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Cross-Country Variation in Financial Inclusion: A Global Perspective

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Cross-country variation in financial inclusion: A global perspective

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ABSTRACT

Recent years have witnessed a global commitment to advancing financial inclusion as a key enabler for equal opportunity and reducing poverty. In this paper, we use six indicators drawn from the IMF's Financial Access Survey and two different approaches to construct a multidimensional financial inclusion index for a global sample of 95 countries over 2004-15. Results reveal an overall progress in financial inclusion over the period under study, most markedly in the use and access dimensions. Financial inclusion appears to be positively and significantly associated with the GDP per capita, banking system conditions, human development, government integrity, and internet usage. Our evidence also points to the importance of accounting for the level of national income when designing policies to boost financial inclusion.

Keywords: Financial Inclusion; Banking Conditions; Cross-Country Analysis; Principal Component Analysis.

JEL Classification: G21, G28, O11

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1 Introduction

Access to financial services is recognised globally as a key factor for economic and social development. Individuals and businesses excluded from mainstream financial services are prone to different types of risk, for instance, social exclusion and missed opportunities for business. Empirical studies have emphasised the importance of financial inclusion and the role it plays in achieving high levels of well-being and development through lowering income inequality, poverty, and consumption smoothing after adverse events such as health shocks (Aslan, Deléchat, Newiak, & Yang, 2017; Burgess and Pande, 2005; Gertler, Levine, & Moretti, 2009). Despite the global commitment and the accelerated efforts to boost more inclusive financial systems in both developed and developing countries, the research in this area remains somewhat limited. One of the difficulties relates to the identification of suitable measurement methods.

This paper contributes to the existing literature on financial inclusion in several ways. First, we construct a multidimensional financial inclusion index that incorporates three main dimensions – access, use, and depth of financial services. We employ both a non-parametric and a parametric approach, namely, a standard geometric mean and a more sophisticated principal component analysis (e.g. Cámara & Tuesta, 2014 and Park & Mercado, 2018a) that limits the problem of exogenous or equal weight assignment needed to construct previous indicators (Sarma, 2008 and Park & Mercado, 2018b). Additionally, we use six indicators from the IMF's Financial Access Survey that provides the longest time-series of financial inclusion allowing us to observe the time trend in the index at a global level.

Second, we expand the time span of the existing research on financial inclusion. Specifically, we focus on a sample of 95 economies over a relatively long time period (2004-2015) that enables us to analyse trends and perform regression analyses. Our financial inclusion index shows an overall progress over the 12 years under investigation, most

markedly in the use and access dimensions, and to a lesser extent in the depth dimension. We also find high variation in financial inclusion between countries and across different macro regions. Although financial inclusion is a universal goal, there have been initiatives focusing on countries from certain macro regions with high level of financial exclusion. These regions include Sub-Saharan Africa (SSA) and Middle East and North Africa (MENA). Analysing regional trends in our financial inclusion index, we find improvements in most of the regions over the sample period. However, European countries over-rank other regions, SSA region ranks the lowest, and East Asia and SSA have the highest growth. These variations motivate the need to investigate factors that can help explain the level of financial inclusion. A number of studies documented the importance of macroeconomic conditions, social development, technological advancements, and institutional quality in advancing financial inclusion (Honohan, 2008; Rojas-Suarez, 2010; Allen, Demirguc-Kunt, Klapper, & Peria, 2016; Demirgüç-Kunt & Klapper, 2013). Therefore, the third contribution of our paper to the extant literature is that we assess a comprehensive set of factors that may affect financial inclusion, including banking system conditions.

Finally, we test whether the impact of these factors differs across countries of different income level. The World Bank reports that there has been a significant improvement in financial inclusion as the share of adults owning an account increased from 51 per cent in 2011 to 62 per cent in 2014 and reached 69 per cent in 2017. This progress has been mainly driven by government policies and the use of technology (mobile phones and the internet). However, the variation across countries with different income levels is still considerably high; as of 2017, 94 per cent of adults have an account in high income countries, compared to 65 per cent in middle income countries and only 35 per cent in low income countries (Demirguc-Kunt, Klapper, Singer, Ansar, & Hess, 2018). Investigating how factors that may impact financial inclusion differ across high versus low income country groups is therefore

particularly important. While in some economies (e.g., the Sub-Saharan Africa region) considerable progress has been achieved mainly through new mobile accounts, other emerging economies such as India have progressed significantly in increasing the account ownership through financial institutions. High income economies, such as for example the richer European Union countries, have more inclusive financial systems not only in terms of having a bank account but also in terms of using different financial services including savings and borrowings. In fact, financial inclusion is not only about having an account; the actual usage of the account is what matters for achieving the benefits of financial inclusion.

Our main findings reveal that financial inclusion is positively and significantly associated with the GDP per capita, banking system conditions, human development, government integrity, and technology. Results are robust across the two parametric and non-parametric approaches used to construct the composite index. We also find that, in addition to the level of national income, among other factors that matter greatly in explaining the variation in financial inclusion across countries is technology proxied by internet usage. This is a useful set of results for policy-makers, particularly in relation to banking system features, social, and technological factors that should be prioritised to achieve greater financial inclusion.

The remainder of the paper is structured as follows. Section 2 presents a review of the relevant literature. Section 3 details the data and the empirical approach that we follow to measure financial inclusion and to test its determinants. Section 4 presents the empirical results. Section 5 concludes.

2 Selected literature review

In this section, we first review how existing empirical research captures financial inclusion, including single and composite measures. In the second part, we discuss the studies that examine the determinants of financial inclusion.

2.1 Measuring financial inclusion

The existing research on financial inclusion has suggested various approaches to measuring its extent. One strand of the literature focuses on single measures of financial inclusion. The most widely used single measure is the proportion of adults that have an account (including transactions, savings, or loan accounts) at a bank or other formal financial intermediary (Allen et al., 2016; Honohan, 2008; Rojas-Suarez, 2010; Demirgüç-Kunt & Klapper, 2013; Beck, Demirguc-Kunt, & Pería, (2007); Owen & Pereira, 2018). Another single measure of financial inclusion is account "usage" that captures the frequency or the volume of account use (Allen et al., 2016; Demirguc-Kunt, Klapper, & Singer, 2013). Beyond account-related measures, branch penetration and mobile money have been used to capture the extent of financial inclusion (Ardic, Heimann, & Mylenko, 2011; Demirgüç-Kunt & Klapper, 2013).

Another strand of literature proposes composite indices of financial inclusion capturing its multidimensional and complex nature. Studies in this strand commonly combine at least two dimensions of financial inclusion – (i) use captured by the size of "banked" population, that is, the proportion of people with an account at a formal financial institution; and (ii) access captured by the presence of physical points of financial services, that is, the number of branches and ATMs (Mialou, Amidzic, & Massara, 2017; Park & Mercado, 2018a, 2018b; Sarma, 2012; Chakravarty & Pal, 2013; Cámara & Tuesta, 2014). Some of the studies incorporate a third dimension in the financial inclusion index – most commonly, the depth dimension that captures the extent of the utilisation of financial services by the population, that is, the volume of loans and deposits (Sarma, 2012; Chakravarty & Pal, 2013; Park & Mercado, 2018a). Barriers to financial inclusion in the form of distance, affordability, and lack of trust in the financial system, have also been included in the financial inclusion index

as a third dimension (Cámara & Tuesta, 2014).[§] When constructing a composite index of financial inclusion, two common approaches have been alternatively used in the literature. Some studies use the non-parametric approach, where the weights for the components of the financial inclusion index are assigned exogenously, based on a judgement element (Sarma, 2008, 2012; Chakravarty & Pal, 2013). Other studies use the parametric approach that allows for the weights to be assigned endogenously, based on the information structure of the data (Camara & Tuesta, 2014; De Sousa, 2015; Park & Mercado, 2018a).

2.2 Financial inclusion determinants

The literature on the determinants of financial inclusion has examined both the individual- and country-level characteristics. This section reviews studies examining country-level determinants of financial inclusion as these are directly relevant to the current research.[**]

Among the first studies that explore the driving forces behind cross-country variation in financial inclusion, Beck et al., (2007) find that factors such as the level of the economic development, the quality of the institutional environment, the strength of the informational environment of credit markets, and the development of the physical banking infrastructure are positively associated with financial outreach (that is, access to and use of financial services) and depth. At the same time, the association is found to be negative for the cost of contract enforcement and the degree of government ownership of the banking sector. The research that

[§] The literature on financial inclusions uses different terms for the dimensions. For example, the proportion of people with a financial account has also been classified as access (Park & Mercado, 2018a), whereas the number of branches and ATMs as availability or outreach (Sarma, 2012; Mialou et al., 2017; Park & Mercado, 2018a).

[**] Studies examining individual-level factors that influence financial inclusion show that the most important determinants are employment, income, housing tenure, marital status, age, gender, and education (Devlin, 2005; Demirguc-Kunt, Klapper, & Randall, 2013). Also, geographic research on financial exclusion suggests that neighbourhood dynamics and location play an important role in determining financial access. For instance, disenfranchised areas and areas with increased number of minorities and immigrants tend to be neglected by banks (Graves, 2003; Joassart-Marcelli & Stephens, 2009).

followed provided further evidence on the importance of benign economic conditions (Ardic et al., 2011; Demirgüç-Kunt & Klapper, 2013; Park & Mercado, 2018b; Rojas-Suarez, 2010), social development (Rojas-Suarez, 2010; Park & Mercado, 2018b; Honohan, 2008), institutional quality (Allen et al., 2016; Rojas-Suarez, 2010; Park & Mercado, 2018b; Honohan, 2008; Owen & Pereira, 2018), and technological infrastructure (Honohan, 2008; Arun & Kamath, 2015) for enhancing financial inclusion. There is also a consensus in the literature on the existence of an important relationship between a country's financial architecture and financial inclusion (Allen et al, 2016). One of the channels through which this relationship can exist is through competition. Higher competitive pressures can incentivise innovation and expansion of financial services, lower their cost, and expand the risk spectrum of customers, thereby fostering financial inclusion (Love & Pería, 2014; Owen & Pereira, 2018). Another channel is bank concentration; however, the empirical evidence on its association with financial inclusion is mixed. Some studies suggest that high level of bank concentration may deter the competitive incentives for banks to provide financial services to smaller businesses and riskier individuals (Ardic et al., 2011; Demirgüç-Kunt & Klapper, 2013). Other studies find evidence to suggest that larger banks in concentrated markets can be more efficient through economies of scale which in turn can incentivise them to provide financial services to households and small enterprises (Owen & Pereira, 2018). Empirical evidence also suggests that restrictions on banking activities and capital stringency can limit the creation of new financial products and services and the use of innovative financial instruments, thereby impairing financial inclusion (De Sousa, 2015; Rojas-Suarez, 2010).

To conclude, while the country-level characteristics discussed above have been found to be important factors for fostering financial inclusion, the literature also suggests that it is not sufficient to develop only one factor, nor it is always necessary to develop all factors to reach

financial inclusion, and that combinations of certain factors might be the optimal solution (Kabakova, & Plaksenkov, 2018).

3. Data and methodology

3.1 Data

To examine the determinants of financial inclusion, we compile a cross-country dataset for the period 2004-2015 using several sources. The data for constructing the financial inclusion index are drawn from the IMF Financial Access Survey (FAS) that contains supply-side annual data and covers the use and access dimensions; for the depth dimension, we use the Global Financial Development database. The data on the macroeconomic and technological factors are obtained from the World Bank Development Indicators (WDI). Banking conditions data are drawn from the Global Financial Development Database, Heritage Foundation, and World Bank Surveys on Bank Regulation (Barth, Caprio, & Levine, 2013).[††] The socioeconomic data are obtained from the UN Human Development reports and the institutional environment data from Heritage. Appendix B summarises the data sources.

When compiling the dataset, we start with all the 189 countries included in the Financial Access Survey. We first exclude countries with population lower than 100,000 adults.[‡‡] We then drop observations with missing values for any of the variables used to construct the financial inclusion index. This selection procedure results in a sample of 95 countries covering the 2004-2015 period. To mitigate the influence of outliers, all variables are winsorised at the top and bottom 1 per cent of the distribution.

[††] The World Bank Surveys on Bank Regulation were conducted in 1999, 2003, 2007, and 2011; therefore, we fill in the remaining years during our sample period with data from the preceding surveys.

[‡‡] These countries include Palau, San Marino, St. Kitts and Ne, Marshall Islands, Dominica, Seychelles, Antigua and Barb, Aruba, Kiribati.

3.2 Variables

3.2.1 Financial inclusion index

In this study we combine in one index three dimensions of financial inclusion: use, access, and depth. The use dimension is used to reflect the outreach of financial services to adults, which we capture employing two indicators: the number of deposit accounts and the number of loan accounts, both per 1,000 adults. For the access dimension, we consider the demographic outreach of banks' physical outlets using two indicators: the number of branches and the number of ATMs, both per 100,000 adults. The depth dimension refers to the actual usage of financial services, which we capture using two indicators: bank deposits and domestic credit to private sector by banks, both scaled by GDP.

To construct the financial inclusion index, we use a three-step procedure commonly followed in literature (for example, in the context of well-being indices such as the Human Development Index, financial development indices (Svirydzenka, 2016), and financial inclusion indices (Park & Mercado, 2018a).

We use a non-parametric approach to derive an equally-weighted composite index. Specifically, in the first step, we normalise the six indicators of financial inclusion using empirical normalisation to arrive at a common scale ranging from 0 to 1:

$$I_{i,t,c}^{n} = \frac{I_{i,t,c} - Min\ (I_i)}{Max\ (I_i) - Min\ (I_i)} \tag{1}$$

where $I_{i,t,c}$ is the value of financial inclusion indicator *i* in period *t* for country *c*. $Min\ (I_i)$ and $Max\ (I_i)$ are the minimum and maximum value, respectively, for indicator *i* over the sample period for all sample countries. Therefore, the normalised value represents the indicator's deviation from the minimum and maximum limits across the sample, that is, it relates a country's extent of financial inclusion to the global minimum and maximum across all

countries and years. A higher value of $I_{i,t,c}$ within the [0; 1] range indicates greater financial inclusion.

In the second step, the six normalised indicators are used to calculate three dimensional indices - use index, access index, and depth index. Each dimensional index is derived by taking the arithmetic mean of the two corresponding indicators. In the final third step, the three-dimensional indices are aggregated into the composite financial inclusion index using the geometric mean as follows:

$$\boldsymbol{Financial\ inclusion\ index} = (\boldsymbol{Access\ index} \times \boldsymbol{Use\ index} \times \boldsymbol{Depth\ index})^{\boldsymbol{1/3}} \quad (2)$$

The construction of the financial inclusion index is summarised in Appendix A.

3.2.2 Determinants of financial inclusion

We examine five categories of factors in their relation to financial inclusion at the country level: (i) macroeconomic factors, (ii) banking system conditions, (iii) institutional environment, (iv) socioeconomic factors, and (v) technological factors.

Within the first category, we use the GDP per capita in logarithm form, *GDP per capita*, as a measure of income. We expect this variable to be positively associated with financial inclusion, as people in countries with a higher level of income tend to be more integrated into the financial system (Ardic et al., 2011; Owen & Pereira, 2018). We next include the level of unemployment in the country, *Unemployment,* measured as the share of total labour force without work and actively seeking employment. We expect a negative association between this variable and financial inclusion, as the unemployed population is less likely to be included or even motivated to participate in the financial system whereas formally employed individuals might be required to have a bank account to receive salary (Allen et al., 2016). We also include the level of general inflation in the economy, *Inflation*, captured by

the GDP deflator. To the extent that inflation creates uncertainty in the economy and hence may adversely affect both the demand for and supply of financial services, we expect this variable to be negatively associated with financial inclusion (Rojas-Suarez, 2010; Allen et al., 2014).

Turning to the second category, we include a set of factors that capture a country's banking system conditions. These factors include the competitive conditions in the banking sector, *Boone indicator*, captured by the commonly used Boone indicator that measures the degree of competition as the elasticity of profits to marginal costs (Leuvensteijn, Sørensen, Bikker, & Rixtel, 2013; Schaeck, & Cihák, 2014). We expect this variable to be negatively related to financial inclusion as higher competitive pressures (lower Boone indicator) can incentivise banks to innovate and expand their financial services, to lower the cost of their financial services, and to reach out to relatively riskier borrowers (Love & Pería, 2014, Owen & Pereira, 2018). We also consider a structural measure that is the banking system concentration, *Bank concentration*, calculated as the share of deposits of the five largest banks in total banking system deposits. The literature provides mixed evidence in terms of the relationship between concentration and financial inclusion. High levels of concentration in a banking sector can be negatively related to financial inclusion if banks become less motivated to assess the quality of and subsequently lend to relatively riskier potential borrowers due to the lack of competitive incentives (Demirgüç-Kunt & Klapper, 2013). On the other hand, banks in a highly concentrated banking sector can achieve higher efficiency through economies of scale and thus be more motivated to invest in information acquisition and hence provide more opportunities for riskier borrowers borrowers (Owen & Pereira, 2018; Petersen & Rajan, 1995). Besides concentration and competition, we examine international differences in the stringency of bank capital regulation and the extent of financial freedom. For the former, we use a capital regulatory index, *Capital regulation*, which is a summary measure of

capital stringency derived as the sum of initial capital stringency and overall capital requirements. On the one hand, it can be expected that higher capital stringency can increase banks' costs and hence discourage them from investing in riskier / smaller customers, subsequently leading to lower financial inclusion (De Sousa, 2015). On the other hand, it can be argued that better capitalised banks have access to cheaper funding and hence more resources for their customers. Additionally, capital stringency can be considered as an indicator of banks' soundness which in turn might encourage customers to engage in the financial system (Rahman, 2014). To capture the extent of an economy's financial freedom, we use a composite index, *Financial freedom*, that draws on the degree of government regulation of financial services, state intervention in financial institutions through direct and indirect ownership, financial and capital market development, government influence on the allocation of credit, and openness to foreign competition. We expect this variable to have a positive association with financial inclusion as government control can deter the ease of access to and provision of financial services (Beck et al., 2007; Rojas-Suarez, 2010).

Our third category of financial inclusion determinants captures the institutional environment in the form of government integrity. We use an indicator, *Government integrity*, based on the perceived levels of public sector corruption. We expect this variable to be positively associated with financial inclusion, as low corruption in a country can facilitate the development of the financial system and strengthen confidence in public institutions (Beck et al., 2007; Rojas-Suarez, 2010; Demirgüç-Kunt & Klapper, 2013; Honohan, 2008; Clausen, Kraay, & Nyiri, 2011). Similarly, more financial inclusion can mitigate corruption, as recently pointed out by Rajan (2014) in relation to the Indian case.

In the fourth category, we broadly capture the socioeconomic environment using the human development index, *HDI*, a composite of the three key dimensions of human development – health, education, and standard of living. We expect this variable to be

positively associated with financial inclusion (Kabakova & Plaksenkov, 2018). For example, the education component of the HDI can be linked to financial literacy that has been shown to improve the ability of consumers to make informed financial decisions (Klapper, Lusardi, & Panos, 2013).

In the fifth category we introduce technological factors. Our proxy for technology is the percentage of population using the internet, *Individuals using internet*. We expect this variable to have a positive association with financial inclusion (Kabakova & Plaksenkov, 2018; Honohan, 2008; Park & Mercado, 2018a). Diffusion of the internet to deliver financial services in both developed and developing countries can deepen financial inclusion by improving access to credit and deposit facilities, providing more efficient allocation of credit, facilitate financial transfers and other financial services like for example insurance products. This can ultimately result in more opportunities to participate in the formal financial sector for the unbanked population (e.g., Kpodar & Adrianaivo, 2011).

The construction of the variables is summarised in Appendix B.

3.3 Model specification

To examine the association between financial inclusion and the country-level factors, we use the following model in a panel setup:

$$
\begin{aligned}
&Financial\ inclusion_{c,t} \\
&\quad = a + \beta_1 GDP\ per\ capita_{c,t-1} + \beta_2 Unemployment_{c,t-1} + \beta_3 Inflation_{c,t-1} \\
&\quad + \beta_4 Bank\ concentration_{c,t-1} + \beta_5 Boone\ indicator_{c,t-1} \\
&\quad + \beta_6 Capital\ regulation_{c,t-1} + \beta_7 Financial\ freedom_{c,t-1} \\
&\quad + \beta_8 Government\ integrity_{c,t-1} + \beta_9 HDI_{c,t-1} \\
&\quad + \beta_{10} Individual\ using\ internet_{c,t-1} + c_c + c_t + u_{ct}
\end{aligned}
\tag{3}
$$

where the dependent variable, 〖Financial inclusion〗_(c,t), is the financial inclusion index of country c at time t, c_c and c_t are country and time fixed effects, respectively, and u_ct is the error term. The model is estimated using ordinary least squares. The independent variables are lagged by one period to control for potential endogeneity issues. Standard errors are clustered at the country level to control for serial correlation of errors and heteroscedasticity (Petersen, 2009). The correlation matrix for the variables used in the main specification is provided in Appendix C.

4 Results

4.1 Summary statistics

Table 1, Panel A, reports the descriptive statistics for the variables used in the baseline regression analysis. Looking at financial inclusion, the mean number of deposit accounts (1,092 per 1,000 adults) is substantially higher than that of loan accounts (294 per 1,000 adults). In terms of volumes, bank deposits total around 50 per cent of GDP, whereas domestic credit to the private sector around 45 per cent. The mean number of branches and ATMs across sample countries is approximately 17 and 35 per 100,000 adults, respectively. The data show a high variation in the level of financial inclusion across the sample countries, most noticeably in the number of deposit accounts where the minimum is 13 (Cameroon, Rwanda, and Central African Republic) and the maximum is 7,211 (Japan) per 1,000 adults. The mean of the composite financial inclusion index is 0.20 which is relatively low compared to the maximum of 0.68 (Spain).[§§]

Panel B of Table 1 reports the statistics on financial inclusion distinguishing between high and upper-middle income countries (referred to as high income countries hereafter) and

[§§] Appendix D reports the list of the sampled countries ranked by the financial inclusion index.

low and lower-middle income countries (referred to as low income countries hereafter). As expected, the data show that high income countries are more financially inclusive across all the indicators, with the most significant difference observed in the number of ATMs and loan accounts.

< Insert Table 1 about here>

Table 2 presents the time trend for the financial inclusion indicators used in the construction of the composite index over the sample period. On average, we observe a stable growth in financial inclusion over the period, except for the years 2008-2012 when the financial inclusion indicators remain stable or decline. The latter can be a consequence of the global financial crisis, the Euro sovereign debt crisis, and for some countries, a greater focus on unconventional monetary policies. The highest growth over the sample period is observed in the number of loan accounts and ATMs, whereas among the slowest growth rates is that of depth measures. The growth is also slow in the number of branches which can be linked to cost cutting strategies particularly in the recession period and most importantly, to the diffusion of internet banking and move towards cashless transactions, particularly in developed countries (Demirguc-Kunt et al., 2018).

< Insert Table 2 about here>

Figure 1 shows the time trend in financial inclusion over the sample period for the composite index and by the dimensional indices. The progress appears most prominent in the use and access dimensions and to a lesser extent in the depth dimension.

< Insert Figure 1 about here>

Figure 2 and 3 present the time trend in the composite financial inclusion index for the sample countries by income group and macro region, respectively. As expected, the data show that high income countries, on average, over-rank low income countries. The growth in financial inclusion before the financial crisis period is more pronounced for high income countries, whereas it grows faster and more steadily in low income countries after 2012. As shown in Figure 3, European countries, on average, over-rank other regions, Sub-Saharan Africa region ranks the lowest[***], and other regions show moderate growth in financial inclusion.

< Insert Figure 2 about here>

< Insert Figure 3 about here>

4.2 Baseline regression analysis

To examine the link between financial inclusion and country-level characteristics we estimate our baseline model in Equation (3). Results are reported in Table 3. In Model (1), we test macroeconomic factors including the GDP per capita, unemployment, and inflation. In Model (2), we introduce banking system conditions related to the structure, competition, capital regulation, and financial freedom. In Model (3), we add institutional environment

[***] We acknowledge that mobile money played an important role in improving account ownership in Sub-Saharan Africa, and can be used to improve financial inclusion in developing economies, rural areas, and conflict-affected areas. However, we do not include this indicator in our analysis due to limited data availability, in addition to our focus on banks (formal sector) that are regulated and monitored.

measured by government integrity. In Models (4) and (5) we include, respectively, the socioeconomic factors captured by the human development index; and technology, proxied by individuals using the internet.[†††] All model specifications are estimated using ordinary least squares (OLS) and include country and time fixed effects. Standard errors in all estimations are clustered at the country level.

< Insert Table 3 about here>

Among the macroeconomic factors, the coefficient on the GDP per capita is positive and statistically significant, thereby suggesting that the countries' level of income is positively associated with financial inclusion. The negative and significant coefficient on unemployment confirms the expectation that higher employment in a country is positively associated with the level of financial inclusion. We also find evidence of a negative association with the rate of increase in prices. This is in line with the expectation that high and volatile inflation rates, tend to be detrimental to financial inclusion (e.g. Allen et al., 2014; Yetman, 2018).

Focusing on the banking system conditions, we find a negative and statistically significant coefficient on the Boone indicator, which shows that greater competition in the banking sector (a lower Boone indicator) is associated with greater financial inclusion. This finding can be linked to the view that high competition fosters access to finance by lowering the cost of finance and increasing the availability of financial services (Love & Pería, 2014; Owen & Pereira, 2018). As to the concentration, the coefficient is positive and significant. This supports the argument that banks operating in more concentrated banking sectors are

[†††] In Models (3)-(5), we alternatively add government integrity, the human development index, and number of individuals using the internet and omit GDP per capita to avoid multicollinearity due to high correlation among these variables. The correlation matrix is reported in Appendix C.

more motivated to invest in information acquisition and hence provide more opportunities for riskier borrowers (Owen & Pereira, 2018; Petersen & Rajan, 1995). Further, we find some evidence of a positive association between bank capital regulation and financial inclusion. This suggests that greater capital stringency lowers banks' cost of funding and enhances customers' confidence in banks' soundness, thereby fostering financial inclusion (Rahman, 2014). We also find evidence of the expected positive relationship between financial freedom and financial inclusion. Taken together, the latter two findings suggest that financial inclusion can be fostered through stringent regulation but without limiting the freedom of financial institutions in their provision of financial services.

Turning to the institutional environment, the coefficient on government integrity is positive and statistically significant. This indicates that lower perceived public sector corruption (higher government integrity) is associated with greater financial inclusion. As to the socioeconomic environment, the coefficient on the HDI is positive and significant and shows the highest magnitude. This suggests that, as expected, human development in terms of health, education, and standard of living has a strong positive association with financial inclusion.

Finally, with regard to the technological factors, we find a positive and significant coefficient on the individuals using the internet, which provides evidence of the positive association between technology and financial inclusion.

4.3 Principal component analysis

To further corroborate the baseline findings, we re-construct the financial inclusion index using a two-stage principal component analysis (PCA). This parametric approach avoids the assignment of exogenous or equal weights to the components and has been applied in the construction of financial inclusion and development indices (Cámara & Tuesta, 2014; De Sousa, 2015; Svirydzenka, 2016; Park & Mercado, 2018a).

In the first step, in line with our baseline approach where we use the geometric mean approach, we normalise the six indicators of financial inclusion (Equation (1)). In the second step, we use a principal component analysis to assign weights to the normalised indicators in their respective dimensional indices (the first stage of the PCA). We then estimate each dimensional index as a weighted average of the two corresponding indicators using the assigned weights. In the third step, we apply the above procedures to the derived dimensional indices (the second stage of the PCA) to construct the aggregate financial inclusion index as follows:

$$\boldsymbol{Financial\ inclusion\ index} = \boldsymbol{w_1} \times \boldsymbol{Access\ index} + \boldsymbol{w_2} \times \boldsymbol{Use\ index} + \boldsymbol{w_3} \times \boldsymbol{Depth\ index} \quad (4)$$

where w is the weight assigned to a dimensional index in the principal component analysis. Finally, we normalise the derived financial inclusion index using Equation (1).

Table 4 reports the weights assigned by the PCA in both stages. In the access index, the weight assigned to the number of branches is 59 per cent compared to 41 per cent assigned to the number of ATMs; in the use index, the number of deposit accounts outweighs (63 per cent) the number of loan accounts (37 per cent); and the domestic credit to GDP has a greater weight (57 per cent) in the depth index than deposits to GDP (43 per cent). Looking at the aggregate financial inclusion index, the largest weight of 41 per cent is assigned to the depth dimension, followed by roughly equal weights (around 29 per cent) for the access and use dimensions.

<Insert Table 4 about here>

We next re-estimate the baseline regressions with the financial inclusion index constructed using the PCA as dependent variable. The results are reported in Table 5 and they largely confirm the findings of the baseline specification. Specifically, financial inclusion is positively related to the GDP per capita, bank concentration, capital regulation, financial freedom, government integrity, HDI, and individuals using the internet. On the other hand, financial inclusion is negatively related to the unemployment, inflation, and Boone indicator.

< Insert Table 5 about here>

4.4 Country income level

In this section we examine whether the association between financial inclusion and the country-level factors varies across countries with different income level. To do so, we first re-construct the financial inclusion index separately for the two sub-samples: high (and upper-middle) income countries and low (and lower-middle) income countries. We use the three-step procedure described in Section 3.2.1; however in this case the minimum and maximum values used in the normalisation of the six financial inclusion indicators (that is, $Min\ (I_i)$ and $Max\ (I_i)$ in Equation (1)) represent the minimum and maximum values over the sample period across all countries in the respective sub-sample.

We next verify our baseline findings by estimating Equation (3) with the re-constructed financial inclusion index as the dependent variable. The results are reported in Table 6, Models (1) – (3), and are consistent with the main results in Table 3, Models (3) – (5).

We then proceed to test whether the results vary with the country's income level. In so doing, we augment Equation (3) with interaction terms between the country-level determinants of financial inclusion and a low-income group dummy, Low Income Group,

which takes the value of one for the countries with low (and lower-middle) income. The results are reported in Table 6, Models (4) – (6).

< Insert Table 6 about here>

We find a positive and statistically significant coefficient on the interaction term between unemployment and low income. However, it should be noted that since the uninteracted coefficient for the variable unemployment is negative, these results imply that unemployment has a "less negative" association with financial inclusion in low income countries. This may suggest that for high income countries unemployment is generally low and stable and hence more influential for financial inclusion. It also signals that other factors appear more important in explaining inclusion in low income countries. For example, the coefficient on the interaction term between inflation and low income is negative and significant, whereas the coefficient on inflation becomes insignificant. This suggests that the negative association between inflation and financial inclusion holds only in low income countries.

We also find evidence to suggest that the estimated positive association between competition and financial inclusion is mainly driven by the low income countries, as suggested by the negative and significant coefficient on the interaction between the Boone indicator and low income and the insignificant coefficient on the Boone indicator (Model (6)). Finally, we find a positive and significant coefficient on the interaction term between individuals using the internet and low income. This indicates a significantly stronger positive association between technology and financial inclusion in low income countries. This finding supports the use of technology for expanding financial access, especially in developing countries such as the introduction of mobile accounts in Kenya (Demirguc-Kunt et al., 2015).

Other countries use digital technology to lower barriers to account ownership, such as the use of biometric identification in India that helped individuals that lack proof of identity to own a bank account (Demirguc-Kunt et al., 2018).

We find no variation in the association between financial inclusion and the remaining banking system conditions, institutional environment, and socioeconomic factors across the two groups of countries, as suggested by the insignificant coefficients on the corresponding interaction terms.

Taken together, the results of this test imply that, when designing policies to enhance financial inclusion, the level of national income should be taken into account, as the most important factors enabling financial inclusion and hence to be supported and promoted might vary across countries of different income level.

4.5 Robustness tests

We conduct a number of robustness tests that allow us to verify whether our main results are robust to changes in the index construction and sample period.

First, we follow the methodology used in the construction of the human development indices in setting the minimum and maximum values for our six financial inclusion indicators as the "natural zeros" and "aspirational targets", respectively.[‡‡‡] For the minimum values we naturally use zeros for all the indicators. As for the maximum values, in the use dimension, we intuitively set the aspirational target for the number of deposit accounts and the number of loan accounts to one respective account per adult (or 1,000 accounts per 1,000 adults given the scale of the indicators). In the access dimension, we set the aspirational target for the number of branches and the number of ATMs equal to the 90th percentile of the distribution.

[‡‡‡] While we winsorise all variables at the top and bottom 1 per cent of the distribution, this test also provides an additional control for the potential effect of outliers in distorting the scale of the index (Sarma, 2012).

In the depth dimension, we set the aspirational target for credit to the private sector to GDP as 100 per cent based on the evidence that the positive effect of financial depth on economic growth vanishes when credit to the private sector reaches that level (Arcand, Berkes, & Panizza, 2015); for the bank deposits to GDP we use the 90th percentile of the distribution as the target level.

We next re-construct the financial inclusion index following the three-step procedure described in Section 3.2.1 and using the set natural zeros and aspirational targets as the minimum and maximum values in the normalisation of the six financial inclusion indicators (that is, $Min\,(I_i)$ and $Max\,(I_i)$ in Equation (1)). We then re-estimate the baseline model (Equation (3)) using the re-constructed index. The results are reported in Table 7. The estimated coefficients are consistent with our baseline findings.

< Insert Table 7 about here>

We also conduct a number of untabulated tests. Among those, we set the maximum values for all the indicators of financial inclusion as the 90th percentile of the sample distribution. We also control for the potential impact of the financial crisis and the ensuing unconventional monetary policy on financial inclusion by dropping the crisis years 2008-2009 from our sample.[§§§] The results of the tests are largely consistent with our baseline findings.

[§§§] This is a crucial exercise because during a crisis changes in deposits may stem from various factors including "flight to quality" of capital from troubled countries to safer ones. This occurred for example during the eurozone crisis when capital fled from the eurozone to Japan (Azis and Shin, 2014). In other cases deposits may have reduced because investors shifted to non-bank investments products, such as money market mutual funds.

5 Conclusions

Increasing financial inclusion is essential to drive development and can bring many associated benefits in reducing poverty and promoting prosperity. Hence, it is important to have a measure of financial inclusion that is comparable across economies and time to be able to monitor progress. In this study we use six indicators drawn from the IMF's Financial Access Survey and two different approaches (geometric mean and the more sophisticated principal component analysis) to construct a multidimensional financial inclusion index for a global sample of 95 countries over 12 years (2004-15).

Our results suggest considerable progress in financial inclusion over the period under investigation, most markedly in the use and access dimensions. At macro regional level, it appears that Sub-Saharan Africa and South Asia countries have all been characterised by substantial improvements over time. However, our data show that countries in the SSA region are still lagging behind and the gap remains significant.

We examine the impact of different macro, socio-economic, and other important factors that may affect financial inclusion. Our findings suggest that financial inclusion is positively and significantly associated with the GDP per capita, banking system conditions, human development, government integrity, and internet usage. Our evidence also highlights the importance of accounting for the level of national income when designing policies to boost financial inclusion.

There are several policy implications that can be drawn from the findings of this paper. There is no doubt that to enhance financial inclusion considerable improvements are needed in a number of country-level characteristics and economic factors. Our study clearly points to the importance of banking system conditions and digital technology. Policy-makers worldwide should consider taking more action, particularly in countries with lower income, to improve the environment for bank competition in conjunction to greater financial inclusion.

We contend that the benefits from pursuing these objectives at the same time are potentially substantial: from more efficient allocation of credit resources to greater use of the formal and regulated financial sector, as well as more access to a wide variety of financial products and services at a reasonable price.

We observe in our study that financial inclusion is not only about having an account; the actual *usage* of financial services that are made available matters hugely for achieving the benefits of financial inclusion. It follows that, in addition to the focus on the supply side, policy-makers globally should continue to have high in their agendas targeted programmes, especially in low income countries aimed at improving financial education. In addition, given the clear indication from our findings of the importance of technology for financial inclusion, we recommend that authorities globally work together to design ways to narrow the digital gaps in our modern societies. This would certainly have many wide benefits including facilitating financial inclusion. Ideally, financial literacy programmes should also include basic technology skills for facilitating greater digital literacy.

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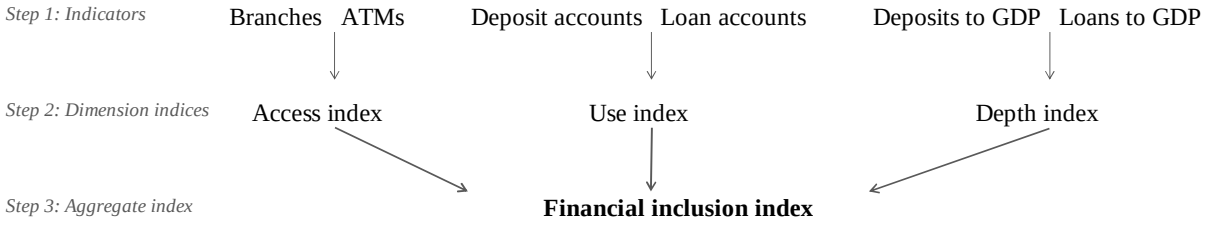
Appendix A: Financial inclusion index



Appendix B: Variables definitions and data sources

Variables	Definition	Source
Financial inclusion		
Financial inclusion index	An aggregate financial inclusion indicator at country level based on three dimensions: use, access, and depth. It ranges from 0 to 1, with a higher value indicating greater financial inclusion.	Author's calculations
Use	Deposit accounts with commercial banks (per 1,000 adults).	FAS
	Loan accounts with commercial banks (per 1,000 adults).	FAS
Access	Branches of commercial banks (per 100,000 adults).	FAS
	ATMs (per 100,000 adults).	FAS
Depth	Bank deposits (% of GDP).	GFDD
	Domestic credit to private sector by banks (% of GDP).	GFDD
Macroeconomic factors		
GDP per capita	Gross domestic product divided by mid-year population (Log).	WDI
Unemployment	Share of the total labour force that is without work but available for and seeking employment (%).	WDI
Inflation	Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.	WDI
Banking system conditions		
Boone indicator	A measure of degree of competition based on profit-efficiency in the banking market. It is calculated as the elasticity of profits to marginal costs. An increase in the Boone indicator implies a deterioration of the competitive conduct of financial intermediaries.	GFDD
Bank concentration	The degree of concentration of deposits in the 5 largest banks.	Bank Regulation Surveys (Barth et al., 2012)
Capital regulation	Sum of Overall Capital Stringency and Initial Capital Stringency. It ranges between 0-10 and higher values indicate higher stringency.	Bank Regulation Surveys (Barth et al., 2012)
Financial freedom	An indicator of banking efficiency as well as a measure of independence from government control and interference in the financial sector. It ranges between 0-100 and higher values indicate higher financial freedom.	Heritage
Institutional environment		
Government integrity	Derived by averaging scores for the following factors, all of which are weighted equally: public trust in politicians, irregular payments and bribes, transparency of government policymaking, absence of corruption, perceptions of corruption, and governmental and civil service transparency. It ranges between 0-100 and higher values indicate higher government integrity.	Heritage
Socioeconomic factors		
HDI (Human development index)	Summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. It ranges between 0-1 and higher values indicate higher human development.	UN human developments reports
Technological factors		
Individuals using internet	Internet users are individuals who have used the Internet (from any location) in the last 3 months. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc. (% of population)	WDI

Note: The table defines the variables used in the analysis and data sources.

Appendix C: Correlation matrix

	Financial inclusion index	GDP per capita	Unemployment	Inflation	Boone indicator	Bank concentration	Capital regulation	Financial freedom	Government integrity	HDI
Financial inclusion index	1.000									
GDP per capita	0.810***	1.000								
Unemployment	0.119***	0.104**	1.000							
Inflation	-0.351***	-0.306***	-0.040	1.000						
Boone indicator	-0.131***	-0.137***	-0.118***	-0.015	1.000					
Bank concentration	-0.184***	-0.044	0.060	-0.026	0.264***	1.000				
Capital regulation	0.029	-0.017	-0.023	0.000	0.011	-0.006	1.000			
Financial freedom	0.564***	0.516***	0.123***	-0.168***	-0.118***	0.060	0.024	1.000		
Government integrity	0.754***	0.692***	0.008	-0.264***	-0.071*	0.044	-0.003	0.553***	1.000	
HDI	0.827***	0.912***	0.141***	-0.293***	-0.090**	-0.073*	0.097**	0.550***	0.686***	1.000
Individuals using internet	0.822***	0.824***	0.172***	-0.335***	-0.101***	-0.023	0.101**	0.524***	0.718***	0.841***

Note: The table reports key correlations for the variables used in our main empirical analysis. Definitions of the variables are provided in Appendix B.

Appendix D: Country ranking by financial inclusion index

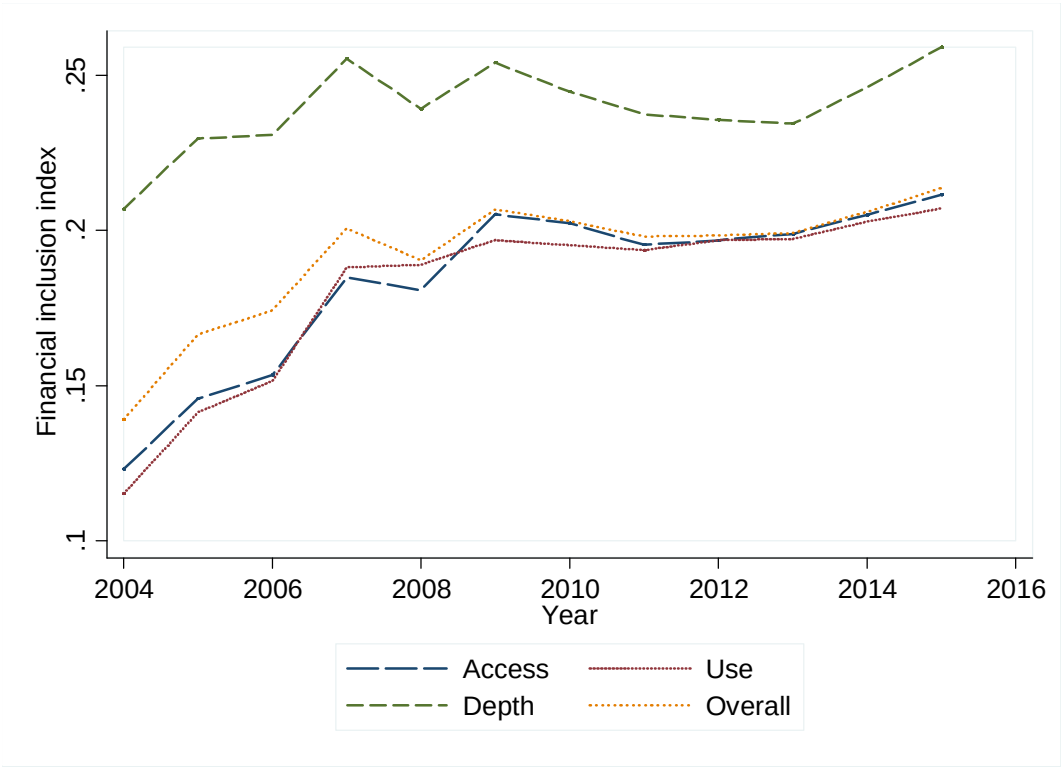
Rank	Country	Financial inclusion index
1	Spain	0.632
2	Japan	0.632
3	Portugal	0.629
4	Malta	0.506
5	Greece	0.504
6	Belgium	0.458
7	Italy	0.443
8	The Bahamas	0.420
9	Netherlands	0.415
10	Estonia	0.392
11	Bulgaria	0.384
12	Malaysia	0.369
13	Lebanon	0.365
14	Poland	0.355
15	Brazil	0.352
16	Brunei Darussalam	0.350
17	Montenegro	0.341
18	Latvia	0.335
19	Mauritius	0.323
20	Thailand	0.313
21	Chile	0.307
22	Panama	0.307
23	Macedonia	0.297
24	Hungary	0.288
25	South Africa	0.286
26	Bosnia and Herzegovina	0.271
27	Costa Rica	0.261
28	Colombia	0.250
29	Belize	0.234
30	Trinidad and Tobago	0.226
31	Vanuatu	0.215
32	Guatemala	0.213
33	El Salvador	0.198
34	Suriname	0.198
35	Jordan	0.195
36	Georgia	0.192
37	Namibia	0.192
38	Saudi Arabia	0.190
39	Republic of Armenia	0.182
40	Fiji	0.176
41	Republic of Kosovo	0.176
42	Honduras	0.172
43	Paraguay	0.165
44	Botswana	0.164

45	Samoa	0.163
46	Sao Tome and Principe	0.159
47	Moldova	0.154
48	Maldives	0.153
49	Tonga	0.151
50	Dominican Republic	0.149
51	West Bank and Gaza	0.142
52	Ecuador	0.140
53	Argentina	0.135
54	India	0.135
55	Jamaica	0.135
56	Bolivia	0.133
57	Peru	0.130
58	Indonesia	0.124
59	Bhutan	0.123
60	Guyana	0.113
61	Kenya	0.101
62	Nicaragua	0.101
63	Nepal	0.101
64	Swaziland	0.100
65	Federated States of Micronesia	0.096
66	Egypt	0.092
67	Angola	0.086
68	Bangladesh	0.083
69	Algeria	0.065
70	Nigeria	0.064
71	Pakistan	0.059
72	Solomon Islands	0.059
73	Djibouti	0.057
74	Cambodia	0.057
75	Lesotho	0.056
76	Gabon	0.045
77	Zambia	0.041
78	Haiti	0.035
79	Tanzania	0.034
80	Malawi	0.034
81	Uganda	0.031
82	Comoros	0.030
83	Rwanda	0.030
84	Liberia	0.027
85	Myanmar	0.024
86	Cameroon	0.019
87	Equatorial Guinea	0.016
88	Madagascar	0.016
89	Islamic Republic of Afghanistan	0.015
90	Burundi	0.013
91	Guinea	0.010
92	Chad	0.008

93	Central African Republic	0.007
94	South Sudan	0.005
95	Democratic Republic of Congo	0.004

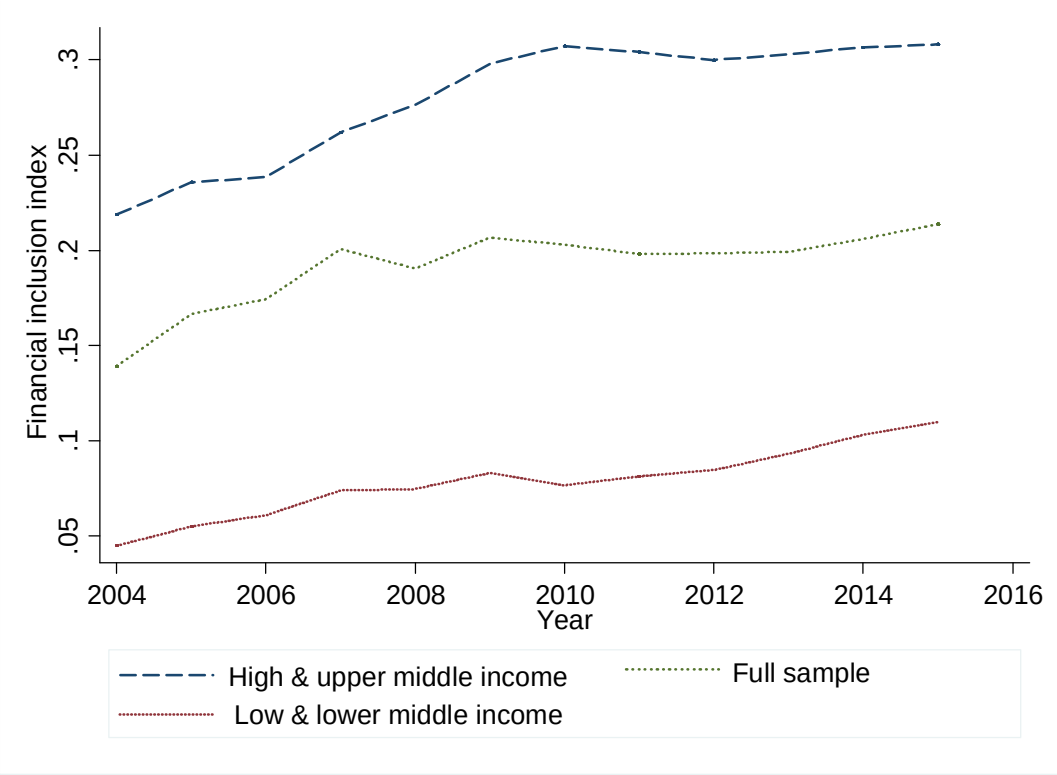
Note: The table reports the average financial inclusion index by country over the period 2004-2015 for 95 countries. The countries are ranked from the most inclusive (highest index score) to the least inclusive (lowest index score).

Figure 1: Financial inclusion index - Time trend



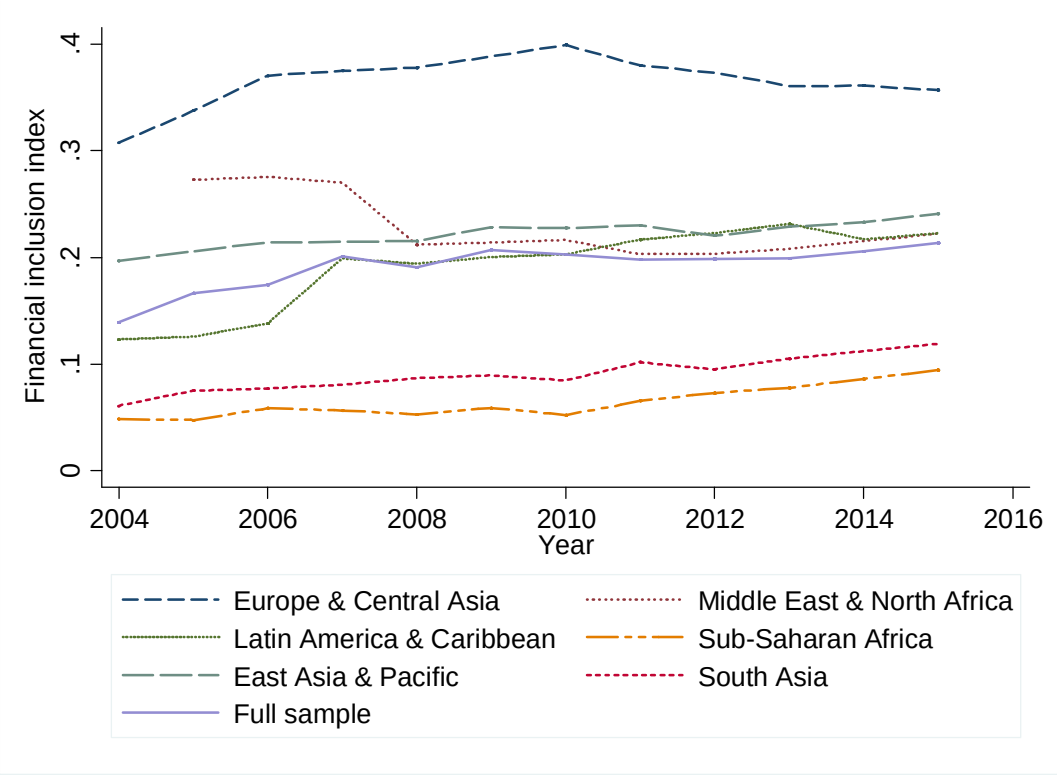
Note: The graph plots the trend of financial inclusion by dimension over the period 2004-2015. The financial inclusion dimensions are: use, access, and depth.

Figure 2: Financial inclusion index - Time trend by income group



Note: The graph plots the trend of financial inclusion by income region over the period 2004-2015. The income regions are grouped into high and upper-middle income region and low and lower-middle income region.

Figure 3: Financial inclusion index - Time trend by macro region



Note: The graph plots the trend of financial inclusion by macro region over the period 2004-2015. The macro regions are grouped into: Europe & Central Asia, Middle East & North Africa, Latin America & Caribbean, Sub-Saharan Africa, East Asia & Pacific, and South Asia.

Table 1: Descriptive statistics

Panel A

Variable	Obs	Mean	Std. Dev.	Min	Max
Deposit accounts with commercial banks (per 1,000 adults)	779	1092.14	1148.59	13.23	7211.21
Loan accounts with commercial banks (per 1,000 adults)	779	293.77	295.57	1.30	1275.83
Branches of commercial banks (per 100,000 adults)	779	16.77	17.81	0.61	99.24
ATMs (per 100,000 adults)	779	34.65	35.05	0.05	157.36
Bank deposits (% of GDP)	779	49.82	38.83	5.07	217.53
Domestic credit to private sector by banks (% of GDP)	779	44.54	33.40	2.63	156.12
Financial inclusion index	773	0.20	0.16	0.00	0.68
GDP per capita	779	8.24	1.30	5.45	10.81
Unemployment	508	9.49	7.09	0.50	32.20
Inflation	779	5.45	6.15	-15.71	29.05
Boone indicator	688	-0.06	0.11	-0.65	0.24
Bank concentration	524	74.24	19.05	37.01	100.00
Capital regulation	583	6.64	2.11	1.00	10.00
Financial freedom	721	50.79	15.66	20.00	90.00
Government integrity	727	36.67	16.01	10.00	87.00
HDI (Human development index)	771	0.66	0.14	0.34	0.91
Individuals using internet	770	29.54	24.22	0.51	89.63

Panel B

	High income group		Low income group		Difference in means %
	Obs	**Mean**	**Obs**	**Mean**	
Deposit accounts with commercial banks (per 1,000 adults)	425	1629.66	354	446.82	256***
Loan accounts with commercial banks (per 1,000 adults)	425	455.55	354	99.56	358***
Branches of commercial banks (per 100,000 adults)	425	23.69	354	8.46	180***
ATMs (per 100,000 adults)	425	53.94	354	11.49	370***
Bank deposits (% of GDP)	425	63.95	354	32.86	95***
Domestic credit to private sector by banks (% of GDP)	425	60.44	354	25.46	137***
Financial inclusion index	425	0.29	348	0.09	239***

Note: Panel A presents the descriptive statistics for the dependent variable that is the financial inclusion index, the index components, and the main independent variables for the full sample over the period 2004-2015. Panel B presents the mean and number of observations statistics for the sub-samples of high income and low income countries. High income group is composed of high income and upper middle income countries and low income group is composed of low income and lower middle income countries as classified by the World Bank. We report the difference in means test that is calculated as the difference between high income countries and low income countries. *, **, *** indicate significance at 10 per cent, 5 per cent, and 1 per cent levels, respectively. Definitions of the variables are provided in Appendix B.

Table 2: Financial inclusion indicators - Time trend

Dimension	Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Use	Deposit accounts with commercial banks (per 1,000 adults)	912.20	992.43	1015.43	1094.93	1043.59	1066.27	1088.62	1081.86	1080.49	1110.39	1168.11	1201.31
	Loan accounts with commercial banks (per 1,000 adults)	135.82	188.38	210.23	289.25	300.54	316.84	308.57	305.62	314.25	309.95	313.82	318.75
Access	Branches of commercial banks (per 100,000 adults)	12.55	15.73	15.92	17.72	16.97	18.28	17.68	16.60	16.55	16.50	16.78	16.85
	ATMs (per 100,000 adults)	19.76	21.83	23.90	30.94	30.83	36.42	36.48	36.02	36.57	37.28	38.78	40.71
Depth	Bank deposits (% of GDP)	45.49	50.21	48.36	51.06	49.07	51.54	49.45	48.41	48.20	48.25	51.11	53.79
	Domestic credit to private sector by banks (% of GDP)	36.94	40.49	42.21	47.79	44.27	47.05	45.68	44.20	43.83	43.40	44.89	46.92

Note: The table presents the annual mean values of the variables used in computing the financial inclusion index for the years 2004-2015. Definitions of the variables are provided in Appendix B.

Table 3: Baseline regression analysis

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
GDP per capita$_{t-1}$	0.1168**	0.0987**			
	(3.99)	(5.08)			
Unemployment$_{t-1}$	-0.0005	-0.0015**	-0.0033**	-0.0029**	-0.0033**
	(-0.61)	(-2.07)	(-3.23)	(-2.64)	(-2.96)
Inflation$_{t-1}$	-0.0007**	-0.0009**	-0.0003	-0.0004	-0.0004
	(-2.13)	(-2.86)	(-1.08)	(-1.24)	(-1.10)
Boone indicator$_{-1}$		-0.0583**	-0.0435**	-0.0433**	-0.0330**
		(-3.24)	(-3.34)	(-2.92)	(-2.62)
Bank concentration$_{t-1}$		0.0009**	0.0012**	0.0010**	0.0009**
		(2.16)	(2.35)	(2.09)	(2.08)
Capital regulation$_{t-1}$		0.0025	0.0028	0.0031	0.0042**
		(1.16)	(1.25)	(1.41)	(2.03)
Financial freedom$_{t-1}$		0.0006	0.0008	0.0005	0.0012**
		(1.26)	(1.56)	(0.97)	(2.37)
Government integrity$_{t-1}$			0.0012**		
			(2.14)		
HDI$_{t-1}$				1.1572**	
				(3.92)	
Individuals using internet$_{t-1}$					0.0019**
					(3.36)
Constant	-0.7453**	-0.6886**	0.1096	-0.6633**	0.0797
	(-2.91)	(-3.63)	(1.52)	(-2.92)	(1.39)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes
Observations	449	343	343	342	343
Ajusted R-squared (within)	0.267	0.309	0.208	0.233	0.272

Note: The table reports the regression results of estimating the relation between financial inclusion and different country characteristics. The dependent variable is the three-dimensional financial inclusion index. The independent variables are economic, banking, institutional, social, and technological country characteristics (all lagged by one year). The regressions are run on the full sample of 95 countries covering the period of 2004-2015. Robust t-statistics are reported under the coefficients in parentheses. Standard errors are clustered at the country level. *, **,*** indicate significance at 10 per cent, 5 per cent, and 1 per cent levels, respectively. Definitions of the variables are provided in Appendix B.

Table 4: Principal component analysis

Indices	Indicators	Normalised weight
Use	Deposit accounts with commercial banks (per 1,000 adults)	0.633
	Loan accounts with commercial banks (per 1,000 adults)	0.367
Access	Branches of commercial banks (per 100,000 adults)	0.591
	ATMs (per 100,000 adults)	0.409
Depth	Bank deposits (% of GDP)	0.574
	Domestic credit to private sector by banks (% of GDP)	0.426
Overall	Access	0.293
	Use	0.298
	Depth	0.408

Note: The table reports the weights of indicators in the dimension sub-indices and weights of the dimensions in the financial inclusion index obtained from principal component analysis. Definitions of the variables are provided in Appendix B.

Table 5: Baseline regression analysis - PCA

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
GDP per capita$_{t-1}$	0.1426**	0.1183**			
	(3.46)	(4.54)			
Unemployment$_{t-1}$	-0.001	-0.0025**	-0.0047**	-0.0044**	-0.0047**
	(-0.82)	(-2.33)	(-3.10)	(-2.64)	(-2.89)
Inflation$_{t-1}$	-0.0008*	-0.0010**	-0.0004	-0.0004	-0.0005
	(-1.95)	(-2.56)	(-0.98)	(-1.08)	(-1.05)
Boone indicator$_{t-1}$		-0.0874**	-0.0697**	-0.0697**	-0.0549**
		(-3.41)	(-3.58)	(-3.21)	(-2.94)
Bank concentration$_{t-1}$		0.0012*	0.0015**	0.0014*	0.0011*
		(1.98)	(2.28)	(1.99)	(2.01)
Capital regulation$_{t-1}$		0.0029	0.0033	0.0036	0.0052*
		(1.07)	(1.14)	(1.28)	(1.98)
Financial freedom$_{t-1}$		0.0007	0.0009	0.0006	0.0014**
		(1.19)	(1.51)	(0.96)	(2.53)
Government integrity$_{t-1}$			0.0016**		
			(2.19)		
HDI$_{t-1}$				1.2000**	
				(3.22)	
Individuals using internet$_{t-1}$					0.0027**
					(3.54)
Constant	-0.8553**	-0.7651**	0.1853**	-0.5991**	0.1366*
	(-2.37)	(-3.07)	(2.17)	(-2.17)	(1.81)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes
Observations	449	343	343	342	343
Adjusted R-squared (within)	0.237	0.289	0.21	0.218	0.285

Note: The table reports the regression results of estimating the relation between financial inclusion and different country characteristics. The dependent variable is the three-dimensional financial inclusion index constructed using principal component analysis. The independent variables are economic, banking, institutional, social, and technological country characteristics (all lagged by one year). The regressions are run on the full sample of 95 countries covering the period of 2004-2015. Robust t-statistics are reported under the coefficients in parentheses. Standard errors are clustered at the country level. *, **,*** indicate significance at 10 per cent, 5 per cent, and 1 per cent levels, respectively. Definitions of the variables are provided in Appendix B.

Table 6: Country income level

	Panel A			Panel B		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
$Unemployment_{t-1}$	-0.0039**	-0.0034**	-0.0040**	-0.0047**	-0.0042**	-0.0044**
	(-3.71)	(-2.97)	(-3.29)	(-4.07)	(-3.53)	(-3.97)
$Unemployment_{t-1}$* Low income $group_{t-1}$				0.0033**	0.0034**	0.0038**
				(2.1)	(2.11)	(2.83)
$Inflation_{t-1}$	-0.0006	-0.0007	-0.0007	-0.0003	-0.0004	-0.0005
	(-1.38)	(-1.55)	(-1.29)	(-0.80)	(-1.17)	(-0.96)
$Inflation_{t-1}$ * Low income $group_{t-1}$				-0.0014*	-0.0009	-0.0008
				(-1.77)	(-1.07)	(-0.89)
Boone $indicator_{t-1}$	-0.0569**	-0.0559**	-0.0462**	-0.028	-0.016	-0.0002
	(-3.57)	(-3.10)	(-2.85)	(-0.99)	(-0.55)	(-0.01)
Boone $indicator_{t-1}$ * Low income $group_{t-1}$				-0.0131	-0.054	-0.0690**
				(-0.40)	(-1.50)	(-2.14)
Bank $concentration_{t-1}$	0.0011*	0.0009	0.0007	0.0012**	0.0010*	0.0010**
	(1.85)	(1.56)	(1.42)	(2.17)	(1.96)	(2.08)
Bank $concentration_{t-1}$ * Low income $group_{t-1}$				-0.0009	-0.0001	0.0007
				(-0.26)	(-0.02)	(0.66)
Capital $regulation_{t-1}$	0.0031	0.0035	0.0046**	0.0022	0.003	0.0039
	(1.27)	(1.48)	(2.1)	(0.79)	(1.16)	(1.64)
Capital $regulation_{t-1}$ * Low income $group_{t-1}$				0.0048	-0.0013	0.0025
				(0.68)	(-0.17)	(0.45)
Financial $freedom_{t-1}$	0.0011**	0.0007	0.0015**	0.0008	0.0006	0.0011*
	(2.04)	(1.33)	(2.71)	(1.53)	(1.06)	(2.00)
Financial $freedom_{t-1}$ * Low income $group_{t-1}$				0.0016	0.0008	0.0013
				(1.6)	(0.68)	(1.18)
Government $integrity_{t-1}$	0.0020**			0.0013*		
	(2.13)			(1.74)		
Government $integrity_{t-1}$ * Low income $group_{t-1}$				0.0035		
				(1.16)		
HDI_{t-1}		1.4840**			1.0578**	
		(3.77)			(2.27)	
HDI_{t-1} * Low income $group_{t-1}$					1.0327	
					(1.61)	
Individuals using $internet_{t-1}$			0.0019*			0.0016**
			(1.95)			(2.71)
Individuals using $internet_{t-1}$ * Low income $group_{t-1}$						0.0058**
						(8.92)
Constant	0.1114	-0.8610**	0.1188**	0.1205	-0.7096**	0.0845
	(1.2)	(-2.81)	(2.05)	(1.22)	(-2.15)	(1.39)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes
Observations	343	342	343	343	342	343
Adjusted R-squared (within)	0.191	0.207	0.214	0.216	0.234	0.402

Note: The table reports the regression results of estimating the relation between financial inclusion and different country characteristics. The dependent variable is the three-dimensional financial inclusion index constructed using high and low income subsamples. The independent variables are economic, banking, institutional, social, and technological country characteristics (all lagged by one year). Panel B additionally includes the interaction terms between the country characteristics and the low income group dummy. The regressions are run on the full sample of 95 countries covering the period of 2004-2015. Robust t-statistics are reported under the coefficients in parentheses. Standard errors are clustered at the country level. *, **,*** indicate significance at 10 per cent, 5 per cent, and 1 per cent levels, respectively. Definitions of the variables are provided in Appendix B.

Table 7: Robustness test – "Natural zeros" and "aspirational targets" for financial inclusion

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
GDP per capita$_{t-1}$	0.2164**	0.1668**			
	(3.97)	(3.99)			
Unemployment$_{t-1}$	0.0018	0.0000	-0.0031**	-0.0021*	-0.0032**
	(1.29)	(0.02)	(-2.33)	(-1.83)	(-2.35)
Inflation$_{t-1}$	-0.0015**	-0.0018**	-0.0009*	-0.0010**	-0.0010*
	(-2.79)	(-3.72)	(-1.93)	(-2.22)	(-1.74)
Boone indicator$_{t-1}$		-0.0725**	-0.0475**	-0.0470*	-0.0331
		(-2.15)	(-2.10)	(-1.86)	(-1.47)
Bank concentration$_{t-1}$		0.0009*	0.0014**	0.0011*	0.0009*
		(1.88)	(2.27)	(2.00)	(1.91)
Capital regulation$_{t-1}$		0.0006	0.0012	0.0016	0.0032
		(0.18)	(0.32)	(0.48)	(0.89)
Financial freedom$_{t-1}$		0.0005	0.0008	0.0001	0.0013*
		(0.74)	(1.06)	(0.08)	(1.68)
Government integrity$_{t-1}$			0.0022*		
			(1.96)		
HDI$_{t-1}$				2.5234**	
				(3.88)	
Individuals using internet$_{t-1}$					0.0026**
					(2.59)
Constant	-1.3449**	-0.9826**	0.3645**	-1.3491**	0.3464**
	(-2.80)	(-2.60)	(3.73)	(-2.73)	(4.87)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes
Observations	449	343	343	342	343
Adjusted R-squared (within)	0.285	0.239	0.102	0.173	0.149

Note: The table reports the regression results of estimating the relation between financial inclusion and different country characteristics. The dependent variable is the three-dimensional financial inclusion index constructed using imposed minimum-maximum values. The independent variables are economic, banking, institutional, social, and technological country characteristics (all lagged by one year). The regressions are run on the full sample of 95 countries covering the period of 2004-2015. Robust t-statistics are reported under the coefficients in parentheses. Standard errors are clustered at the country level. *, **,*** indicate significance at 10 per cent, 5 per cent, and 1 per cent levels, respectively. Definitions of the variables are provided in Appendix B.

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