impact of financial inclusion on the unemployment rate in developing countries. Specifically, this study intends to develop a new financial inclusion index to be able to measure the level of financial inclusion in several developing countries and examine its impact on the unemployment rate. Moreover, the study aims to examine the existence of a bi-directional relationship between financial inclusion and the unemployment rate in developing countries. Furthermore, the study aims to ensure that policymakers design appropriate measures that can help improve financial inclusion, support access to finance, and consequently contribute to the creation of employment opportunities.

The rest of the study is organized as follows: the next section provides a review of literature that investigated the effects of financial inclusion and a theoretical discussion of how some of the possible channels through financial inclusion may impact the unemployment rate. Section three clarifies the type of data, data collection procedure, the research methods and statistical techniques used to achieve the aim of the study. The empirical results are discussed and analyzed in Section four. The concluding section summarizes the main findings and highlights the implications of the study.

2. LITERATURE REVIEW

This section provides various definitions for financial inclusion and deliberates how the increase in financial inclusion might impact the unemployment rate in developing countries based on previous studies.

2.1. Financial Inclusion

There are various definitions of financial inclusion by several entities and researchers in literature. It was simply defined as a process that ensures the ease of availability, access, and use of the formal financial system to all members of the economy by Sarma (2008). On the other hand, Kochhar (2009) stated that financial inclusion is not only the process of ensuring access to financial services, as stated by Sarma (2008), or making available timely and adequate credit when needed by vulnerable groups at an affordable cost, but it must also be appropriate, transparent, and fair. Financial inclusion is not achieved by enabling people to get credit from informal money lenders and small institutions. Access should be through formal financial institutional players, and only then such access will be transparent, fair, and cost-effective. In the latest study by Nandru et al., (2016), it was stated that financial inclusion encompasses a wide range, quality and availability and outreach of banking services (having a bank account, savings,

credit, remittance, and insurance services) at an affordable cost to the massive sections of low-income and disadvantaged groups in the society.

According to a report by the UN, financial inclusion is the sustainable provision of affordable financial services that bring the underprivileged to the formal economy (International Telecommunication Union, 2016). The International Monetary Fund (IMF) defined financial inclusion as the planned and organized efforts aiming at making the financial services available for everyone, especially for the deprived and the poor. Also, the World Bank defined financial inclusion as affordable and useful financial products and services, accessible to individuals and businesses, meet their needs (credit, payments, insurance, and savings) and at the same time are delivered to all the individuals and businesses in the society responsibly and sustainably (World Bank, 2018).

Financial inclusion strives to engage the population, which is excluded from the financial system into the formal financial system to allow them to access financial services such as savings, payments, credit, transfers, and insurance (Hannig and Jansen, 2010). In other words, financial inclusion aims to bring the population out of the financial system under its roof, to ensure that the banking services are available to everyone, especially the low-income groups, to facilitate allocating productive resources efficiently, and to deliver different financial services at affordable prices to financially excluded households and micro, small and medium-sized entrepreneurs (MSME) and consequently reach an inclusive financial system (Yorulmaz, 2013). An inclusive financial system has several benefits on a micro and macro level. On the micro-level, families can organize their income in a better way while having access to credit (loans). Also, microfinance permits them to plan their expenses and be able to pay for an educational plan, thus have the chance to enjoy a better life in the future. Moreover, by increasing the accessibility to credits, a country can encourage entrepreneurs, so they can start-up new small businesses, resulting in a higher national economic output (Blando, 2013). Shirin (2016) explained further that financial inclusion is not only about ensuring access to financial services, but access must also be appropriate. For access to be appropriate, it has to be transparent, fair, and cost-effective and through mainstream institutional players. Greater access and usage of financial services can not be guaranteed by only increasing access to deposit accounts, increasing the number of branches, and having a larger number of Automated Teller Machines (ATM).

International institutions² and governments have a growing interest in improving financial inclusion. Not only because will it improve the wellbeing of their citizens and provide them with more opportunities, reduce the poverty level, and protects them against unexpected negative scenarios, but also because financial inclusion helps in reducing corruption, reducing tax evasion by reducing the

2 Alliance for Financial Inclusion(AFI), IMF, World Bank, UN, Global Partnership for Financial Inclusion (GPMI), Organization for Economic Cooperation and Development (OECD), G20, and other multilateral institutions recognize the benefits of financial inclusion for sustainable growth, stability, and integrity.

size of the informal economy and providing greater transparency in financial transactions. Moreover, it ensures that domestic and foreign aid arrives effectively to the people who need it the most, reduces administrative costs, and improves efficiencies in government tasks like pension payments and tax collection. Last but not least, it increases security in a country as people would not need to move with large amounts of cash (Lochy, 2020).

2.2. Financial Inclusion and Unemployment

Both financial inclusion and employment are targets associated with one of the 17 new Sustainable Development Goals (SDGs) adopted by the United Nations (UN) recently. The SDGs aims to eradicate poverty and inequality globally by 2030. The question is, does the development of domestic financial sectors decrease the rate of unemployment in developing countries? And how? The recent financial crisis, which caused massive job losses, particularly in countries with more developed financial sectors, has raised a question about the role of finance in the labor market (Pagano and Pica, 2012). Nevertheless, Bruhn and Love (2014) found out that financial access significantly impacted labor market outcomes positively and suggested that finance may reduce poverty, as it positively affects the labor market.

A well-developed financial sector provides robust and dynamic local financial structures and networks. Delivering a range of functions, including financial products and services, business, financial risk assessment, development advice, appropriate regulation development, and providing adequate financial supervision, is the responsibility of the financial sector. This intermediation role that the financial sector plays; improves and boosts productive investment and consumption through mobilizing savings, allocating credit, supporting in targeting profitable investments, offering insurance, and supporting networks for transfers and payments. All of the abovementioned should simplify and smooth business development, especially for MSMEs. Moreover, strengthening and developing domestic financial sectors, a sustainable local funding base is provided, employment opportunities are created, technology and innovation are exchanged, economic competitiveness is improved across different sectors extending from construction to infrastructure, from agriculture to food processing, and from manufacturing to industrial production. Financial sector development is the driver for the required transformation to develop and integrate economic sectors with the highest potential to offer productive jobs that bring worthy employment prospects (Osikena and Ugur, 2016).

A study focusing on the Philippines by Kondo (2007) indicated that micro-credit has a significant impact on both start-ups of new micro-enterprises and job creations. Individuals that received microcredit were responsible for 20% more micro-enterprises than non-recipient households and were the reason behind employing 17% more people per capita. Additionally, The Uganda Commercial Bank, which was once the largest state-owned bank in Uganda, was sold to South Africa's Stanbic and privatized with the condition that post-acquisition Stanbic has to maintain the existing branches. As a result of this acquisition, new branches were opened, new financial products were introduced, and the service delivery to the unbanked population groups increased. Also,

leading to the agricultural sector expanded, which is considered an essential source for job creation in Uganda (Clarke et al., 2007). An analysis by the World Bank to assess its potential to increase financial inclusion showed that financial inclusion had a positive impact on employment, new businesses, and GDP where a 1% increase in the level of financial inclusion leads to a 0.7% increase in the level of employment, a 0.5% rise in new businesses, and a 0.3% growth in GDP (Bruhn and Love, 2009).

Fonseca et al., (2001) recommended that in order to build a new job, the initial capital is needed. Nevertheless, when start-up costs (initial capital) are high, entrepreneurs are discouraged, and the portion of the population who become workers increases. Job creation suffers, and the employment level becomes low. Therefore, reducing the credit access for entrepreneurs prevents the start-ups of new firms leading to employment problems (Acemoglu, 2001; Wasmer and Weil, 2004). Therefore financial inclusion that facilitates access to financial services, especially credit, could allow entrepreneurs to start their own business and eventually grow in size, which could sequentially decrease the unemployment rate as new start-ups are opened. Hence, more unemployed citizens are hired and become employed.

Cull et al., (2014) evaluated the impacts of financial inclusion on the macro and micro-level on poor households globally. Results found that financial inclusion is positively correlated with employment. Also, World Bank (2014) postulated that access to finance, particularly for small firms, is associated with innovation, job creation, and growth. Moreover, Mol (2014) argued that financial inclusion reduces the vicious cycle of poverty and unemployment and acts as a source of empowerment and better control of one's finances. Zulfiqar et al., (2016) conducted studies that have demonstrated a positive relationship between financial inclusion and employment creation. The main consensus of these studies is that financial inclusion means making financial services available to the poor, and therefore offering them credit facilities according to their needs, creating self-employment opportunities.

There is also evidence that financial inclusion interventions can have direct and indirect employment outcomes. By increasing access to financial services along with increasing the financial capability to use those services effectively, people can invest in their education to improve their potential to become employed or create their own employment by financing their own projects to generate income (Sykes et al., 2016). Thus financial inclusion has a positive effect on the level of employment. Moreover, Mugo and Kilonzo (2017) assessed the impacts of financial inclusion on poverty and unemployment in Kenya. The study found that financial inclusion provides vulnerable groups, low-income households, and informal enterprises with an opportunity to accept financial transactions, accumulate assets, generate more income, and manage their financial risks. This allows their contribution to achieving inclusive growth. The study also found that mobile money supported about 185,000 women in Kenya shift from farming to business, which not only created employment for them alone but also provided employment opportunities for others.

Kim et al., (2018) empirically examined the importance of finance for labor market outcomes. Using a balanced annual panel of 49 developed and developing countries from 1991 to 2014, it was found that finance significantly influences unemployment. More specifically, unemployment increases with financial development and concentration in banking markets but decreases with increasing market orientation. It was also found that joblessness depends on the flexibility of business, labor markets, and credit; whenever regulations to obtain credit are rigid, unemployment increases³.

Furthermore, Molefhi (2019) examined the impact of financial inclusion on employment creation for the period 2004–2016 in Botswana. The findings of the study indicated that the ownership of bank account, availability of bank branches, and borrowing from the commercial bank impacts the level of employment positively both in the short run and in the long run. On the other hand, the number of depositors with commercial banks was found to affect employment negatively. As it increases, the employment level decreases in both the short run and the long run.

Although Yorulmaz (2016) found that employment and financial inclusion are positively correlated, however, the study was of the view that the unemployed and irregularly employed populations seem less likely to participate in the financial system. In other words, it is employment that causes access to the financial sector and not the other way round.

On the Contrary, Barnes et al., (2001) analyzed data from Zimbabwe and indicated that micro-credit has no impact on employment levels in businesses. Moreover, a review by Van Rooyen et al., (2012) in SSA found that microfinance had little impact on job creation. Another study on evaluations of the youth business start-up project, by Grimm and Paffhausen (2015) across 54 countries, found out that microfinance was not a successful tool for creating new jobs. An explanation for the unconvincing effect is that the focus of most microfinance programs was not on job creation, but instead, it was on income stabilization. This meta-analysis found that it is often a challenging and complicated process to confirm that such interventions may increase the chances for employment creation and reduce the problem of unemployment that faces most of the developing countries.

Persistently high levels of unemployment in the long-run have undesirable consequences on the labor market, income inequality, and sociopolitical stability. Therefore it is interesting to examine the effectiveness of financial inclusion as an instrument to reduce unemployment. From the abovementioned studies, it is clear that the link between financial inclusion and unemployment rate has not been investigated sufficiently, and there is still inconsistency in the results. Some empirical research supported the argument that financial inclusion plays a dominant role in reducing unemployment. In comparison, other studies found out that financial inclusion has no impact on unemployment. Other scholars also argued that employment that causes access to the financial sector. The gap lies in making a cross- country study to

assess the impact of financial inclusion on unemployment and test if there is a bidirectional or unidirectional relationship. to the best of our knowledge, this is one of few works to bring financial inclusion into the determination of unemployment and measure the impact of financial inclusion on the level of unemployment rate in developing countries.

3. DATA AND METHODOLOGY

This section is divided into two main subsections; subsection 3.1 elaborates the population and the sample size of this study and describes the selected sample. Moreover, the type of data and the method of data collection used are discussed. Subsection 3.2 discusses the methodology used in the study.

3.1. Data

This study is based on quantitative research. The dataset is a balanced panel comprising annual information on the unemployment rate, nine financial inclusion indicators, and a set of control variables for 35 developing countries over the period 2009–2018, thus totaling 350 observations. Data for all the indicators used are collected exclusively from secondary sources. Several international published sources were used in collecting the data for all the variables.

The dependent variable, the unemployment rate, is measured as a percentage of the total labor force. The control variables used in this study are inflation rate (% of the change in the Consumer Price Index [CPI]), economic growth (Gross Domestic Product Per Capita [GDPPC] growth rate), and Primary School Enrollment was used as a proxy to measure education which is obtained from the UNESCO. The rest of the variables are obtained from the World Development Indicators (WDI) of the World Bank.

Financial inclusion is the independent variable of this study. Since there is no concrete measure for financial inclusion, this study attempts to construct a new financial inclusion index⁴ composed of three dimensions (access, usage, and quality) using the PCA method following Cámara and Tuesta (2014). The data concerning the indicators used to measure each of the three dimensions are collected from the FAS by the IMF and the World Bank Group Doing Business.

3.1.1. Sample

According to the World Economic Situation and Prospects Report (WESP) 2020 by the UN (United Nations, 2020), there are 78 developing countries worldwide. Due to the unavailability of financial inclusion indicators data and other macroeconomic indicators data in several countries, the sample of this study includes 35 developing countries after excluding the 43 countries with missing data. The 35 countries of the sample are from 5 developing regions and are classified, as shown below in Table 1. Also Table 2 below lists the 35⁵ developing countries included in the sample of the study.

3 These effects are more predominant in countries with higher levels of financial and economic development, lower income inequality, higher democracy, and greater trade openness than other countries.

4 The construction of the financial inclusion index is discussed in detail in the following sub-section 3.2.1.

5 The sample includes 6 High-Income countries, 19 Upper Middle-Income countries, and 10 Lower Middle-Income countries.

3.1.2. Data trend

This section visualizes the data used in the study into graphs to show the trend of the independent and control variables; Unemployment rate, economic growth, and inflation rate.

Figure 1 above illustrates the trend of average unemployment, inflation and economic growth rates in developing countries from 2009 to 2018. Unemployment rate in developing countries have experienced an increase between 2014 and 2016, driven by major economic downturns, in part due to the commodity price slump in many large economies, such as Brazil and the Russian Federation (International Labour Organization, 2018).

Table 1: Sample description

Region	Number of Countries in the Region
East Asia and Pacific	7
Latin America and Caribbean	15
Middle East and North Africa	5
South Asia	2
Sub-Saharan Africa	6
Total number of countries included in the sample	35

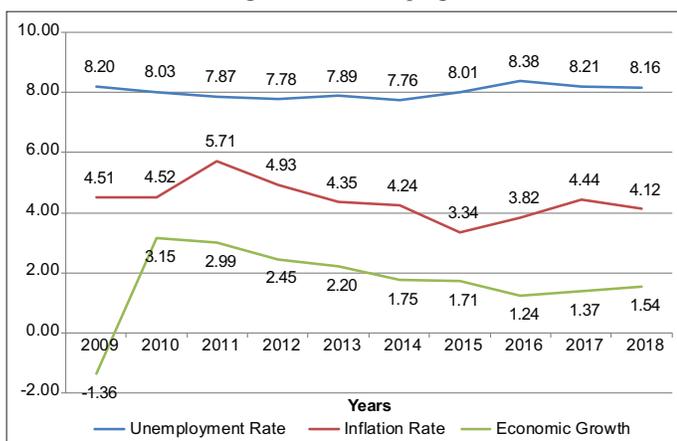
Source: Prepared by the author based on data from the WESP 2020

Table 2: Sample of the study

#	Country	#	Country	#	Country
1	Algeria	13	Dominican Republic	25	Mauritius
2	Argentina	14	Ecuador	26	Mongolia
3	Bahamas	15	Egypt, Arab Rep.	27	Namibia
4	Belize	16	El Salvador	28	Oman
5	Bolivia	17	Eswatini	29	Pakistan
6	Botswana	18	Fiji	30	Panama
7	Brazil	19	Guatemala	31	Peru
8	Brunei Darussalam	20	Honduras	32	Samoa
9	Cameroon	21	India	33	Saudi Arabia
10	Chile	22	Indonesia	34	South Africa
11	Colombia	23	Jordan	35	Thailand
12	Costa Rica	24	Malaysia		

Source: Prepared by the author based on data from the WESP 2020

Figure 1: Average unemployment and inflation rates and average economic growth in developing countries



Source: Author based on data from WDI

The average economic growth rate in 2009 was negative in developing countries, mainly due to the Great Economic Crisis. Developing countries recovered from this crisis and the rate turned positive in 2010. There was another slow-down in the rate of economic growth till the end of 2016, and it started to increase again in 2017 and 2018.

The average inflation rate across the developing countries from 2009 to 2018 is almost 4.4%. The highest average inflation rate was 5.71% in 2011, while the lowest average in the 10 years was in the year 2015 (3.34%). The maximum inflation rate was 34.28% in Argentina in 2018. Argentina's is from the top five countries with the highest inflation rates in the world after Venezuela, Zimbabwe, South Sudan, and Sudan (these countries are not included in the sample due to the unavailability of data).

3.2. Methodology

Before assessing the impact of financial inclusion on the unemployment rate, the extent of financial inclusion needs to be identified first. To determine the extent of financial inclusion first, the indicators that will be used to measure the accessibility and usage of financial services in a country needs to be identified. This section is composed of 3 main subsections. The first subsection describes in detail the process of constructing a financial inclusion index. The specification of the model used to assess the impact of financial inclusion (using the index) on the unemployment rate is explained in subsection 3.2.2, while the empirical methods used are explained in subsection 3.2.3.

3.2.1. Measuring financial inclusion

The individual financial inclusion dimensions (access, usage, and quality) may not provide comparable outcomes across countries since countries are heterogeneous. That is, a country can perform better in one of the dimensions but not in others, and vice versa. In recent literature, financial inclusion is viewed as a multidimensional construct, and different parameters to measure the inclusiveness of a financial system are proposed to address this challenge. This study measures the extent of financial inclusion across a number of developing countries by constructing new multidimensional indices⁶ before assessing the impact of financial inclusion on the unemployment rate following the abovementioned studies in the literature. Several variables could be theoretically relevant for inclusion in each of the three dimensions of financial inclusion. However, because the data for several variables are usually not available, their proxies are used to measure each dimension. Ideally, all the dimensions (demand-side and supply-side) should be taken into consideration to have a complete picture of the inclusive financial system⁷.

No standard measure of financial inclusion is universally accepted, just as no single conceptual definition of financial inclusion exists. Accordingly, following the Financial Inclusion Indicators set,

6 A significant number of studies in the literature have focused on multidimensional aspects of financial inclusion (Amidzic, Massara, & Mialou, 2014; Cámara & Tuesta, 2014; Gupte, et al, 2012; Park & Mercado, 2018; Sharma, 2016; Yorulmaz, 2013).

7 However, the constraints of data availability are from the major obstacles in attaining this objective.

which was endorsed by G20 leaders in 2012 and established by the Global Partnership for Financial Inclusion (GPII), the degree of financial inclusion in this study is determined by three dimensions: (1) access to financial services; (2) usage of financial services; and (3) the quality of the financial products and the service delivery. Adding the usage and quality dimensions in the definition and the financial inclusion index besides the access dimension is vital because it helps to overcome the often mistaken assumption that financial inclusion will only be achieved by merely offering enough access points. Therefore the frequency of use by individuals and the quality of financial services are both believed to provide more useful and analytical findings and explanations for financial inclusion. Table 3 below summarizes the list of indicators used to compute the financial inclusion index in this study. The indicators used are selected based on data mode and availability.

Getting credit: Depth of credit information index, prepared by the WBG Doing Business (DB), will be used as an indicator for the quality dimension. This index measures the scope, coverage, and accessibility of credit information available through credit reporting service providers such as credit registries or credit bureaus. The index ranges from 0 to 6 based on the methodology in the DB 2005-2014 studies and ranges from 0 to 8 based on the methodology in the DB 2015-2020 studies. Since the methodology used to calculate the index from 2009 to 2014 is different from that used from 2015 to 2020, therefore this indicator cannot be used for the period from 2009 to 2018. As a way out for this problem, a dummy variable is created where 1 if the index score is 1-8 and 0 if otherwise.

Considering the view proposed by Cámara and Tuesta (2014), the two-stage PCA method is applied as an indexing strategy to estimate the degree of financial inclusion. The calculation of

Table 3: Financial inclusion indicators

Dimension	Indicator	Source
Access	Number of bank branches per 100,000 adults	IMF – FAS Database
	Number of ATMs per 100,000 adults	
	Number of branches per 1000 Km ²	
	Number of ATMs per 1000 Km ²	
Usage	Number of deposit accounts with commercial banks per 1000 adults	(WBG Doing business)
	Number of loan accounts with commercial banks per 1000 adults	
	Outstanding Deposits from commercial banks % of GDP	
	Outstanding Loans from commercial banks % of GDP	
Quality	Credit Barriers	(WBG Doing business)
	Getting Credit: Depth of credit information index (0-6) (2005-2014 methodology)	
	Getting Credit: Depth of credit information index (0-8) (2015-2020 methodology)	

Source: Prepared by the author

the index and the derivation of the two-stage PCA involves the following steps:

3.2.1.1. Step 1: Normalization of values of indicators

There are significant variations across country-specific values of the different indicators of financial inclusion. Each indicator has been “normalized” in order to ensure better comparability of these data and to smooth out the different scales and transform the highly skewed indicators, the dataset is normalized using the Min-Max method. This process makes all the different indicators in an equal range between 0 and 1, by subtracting the minimum value and dividing it by the range of the indicators’ values (Le et al., 2019; Yorulmaz, 2018). The formula used for the normalization process is shown below in equation (1):

$$X_{i,d} = \frac{(x_i - m_i)}{(M_i - m_i)} \tag{1}$$

Where x_i is the actual value of indicator i , m_i is the minimum value of indicator i , and M_i is the maximum value of dimension i . $X_{i,d}$ is the standardized value of indicator i of dimension d . The normalized indicator takes a value 0 representing the lower end of the country’s scale of financial inclusion, while 1 indicates the top end of the country’s degree of inclusion for all the individual categories of indicators, and which varies between 0 and 1 for all other countries. Based on the abovementioned normalized figures, PCA has been applied to calculate the financial inclusion index for every country.

3.2.1.2. Step 2: First stage PCA

The first stage of PCA aims to estimate the dimensions, that is, the three unobserved endogenous variables D_i^A , D_i^U , and D_i^Q and the parameters in the following equations:

$$D_i^A = \gamma_1 AC 1 + \gamma_2 AC 2 + \gamma_3 AC 3 + \gamma_4 AC 4 + \epsilon_i \tag{2}$$

$$D_i^U = \alpha_1 US 1 + \alpha_2 US 2 + \alpha_3 US 3 + \alpha_4 US 4 + \epsilon_i \tag{3}$$

Where: γ and α are coefficients for the equations to be estimated for both equations, AC 1: Number of commercial bank branches per 1000 km², AC 2: Number of commercial bank branches per 100,000 adults, AC 3: Number of ATMs per 1000 km², AC 4: Number of ATMs per 100,000 adults, US 1: Number of deposit accounts with commercial banks per 1000 adults, US 2: Number of loans accounts with commercial banks per 1000 adults, US 3: Outstanding deposits from commercial banks as a % of GDP, US 4: Outstanding loans from commercial banks as a % of GDP, and ϵ_i is the error term.

3.2.1.3. Step 3: Second stage PCA

After obtaining the dimension indices, another principal component analysis is applied to derive the dimension weights for the overall financial inclusion. Following Cámara and Tuesta (2014), it is assumed that the financial inclusion index can be expressed as a linear function as follows:

$$FII_i = w_1 D_i^A + w_2 D_i^U + w_3 D_i^Q + \epsilon_i \tag{4}$$

Where FII_i : Financial Inclusion Index, D^a , D^u , and D^q capture the access, usage, and quality dimensions of financial inclusion, respectively. The subscript i denotes the country and ϵ_i : Error Term. Equation 4 states that the index of financial inclusion for the sample of the study of 43 developing countries is a weighted average of individual dimensions.

3.2.2. Model specification

The unemployment rate was regressed against the level of financial inclusion and other control variables for a sample of 35 developing countries from 2009 to 2018, to test the following hypothesis;

H_1 : Financial Inclusion has a significant negative impact on the unemployment rate in developing countries.

Therefore the econometric model used in the empirical analysis to measure the impact of financial inclusion on unemployment is as follows:

$$\text{Unempl}_{it} = \beta_0 + \beta_1 FII_{it} + \beta_2 X_{it} + \epsilon_{it} \quad (5)$$

Where: β is the coefficient of the estimated equation, Unempl_{it} is the unemployment rate, FII_{it} is the financial inclusion index, X_{it} is a vector of control variables, and ϵ_{it} is the error term of the model i and t indicate country and year, respectively. The specific form of equation (5) that is used for performing multiple regression is given by equation (6):

$$\text{Unempl}_{it} = \beta_0 + \beta_1 FII_{it} + \beta_2 \text{EDU}_{it} + \beta_3 \text{EG}_{it} + \beta_4 \text{INF}_{it} + \epsilon_{it} \quad (6)$$

Where EDU_{it} is the primary school enrollment as a proxy for the education level, EG_{it} is economic growth, INF_{it} is the inflation rate, ϵ_{it} is the error term.

The rationale underlying the above model is that better access to finance encourages and attracts entrepreneurs to offer their new business ideas, encouraging innovation and creativity in the business environment and therefore increasing the startup businesses in the market and offering more job opportunities. Moreover, Cull et al., (2014) mentioned that offering a healthy investment environment and lucrative financial inclusion strategies could help SMEs to expand, grow, get into the formal sector, and hence have access to finance since most of the those enterprises are in urgent need for having financing solutions for their businesses and secure payment systems for their daily operations.

Following Blancher (2019), education, inflation rate, and economic growth are used as control variables. The higher the educational level, the higher the level of employment, and the lower the level of unemployment (Jamir and Ezung, 2017); therefore, the coefficient of education is expected to be negative. Philips developed the concept of the Philips curve in 1958. The curve shows a trade-off between the rate of unemployment and the prices of goods and services in an economy. Philips curve indicates that there exists an inverse relationship between the unemployment and inflation rate. Therefore the coefficient of the inflation rate is expected to be negative. Rising economic growth is expected to translate into better livelihoods by improving the earnings of those

already employed as well as providing job opportunities for the unemployed (Adarkwa et al., 2017). Therefore the coefficient of economic growth is expected to be negative.

3.2.3. Empirical methodology

The modeling strategy of this study applied a dynamic two-step system GMM technique to control for potential biases associated with endogeneity after conducting several diagnostic tests.

3.2.3.1. Descriptive statistics

Before starting the regression analysis, summary statistics are performed to show the nature of the data in general, listing the mean, standard deviation, minimum and maximum values for each of the selected variables used in the model.

3.2.3.2. Diagnostic tests

Before conducting regression analysis, multicollinearity, heteroscedasticity, autocorrelation, and endogeneity assumptions should be verified to be able to use the best technique for the regression analysis. Variance Inflation Factor (VIF) is used to check for the existence of multicollinearity, Wooldridge test is used to test for the presence of autocorrelation, Likelihood ratio test is used to test for the heteroscedasticity problem, and Davidson-MacKinnon test is used to test for the problem of endogeneity.

3.2.3.3. GMM

This study adopted the two-step system GMM estimation, outlined in Arellano and Bover (1995) and fully developed in Blundell and Bond (1998), which incorporates the finite sample corrected standard errors introduced by Windmeijer (2005). Moreover, the system GMM estimator provides consistent and efficient estimates, overcomes the endogeneity problem, and is a better fit for panel studies, having fewer time points and greater numbers of individuals ($N > T$). Blundell and Bond (1998) found that system GMM has significantly smaller bias and generates more precise estimates compared to difference GMM. System GMM uses a lagged dependent variable model to assess the dynamic nature of both dependent and independent variables in the model.

Furthermore, in recent years, several studies including Ghosh (2011); Andrianaivo and Kpodar (2012); Mehrotra and Yetman (2014); Kim et al., (2017); Minhaj et al. (2019); Akanbi et al. (2020) and Burguillos and Cassimon (2020) used the two-stage system GMM to estimate the impact of financial inclusion on macroeconomic indicators such economic growth, inflation rate, and unemployment rate.

As recommended by Roodman (2006) the inclusion of time dummies makes the following assumption more valid – “the autocorrelation test and the robust estimates of the coefficient standard errors assume no correlation across individuals in the idiosyncratic disturbances.” The following equation 7 is used to investigate the impact of financial inclusion on the dependent variable; unemployment rate using the two-step system GMM estimator:

$$\text{Unempl}_{it} = \beta_0 + \beta_1 \text{Unempl}_{i,t-1} + \beta_2 FII_{it} + \beta_3 \text{EDU}_{it} + \beta_4 \text{INF}_{it} + \beta_5 \text{EG}_{it} + \alpha_i + \epsilon_{it} \quad (7)$$

Where: $Unempl_{i,t-1}$ the lagged unemployment rate, α_i represents yearly dummies to control time effects. It is important to include time effects to capture macro-economic factors that are beyond country control.

3.2.3.4. Granger causality

To further strengthen the evidence in this study, the existence of unidirectional/bi-directional causality between FII and unemployment rate is assessed using the Panel VAR Granger causality/block exogeneity Wald test.

4. EMPIRICAL RESULTS AND DISCUSSION

This section covers the analysis of data and interpretation of the results; it is divided into three sub-sections. The first sub-section explains the results of the PCA for developing the FII. After constructing the index, the results of the descriptive statistics are presented in sub-section 4.2 followed by the results of several diagnostic tests that were carried out to detect model misspecification un sub-section 4.3. The findings of the Dynamic two-step system GMM used to examine the impact of financial inclusion on the unemployment rate in developing countries are analyzed in sub-section 4.4. In sub-section 4.5, the results of the Granger Causality test are elaborated.

4.1. Developing FII using PCA

In this section, the measurement model for developing FII is conducted using STATA version 16. The measurement model depends on three main dimensions, which are: Access, Usage, and Quality. Before using PCA, indicators of each dimension are normalized to have values between zero and one to ensure that the scale in which they are measured is immaterial. Where zero indicates financial exclusion, and one indicates financial inclusion.

4.1.1. Validity and reliability results

Table 4 below shows the KMO measure values for all the nine indicators to identify the adequate indicators to be included to develop the FII.

Table 5 below shows the KMO values for the final indicators to be added to the index after deleting four items, as mentioned above. It could be observed that quality had not been included due to weak item loading (Item loading <0.49). Also, two items had been deleted from access, which are AC1 (Number of commercial bank branches per 1000 km²) and AC3 (Number of ATMs per 1000 km²), and one item had been deleted from usage, which is US1 (Number of deposit accounts with commercial banks per 1000 adults). Other items had loading greater than 0.49 and been included. Therefore the FII will include a total of 5 indicators, two indicators under the access dimension, and three indicators under the usage dimension.

Regarding the items included, it could be observed in Table 6 that all AVE values are greater than 50%, meaning that there is no problem with convergent validity. AVE value is also greater than the SC value (0.733>0.196) and (0.781>0.196); therefore, there is no problem with discriminant validity (Table 7). Cronbach's alpha is greater than 0.7 (Table 6), implying that the data under

study have adequate validity and reliability after deleting the mentioned items.

Table 8 below presents the descriptive statistics about the indicators used to measure FII.

4.1.2. First-stage PCA results

Through the PCA method, eigenvalues of each sub-index are calculated, and the latent variables: access (D_i^A) and usage (D_i^U),

Table 4: KMO values for all indicators

Variable	KMO
AC 1	0.4357
AC 2	0.7201
AC 3	0.4641
AC 4	0.7591
US 1	0.8080
US 2	0.4462
US 3	0.7629
US 4	0.8164
Q 1	0.4781
Overall	0.6293

Source: Calculated by the author on Stata 16

Table 5: KMO values for the final indicators included in the index

Variable	KMO
AC 2	0.7940
AC 4	0.6703
US 1	0.7515
US 3	0.5701
US 4	0.6117
Overall	0.6498

Source: Calculated by the author on Stata 16

Table 6: Reliability and validity for FII dimensions

FII dimensions	Items	AVE	Cronbach's alpha
Access	AC 2	0.733	0.7910
	AC 4		
Usage	US 1	0.781	0.8307
	US 2		
	US 4		

Source: Calculated by the author on Stata 16

Table 7: Squared correlations

	Access	Usage
Access	1.000	
Usage	0.196	1.000

Source: Calculated by the author on Stata 16

Table 8: Descriptive statistics for financial inclusion indicators

Variable	Observation	Mean	Standard deviation	Min	Max
Access					
AC 2	430	15.437	11.046	1.299	71.212
AC 4	430	40.398	27.606	1.531	133.791
Usage					
US 1	428	1071.303	570.517	68.695	2828.528
US 3	430	54.636	41.625	8.09	250.274
US 4	430	44.571	24.642	5.306	118.136

Source: Calculated by the author on Stata 16

are estimated as shown below in Table 9. The highest eigenvalue of the components retains more standardized variance, among others, and an eigenvalue greater than 1 is considered for the analysis (Nguyen, 2020). Table 9 shows the results of the first-stage PCA. It can be seen that the eigenvalues of the principal components for the two dimensions in the corresponding order are: 1.35; 0.64 (Access) and 2.056; 0.703; 0.236 (Usage). Except for the first principal (component 1 of the two dimensions), no other principal components have an eigenvalue greater than 1. Therefore, the first component only is taken for analysis, and the dimensions are estimated by using the weights assigned to the first principal component of each dimension.

Table 9: Principal components estimates for sub-indices

Component	Eigenvalue	Difference	Proportion	Cumulative
Access dimension				
Component 1	1.35231	0.704628	0.6762	0.6762
Component 2	0.647686	.	0.3238	1.0000
Usage dimension				
Component 1	2.05967	1.35578	0.6866	0.6866
Component 2	0.703884	0.467434	0.2346	0.9212
Component 3	0.23645	.	0.0788	1.0000

Source: Calculated by the author using PCA on Stata 16

Table 10: Scoring coefficients for orthogonal varimax rotation (weights)

Variable	Component 1	Unexplained
Access dimension		
AC 2	0.7071	0
AC 4	0.7071	0
Usage dimension		
US 1	0.4903	0
US 2	0.5887	0
US 4	0.6427	0

Source: Calculated by the author using PCA on Stata 16

Table 11: Financial inclusion indicators of countries by dimension – results of first-stage PCA

Country	Access Mean	Usage Mean	Country	Access Mean	Usage Mean
Algeria	0.232	0.456	India	0.358	0.3989
Argentina	0.276	0.324	Indonesia	0.348	0.4370
The Bahamas	0.212	0.312	Jamaica	0.181	0.2279
Belize	0.253	0.281	Jordan	0.230	0.3634
Bolivia	0.275	0.329	Kenya	0.354	0.4152
Botswana	0.236	0.265	Lebanon	0.276	0.5092
Brazil	0.246	0.426	Malaysia	0.288	0.3575
Brunei Darrusalam	0.207	0.328	Maldives	0.282	0.3440
Cameroon	0.201	0.266	Mauritius	0.238	0.4616
Chile	0.230	0.325	Mongolia	0.311	0.3212
Colombia	0.350	0.321	Namibia	0.299	0.3949
Costa Rica	0.238	0.451	Nicaragua	0.364	0.4840
Dominican Republic	0.176	0.262	Oman	0.284	0.4256
Ecuador	0.275	0.296	Pakistan	0.362	0.4186
Egypt	0.287	0.351	Panama	0.264	0.4018
El Salvador	0.201	0.270	Peru	0.243	0.3577
Equatorial Guinea	0.259	0.489	Samoa	0.272	0.3378
Eswatini	0.297	0.399	Saudi Arabia	0.253	0.4683
Fiji	0.197	0.301	South Africa	0.246	0.2651
Guatemala	0.314	0.348	Thailand	0.303	0.4960
Guyana	0.322	0.456	Trinidad and Tobago	0.313	0.4883
Honduras	0.266	0.415			

Source: Calculated by the author using PCA on Stata 16

Table 10 shows the extracted weights for each of the five indicators. Accordingly, regarding the access dimension, the weights assigned to the first component are 0.7071 for the number of bank branches per 100,000 adults (AC 2) indicator; 0.7071 for the number of ATMs per 100,000 adults (AC 4) indicator. Meanwhile, for the usage dimension, the Outstanding Loans (US 4) indicator has a higher weight (0.6427) than the Outstanding deposits (US 3) indicator (0.5887) and Deposit Accounts (US 1) indicator (0.4903). By assigning the above-extracted weights to Equations 2 and 3 (see section 3.2.1); the following Equations 8 and 9 are derived for the access and usage dimensions, respectively:

$$D_i^A = 0.7071 AC_2 + 0.7071 AC_4 + \epsilon_i \tag{8}$$

$$D_i^U = 0.4903 US_1 + 0.5887 US_3 + 0.6427 US_4 + \epsilon_i \tag{9}$$

The average value results of FI indicators by dimension are shown in the below Table 11:

4.1.3. Second stage PCA results

In the second stage, by applying the same procedure described in the first stage, the PCA method is applied to the two sub-indices (access and usage) to calculate their weights in the overall FII. The following Table 12 shows the results of principal components estimates for the composite FII. The eigenvalues of the two principal components, respectively are 1.40, and 0.599. This shows that only the first component has an eigenvalue greater than 1, so it is taken to find the weights assigned to the principal components.

Similar to the method in the first phase, weights for the two dimensions are calculated. Table 13 below shows that the PCA assigned equal weights to the access and usage dimensions (0.7071).

By assigning the above-extracted weights to Equation 4 (section 3.2.1); the following Equation 10 is derived for the overall FII, respectively:

$$FII_i = 0.7071D_i^A + 0.7071D_i^U + \varepsilon_i \quad (10)$$

By doing so, the overall FII for developing countries is estimated, as shown in Table 14:

Table 12: Principal component estimates for the overall FII

Component	Eigenvalue	Difference	Proportion	Cumulative
Component 1	1.40096	0.801928	0.7005	0.7005
Component 2	0.599036		0.2995	1.0000

Source: Calculated by the author using PCA on Stata 16

Table 13: Scoring coefficients (weights assigned to access and usage)

Variable	Component 1	Unexplained
Access	0.7071	0
Usage	0.7071	0

Source: Calculated by the author using PCA on Stata 16

Table 14: FII values computed for the period 2009-2018

Country	Year										Mean
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Algeria	11.69	11.38	11.11	11.39	12.58	14.57	15.70	15.54	16.40	16.21	13.66
Argentina	25.73	27.05	29.06	31.76	33.27	35.74	38.16	40.15	42.40	44.66	34.80
The Bahamas	56.47	54.04	55.46	52.94	56.30	55.66	52.97	56.71	52.74	53.58	54.69
Belize	35.15	34.34	33.84	33.17	33.28	31.49	30.19	31.34	29.75	30.83	32.34
Bolivia	22.23	23.35	25.15	26.68	28.74	32.10	35.17	37.42	39.73	40.42	31.10
Botswana	26.75	25.61	24.40	26.73	26.80	28.64	30.06	28.25	28.35	30.46	27.61
Brazil	46.30	48.75	51.23	62.30	65.03	65.27	64.16	68.74	66.68	66.31	60.48
Brunei Darussalam	52.84	48.32	46.52	53.36	51.03	58.19	60.61	58.80	57.00	56.82	54.35
Cameroon	0.34	0.76	1.32	1.26	8.48	8.51	9.46	9.64	9.63	14.62	6.40
Chile	60.82	61.54	65.17	67.73	68.01	70.61	71.32	71.27	71.04	72.20	69.97
Colombia	34.58	35.36	37.13	39.29	41.33	45.06	47.14	48.00	48.77	49.52	42.62
Costa Rica	46.69	46.25	49.41	50.63	56.14	59.68	57.97	62.69	65.16	66.86	56.15
Dominican Republic	29.54	30.35	31.36	32.20	34.40	36.88	39.45	40.56	40.75	40.49	35.60
Ecuador	27.15	29.27	27.87	28.09	30.03	33.32	33.10	34.34	34.63	35.25	31.30
Egypt	23.55	24.79	25.24	24.35	25.37	28.75	30.67	36.51	36.67	36.23	29.21
El Salvador	43.53	42.46	42.21	42.36	44.04	45.17	45.96	47.33	49.93	50.54	45.35
Equatorial Guinea	0.33	0.50	0.78	1.27	1.60	2.06	11.57	12.53	13.20	13.81	5.76
Kingdom of Eswatini	20.01	20.81	21.84	22.81	22.38	27.53	27.51	27.17	26.72	28.39	24.52
Fiji	35.32	35.77	35.99	35.76	38.26	41.91	44.44	47.06	37.99	37.78	39.03
Guatemala	39.35	41.67	43.73	45.91	48.62	51.74	52.45	51.82	50.73	47.25	47.33
Guyana	13.95	14.74	15.43	16.15	16.76	16.73	16.57	16.04	28.78	28.73	18.39
Honduras	35.98	34.80	36.30	38.44	39.78	42.53	42.60	43.31	43.24	44.37	40.14
India	36.70	37.93	40.08	42.30	44.78	49.01	51.90	54.27	55.78	56.14	46.89
Indonesia	25.96	26.53	30.63	36.55	40.87	42.02	43.06	44.32	48.25	49.13	38.73
Jamaica	22.53	21.81	21.46	22.54	23.11	23.80	35.63	37.91	43.17	44.93	29.69
Jordan	37.67	36.26	36.31	36.44	35.97	35.33	36.02	37.24	37.81	49.74	37.88
Kenya	8.29	10.38	11.78	12.26	15.28	19.07	21.09	34.24	34.66	37.60	20.46
Lebanon	83.60	87.87	89.83	90.08	90.02	92.25	93.48	95.67	97.01	95.68	91.55
Malaysia	71.96	72.23	73.65	75.26	77.54	77.82	76.77	75.48	74.41	74.28	74.94
Maldives	77.82	74.41	49.81	58.62	60.91	65.04	67.64	75.36	83.53	87.91	70.11
Mauritius	87.42	91.53	92.59	94.64	97.60	99.29	97.45	95.89	94.23	86.80	93.74
Mongolia	36.48	37.80	44.68	48.26	54.47	57.58	58.50	66.06	63.59	67.72	53.51
Namibia	33.90	35.08	36.39	35.41	36.77	40.92	42.82	61.45	54.86	53.23	43.08
Nicaragua	21.36	20.67	21.05	21.87	23.30	25.35	27.88	29.67	30.49	28.62	25.03
Oman	25.35	27.88	29.67	18.73	19.34	20.34	24.38	25.65	30.49	28.62	25.04
Pakistan	25.35	27.88	28.62	25.35	27.88	18.73	19.34	20.34	24.38	25.65	24.35
Panama	64.73	66.59	67.63	68.24	69.45	73.49	75.27	75.09	73.02	72.46	70.60
Peru	26.02	27.57	29.33	31.09	33.30	38.78	49.63	48.58	48.42	50.18	38.29
Samoa	25.43	26.40	27.07	28.40	32.44	33.33	32.80	38.19	39.05	40.42	32.35
Saudi Arabia	38.31	36.79	35.49	36.37	39.32	43.19	47.24	48.67	47.74	46.45	41.96
South Africa	46.09	46.40	46.39	48.54	49.55	53.00	52.36	52.41	52.43	50.51	49.77
Thailand	54.10	55.70	58.06	62.04	65.31	69.60	70.71	70.51	71.26	71.69	64.90
Trinidad and Tobago	48.98	48.12	47.33	48.43	49.45	51.58	53.24	55.27	56.03	55.67	51.41
Mean	36.89	37.39	37.87	39.21	41.14	43.29	44.99	47.15	47.70	48.34	

Source: Calculated by the author on Stata 16

Table 14 shows the computed values for the FII according to equation 10 for 43 developing countries in the period from 2009 to 2018. It could be observed that the highest value of FII (99.29) was by Mauritius in 2014, but afterward, the score started to decline to reach nearly the same value it was in 2009, meaning that from 2009 to 2018, Mauritius level of FI remained almost the same, while Lebanon had the highest FI value (95.68) in 2018.

On the other hand, it could be observed that the lowest value of FII (0.33 and 0.34) by Equatorial Guinea and Cameroon, respectively, in 2009. Nevertheless, there was progress in the level of FI in these two countries to reach 13.81 and 14.62, respectively, in 2018. The progress in Cameroon can be due to that the value of mobile banking transactions as a percentage of GDP increased from 0.08% in 2013 to 4.50% in 2016, and then to 30.24% in 2018 in

Table 15: Descriptive statistics

Variables	Observations	Mean	Standard deviation	Min	Max
Unemployment rate	350	8.029	6.021	0.489	27.447
FII	350	0.432	0.184	0.003	0.993
Primary school enrolment	350	105.858	9.943	75.4	134.52
Inflation rate	350	4.397	4.294	-1.261	34.28
Economic growth	350	1.7045	3.016	-9.442	15.154

Source: Calculated by the author on Stata 16

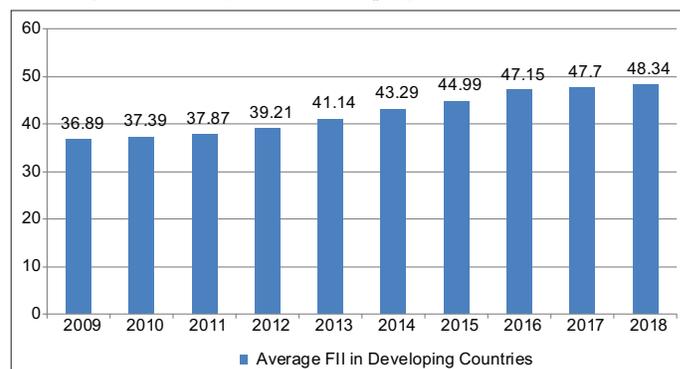
Cameroon; this reflects the importance of this phenomenon, and further explains the growth rates observed in this country (IMF, 2019).

The greatest improvement in the FII from 2009 to 2018 was by Kenya, followed by Peru. The FII in 2009 in Kenya was 8.29 and increased by 29.31 points to reach a score of 37.6 in 2018. This improvement can be due to the M-Pesa as an example of financial technology solutions adopted in Kenya. As for Peru in 2009, the FII was 26 and increased by 24.16 points to reach 50.18 in 2018. The reason behind this advancement in the level of financial inclusion is due to that Peru launched its National Financial Inclusion Strategy in July 2015 and has set an ambitious goal to expand and accelerate financial access and inclusion to 50% of adults by the end of 2018 and then to at least 75% of adults by the end of 2021 (World Bank, 2015).

The lowest change in the level of financial inclusion from 2009 to 2018 was found in Belize and The Bahamas. The FII decreased in these two countries within the ten years, where the FII in Belize was 35.15 in 2009 and declined to reach 30.83 in 2018. Belize did not have a national financial inclusion strategy within the period of the study; its National Financial Inclusion Strategy was launched in September 2019 by the Central Bank of Belize. As for The Bahamas, the FII was 56.47 and declined by almost 3 points to reach 53.58 in 2018. The Bahamas Central Bank's governor mentioned that although The Bahamas enjoys the 35th highest density of bank branches in the world and the 15th highest density of ATMs in the world relative to the size of the population, but financial access is very uneven. He specified that the reason behind this might be due to that the basic banking services are not available at many of the rural island communities. Also, the rising costs of providing banking through traditional physical channels have further scaled-back this access. Moreover, affordability of access is more constrained in property insurance markets, where financial vulnerability is heightened because of the increasing frequency and intensity of hurricanes (Hartnell, 2019).

As seen in the above Figure 2, there is an increasing trend in the FII of developing countries from 2009 to 2018 due to its increasing importance of financial inclusion, especially for developing countries in the last decade. This finding could be attributable to the genuine political will, and actions were taken by the governments of developing countries over the past decade to enhance financial inclusion.

Moreover, Figure 3 above presents the average value of FII in the 43 developing countries under study. It could be observed that Mauritius and Lebanon have the highest average FII score, while

Figure 2: Average FII in developing countries across years

Source: Author

Cameroon and Equatorial Guinea have the lowest average FII and the highest level of financial exclusion.

4.2. Descriptive Statistics

A preliminary step to the inferential analysis is the descriptive analysis presented in Table 15 below for all the variables used in the model. The average unemployment rate from 2009 to 2018 across the 35 developing countries is 0.432%. The highest unemployment rate (27.447%) was found in South Africa in 2017. The number of employed people has decreased by 237,000 to 16.3 million in the first quarter of 2017, while the number of those unemployed has increased by 62,000 to 6.2 million from the fourth quarter of 2018 (Morangi, 2019). As the growth was anticipated, at a rate of <1%, the idea that the unemployment rate would increase was anticipated. This sharp increase in the unemployment rate symbolically is unwelcome and unhealthy.

On the other hand, the lowest unemployment rate (0.489%) was in Thailand in 2013. Thailand's unemployment rate has held below 1% since 2011; the agricultural sector absorbs laborers, and those who cannot find work can always look for jobs in the informal sector or do something on their own, seek out a part-time job, and are counted as employed. The informal sector of the Thai economy, comprising anyone who is not covered by formal work agreements, accounted for more than 64% of the total workforce in 2013. It includes street vendors, taxi-motorbike drivers, and self-employed (Fernquest, 2015). The volatility from the mean value is over 6 points, showing that the unemployment rate varies enormously across developing countries.

4.3. Diagnostics Tests Results

To test for the existence of multicollinearity, the Variance Inflation Factor (VIF) test was applied. It could be observed that the VIFs of

the independent variables, FII, primary school enrolment, inflation rate, and economic growth, are <5 , as shown in the below Table 16. This outcome implies that there is no problem of multicollinearity between the independent variables assigned for the model. Moreover, to check for the existence of a heteroscedasticity problem, the likelihood ratio test is used. Table 17 below shows that the model of this study has a heteroscedasticity problem since the probability value is <0.05 .

Furthermore, to test for the existence of autocorrelation, the Wooldridge test is used. Results for the Wooldridge test are significant, as shown in Table 17 below, indicating that this model also has an autocorrelation problem as the probability value is <0.05 . Finally, the Davidson-MacKinnon test of exogeneity is applied to test for the presence of an endogeneity problem in the model under study. Results show that there is an endogeneity problem in the model as the $P < 0.05$.

4.4. Dynamic Panel Estimation Results

After constructing the FII using the PCA and applying all the diagnostic tests needed, a dynamic panel system GMM model is applied to find if financial inclusion has a significant impact on the unemployment rate in developing countries. As mentioned earlier, the two-step system GMM is used in this study. Results are presented in the below Table 18:

The system GMM results indicate that financial inclusion significantly and negatively impacts the rate of unemployment in developing countries. In other words, whenever financial inclusion increases by 1 unit, the unemployment rate will decrease by

2.21 units. By increasing access to financial services along with increasing the financial capability to use those services effectively, people can invest in their education to improve their potential to become employed or create their own employment by financing their own projects to generate income, therefore decreasing the level of unemployment. Borrowing from formal financial institutions aids households in investing in employment, creating activities such as micro, small and medium enterprises (MSMEs), increasing job opportunities, and hence decreasing the unemployment rate.

This finding is in line with Mol (2014); Sykes et al. (2016); Mugo and Kilonzo (2017); and Blancher (2019), who argued that

Table 16: Multicollinearity test

Independent variables	VIF
FII	1.08
Primary school enrolment	1.06
Inflation	1.05
Economic growth	1.06
Mean VIF	1.06

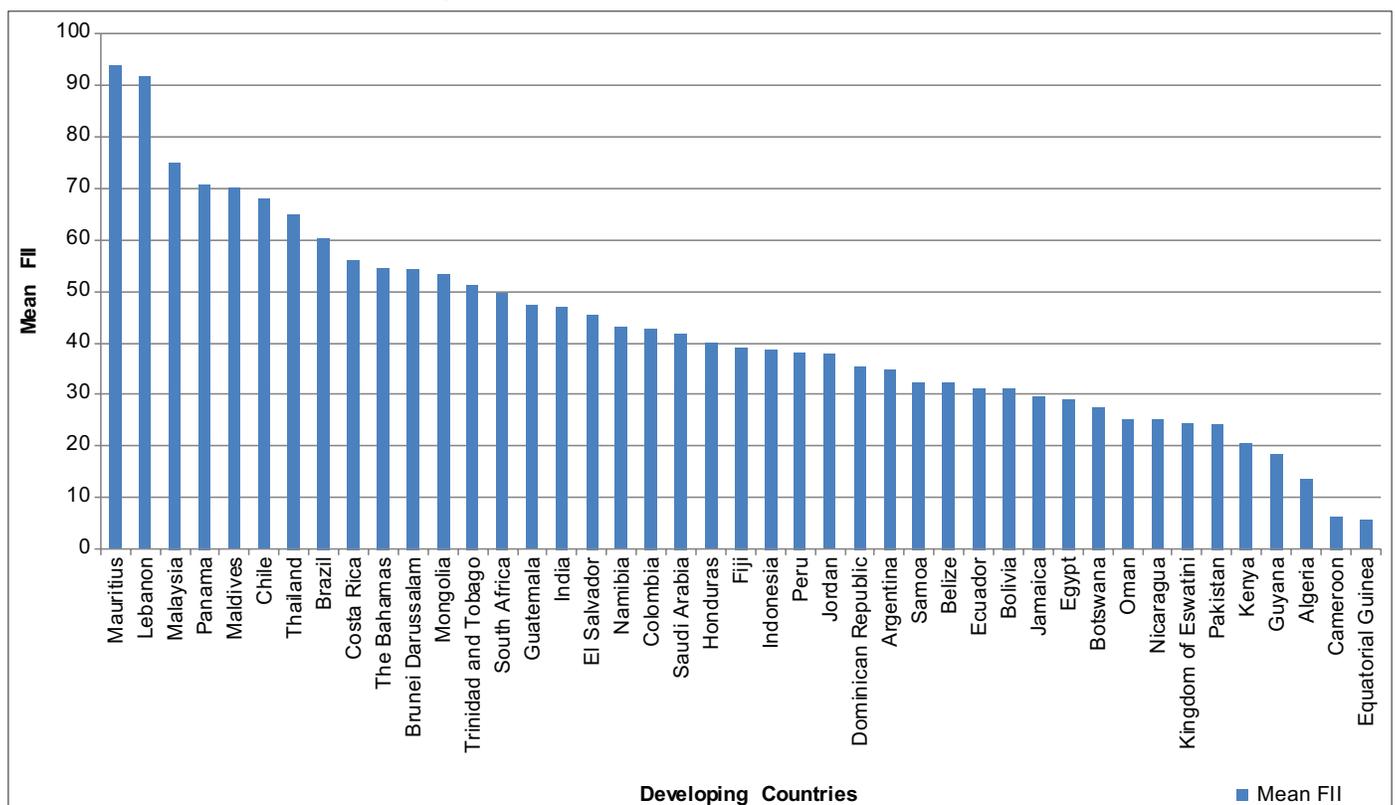
Source: Calculated by the author on Stata 16

Table 17: Heteroscedasticity, autocorrelation, and endogeneity tests

Likelihood ratio test		Wooldridge test		Davidson-MacKinnon test of exogeneity
LR Chi-square	Prob >Chi-square	F	Prob >F	P-value
623.36	0.000	70.000	0.000	0.018

Source: Calculated by the author on Stata 16

Figure 3: The mean FII of 43 countries from 2009 to 2018



Source: Author

financial inclusion reduces unemployment. Other studies found that financial inclusion positively impacts employment (Bruhn and Love, 2014). By increasing financial access and usage, startups business and entrepreneurs are attracted and encouraged to offer their new business ideas; therefore, new job opportunities are offered. On the contrary, the results contradict the view of Kim et al., (2018), who found that unemployment increases with financial development and concentration in banking markets. They argue that the increase of finance strengthens the substitution of capital for labor and/or encourages more investment in capital-intensive technologies, thereby increasing unemployment.

As for the control variables, the level of education, inflation rate, and economic growth have a significant negative impact on the unemployment rate. In other words, in order to decrease the level of unemployment in developing countries, the level of education should be increased. Also, supporting the Philips curve, it was found out that the inflation rate has a negative impact on the unemployment rate. Furthermore, rising the rate of economic growth translates into better livelihoods by improving the earnings of those already employed as well as providing job opportunities for the unemployed (Adarkwa et al., 2017).

4.5. Panel VAR Granger Causality Test Results

The causality test reported in Table 19 reveals that there is a bi-directional causality running between financial inclusion and unemployment rate. The unemployed and irregularly employed populations seem less likely to participate in the financial system. In other words, it can be concluded that the financial inclusion in developing countries affects and is affected by unemployment rate.

Table 18: GMM results

Variables	Unemployment rate
Lag unemployment rate	0.526*** (0.0107)
FII	-2.208*** (0.507)
Primary school enrolment	-0.0434*** (0.00464)
Inflation rate	-0.00824** (0.00382)
Economic growth	-0.120*** (0.00950)
Constant	9.548*** (0.564)
Observations	315
Number of countries	35
Year dummies	Yes
AR(2) test	0.198
Hansen test	0.958

Source: Calculated by the author on Stata 16. (a) Standard errors are in parentheses. (b) *Is significant at 1%, **Is significant at 5% and ***Is significant at 10%

Table 19: Results of panel granger causality test

Direction of causality	Chi-square	Degree of freedom	P-value
Unemployment rate → FII	8.057	1	0.005
FII → Unemployment rate	10.482	1	0.001

Source: Calculated by the author on Stata 16

5. CONCLUSION AND POLICY IMPLICATIONS

This paper constructed a new multidimensional financial inclusion index for 35 developing economies using weights derived from PCA in aggregating indicators for two dimensions; access and usage following Cámara and Tuesta (2014) and Park and Mercado (2018) and by using the FAS-IMF database. This index can be used to compare the extent of financial inclusion across different developing countries and to monitor their progress over time. This index can also be useful to other researchers and academics to address empirical questions concerning the impact of financial inclusion on other macroeconomic indicators such as income inequality, poverty, economic growth, and inflation rate. The highest level of financial inclusion was found in Mauritius and Lebanon. On the other hand, the highest level of financial exclusion was noticed in Cameroon and Equatorial Guinea. Therefore, financial inclusion policies in Cameroon, Equatorial Guinea, and other developing countries should be improved to allow banking services to reach the underserved segments of the population, specially SMEs and households in rural areas. This paper also assessed the impact of financial inclusion on the unemployment rate in developing countries using a dynamic panel. The estimates provided robust evidence that as the level of financial inclusion increases, the unemployment rate decreases in developing countries.

Since the unemployment rate is one of the challenges that face developing countries, governments and central banks should put too much emphasis and increase their attention and focus on increasing the level of financial inclusion, not only financial access but also financial usage, as such, increasing the degree of financial inclusion in the future would allow developing countries to reach a significant milestone. Increasing the level of financial inclusion is necessary and urgent for the continuation of economic growth (Sharma, 2016; Sethi and Sethy, 2018), decreasing the inflation rate as mentioned in previous studies (ElSherif, 2019) and reducing the unemployment rate.

The findings of this study could help in formulating better policies to reform the financial sector in developing countries, in general, by highlighting how can broadening the access and use of banking services, in particular, have a significant direct impact on the level of unemployment in developing countries. Governments should play a positive role in promoting financial inclusion by integrating it into national development strategies; additionally, the relevant legislative and regulatory work should be improved to support this achievement. Finally, the exchange of experiences between countries should be strengthened through international financial organizations, such as the Alliance for Financial Inclusion (AFI) and The Global Partnership for Financial Inclusion (GPII). These organizations must work together to promote financial inclusion in countries with high levels of financial exclusion and also in countries that didn't reach full financial inclusion yet.

The study recommends that developing countries benefit from the positive impact of financial inclusion through increasing the availability of financial services to be able to increase the level

of financial access. Initially, the banking sector, more specifically central banks, in developing countries, should focus on adopting financial inclusion initiatives aiming at increasing the number of people that have a formal financial account. This can be done by increasing access points beyond branches by providing more innovative ways of offering banking services (ATMs, mobile banking services, and digital branches). Also, banks can attract more financially excluded people into the formal financial system by reducing fees and documents required for opening an account, reducing the minimum account opening balance requirement and fees. Banks that had already adopted financial inclusion initiatives should focus on implementing and evaluating the outcome of these initiatives.

A primary step for financial inclusion is financial literacy as it increases their understanding and therefore makes people seek and receive financial services and products. Financial literacy means a high level of awareness, knowledge, and upgrade skills to make financial decisions about borrowings, savings, investments, and expenditure in an informed manner (Bhatt, 2017). It is considered an instrument to expand and broaden financial inclusion. Therefore, governments should shed light on raising awareness of financial literacy as without financial literacy, financial inclusion is meaningless and useless to the economy.

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