Defining and measuring financial inclusion: A systematic review and confirmatory factor analysis

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This study re-examines the construct of financial inclusion, through a literature review and confirmatory factor analysis (CFA). First, we conduct a systematic review of definitions, measures, and data sources. Second, we apply CFA to test two prominent financial inclusion indices. The CFA analysis reveals a high correlation between the "access" and "use" dimensions; hence, indices fail to capture the multidimensionality of financial inclusion. Existing indices tend to be biased toward measuring the supply-side and quantitative aspects of financial inclusion. The extent to which lower-income individuals and smaller firms have been incorporated into the formal financial sector is not captured.

Keywords: Financial inclusion, access to finance, systematic review, measures, confirmatory factor analysis

1. Introduction

Financial inclusion has risen to the top of the development agenda (Ardic et al. 2011). According to the World Bank's 2017 Global Findex, 1.7 billion adults worldwide have no access to formal financial services. Advocates of financial inclusion argue that improving access to finance is central to achieving inclusive growth and development (Helms 2006; World Bank 2014). There is, however, growing criticism that financial inclusion is little more than a new label for microfinance, whose effectiveness for poverty alleviation is now in doubt (Bateman 2012; Bateman and Chang 2012; Taylor 2012; Ghosh 2013; Guérin et al. 2014; James 2014; Aitken 2015; Mader 2017). Critics of financial inclusion challenge the narrative that emphasises individual access to financial services and entrepreneurship as a route out of poverty (e.g., Bateman and Chang 2012). More generally, they question the assumption that there is a causal relationship running from financial inclusion to increased growth and reduced poverty and inequality (e.g., Mader 2017). To date, the empirical evidence on the development impact of financial inclusion remains inconclusive (e.g., Honohan 2008; Imai et al. 2012; Banerjee et al. 2015; Zhang and Posso 2017; Park and Mercado 2015, 2018; Dabla-Norris et al. 2020).

There are several reasons for these discrepancies in findings, including differences in contexts, data, and methods. Above all, however, there is growing realisation that our knowledge of the impact of financial inclusion can only be as good as our measurement of it (Chakravarty and Pal 2010, 2013; Sarma and Pais 2011; Gupte et al. 2012; Mialou et al. 2017). In this literature, there is much agreement on the need to treat financial inclusion as a multidimensional concept but little agreement on what its main dimensions are. Similarly, there is agreement that the advantages of measuring financial inclusion through composite indices outweigh the disadvantages, but there is no consensus on how best to construct such indices.

Against this background, this paper re-examines the construct of financial inclusion, focusing on how it is conceptually defined and empirically measured, through a literature review and confirmatory factor analysis. Our contributions are twofold. The first is to provide a systematic review of existing definitions and measures of financial inclusion. With the exceptions of Arora (2018) and Beck (2016), recent reviews of the financial inclusion literature have tended to focus on its development impact, rather than on its definition and measurement (e.g., Cull et al. 2014; Demirgüç-Kunt et al. 2017; Duvendack and Mader 2018). Unlike our paper, these works review the literature on financial inclusion but do not aim to test empirically existing definitions or index-based measures of financial inclusion. This paper extends these works by providing a more detailed and critical analysis of current understandings of financial inclusion. We compare a wider range of financial inclusion measures and discuss the conceptual and methodological shortcomings of index-based measures. Our second and main contribution is to demonstrate how confirmatory factor analysis (CFA) can be used to develop better financial inclusion indices. We use CFA to test two of the most frequently used indices in cross-national studies of financial inclusion and the assumptions that underpin them. These two contributions are intertwined. Unlike exploratory factor analysis or principal component analysis, confirmatory factor analysis is theory- rather than data-driven. Hence, a critical review of existing definitions and measures of financial inclusion is not only valuable in itself, but it is a prerequisite for our confirmatory factor analysis. It is through confirmatory factor analysis that we can empirically test our theoretical constructs of financial inclusion. Our approach allows us to address empirically the fundamental questions of why should financial inclusion be conceptualised as a single construct; what are its main dimensions or components; and why do countries score so differently on financial inclusion when measured by different indices?

Our approach contributes to and builds on alternative approaches in the literature. Mialou et al. (2017) use factor analysis to derive the weights for their index of financial inclusion, which captures the "use" and "outreach" of financial services. Similarly, Cámara and Tuesta's (2014) two-stage principal component analysis is concerned with deriving the weights for an alternative index which measures the "usage", "barriers" and "access" to formal financial services. These alternative approaches are explored in Section 4. Our approach differs in that we do not aim to construct our own financial inclusion index; instead, we use CFA to test two important indices of financial inclusion that have been frequently used in the cross-country literature on the relationship between financial inclusion and economic development, those developed by Arora (2010) and Park and Mercado (2015, 2018). We also seek to understand why these indices exhibit no correlation or even a slight negative correlation. Our CFA models are assessed for model fit using Chi-square test statistics, the root mean square error of approximation (RMSEA) and the confirmatory fit index (CFI). We also derive modification indices based on Sörbom (1989), which reveal significant correlations between error terms of common measures (e.g. borrowers and depositors). Our approach explicitly incorporates these correlations between error terms and hence enhances model fit and reliability.

The paper's main findings are as follows. First, we show that the existing indices of financial inclusion suffer from conceptual and methodological shortcomings. There are several reasons for this. In some cases, they fail to accurately measure the various dimensions of financial inclusion which are incorporated into its definition. In other cases, they assign weights to its various dimensions arbitrarily or subjectively. Still in other cases, different dimensions of financial inclusion are treated as fully substitutable. Second, financial inclusion indices are often based on aggregate indicators that do not tell us much about individuals' access to or use of financial services. Third, our findings contribute to a better measurement of financial

inclusion, and point to the importance of distinguishing between improvements in measurement and improvements in financial inclusion. Our application of CFA indicates that some of the progress in improving financial inclusion could reflect a bias towards measures based on access. Fourth, our findings also highlight the value of CFA for policy makers of accurately measuring the different dimensions of financial inclusion, such as "access", "use", and "quality" of financial services This helps overcome a significant limitation of existing approaches, namely the tendency to focus on the quantitative dimensions of financial inclusion (e.g., aggregate level of access and use of financial services) rather than the qualitative ones (e.g., financial literacy, consumer protection and product appropriateness) and the emphasis on a narrow group of financial providers (i.e., commercial banks), delivery channels (i.e., branches or ATMS), and financial services (i.e., deposits and loans), while ignoring others.

The paper is structured as follows. Section 2 examines the evolving conceptualisation of financial inclusion. Sections 3 analyses the main conceptual, methodological and data challenges involved in measuring financial inclusion. Section 4 conducts CFA to test the validity of current measures. Finally, Section 5 discusses the implications of our findings for research and policy, and Section 6 concludes.

2. Defining Financial Inclusion

CFA requires a definition of a concept or construct before it can be used to test whether it exists and what its main dimensions are. Yet, there is no unanimously accepted definition of financial inclusion (see Table A1). At a general level, they can be distinguished by their scope: whether they describe financial inclusion as a unidimensional or multidimensional concept. Early definitions focus on *access* to formal financial services by different population segments (see Leyshon and Thrift 1995; Carbó et al. 2005). More recent definitions broaden the concept to

include not only *access* to formal financial institutions, but also the *use*, *cost* and *quality* of financial services (see Demirgüç-Kunt and Klapper 2013; Allen et al. 2016; Demirgüç-Kunt et al. 2017). In these multidimensional definitions of financial inclusion, the "access" dimension refers to the availability or opportunity to use financial services, while the "use" dimension refers to the actual use of such services (for example, Beck et al. 2007). The "cost" dimension of financial inclusion is usually described as comprising the monetary and non-monetary costs of accessing and using financial services, such as bank fees or proximity (Arora 2010). Finally, the "quality" dimension assesses whether financial services meet consumers' needs and, more importantly, how well informed and protected consumers are (for example, Amidžić et al. 2014; Queralt 2016; Mialou et al. 2017).

At a deeper level, definitions of financial inclusion differ not only in their scope, but also in their views of which financial services should be made more accessible, to whom, by whom, and how. For some, financial inclusion involves improving access to a wide variety of financial services including "insurance, pensions, and securities markets" (World Bank 2014: 15), while for others it is about reducing exclusion from "essential" services (Sinclair et al. 2009). The primary aim of financial inclusion is, in the view of some, to increase "the proportion of individuals and firms that use financial services" (World Bank 2014: 1) and, in the view of others, to ensure "access to finance by the poor and vulnerable groups" (Rangarajan 2008:1). All recognise the advantages of having multiple providers, but some place private (for-profit) providers at the centre of the inclusion agenda (see, Chakrabarty 2012), while others emphasise the equally if not more important role of non-profit and public providers (UN 2006).

Definitions of financial inclusion also reflect different views on whether financial services should be provided at a price which is "sustainable" for providers (World Bank 2018) or "affordable" to customers (Rangarajan 2008). Likewise, they differ in whether they incorporate the quality dimension of financial inclusion and how they distinguish between

high- and low-quality financial inclusion[1] (e.g., World Bank 2014; Claessens 2006), with the most common criteria being financial literacy and consumer protection (e.g., Demirguc-Kunt et al. 2017). Finally, the optimal level of financial inclusion is disputed: either one in which "individuals and firms are not denied access to basic financial services based on motivations other than efficiency criteria" (Amidžić et al. 2014) or, rather, one in which "all working age adults" are given access to basic financial services, regardless of efficiency considerations (Queralt 2016). From a policy perspective, a central issue is thus whether to bank the *unbanked* but *bankable* (by reducing the market imperfections preventing access) or to bank the *unbanked* even if *unbankable* from a commercial perspective.

3. Measuring Financial Inclusion[2]

Beck et al. (2007) are among the first to measure the inclusiveness of financial systems using data collected from bank regulators. They construct indicators of *access* to, and *use* of, banking services across 99 countries, including: the number of bank branches and ATMs per capita and per square kilometre, the number of deposit and loan accounts per capita, and the average size of deposits and loans relative to GDP per capita. Building on this work, the Consultative Group to Assist the Poor and the International Monetary Fund develop new indicators of *access to deposit services*, *access to credit*, and *outreach of financial institutions* for 139 countries (CGAP 2009; Kendall et al. 2010).

[1] In some definitions of financial inclusion, the convenience and affordability of financial services are important components of the "quality" dimension of financial inclusion rather than of its "cost" dimension (e.g., Amidžić et al. 2014; Mialou et al. 2017).

[2] See Table A1 for a list of the specific definitions of financial inclusion adopted by the works discussed in section 3, if/when available.

A common limitation of these early attempts is their exclusive reliance on aggregate indicators. As acknowledged by Beck (2016), these indicators do not tell us much about one of the main questions policymakers are interested in: who these services are available to and used by. Moreover, they suffer from various measurement problems. Some aggregate indicators of deposit and loan penetration, such as the number of deposits and loans (relative to population), may overestimate the access and use of financial services because they do not account for multiple and/or dormant accounts (Kendall et al. 2010; Beck 2016; Allen et al. 2016). Another problem with aggregate indicators is their inability to exclude non-residents, which can significantly inflate measures of financial inclusion in off-shore financial centres. Other commonly used indicators, such as the value of deposits and loans (relative to GDP) (see, CGAP 2009), are probably better measures of financial development (or depth) than of financial inclusion (or breadth).

To overcome these shortcomings, later studies, such as that by Allen et al. (2016), turn to micro-level survey data collected by the World Bank and Gallup from financial service users in more than 140 countries. Their use of micro-level, demand-side data allowsthem to address questions that cannot be addressed with aggregate, supply-side data, such as the individual determinants of financial inclusion. In these studies, financial inclusion is typically measured by indicators such as: account ownership at a formal financial institution; use of accounts to make payments, save and borrow; and reasons for not having a formal account or for not applying for a loan (see, Demirgüç-Kunt and Klapper 2013; Allen et al. 2016). Like previous studies, these have also often use multiple individual indicators to measure financial inclusion.

More recent efforts to measure financial inclusion focus on the development of indices. There are significant advantages in using indices instead of individual measures. First, indices can summarize complex, multidimensional phenomena like, presumably, financial inclusion. Second, they can reduce the size of a set of individual metrics without losing the underlying

information. Third, they are also easier to interpret than a set of multiple indicators. Fourth, they enable us to compare complex dimensions effectively. Finally, they provide a synthetic measure of a country's relative performance and progress over time in achieving a policy goal such as financial inclusion (OECD 2005: 13-14)[3].

Sarma (2008) and Sarma and Pais (2011) are among the first to develop an index of financial inclusion. They define financial inclusion as "a process that ensures the ease of access, availability and usage of the formal financial system for all members of an economy" (Sarma 2008: 5; Sarma and Pais 2011: 13). Their index summarises information on the *accessibility*, *availability*, and *usage* of banking services into a single number in the range from 0 to 1, with 0 indicating complete financial exclusion and 1 complete inclusion. To construct the index, they adopt a similar approach to that used by the United Nations Development Programme for the construction of the Human Development Index and follow a three-step process involving: (1) the selection of dimensions and their variables; (2) the normalisation of the selected indicators; and, finally, (3) the assignment of weights to each of the variables and dimensions, and their aggregation into a single index of financial inclusion.

In their study, the *accessibility* is measured by the number of bank accounts per 1,000 people (1 variable). Financial service *availability* is proxied by the number of bank branches and ATMs per 100,000 people (2 variables). And *usage* of the banking system is measured by the level of loans and deposits over GDP (1 variable). Variables are normalised using the min-max method;[4] the three dimensions are assigned either equal weights (Sarma 2008) or arbitrary

[3] This is supported by, for example, Camara and Tuesta (2014: 3). In their view, using an index to measure financial inclusion has three main advantages. "First, a measure that aggregates several indicators into a single index is helpful to capture the complex nature of financial inclusion and monitor its evolution. Second, a better measure of financial inclusion allows us to better study the relationship between financial inclusion and other macroeconomic variables of interest. Finally, an index of financial inclusion can be a useful tool for policy making and evaluation."

[4] The purpose of the min-max method is to normalise the indicators to range between 0 and 1 by subtracting the minimum value and dividing by the range of the indicator values (OECD 2008: 28).

weights (Sarma and Pais 2011); and they are aggregated using Euclidean distance-based methods (see Tables 1 & 2). Table 1 also shows that most subsequent cross-country and national studies, such as those by Park and Mercado (2015, 2018) or Chattopadhyay (2011), use the same methodological approach to develop indices of financial inclusion as that adopted by Sarma (2008). The main difference being that more recent indices tend to be more comprehensive (Ambarkhane et al. 2016). As shown in Tables 1 and 2, this is because they have either incorporated additional indicators or dimensions (e.g., Park and Mercado 2015, 2018), or considered financial services other than savings and credit, and financial service providers other than banks (e.g., Ambarkhane et al. 2016).

[Tables 1 and 2 here]

New indices proposed by Arora (2010), Gupte et al. (2012), and Mialou et al. (2017), amongst others (Chakravarty and Pal 2010, 2013; Zhang and Posso 2017), differ from that of Sarma (2008) in their methodological approaches. At one end are the indices by Arora (2010) and Gupte et al. (2012), which are methodologically quite similar to that of Sarma (2008). Like the latter, these indices are constructed using min-max normalisation and subjective weighting methods (i.e., equal or arbitrary weighting schemes), but their dimensions are aggregated using either linear or geometric methods, instead of the Euclidean distance approach (i.e., arithmetic or geometric mean). At the other end of the continuum is the index recently proposed by Mialou et al. (2017), which differs significantly from that of Sarma (2008) in its normalisation, weighting and aggregation techniques. In this case, indicators are normalised using the distance to a reference method; weights are assigned to variables and dimensions using factors analysis; and the various indicators and dimensions are aggregated using geometric methods (i.e., weighted geometric mean). Thus, while progress has been made, conceptual and/or methodological shortcomings remain, which render them less useful for policy analysis than they could otherwise be. These shortcomings and their causes are discussed below.

Conceptual weaknesses of indices: The selection of variables and dimensions

One reason why indices of financial inclusion are in some cases conceptually weak is that they have not been constructed based on a robust theoretical framework that informs the choice of their components and variables (see Arora 2010). Another reason is the gap between how financial inclusion is defined in theory and how it is measured in practice. One instance is when financial inclusion is defined as the process that ensures access and use of the formal financial system by "all members of an economy", but it is measured by indices based on aggregate indicators (see Park and Mercado 2015, 2018). Another instance is when financial inclusion is defined to include the qualitative aspects of the process by which "the unbanked" are brought into the formal financial system, and yet it is still measured by indices focused on the quantitative dimensions of financial inclusion and, within these dimensions, on certain financial providers (i.e., commercial banks), delivery channels (i.e., branches or ATMS), and financial services (i.e., deposits and loans) (for example, Mialou et al. 2017).

This mismatch between concepts and measures of financial inclusion is largely explained by either an exclusive reliance on supply-side data (for example Park and Mercado 2015, 2018) or by the limited availability of data on some aspects of it (for example Mialou et al. 2017). Data collection efforts have increased in recent years but there are still some data gaps, particularly with respect to the quality and impact of financial inclusion (IFC 2016) (see Table A2). At the national level, these data collection efforts have been mostly carried out by central banks as part of their new mandate to promote financial inclusion (IFC 2016). A recent survey conducted by the Irving Fisher Committee on Central Bank Statistics in 47 countries (30 of them, developing ones) reveals, however, the limitations of such efforts. Over 80% of the central banks surveyed reported collecting data on "the availability or supply of financial services" and on "the access to financial services". Over 60% also reported availability of data about "the demand for financial services" in their countries. By contrast, only around 20%

reported collecting data on “the quality of financial services”, “the quality of the institutional infrastructure”, or “the welfare benefits of financial inclusion” (IFC 2016: 16-18).

At the international level, data collection efforts have been led by the International Monetary Fund and especially by the World Bank. Three of the most important international data sources on financial inclusion are: (1) the International Monetary Fund’s Financial Access Survey, which provides aggregate data on the supply of and access to financial services for 189 countries; (2) the World Bank’s Financial Inclusion dataset (Global Findex), which provides individual-level data on the use of financial services in 148 countries; and (3) and the World Bank’s Enterprise Survey, which provides firm-level data on access to finance for 139 economies. Also in this case, the most widely available data are indicators of the level of access and use of financial services, rather than of the quality and benefits of increased access and use**.** Nonetheless, new indicators of financial literacy developed by the OECD (i.e., International Survey of Adult Financial Literacy Competencies) and Standard and Poor’s (i.e., Global FinLit Survey), as well as new data on consumer protection collected by CGAP (2010) and the World Bank (i.e., Global Consumer Protection Survey) have contributed to filling this gap.

Methodological weaknesses: Standardisation, weighting, and aggregation methods

In addition to conceptual weaknesses, indices also suffer from several methodological weaknesses, which are associated with the normalisation, weighting and aggregation methods used to construct them. As regards the normalisation of variables, the most frequently used procedure is the so-called min-max method. It is well known that this method is problematic in the presence of outliers in the data, as they can become unintended benchmarks (OECD

2008). However, in some studies, little attention has been paid to identifying and removing countries/regions with extreme values in one or more variables (see Arora 2010).

A second major limitation of existing indices is that most of them have been constructed using subjective rather than objective weighting methods, with some of them assigning equal weights to each of the dimensions (for example, Gupte et al. 2012 and Zhang and Posso 2017) and others assigning them different weights arbitrarily (see Sarma and Pais 2011). Subjective weights based on an assumed importance for financial inclusion introduces an arbitrary element into the index construction process, which may be justified in some cases for theoretical or policy reasons but not in many others (OECD 2008). In the case of indices relying on unequal weighting, weights have generally been chosen to reflect the quality of the data on financial inclusion rather than theoretical factors or policy priorities. As a result, the accessibility of financial services, for which more and better data is available, has often been given greater weight (Sarma and Pais 2011). In the case of indices relying on equal weighting, some of them also suffer from this same problem. This is because they have assigned the same weight to each of the indicators but they have incorporated a larger number of indicators to measure the access dimension of financial inclusion. The equal weighting of the indicators has thus resulted in an unequal weighting of the dimensions of financial inclusion, with dimensions other than access receiving a lower weight (for example, Chakravarty and Pal 2010).

A last major limitation of existing indices concerns the choice of aggregation techniques. The use of additive or geometric methods results in different components being (fully or partially) substitutable among themselves: a low score in, e.g., the level of financial consumer rights protection (i.e., quality), could be compensated for by a high score in the number of bank branches (i.e., access) and/or the number of loans per capita (i.e., use). All this indicates that for reasons related to the choice of data, variables, weighting and aggregation methods, our composite measures of financial inclusion tend to be biased toward measuring

the supply-side and quantitative aspects of financial inclusion processes. This contrasts with the emphasis on developing a "responsible finance agenda" that puts the needs of people at its centre (World Bank 2014: 85).

4. Assessing Measures of Financial Inclusion

Alternative methods

To highlight some of the issues common in measuring financial inclusion we use confirmatory factor analysis (CFA). These issues include: (1) how many dimensions of financial inclusion should be used, (2) which variables provide the best estimate, (3) how can weights of variables and dimensions in the index construction be justified? We apply CFA to two prominent measures developed by Park and Mercado (2015, 2018) and Arora (2010). There are various reasons why our CFA analysis focuses on testing the financial inclusion indices developed by Arora (2010) and Park and Mercado (2015, 2018). The main one is that these are among the most widely cited indices of financial inclusion. Another reason is related to the unexpected finding that these two indices are actually not correlated with each other. A third reason is that these studies are increasingly cited as evidence of the effectiveness of financial inclusion as a development policy tool.

However, there are alternative approaches. For instance, Camara and Tuesta (2014) use Principal Component Analysis (PCA). It is important to note that PCA and CFA are very similar at first glance. However, they do differ fundamentally in how they reduce dimensionality in the context of multi-dimensional measures of financial inclusion. Both methods reduce the dimensionality of data, i.e. the explanatory power of many variables is captured by a handful of dimensions or principal components. However, PCA and CFA differ quite fundamentally in how they reduce dimensionality. As outlined in Camara and Tuesta

(2014), PCA is a linear combination of variables. In contrast, CFA refers to a measurement model of a latent variable, that is, a variable that cannot be observed or measured directly. CFA allows us to represent a latent variable (e.g., "access to financial services") with one or more observable indicators (e.g., "number of bank branches" or "number of ATMs") that accurately capture the intended concept (e.g., "financial access").

Finally, CFA is mathematically identical to a Factor Analysis (FA). The difference is that CFA requires a theoretical starting point, i.e. a conceptual understanding of a complex phenomenon such as financial inclusion.

Reducing dimensions

Both methods PCA and CFA reduce the dimensionality of data. That means that we start with many measures (or indicators) such as the number of ATMs, the number of bank branches etc. Say we use 20 measures, which means that we operate in a linear space with dimension 20. Obviously, this is very complex and not useful from a policy perspective. Hence, reducing dimensionality by combining these measures into indices is beneficial. PCA and CFA do exactly that. They reduce the number of measures needed but still ensure that the crucial features of the data are preserved in lower dimensions. However, PCA and CFA differ quite fundamentally in how they reduce dimensionality. PCA is a linear combination of variables, whereas CFA refers to a measurement model of a latent variable. PCA creates components (or an index) using a linear combination of many measures. Thus, one can write the index Y as follows.

$$Y = a_1 x_1 + a_2 x_2 + \cdots a_k x_k \qquad (1)$$

The aim of PCA is to find the optimal number of measures k, the optimal number of indices (components) and the optimal weights a_i. This is basically a single equation model,

where the variables on the right-hand side determine the index Y. The direction of influence is from right to left.

In contrast, CFA is a type of structural-equation modelling, where the focus is on a measurement model that relates the alleged impact of a latent variable (denoted Y) on a larger set of observed variables (or indicators) such as responses to survey questions. CFA originated from the common factor model developed by Thurstone (1947), which refers to a decomposition of the observed variance of an indicator into the variance due to the latent variable and an idiosyncratic variance (error term). We follow the approach outlined in Jöreskog (1969). This means that we cannot observe Y directly. However, we can observe certain measures (or indicators) such as the number of bank branches or the responses of individuals to questions asked about their use of financial services. Thus, the latent variable, financial inclusion, manifests itself in physical infrastructure such as branch networks of banks or how people perceive their access to finance. This means that the direction of influence goes from the latent variable, financial inclusion, to the respective measure (or indicator).

In contrast to PCA, CFA is a system of equations where the measures x_i are the dependent and observed variables and the latent variable, financial inclusion, influences their manifestations.

$$\begin{matrix} x_1 \\ \vdots \\ x_k \end{matrix} = \begin{matrix} b_1 Y + u_1 \\ \vdots \\ b_k Y + u_k \end{matrix} \qquad (2)$$

Each equation of the measurement model has an error term (denoted u_i). Apart from the latent variable, financial inclusion, other factors might also influence the respective measure x_i. Hence, CFA permits that errors occur. In addition, as in our application of CFA, these error

terms can be correlated. This means that an unknown factor (e.g. financial regulation) can affect the number of bank branches and also the number of ATMs in a similar way[5].

Construction of indices based on Park and Mercado (2015, 2018) and Arora (2010)

To replicate the financial inclusion measure developed by Park and Mercado (2015, 2018), five variables are obtained from the World Bank's Development Indicators database covering all countries from 2004 to 2017. The five measures include the number of automated teller machines per 100,000 adults (atm), commercial bank branches per 100,000 adults (com), borrowers from commercial banks per 1,000 adults (bor), depositors with commercial banks per 1,000 adults (dep), and domestic credit provided by financial sector relative to GDP (dom).

The methodology applied by Park and Mercado (2015, 2018) follows Sarma (2008) (see Table 1), which actually refers to an equally weighted index as each dimension (i.e. each of the five measures) after standardisation enters the Euclidian distance measure equally weighted. The following standardisation is used, where m_i refers to the average value of the measure m of country i over the whole period.[6]

$$s_i = \frac{m_i - \min_j(m_j)}{\max_j(m_j) - \min_j(m_j)} \qquad (4)$$

By construction, the standardised measure s_i takes values in the closed interval [0, 1]. Hence, the ideal point refers to the all one vector in this five-dimensional space. Distance to this ideal point is determined using the Euclidian distance measure (see equation 5). There are several concerns associated with this approach. First, outliers have a strong impact on the

[5] For a discussion of the measurement of latent variables in structural equation models see Knoke (2005).

[6] The treatment of missing data is unknown as Park and Mercado (2015, 2018) take averages over the whole period, and argue that this includes more countries, which suggests that missing values are treated as missing at random. Taking averages, however, also removes the possibility to observe trends over time. An alternative approach is to take sample averages at a point in time for a certain subset of countries.

standardisation method. Second, equal weights are not justified. Third, measurement error is not accounted for. Fourth, measures are assumed to be independent, otherwise the Euclidean distance measure is not valid as we are not operating in a linear metric space.

$$FII_i = 1 - \sqrt{\frac{1}{5}\sum_{i=1}^{5}(1 - s_i)^2} \tag{5}$$

Park and Mercado (2015, 2018) contend that the number of ATMs and bank branches refer to the availability or access dimension of financial inclusion, whereas the other three measures proxy the usage dimension. To be precise, the five measures have two latent common factors, the two dimensions of financial inclusion (FI), access (ACCESS) and usage (USE). In practice, many countries have missing values, which makes this index less useful, e.g. FII cannot be determined for India. Even in the case of the USA, some missing values occur.

Next, we replicate Arora's (2010) index, which uses three dimensions: outreach of banks (OUT), ease of transactions (EASE) and costs of financial products (COST). To measure outreach, four variables are used including: the number of bank branches per 1,000 sq. km (branch_g), the number of bank branches per 100,000 people (branch_d), the number of ATMs per 1,000 sq. km (atm_g) and the number of ATMs per 100,000 people (atm_d). To measure ease, twelve variables are used including: locations to open deposit account (location), minimum amount to open checking account (min_c), minimum amount to open savings account (min_s), minimum amount to be maintained in checking account (min_c_m), minimum amount to be maintained in savings account (min_s_m), number of documents to open checking account (docs_s), number of documents to open savings account (docs_c), locations to submit loan applications (location_l), minimum amount of consumer loan (min_cl), minimum amount of mortgage loan (min_mo), days to process consumer loan application (day_cl) and days to process mortgage loan application (day_mo). To measure the cost dimension, six variables are used including: fees consumer loan (% of minimum loan

amount) (fee_c), fees mortgage loan (% of minimum loan amount) (fee_s), annual fees checking account (fee_cl), annual fees savings account (fee_mo), cost to transfer funds internationally (%$250) (fee_t) and amount of fees for using ATM cards (%$100) (fee_atm).

Arora's (2010) index is based on a much larger set of variables compared to Park and Mercado (2015, 2018); however, data is only available for 50 countries if listwise deletion is applied. Moreover, the data refers to the World Bank and CGAP Finance for All database, which is not available for several years. The variables used are not justified, and many variables exhibit high correlations, which we uncovered in our analysis. In line with Park and Mercado (2015, 2018), all variables are standardised using equation (4). The three dimensions are constructed using equally weighted standardised variables. Finally, the financial inclusion index (FAI) uses a weight of two for the outreach dimension and weights of one for the two other dimensions.

To assess whether the indices developed by Arora (2010) and Park and Mercado (2015, 2018) agree, Table 3 shows three different types of correlation coefficients for 37 countries for the period 2005 to 2016. The Pearson correlation coefficients and the rank correlation coefficients based on Spearman and Kendall exhibit low correlations between Park and Mercado's (2015, 2018) index (FII) and two versions of Arora's (2010) index (FAI, FAI_II). Hence, there is no alignment between the two indices.

[Insert Table 3]

Application of CFA to both indices

To validate both indices, we conduct a CFA analysis based on the suggested number of dimensions. Park and Mercado's (2015, 2018) index relies on two dimensions, and Figure 1 illustrates the implied model structure using the two dimensions access (ACCESS) and usage

(USE). Fitting this model including the latent variable financial inclusion (FI) fails as the two dimensions exhibit very high correlation shown in Table 4. Table 4 reports a CFA model, where we estimate two measurement models for the two dimensions.

[Insert Figure 1]

[Table 4 here]

Note that variances of latent variables are standardised to one; hence, the covariance between USE and ACCESS shown in Table 4 is equal to the correlation coefficient, indicating a high positive correlation between the two dimensions. Table 4 reports standardised coefficients (Coef), standard deviations (Std) and goodness of fit measures. Following Acock (2013), a good model should have an insignificant Chi-square test statistic, a RMSEA below 0.05 and a CFI above 0.95. Using these measures of goodness of fit, we evaluate the baseline CFA model. If the model exhibits poor fit (RMSEA>0.05 or CFI<0.95), we determine modification indices based on Sörbom (1989) and Wooldridge (2010). To improve model fit, we include the covariance between error terms of questions with the highest modification index (MI). Table 4 shows that RMSEA>0.05 but CFI<0.95, and the covariance cov(e.bor,e.dep) exhibits the highest MI of 47.744. After considering the correlation between the error terms of borrowers and depositors, the model fit improves to an RMSEA 0.037 and CFI 0.998. The CFA model reported in Table 4 would suggest different weights for the set of variables used. Moreover, the two dimensions are highly correlated, suggesting that both dimensions measure the same aspect of financial inclusion.

Using a CFA based on Arora's (2010) model with three dimensions shown in Table 5 encounters other problems. First, the sample size is small; hence, goodness of fit measures are not reliable as too many coefficients need to be estimated based on a small number of observations. Second, many CFA specifications, e.g. including covariances between measurement errors do not converge. However, some of the three dimensions exhibit very low

correlation coefficients, suggesting that they measure different aspects of financial inclusion. Yet, ease and cost are highly correlated. Table 5 reports standardised coefficients (Coef), standard deviations (Std) and goodness of fit measures. As in the previous case, weights determined through CFA are very different from equal weighting. Moreover, several variables are insignificant. Hence, adding many variables as in Arora's (2010) model does not necessarily improve our understanding of financial inclusion.

[Table 5 here]

In addition to validating the indices developed by Arora (2010) and Park and Mercado (2015, 2018), our CFA results can be used to understand the underlying reasons for a lack of financial inclusion. Table 6 shows countries ranked by the Park and Mercado (2015, 2018) denoted FII from the lowest to the highest score. It also reports FAI_II, which is a simplified version of Arora's (2010) index focused on the outreach dimension as well as the five factors derived from our CFA analysis. These factors include measures for the dimensions outreach (F_OUT), ease of use (F_EASE), costs (F_COST), use (F_USE), and access (F_ACCESS). The table reports the respective quintile position, where 1 refers to the lowest quintile.

[Insert Table 6]

In line with our analysis based on correlation coefficients, discrepancies between Park and Mercado's (2015, 2018) and Arora's (2010) index appear in most cases. For instance, Chile is in the bottom 20% based on Park and Mercado's (2015, 2018) index – but in the top 40% according to Arora's (2010) index. The CFA factors can shed some light on the underlying reasons for these discrepancies. For instance, Chile exhibits higher scores in the dimensions of ease of use and costs - but lacks in outreach. In contrast to established indices, which have methodological weaknesses as shown by our CFA analysis, our methodology derives factors,

which quantify various dimensions of financial inclusion. By analysing these predicted factors, countries can identify their improvement potential.

5. Research and Policy Implications

Moving beyond financial access

A key issue that emerges from this paper is the need for financial inclusion research and policy to move from a focus on "access" to one also considering "use", and from a focus on the "quantity" of financial inclusion to one also emphasising its "quality" (for example, consumer protection, financial literacy, product appropriateness). This is especially the case with research and policy informed by index-based studies of financial inclusion, as most of them have so far only made use of aggregate supply side data, which do not fully capture who uses which financial services, and what their perceptions of the quality of such services are.

Paying greater attention to financial innovations

New financial providers, products and delivery channels are an important element of the financial inclusion agenda in developing countries (Beck 2016; World Bank 2018). This has implications for measurement. Our (composite) measures of financial inclusion, however, still tend to focus on certain provider types (e.g., commercial banks) and access channels (e.g., bank branches and ATMs) and thus cannot fully capture the diverse and evolving approaches to advancing financial inclusion across developing countries.

The choice of data sources and measurement approaches

For reasons related to the choice of data, variables, weighting and aggregation methods, the indices used in cross-country and national studies of financial inclusion are often biased toward measuring the supply-side and quantitative aspects of it. Thus, there is a need, also recognised

by other studies (for example, Beck 2016), for combining aggregate and micro-level data, as well as supply- and demand-side indicators, on the different dimensions and aspects of financial inclusion to obtain a more complete picture. In this regard there is much to gain from using CFA to refine the conceptualisation and measurement of financial inclusion, as well as for increasing consistency, objectivity, and transparency in the index construction process.

7. Conclusion

This study shows that there are many ways to define and measure financial inclusion. From a policy perspective this ambiguity is an issue as any evidence-based approach requires reliable measurements. Our review demonstrates that there is no widely accepted definition or concept, and that country-specific issues need to be considered. Using a CFA approach, our empirical analysis shows that widely adopted measures of financial inclusion have shortcomings. First, the "access" and "use" dimensions are highly correlated, suggesting that they measure the same aspects of financial inclusion. This is consistent with the view that aggregate indicators, such as deposit and loan penetration, are only "rough proxies" for the use of financial services (Martínez-Pería 2014: 94). Second, standardised coefficients are very different from equally-weighted index constructions used by Park and Mercado (2015, 2018) and Arora (2010). Third, the CFA approach can account for measurement errors and demonstrates that some errors are highly correlated. Fourth, although Arora (2010) offers a broader index of financial inclusion, several of the variables are not significant and hence do not improve the quality of the model.

In summary, we recommend that composite measures of financial inclusion should be checked using CFA or alternative methods to ensure index constructions follow a systematic approach in terms of defining dimensions, selecting variables and deriving weights. More specifically, the use of confirmatory factor analysis allows us to identify and overcome some of the

conceptual and methodological shortcomings of previous financial inclusion indices that are associated with a poor selection of indicators or a lack of appropriate methods for the normalisation, weighting and aggregation of such indicators.

Our study reinforces the need to use demand-side data from households and firms, as well as to incorporate indicators of the quality of provision. This is particularly important in countries such as China, where the increase in access to the financial sector does not seem to have been accompanied by an equivalent increase in the actual use and quality of financial services (World Bank 2018).

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Tables

Table 1. Select Indices of Financial Inclusion: Dimensions, Weighting, Normalization and Aggregation Methods

Publication	Main Data Source(s)	Dimensions of Financial Inclusion				Financial Services				Providers		Channels		Number Dimensions (*Indicators*)	Weights	Normalization & Aggregation Method*
		Access	Use	Cost	Quality	Savings	Loans	Payments	Insurance	Banks	Other	Physical access	Other			
Sarma (2008)	World Bank's World Development Indicators database	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes	No	3 (4)	Equal	$d_i = w_i \frac{A_i - m_i}{M_i - m_i}$ $\text{IFI} = 1 - \sqrt{\frac{(w_1 - d_1)^2 + (w_2 - d_2)^2 + (w_3 - d_3)}{(w_1^2 + w_2^2 + .. w_n^2)}}$ Where: w_i = weight given to dimension i A_i = Actual value of dimension i M_i = Maximum value of dimension i m_i = Minimum value of dimension i
Sarma and Pais (2011)	World Bank's World Development Indicators database	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes	No	3 (4)	Arbitrary	$d_i = \frac{A_i - m_i}{M_i - m_i}$ $\text{IFI} = 1 - \sqrt{\frac{(1 - d_1)^2 + (0.5 - d_2)^2 + (0.5 - d_3)^2}{1.5}}$
Chakravarty and Pal (2010)	Data from Beck et al. (2007)	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes	No	2 (6)	Equal	$d_i = \left(\frac{A_i - m_i}{M_i - m_i}\right)^r$ $\text{IFI} = \frac{1}{n}\sum_{i=1}^{n} d_i$
Arora (2010)	World Bank's Finance for All database	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No	3 (22)	Arbitrary	$d_i = \frac{A_i - m_i}{M_i - m_i}$ $\text{IFI} = d_1 * w_1 / d_2 * w_2 + d_3 * w_3$
Park and Mercado (2015, 2018)	World Development Indicators database	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes	No	2 (5)	Equal	$d_i = \frac{A_i - m_i}{M_i - m_i}$ $\text{IFI} = 1 - \sqrt{\frac{(1 - d_1)^2 + (1 - d_2)^2 + (1 - d_n)^2}{\sqrt{n}}}$
Gupte et al. (2012)	Financial Access database by CGAP and the World Bank Group	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No	4 (24)	Equal	$d_i = \frac{A_i - m_i}{M_i - m_i}$ $\text{IFI} = d_1^{1/5} + d_2^{1/5} + d_{3a}^{1/5} + d_{3b}^{1/5} + d_4^{1/5}$
Ambarkhane et al. (2016)	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3 (33)	Equal**	$d_i = \frac{A_i - m_i}{M_i - m_i}$ $\text{IFI} = 1 - \sqrt{\frac{(1 - d_1)^2 + (1 - d_2)^2 + (1 - d_3)^2}{3}}$

Amidžić et al. (2014); Mialou et al. (2017)	IMF's Financial Access database	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes	No	2 (6)	Factor analysis	$nX_{ic} = \frac{X_{ic}}{M_i}$ A= exp $(\frac{\sum_{i=1}^{N} w_i Log x_i}{\sum_{i=1}^{N} w_i})$ Where: x_{ic} =value of variable/dimension i for country c nx_{ic} = normalized value of i for country c M_i = Maximum value of i across countries A = weighted geometric aggregator w_i = weight given to variable/dimension i

Notes: *This formula is used to aggregate the various sub-indices or dimensions of financial inclusion into an overall index. In most of the above-cited studies, the variables are aggregated into different sub-indices or dimensions using the arithmetic mean (e.g., Arora 2010; Gupte et al. 2012). ** Ambarkhane et al. (2016) assign different and arbitrary weights to each of the variables aggregated into each of the three dimensions of their index. Each of the dimensions is, nonetheless, given equal weight.

Table 2. Financial inclusion indices: Main indicators

Publications	Sarma (2008); Sarma and Pais (2011)	Chakravarty and Pal (2010)	Arora (2010)	Park and Mercado (2015, 2018)	Gupte et al. (2012)	Ambarkhane et al. (2016)	Amidžić et al. (2014); Mialou et al. (2017)
Access							
No. bank branches (population)	√	√	√	√	√	√	√
No. ATMs (population)	√	√	√	√	√	√	√
No. bank branches (territory)		√	√		√	√	√
No. ATMs (territory)		√	√		√	√	√
No. bank accounts (population)	√					√	
No. bank correspondents (population)						√	
No. post offices (population)						√	
No. microfinance institutions (pop)						√	
No. life insurance companies (pop)						√	
No. mobile users (pop)						√	
Use							
No. bank borrowers (population)				√		√	√
No. bank depositors (population)				√	√	√	√
No. loans (population)		√					
No. deposits (population)		√					
No. transactions deposit accounts						√	
Credit plus deposits relative to GDP	√						
Domestic credit over GDP				√			
Insurance density						√	
Insurance penetration						√	
Domestic remittances						√	
Ease/Cost							
Locations to open account			√		√		
Minimum amount to open account			√		√		
Documents to open account			√		√		
Minimum amount in account			√		√		
Locations to submit loan applications			√		√		
Minimum amount of loan			√		√		
Days to process loan application			√		√		
Annual fees account			√		√		
Fees for using ATM cards			√		√		
Fees loan (% minimum loan amount)			√		√		
Cost to transfer funds internationally			√		√		
Quality							
Financial literacy						√	
Consumer protection							
Consumer satisfaction							

Table 3. Comparing Arora's (2010) and Park and Mercado's (2015, 2018) indices

This table shows Pearson correlation coefficients and the rank correlation coefficients based on Spearman and Kendall. FII refers to the index developed by Park and Mercado (2015, 2018), whereas FAI stands for Arora's (2010) index. FAI_II is a simplified version of Arora's (2010) index focused on the outreach dimension.

	Pearson	Spearman	Kendall
	FII	FII	FII
FAI	-0.183	-0.001	0.010
FAI_II	-0.236	-0.087	-0.067

Table 4. Measurement models for access and use

	ACCESS		USE		
VARIABLES	Coeff	Std	Coeff	Std	Error variance
atm	0.954***	[0.021]			0.091
com	0.473***	[0.028]			0.776
bor			0.873***	[0.011]	0.238
dep			0.862***	[0.011]	0.257
dom			0.587***	[0.024]	0.655
cov(ACCESS, USE)	0.906				
RMSEA	0.115				
CFI	0.979				
Observations	920				

Notes The variables refer to the number of automated teller machines per 100,000 adults (atm), commercial bank branches per 100,000 adults (com), borrowers from commercial banks per 1,000 adults (bor), depositors with commercial banks per 1,000 adults (dep), and domestic credit provided by financial sector relative to GDP (dom). The covariance between access and use measures is denoted cov(ACCESS, USE). Standard errors are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

Table 5. Measurement models for outreach, ease and cost

	OUT		EASE		COST		
VARIABLES	Coeff	Std	Coeff	Std	Coeff	Std	Error variance
branch_g	0.776***	[0.086]					0.397
branch_d	0.593***	[0.161]					0.649
atm_g	0.873***	[0.091]					0.238
atm_d	0.714***	[0.112]					0.490
location			0.036	[0.089]			0.999
min_c			0.850***	[0.041]			0.278
min_s			0.880***	[0.038]			0.225
min_c_m			0.960***	[0.016]			0.079
min_s_m			0.959***	[0.017]			0.081
docs_s			0.416***	[0.119]			0.827
docs_c			0.338**	[0.127]			0.886
location_l			(0.289*)	[0.132]			0.916
min_cl			0.932***	[0.023]			0.132
min_mo			0.768***	[0.060]			0.410
day_cl			0.111	[0.142]			0.988
day_mo			-0.004	[0.143]			1.000
fee_c					0.833***	[0.051]	0.306
fee_s					0.933***	[0.034]	0.129
fee_cl					0.089	[0.146]	0.992
fee_mo					0.026	[0.149]	0.999
fee_t					0.082	[0.148]	0.993
fee_atm					-0.047	[0.146]	0.998
cov (OUT,EASE)	-0.213						
cov(OUT,COST)	-0.269						
cov(EASE,COST)	0.925						
RMSEA	0.000						
CFI	1.000						
Observations	50						

Notes The variables refer to the number of bank branches per 1,000 sq. km (branch_g), the number of bank branches per 100,000 people (branch_d), the number of ATMs per 1,000 sq. km (atm_g), the number of ATMs per 100,000 people (atm_d), locations to open deposit accounts (location), minimum amount to open checking accounts (min_c), minimum amount to open savings accounts (min_s), minimum amount to maintain checking accounts (min_c_m), minimum amount to maintain savings accounts (min_s_m), number of documents to open checking accounts (docs_s), number of documents to open savings accounts (docs_c), locations to submit loan applications (location_l), minimum amount of consumer loan (min_cl), minimum amount of mortgage loan (min_mo), days to process consumer loan application (day_cl), days to process mortgage loan application (day_mo), fees consumer loan (% of minimum loan amount) (fee_c), fees mortgage loan (% of minimum loan amount) (fee_s), annual fees checking account (fee_cl), annual fees savings account (fee_mo), cost to transfer funds internationally (%$250) (fee_t) and amount of fees for using ATM cards (%$100) (fee_atm). Covariances are denoted cov. Standard errors are in parentheses. *** p<0.001, ** p<0.01, * p<0.05.

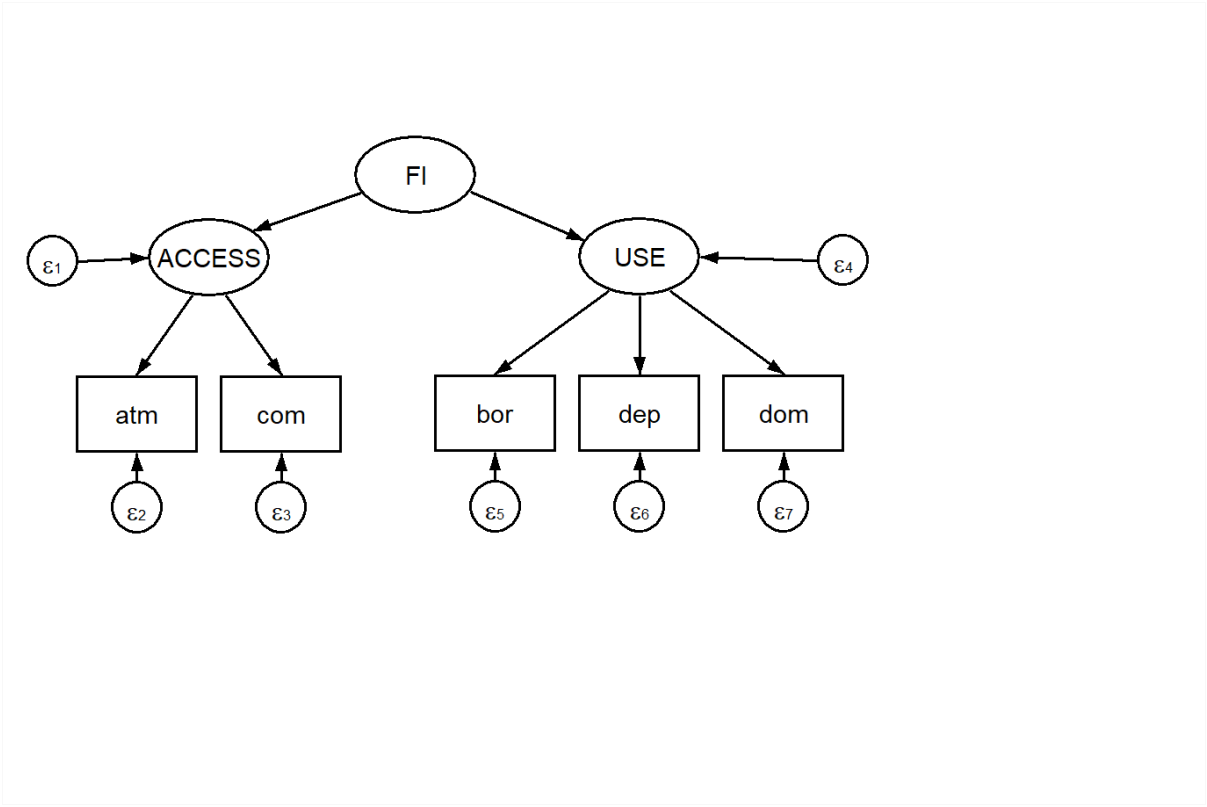
Table 6. Indices and CFA factors for different countries

Country	FII	Q_FII	FAI_II	Q_FAI_II	Q_F_OUT	Q_F_EASE	Q_F_COST	Q_F_USE	Q_F_ACCESS
Chile	0.028	1	0.069	4	3	2	4	1	1
China	0.031	1	0.010	1	2	1	1	1	1
Guatemala	0.038	1	0.069	4	4	3	3	2	2
Georgia	0.040	1	0.010	1	1	5	2	1	1
Thailand	0.041	1	0.054	4	3	3	5	1	1
Italy	0.044	1	0.312	5	5	1	2	5	5
Zambia	0.049	1	0.004	1	1	5	5	1	1
Tanzania	0.050	1	0.001	1	1	4	4	1	1
Peru	0.051	2	0.021	2	2	2	3	3	3
El Salvador	0.052	2	0.040	3	4	3	3	2	2
Honduras	0.054	2	0.008	1	1	4	4	2	1
Croatia	0.057	2	0.144	5	5	1	1	2	2
Portugal	0.061	2	0.370	5	5	2	1	3	3
Albania	0.064	2	0.010	1	1	4	3	1	1
Hungary	0.066	2	0.142	5	5	1	1	2	2
Estonia	0.068	3	0.149	5	5	5	2	2	2
Pakistan	0.082	3	0.016	2	2	3	1	3	3
Belgium	0.086	3	0.355	5	5	1	1	2	2
Dominican Republic	0.097	3	0.049	3	4	2	1	3	3
Madagascar	0.101	3	0.001	1	1	5	5	3	3
Namibia	0.101	3	0.033	2	2	4	4	1	2
Bosnia and Herzegovina	0.108	3	0.020	2	2	2	2	3	3
Lebanon	0.112	3	0.115	5	5	5	5	4	3
Argentina	0.117	4	0.053	3	3	2	5	3	4
Costa Rica	0.122	4	0.052	3	3	3	3	4	4
Uganda	0.128	4	0.002	1	1	5	5	3	3
Bolivia	0.153	4	0.012	2	1	5	5	4	4

Saudi Arabia	0.170	4	0.040	3	3	4	3	4	4
Poland	0.173	4	0.058	4	4	1	1	4	4
Turkey	0.183	4	0.059	4	4	1	2	4	4
Malaysia	0.214	5	0.059	4	4	3	3	5	5
Colombia	0.220	5	0.041	3	3	2	3	4	4
Indonesia	0.229	5	0.034	3	2	3	4	5	5
Botswana	0.233	5	0.025	2	2	4	4	5	5
Brazil	0.259	5	0.071	4	3	1	2	5	5
Ecuador	0.294	5	0.037	3	3	4	4	5	5
Bangladesh	0.363	5	0.029	2	4	3	2	5	5

Notes The table shows countries ranked by the Park and Mercado (2015, 2018) denoted FII from the lowest to the highest score. FAI_II is a simplified version of Arora's (2010) index focused on the outreach dimension as well as the five factors derived from our CFA analysis. These factors include measures for the dimensions outreach (F_OUT), ease of use (F_EASE), costs (F_COST), use (F_USE), and access (F_ACCESS). The prefix Q stands for quintiles, i.e. the rank of each country is expressed in its quintile position from 1 (lowest) to 5 (highest).

Figure 1. CFA using the two dimensions access and use



Appendix

Table A1: Select definitions of financial inclusion listed by year of publication

Financial inclusion refers to "access at a reasonable cost of all households and enterprises to the range of financial services for which they are bankable (…)". It involves "multiple providers of financial services, wherever feasible, so as to bring cost-effective and a wide variety of alternatives to customers which could include any number of combinations of sound private, non-profit and public providers" (UN 2006).
Financial inclusion implies "the availability of a supply of reasonable quality financial services at reasonable costs…" (Claessens 2006).
Financial inclusion is the "process of ensuring access to financial services and adequate credit where needed by vulnerable groups such as low-income groups at affordable cost" (Rangajaran 2008; Ambarkhane et al. 2016).
Financial inclusion is "a process that ensures the ease of access, availability and usage of the formal financial system for all members of an economy" (Sarma 2008; Sarma and Pais 2011; Park and Mercado 2015; Park and Mercado 2018).
Financial inclusion is the "absence of price and non-price barriers in the use of financial services" (Dermigüc-Kunt and Levine 2008).
Financial inclusion involves "providing access to financial services for all" (CGAP 2009).
Financial inclusion refers to "the delivery of financial services of an economy to its members" (Chakravarty and Pal 2010).
Financial inclusion involves "providing access to financial services for the poor" (Kendall et al. 2010).
"Financial inclusion refers to a state in which all working age adults, including those currently excluded by the financial system, have effective access to the following financial services provided by formal institutions: credit, savings (defined broadly to include current accounts, payments, and insurance". Effective access "involves convenient and responsible service delivery, at a cost affordable to the customer and sustainable for the provider (…)". Meanwhile, responsible delivery "involves both responsible market conduct by providers and effective financial consumer protection and oversight" (CGAP 2011).
"The essence of financial inclusion is to ensure that a range of appropriate financial services is available to every individual and enabling them to understand and access those services" (Chattopadhyay 2011).
"Financial inclusion is a process that ensures the ease of access, availability and usage of the formal financial system for all members of an economy' (Sarma and Pais 2011).
"Financial inclusion is the process of ensuring access to appropriate financial products and services needed by all members of the society in general and vulnerable groups in particular, at an affordable cost in a fair and transparent manner by mainstream institutional players" (Chakrabarty 2012).
Financial inclusion is "the proportion of individuals and firms that use financial services. It has a multitude of dimensions, reflecting the variety of possible financial services, from payments and savings accounts to credit, insurance, pensions, and securities markets" (World Bank 2014).
Financial inclusion can be defined as "an economic state where individuals and firms are not denied access *to* basic financial services based on motivations other than efficiency criteria" (Amidžić et al. 2014; Mialou et al. 2017).
Financial inclusion refers to "the access to and use of formal financial services" (Sahay et al. 2015).

Financial inclusion is "the use of formal financial services" (Allen et al. 2016; Dermigüc-Kunt and Klapper 2013).
Financial inclusion is concerned with "*effective access* to finance. It seeks to ensure universal availability – not usage – of affordable and adequate *basic* financial services, namely, credit, savings, insurance and payment services" (Queralt 2016).
Financial inclusion means that "adults have access to and can effectively use a range of appropriate financial services. Such services must be provided responsibly and safely to the consumer and sustainably to the provider in a well-regulated environment" (Demirgüc-Kunt et al. 2017).
Financial inclusion involves "access to useful and affordable financial products and services that meet individual's needs for transactions and payments, savings, credit, and insurance (World Bank, 2017). (World Bank 2017; Zhang and Posso 2017).
"Financial inclusion is universal access, at a reasonable cost, to a wide range of financial services, provided by a variety of sound and sustainable institutions" (UN 2018).
Financial inclusion can be defined as "the uptake and usage of a range of appropriate financial products and services by individuals and micro and small enterprises (MSEs), provided in a manner that is accessible and safe to the consumer and sustainable for the provider" (World Bank 2018).

Table A2: Multi-country supply- and demand-side data sources on financial inclusion

Survey	Description	Frequency	Coverage	Publicly available
IMF Financial Access Survey	Cross-country data on penetration and usage of financial services collected from regulators	Annual	Global	Yes
IMF International Financial Statistics	Collects eight financial inclusion indicators from regulators of roughly 190 countries	Varies	Global	Yes
IMF Financial Soundness Indicators	Indicators of financial soundness that assess strengths and vulnerabilities of financial systems.	Varies	Global	Yes
Findex (World Bank)	Cross-country, nationally representative survey of household finance	Triennial	Global	Yes
Enterprise Survey (World Bank)	Collects eight financial inclusion indicators from regulators of roughly 190 countries	Triennial rounds, annual rounds for selected questions	Global	Yes

Source: Adapted from World Bank (2012b: 20)