



TRIGGERS AND BARRIERS OF FINANCIAL INCLUSION: A COUNTRY-WISE ANALYSIS



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ABSTRACT

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The objective of this study was twofold. The first goal was to construct a composite multi-dimensional index for financial inclusion using two stage principal component analysis for 91 countries for two benchmark years, 2011 and 2014 which includes both supply and demand side factors and compare the rank mobility using the World Bank Findex database. The second goal was to track the binding determinants of financial inclusion using a panel fixed effects model. A panel ordered probit model was used to judge the extent of causality between growth, sectoral share, female workforce participation, poverty reduction with different levels of financial inclusion. The middle- and low-income countries can reach their potential if the sources of barriers have been tracked efficiently as this is the main constraint for an inclusive financial system. To reduce the multidimensional poverty through endogenous stimulus of the poor population in South-Asian, Sub-Saharan and few Latin American countries, it is essential to reinforce the provision of financial resources for the working-age female population and to improve the affordability and accessibility of inclusive investment for rural populations.

Contribution/ Originality: The paper proposes a new estimation methodology for constructing a multi-dimensional financial inclusion index considering both demand and supply side parameters. The study explored the causality of financial inclusion with other macroeconomic variables such as inclusive growth and financial stability, employment, poverty using the panel ordered probit model.

1. INTRODUCTION

The efficacy of the financial system depends on its ability to source funds from surplus units and finance deficit units. Financial inclusion, in its simplest sense, can be defined as the delivery of financial services such as credit, deposits, insurance and payments at affordable costs to large sections of the disadvantaged and poor sections of the society. In the sense of a quasi-public good, the purpose of financial inclusion is to provide equitable opportunities to every individual to avail formal financial facilities for their welfare generation.

Financial inclusion is being recognised as fundamental need for economic growth and poverty alleviation. It is crucial to innovate and provide means to include the financially excluded by way of ensuring access to financial services, and timely and adequate credit for the inclusive growth and sustainable development of a country. Issues relating to financial inclusion have caught the eye of many institutions, financial organizations, policymakers and governments.

Financial inclusion has been made a core objective of the development agenda in most of the emerging economies. The World Bank declared the target of achieving universal formal financial access by 2020.¹ According to the World Bank estimates, the number of people worldwide with an account grew by 700 million between 2011 and 2014. Around 62 percent of the world's adult population had an account in 2014; up from 51 percent in 2011. However even today, 2 billion adults remain without an account.

The importance of banking services is being viewed increasingly as needing to be made available to the entire population without discrimination hence termed as a 'quasi-public good' (Mehrotra, Puhazhendhi, Nair, & Sahoo, 2009). This recognition has made financial inclusion a policy objective for policy makers and others engaged in developmental activities.

Many countries have tried to solve the problem of financial inclusion given their resources. In South Africa the banking markets were extremely expensive. In order to overcome this, the South African Banking Association launched an 'Mzansi account' a 'No Frill' bank account which facilitated five free transactions in a month.

The Banking Correspondent/Banking Facilitator (BC/BF) model was used in Brazil. It was a partnership between the banks and third-party agents. Agents called banking correspondents were used to spread access to banking.

Kenya demonstrated the best use of technology as a step towards increasing inclusion. They used a mobile phone company as a conduit for keeping and transacting money. M-PESA, an e-money transfer service was launched by Safari.com-Vodafone with a cap of \$500 on a transaction followed by M-KESHO which provided deposit facility too.

Microfinance Institutions led an extremely efficient and transparent lending mission in Mexico. It has succeeded to bring in safe reliable inclusive financial system in economy. Philippines launched the first successful mobile payment service in a developing country in 2004. Indonesia proved how public-owned financial institutions may become the driving force behind economic development in the rural areas. Bank Rakyat Indonesia (BRI), a government owned development bank, is the biggest provider of rural financial services within Indonesia. Even when the Indonesian banking system collapsed during the financial crisis in 2008, BRI's micro-banking division remained relatively profitable. Thereby these achievements in developing countries around the world inspire us to adopt new techniques to serve the poor (Khan, 2011).

Although in one hand financial inclusion is the key to inclusive growth for an economy, sometimes financial inclusion banking sector counterproductive when it gets associated with non-performing loans due to information asymmetry which in turn creates loss of banking stability while dealing with priority sector lending (Acharya, Hasan, and Saunders (2006). It occurs due to inefficiency in managerial expertise. The inadequate capital asset ratio makes financial inclusion process costly while dealing with poor households and small-scale business. Banks' capital to asset ratio is used to protect depositors and promote the stability and efficiency of financial systems. The reason why minimum capital adequacy ratios are critical is to make sure that banks have enough cushion to absorb a reasonable amount of losses before they become insolvent and consequently lose depositors' funds (Ahamed & Mallick, 2019).

2. LITERATURE REVIEW

Various studies have been conducted on the spectrum of financial inclusion by formulating a methodology for cross country comparison. Honohan (2008) has constructed estimates of the fraction of the households who have access to formal financial intermediaries and thereafter compared these estimates to poverty and inequality using

¹ The Global Financial Development report for 2014, by the World Bank (2013) is the second report that focuses on the relevance of financial inclusion. It offers an overview of financial inclusion status and problems based on new evidence about financial sector policy.

the Gini coefficient. He has used the ratio of Micro Finance accounts and bank accounts to the total population, household survey-based access and the average deposit size and the per capita GDP for more than 160 countries.

Sarma (2008); Sarma. (2012) in her concept note 'Index of Financial Inclusion' (hereafter known as IFI) has considered three dimensions to measure the extent of financial inclusion, namely, (a) depth of access using a proxy measure of the bank accounts per 1000 population, (b) availability to measure proximity of access using the number of bank branches and number of ATM branches per 1000 population and (c) usage to measure the extent and frequency of use by the customers. However, Sarma has attached equal weights to the three dimensions and ranked the 45 countries (where data for all three dimensions were available) and 81 countries (where data for only two dimensions were available) in order of the IFI to show the relative position among other countries. The index used distance approach to calculate the IFI, unlike the UNDP method in which the average approach was used.

Mehrotra et al. (2009) also built an index for financial inclusion using similar aggregate indicators like the number of rural offices, number of rural deposit accounts, volume of rural deposit and credit from banking data for sixteen major states of India. Charkravarty and Pal (2010) used the axiomatic measurement approach for the measurement of financial inclusion. Gupte, Venkataramani, and Gupta (2012) computed the IFI only for 98 countries for the years 2009 and 2010 as a geometric mean of 4 critical dimensions- outreach (penetration and accessibility), usage, and ease of transactions and cost of transactions, following the methodology used by UNDP in computing the HDI in 2010.

Camara and Tuesta (2014) has measured the extent of Financial Inclusion for 82 developed and less developed countries for 2011. They have applied a two stage PCA postulating that the degree of financial inclusion is determined by three dimensions namely usage, access to financial services and barriers. Using the World Findex database they calculate a comprehensive measure of financial inclusion across countries. A recent empirical paper written by Ngo (2019) estimated the impacts of social factors on financial inclusion level for Asian countries in the period 2008-2016. However, the estimation of index has been composed with distance formula and external weights.

There are few more studies that have been conducted on the spectrum of financial inclusion by formulating a methodology for cross country comparison. A study by Ghosh and Vinod (2017) was a major contribution in within-country studies to identify the interface between gender and finance. The study conducted imbibed evidence from Indian household-level data to analyse the disparity between the access and the use of finance between female-represented and male-represented households. By employing a multivariate regression model, their study empirically showcased that female-headed households are hardly likely to access formal finance because of the prevalence of educational and wage discrimination whereas the role of politics and society becomes pivotal determinants to explain the likelihood of financial usage by gender.

The impact of financial inclusion programs, which ideologically appears to be similar on surface, has deeper insights when gender is incorporated and studied (Swamy, 2014). Another study by Li (2018) emulates the relationship between poverty alleviation and financial inclusion in terms of access of bank credit by identifying the role of relative income. Taking evidence from Chinese households estimated through a logit model analysis, the framework of the paper extensively indicates the incentive of "tunnel effect", the effect of wealthy's economic success which inspires the poor to participate in the credit market for investment, on relatively poor households to access financial services to escape from poverty.

The age of individuals, money poverty, lack of trust in formal financial institutions, wealth class and distance to financial institutions were found out to be the major determinants in explaining the lack of inclusivity in the spectrum of formal finance especially in the developing countries of Western Africa particularly Ghana (Akudugu, 2013). A study by Sayed and Shusha (2019) empirically showcased the prevalence of integration of differentiated financial services and products in Egypt as a major determinant which influences consumers approach towards financial inclusivity. The study incorporated Karl Pearson's correlation coefficient and regression analysis to

underline the impact of religious sentiment that hovers around consumer's preference towards accessing financial services.

The penetration of financial branches (bank) and ATMs significantly broaden the horizon of financial inclusion in context of accessing formal financial services, noted a study by [Allen, Demirguc-Kunt, Klapper, and Martinez Peria \(2016\)](#). With Angola having approximately one bank branch per 1000 sq. km compared to 30 bank branches in India, the said study focused on the importance of greater proximity to financial intermediaries, legal rights and lower account costs to be pivotal determinants associated with the use of formal accounts for those likely to be excluded from the societal strata such as the poor, young individuals, or even rural areas.

Various studies over time have indicated specific government integration policy is required in a developing economy. Analysing dataset culminated through a questionnaire formulated as specified by [Berg \(2001\)](#) a study by [Shankar \(2013\)](#) empirically estimated the exposure and role played by micro finance institutions (MFI) in promoting financial inclusivity on a developing economy. The study employed an unconventional approach of field interviews with one hundred and three Indian MFI officers, concluding the presence of an exorbitant skewness rooted in the penetration of MFI's especially in the rural segment and further prescribing policies such as portability of accounts and skills training of MFI officers to empower the idea of financial inclusivity in Indian rural areas.

The penetration of banking services promoting the ideology of financial inclusion reduces the risk of non-performing assets (NPA) thereby, reducing the exposure to risk of banking sector in Middle Eastern, Northern African, Pakistan and Afghanistan (MENAP) region ([Shihadeh, 2020](#)). The study incorporated a quantile regression and Ordinary Least Squares (robustness) econometric analysis on the dataset collected from 271 banks from 24 MENAP region, to empirically portray the causality between greater financial accessibility and increased banks performance measured by various controlled variables. A prominent study devised to compute weights of nine indicators of access, availability and usage of formal financial services incorporated a cross country comparison methodology of 151 economies ([Park & Mercado, 2017](#)). The study used a principal component analysis to empirically determine a framework for factors influencing financial inclusion. Their study showcased a significant correlation between higher growth of output and ease of financial accessibility among middle low-income economies.

Over the discourse of empirical research in the spectrum of financial inclusivity, cross country comparison incorporating various econometric methodologies such as logit model, ordinary least and difference in difference estimation techniques have garnered the spotlight. However, few studies have been conducted in the said field of principal component analysis technique. One of the studies which uses the principal component approach in determining the factors impacting financial inclusivity has been conducted by [Park and Mercado \(2017\)](#) however, their study has only been presented on a workshop in Australia and have exorbitant gap in underlying the effect of major determinants other than higher output growth influencing accessibility and ease of financial services.

Thus, there exists notable gaps in the literature in context of cross-country comparison emulating the ideology of financial inclusion through a principal component analysis which can be formulated in this study. A recent study established a long-run bi-directional causal relationship between financial inclusion and economic growth using 31 countries including developed and developing for a period of six years (2004-2010) ([Sethi & Acharya, 2018](#)). However, the study does not factor-in social and infrastructural elements which affect the financial inclusion.

([Grohmann, Klühs, & Menkhoff, 2018](#)) assessed the association between financial literacy and financial inclusion for 93 countries. It claimed that from "access to services" perspective, a marginal effect in financial literacy results in a larger change in the low-level financial inclusion. And from the "use of financial services" perspective, a marginal change in financial literacy has a large impact on a high-level financial inclusion.

A study conducted by [Evans \(2016\)](#) used the data of fifteen countries of Africa to determine the factors affecting the determination of IFI. The paper focused on the major positive change inducers in the level of financial inclusion

to the African policymakers. The IFI values were calculated using the UNDP method. The study concluded that per capita GDP, literacy rate of adults, access to the internet, broad money (as a % of GDP) and Islamic presence and banking activities were statistically significant and have a positive impact on identifying the level of financial inclusion in the continent. Another key finding of the study was that domestic credit, the interest rate on deposits, inflation rate and the total population have an insignificant impact on financial inclusion. However, this study was limited by the fact that the number of account holders was not synonymous to the usage of accounts. Therefore, the number of account holders can be replaced by the nature and frequency of transaction.

Apart from these studies, researchers have explored how to increase financial penetration on the ground level. According to [Chaia, Schiff, and Silva \(2010\)](#) one of the ways to increase the ground coverage of financial services is to increase the usage or promote correspondent banking in uncovered areas. Their paper discusses various benefits and disadvantages of Correspondent banking. The main benefit of correspondent banking is that no extra or physical outlet is required for this model.

However, finding the right retailer poses a big problem in this model. A study conducted by [Beshouri, Chaia, Cober, and Gravrak \(2010\)](#) used mobile financial services (MFS) as one of the cost-effective measures to increase financial penetration. The study discusses the pros and cons of using MFS model. One of the biggest benefits highlighted in the study was that the penetration of mobile phones is greater than banking penetration. Hence, it would be able to cover the ground that banking institutions alone would never be able to cover. There were sector specific studies where it has been shown that one of the major steps undertaken by MSME's to promote financial inclusivity is digital financing ([Madan, 2020; Rasheed, Siddiqui, Mahmood, & Khan, 2019](#)).

[Center for Financial Inclusion \(2018\)](#) reviewed the connection between financial inclusion and digital financing for 55 countries in 2018. It was observed that digital financial services being the engine for growing financial services but this growth is not without risk. Therefore, to realize the full potential of digital financial services, an individual needs to realize all the benefits and the risk associated with it. Both private and public sector needs to ensure attractive and assessable service to their consumers to promote financial inclusion.

Literature that tracks the causes and effects of financial inclusion is inadequate. There have been very few studies on both constructing an index and finding the extent of impact of financial inclusion status on sectoral share of growth, human development, financial stability etc. Apart from that no study has taken the initiative to estimate the likelihood of getting experienced of high, medium and low degree of financial inclusion for a country with different determining factors. This disaggregated frame of analysis is necessary to bring-in efficient policy intervention. Our study aimed at filling all these gaps.

3. FINANCIAL INCLUSION DIMENSIONS: DESCRIPTION AND DATA

The extent of the inclusion of a financial system depends on the usage and accessibility of formal financial services. High usage and accessibility do not mean higher financial inclusion per se. The usage of financial services can be conditioned by other factors like per capita GDP, habits or the development status which shapes an individual's usage of a financial service. In the context of accessibility in terms of the number of ATM's and branches, information about the geographical distribution and concentration of these services is inadequate. Therefore, many of these indicators stress a more inclusive system which is methodologically correct.

The study postulates that the degree of financial inclusion is determined by usage, access and barriers to financial services. Data for usage and barriers were determined by several demand side individual level indicators. For usage, it considered indicators that represented the actual use of services by the banked population. For barriers, we used information on the unbanked population highlighting the obstacles perceived by individuals that prevent them from using financial services. Regarding accessibility, the study included supply-side country level indicators considering both the demographic and geographic aspects.

The study used the demand side indicators from the World Bank's Global Findex. The Global Financial Inclusion database provides individual level data for 172 countries around the world for two years: 2011 and 2014. The indicators are constructed using survey data from interviews with more than 150,000 nationally representative and randomly selected adults over the calendar year (Demirguc-Kunt & Leora, 2012; Demirguc-Kunt, Klapper, Singer, & Van, 2015). It is the largest demand-side harmonized dataset ever collected.

The supply side data was collected from the IMF (2015). It contains data on 47 key indicators for 152 countries for the period 2004-2015. Finally, data on the macroeconomic variables and banking efficiency variables was taken from the World Bank's World Development Indicators. It presents the most current and accurate global development data available and includes national, regional and global estimates.

3.1. Usage

To construct this dimension the present study needed to consider the utility of the individuals in the following four indicators: having an account at a financial institution, keeping savings, having non-zero withdrawals and deposits. There are people who hold an account but do not use it. Hence the study considered people who have made at least one transaction viz. either a withdrawal or deposit in a month. The savings and loans indicators show the proportion of population who saves and borrows from a formal financial institution respectively.

3.2. Barriers

The barriers to financial inclusion give us an idea of the obstacles to the use of formal financial inclusion from the perspective of unbanked population. The study included six barriers, viz., distance, affordability, lack of trust, lack of necessary documentation, religion and lack of money in negative form so that fewer people reporting implied a greater value of financial inclusion. Fixed transaction costs and fees involved make small transactions unaffordable for a majority of the population in the developing economies and often people living in the rural areas or those working in the informal sector do not have the necessary documents to open a bank account like proof of residence or employment. The state of uncertainty in the economy, traditional thinking and religious reasons often creates a lack of trust in the financial institutions. In most of the countries dominated by Muslim populations religious reasons were cited by many as a barrier.

3.3. Access

Accessibility to financial services leads to greater inclusion if the services meet the needs of the people. Four indicators to represent access such as no. of ATMs (per 100,000 adults), ATMs (per 1000 km²), commercial bank branches (per 100,000 adults), commercial bank branches (per 100 km²) were used. They account for the physical point of services offered by the various financial institutions. These supply-side indicators were collected by the finance service providers from the IMF (2015). However, these are just one aspect of accessibility. Mobile banking was included in the usage dimension.

3.4. Select Macroeconomic Variables

To determine the relationship between financial inclusion and select macroeconomic variables, we used variables taken from the World Development Indicators' UNDP data base. Due to data unavailability for all the 91 countries, the study used the data for 59 countries for the two years viz. 2011 and 2014 for panel data analysis. The study included macroeconomic variables such as agricultural value added, industrial value added, service value added, per capita GDP growth rate and household consumption expenditure. To capture the financial stability of an economy, the bank capital asset ratio which represents banking profitability and bank non-performing assets which signifies the burden of the banks, were included in this analysis. The female workforce participation, multi-

dimensional poverty index, and the expected years of schooling parameters were added to capture the inclusive development status of a country.

4. INDEXING METHODOLOGY

Financial inclusion is supposed to be determined by the interaction of several causal variables. It is assumed that behind a set of correlated variables an underlying latent structure can be identified with a latent variable as is the case of financial inclusion. A principal component methodology was applied to estimate the degree of financial inclusion. Each causal variable related to different dimensions that define financial inclusion. Since the sub-indices contained highly inter-correlated indicators, the study estimated the sub-indices first, rather than estimating the overall index directly.

In the first stage, the three sub-indices: usage, barriers and access which defined financial inclusion were estimated. In the second stage, the overall financial inclusion index was constructed using the dimensions as explanatory variables.

Let us postulate that the latent variable financial inclusion is linearly determined as follows:

$$FI_i = w_1 Y_i^u + w_2 Y_i^b + w_3 Y_i^a + e_i \quad (1)$$

Where i denotes the country and (Y_i^u, Y_i^b, Y_i^a) denote the dimensions usage, barrier and accessibility respectively. Here the variation in financial index can be due to the variation in the causal variables or variation in the error term.

4.1. First Stage PCA

Firstly, the study estimated each of the dimensions, that is (Y_i^u, Y_i^b, Y_i^a) , using the indicators specified in section 3 and the parameters in the following equations.

$$Y_i^u = \beta_1 \text{account}_i + \beta_2 \text{savings}_i + \beta_3 \text{loan}_i + \beta_4 \text{nonzero withdrawal}_i + \beta_5 \text{nonzero deposits}_i \quad (2)$$

Here principal components were constructed with the interrelated parameters such as number of accounts, proportion of population with savings account, loan account, having nonzero withdrawals and nonzero deposits with financial institutions as shown in Equation 2.

$$Y_i^b = \alpha_1 \text{distance}_i + \alpha_2 \text{affordability}_i + \alpha_3 \text{documentation}_i + \alpha_4 \text{trust}_i + \alpha_5 \text{religion}_i + \alpha_6 \text{lack of money}_i + u_i \quad (3)$$

Then the study included six barriers, viz., distance, affordability, lack of trust, lack of necessary documentation, religion and lack of money in inverse to get another set of principal components as shown in Equation 3.

$$Y_i^a = \gamma_1 \text{ATM}_{popi} + \gamma_2 \text{branch}_{popi} + \gamma_3 \text{ATM}_{sq.kmi} + \gamma_4 \text{branch}_{sq.kmi} + v_i \quad (4)$$

The study used principal components with a set of four interrelated indicators to represent access, viz., number of ATM's (per 100,000 adults), ATM's (per 1000 km²), Commercial bank branches (per 100,000 adults), Commercial bank branches (per 100 km²) as shown on Equation 4.

Hence, these three dimensions were estimated using PCA. Both the endogenous variables (Y_i^u, Y_i^b, Y_i^a) and the parameters β, α, γ have to be jointly estimated. Let $R_p(p \times p)$ define the correlation matrix of the p standardize

indicators for each dimension. λ_j ($j = 1, \dots, p$) denotes the j -th eigenvalue, subscript j refers to the number of principal components that also is less than or equal to the number of indicators or sub-indices, p . $\Phi_j(px1)$ is the eigenvector of the correlation matrix. It is assumed that $\lambda_1 > \lambda_2 > \dots > \lambda_p$ and denote P_k ($k = 1, \dots, p$) as the k -th principal component. The study gets the corresponding estimator of each dimension according to the following weighted averages.

$$Y_i^u = \frac{\sum_{j,k=1}^p \lambda_j^u P_{ki}^u}{\sum_{j=1}^p \lambda_j^u} \tag{5}$$

$$Y_i^b = \frac{\sum_{j,k=1}^p \lambda_j^b P_{ki}^b}{\sum_{j=1}^p \lambda_j^b} \tag{6}$$

$$Y_i^a = \frac{\sum_{j,k=1}^p \lambda_j^a P_{ki}^a}{\sum_{j=1}^p \lambda_j^a} \tag{7}$$

Where, $P_k = X\lambda_j$, λ_j represents the variance of the k^{th} principal component (weights) and X is the indicators matrix. In Equations 5, 6 and 7 three composite indices have been constructed with respective set of principal components in weighted average forms, where eigen values are taken as weights.

4.2. Second Stage PCA

In the second stage of the principal component analysis, the three different composite indices (Y_i^u, Y_i^b, Y_i^a) as shown in Equations 5, 6 and 7 respectively, were considered as interrelated parameters for financial inclusion and a similar procedure was applied as described in the first stage to compute the overall 'Financial Inclusion Index'. This produced the following estimator of the financial inclusion index as a weighted average index of all estimated principals as shown in Equation 8.

$$FI_i = \frac{\sum_{j=1}^p \lambda_j P_{ki}}{\sum_{j=1}^p \lambda_j} \tag{8}$$

Rearranging the terms what we got was Equation 9 where the overall Financial Inclusion Index is expressed as a weighted average of the three dimensions, usage (Y_i^U), barriers (Y_i^B), and access (Y_i^a).

$FI_i = w_1 Y_i^u + w_2 Y_i^b + w_3 Y_i^a + e_i$, Where the relative weights for each dimension i.e. w_k are given by:

$$w_k = \frac{\sum_{j=1}^p \lambda_j \Phi_{jk}}{\sum_{j=1}^p \lambda_j}, k = 1,2,3. \tag{9}$$

Equation 9 specifies the weights which are the eigen values of second stage principal component analysis.

4.3. Panel Data Analysis

Having computed a comprehensive index for financial inclusion for two benchmark years viz. 2011 and 2014, th

e relationship between financial inclusion and several other variables, as specified in section 3.4, was considered using the calculated index value for each country as a proxy for financial inclusion in that country. Due to data unavailability for all the select parameters, the number of countries reduced from 91 to 59 for the panel data analysis. We got a balanced panel of 59 countries for the two years viz. 2011, 2014.

Model I:

$$\text{Fin}_{it} = \text{constant} + \beta_1 \text{AgrVal}_{it} + \beta_2 \text{IndVal}_{it} + \beta_3 \text{SerVal}_{it} + \beta_4 \text{Cons}_{it} + \beta_5 \text{NPl}_{it} + \beta_6 \text{Cap}_{it} + \beta_7 \text{GDPgrowth}_{it} + u_i + v_{it} \quad (10)$$

$$\text{Fin}_{it} = \text{constant} + \alpha_1 \text{AgrVal}_{it} + \alpha_2 \text{IndVal}_{it} + \alpha_3 \text{SerVal}_{it} + \alpha_4 \text{Cons}_{it} + \alpha_5 \text{NPl}_{it} + \alpha_6 \text{Cap}_{it} + e_i + z_{it} \quad (11)$$

Where $i = 1, 2, \dots, 59$ and $t = 1, 2$. Here u_i and e_i are the cross-country time-invariant fixed-effects (FE), which enable us capturing unobserved time-invariant heterogeneity that might significantly bias our estimates. In model I, two different specifications were considered in a panel data framework where the dependent variable is estimated financial inclusion index values for each country. In specification 1, independent variables were macroeconomic variables such as agricultural value added, industrial value added, service value added, GDP growth rate, non-performing assets and gross capital formation as shown in Equation 10. In specification 2, independent variables were household consumption expenditure along with agricultural value added, industrial value added, service value added, GDP growth rate, and non-performing assets as shown in Equation 11.

Model II:

$$\text{Cap}_{it} = \text{constant} + \gamma_1 \text{Fin}_{it} + \gamma_2 \text{AgrVal}_{it} + \gamma_3 \text{IndVal}_{it} + \gamma_4 \text{SerVal}_{it} + \gamma_5 \text{Cons}_{it} + \gamma_6 \text{NPl}_{it} + \mu_i + \varepsilon_{it} \quad (12)$$

. In model II, the study used bank capital to asset ratio as the dependent variable and checked for reverse causality with our financial inclusion index and other explanatory variables as shown in Equation 12. We estimated the model, first, using both fixed effects as well as random effects conditions. Then, the computed Hausman test (Hausman, 1978) rejected the null hypothesis that individual effects are uncorrelated with the independent variables; hence the fixed effect model was preferred over the random effect model. However, in this case the study method evaluated the relationship between the financial inclusion index value and other macroeconomic variables. However, if the financial index values are classified into four broad categories in terms of degree of the performances according to the range of their ordinal values, it can determine the conditional probability of getting financially included. To cast this framework of ordinal choice models with the existing dataset, the study needed to adopt a panel ordered probit model with different specifications as required to explain all mentioned aspects of growth and development.

4.4. Ordered Probit Model

A panel ordered probit model was performed to analyse the impact of financial inclusion. Ordered probit technique is a logistic regression analysis to the cases where the dependent variable is discrete and takes only a finite number of values possessing a natural ordering (Hausman, Lo, & MacKinlay, 1991). Here, the dependent variable to be modeled was financial inclusion class (Y^*) which takes on 4 different values, which were naturally ordered: $Y^*_{it} = 1, 2, 3$ and 4 , $i = 1, 2, \dots, n$, $t = 2011, 2014$. Here, the observed Y is generated by a latent variable Y^* , where the link between the latent and observed data is given as follows:

$$Y=1 \text{ if } a_1 < Y^* < a_2$$

$$Y=2 \text{ if } a_2 < Y^* < a_3$$

$$Y=3 \text{ if } a_3 < Y^* < a_4$$

$Y=4$ if $a_4 < Y^* < a_5$

Where, the range of the values is a_1 to a_5 . Now the regression model takes a form as follows.

$$y_{it}^* = \alpha + \beta x_{it} + \varepsilon$$

Here x represents the matrix of independent variables, β is slope coefficients, and ε is a stochastic error term. The likelihood for the panel ordered probit is defined as the product of the probabilities associated with each discrete outcome.

$$L(\beta, \alpha) = \prod_{i=1}^n \Pr(Y_{it} = j/x_{it})$$

The α_j are called cut points or threshold parameters. The cut points are computed from the data and help to match the probabilities associated with each discrete outcome. From these, the category-specific marginal effects can be obtained. The analysis refers to a 'virtual' regression model, where conditional mean is a linear function of observed 'explanatory' variables. In order to get a simplified index within the range of 0 to 1, has been measured by applying a distance formula on the financial inclusion index (composite index value) as displayed in Equation 13.

$$\text{Financial index (modified)}_{it} = \frac{(\text{Fin}_{it} - \text{min value})}{(\text{max} - \text{min})} \quad (13)$$

Here the financial inclusion modified status is categorized into 4 different levels in a descending order. Therefore, dependent variable is discrete and logically ordered as shown in Equation 14.

$$P(\text{fin}_{ind_class_{it}}) = 1 \text{ if rank of the countries according to } \text{fin}_{ind} \leq 0.3;$$

$$P(\text{fin}_{ind_class_{it}}) = 2 \text{ if rank of the states according to } 4 < \text{fin}_{ind} \leq 0.6;$$

$$P(\text{fin}_{ind_class_{it}}) = 3 \text{ if rank of the states according to } 8 < \text{fin}_{ind} \leq 0.8;$$

$$P(\text{fin}_{ind_class_{it}}) = 4 \text{ if rank of the states according to } 12 < \text{fin}_{ind} \leq 1; \quad (14)$$

The ordered probit regression models are formed as follows. Here, two more specifications have been considered taking financial inclusion category as ordered dependent variable as shown in Equation 15, and 16.

Model III:

$$P(\text{fin}_{ind_class_{it}}) = c\text{constant} + \beta_1 \text{AgrVal}_{it} + \beta_4 \text{Cons}_{it} + \beta_5 \text{NPl}_{it} + \beta_6 \text{Cap}_{it} + \beta_7 \text{GDPgrowth}_{it} + \tau_{it} \quad (15)$$

In specification 1, the study included independent variables that are macroeconomic variables such as agricultural value added, GDP growth rate, non-performing assets, consumption expenditure and gross capital formation as shown in Equation 15. In specification 2, independent variables are multi-dimensional poverty index values, non-performing assets, gross capital formation, GDP growth rate, and expected years of schooling as presented in Equation 16.

Model IV:

$$P(\text{fin_ind_class}_{it}) = c\text{constant} + \beta_1 \text{Multi-Dimensional Poverty}_{it} + \beta_2 \text{NPI}_{it} + \beta_3 \text{Cap}_{it} + \beta_7 \text{GDPgrowth}_{it} + \text{expected Schooling (In terms of Years)}_{it} + \tau_{it} \quad \dots \quad (16)$$

The estimator which maximizes this function was consistent, asymptotically normal and efficient. It can be shown that this log-likelihood function was globally concave in β , and therefore standard numerical algorithms for optimization will converge rapidly to the unique maximum. It can be expressed as $y^* = x^* \beta + \epsilon$ Equation 4.

$$\begin{aligned} P[y_i = 1] &= P[\mu_0 < y_i^* \leq \mu_1], \\ &= P[\mu_0 - x_i^* \beta < \epsilon \leq \mu_1 - x_i^* \beta], \\ &= f(\mu_1 - x_i^* \beta) - f(\mu_0 - x_i^* \beta) \end{aligned} \quad (17)$$

Similarly, in a generalized form the equation can be represented as shown in Equation 18,

$$P[y_i = j] = f(\mu_j - x_i^* \beta) - f(\mu_{j-1} - x_i^* \beta); j=1, 2, 3, \text{ and } 4 \quad (18)$$

5. EMPIRICAL RESULTS

The study now first portrayed the financial inclusion index for 91 countries and for the two benchmark years, viz. 2011 and 2014 and compared the mobility for each dimension and for overall composite index. The first component explained around 75 percent of the variation in the dimension which is a good amount. Other components explained around 85-90 percent of the variation.

Here, almost all components were evenly distributed among all three dimensions which clearly indicated that the estimated composite index was efficient and unbiased towards a single indicator. These sub-indices are important to the policymakers and government for designing financial inclusion strategies in a disaggregated way which can focus to foster greater inclusion.

Using the three-dimension sub-indices the study used PCA to obtain our final Financial Inclusion Index. Table 1 presents the rankings of the countries according to their respective financial inclusion index for the year 2011. Table 2 presents the rankings of the countries according to their respective financial inclusion for the year 2014. Thus, the transition in comparative ranking in the financial inclusion over the two years was evaluated.

It was clear that the upper quartile of rankings was mostly dominated by the high income and developed countries except for Mongolia and Thailand who have been doing quite well. These Asian countries have performed better than some high income and other upper middle-income countries. For Mongolia, a large extent of financial inclusion is due in huge part to universal cash hand-outs from the government's Human Development Fund as well as other committed expenditures like pensions, health insurance and student tuition payments². In the case of Thailand, its high position in the ranking was mainly due to the large number of bank accounts and the insurance schemes, particularly for healthcare, offered by the Government (Camara & Tuesta, 2014).

² Financial Literacy and Inclusive Insurance Awareness in Mongolia: Work in Progress, October, 2018.

"In 2008, Mongolia's Parliament [Great Khural] passed a National Development Strategy and created a Human Development Fund (HD Fund) with the ambitious goal of bringing Mongolia's human development status to the same level as that of the developed countries by 2020. This Fund made it legally possible for every citizen of Mongolia to be equally eligible to own a share of the nation's mineral wealth".

Table-1. Ranks of financial inclusion index for countries in 2011.

Country	Rank	Country	Rank	Country	Rank
Australia	1	Serbia	31	Vietnam	61
Luxembourg	2	Slovak Republic	32	Romania	62
Singapore	3	Bosnia and Herzegovina	33	Peru	63
Belgium	4	United Arab Emirates	34	Indonesia	64
Canada	5	Russian Federation	35	Botswana	65
Netherlands	6	Poland	36	Albania	66
Portugal	7	Bulgaria	37	Nigeria	67
Cyprus	8	Brazil	38	Jamaica	68
France	9	Turkey	39	Rwanda	69
Austria	10	Malaysia	40	Angola	70
New Zealand	11	Venezuela, RB	41	Ghana	71
Denmark	12	Georgia	42	Sri Lanka	72
Malta	13	Uzbekistan	43	Armenia	73
Italy	14	Kazakhstan	44	Chile	74
Japan	15	Macedonia, FYR	45	Malawi	75
Spain	16	Saudi Arabia	46	Colombia	76
Sweden	17	Azerbaijan	47	Dominican Republic	77
Finland	18	Hungary	48	Panama	78
Mongolia	19	South Africa	49	Argentina	79
Slovenia	20	Nepal	50	Kenya	80
Croatia	21	Guatemala	51	India	81
Israel	22	Ukraine	52	Jordan	82
Ireland	23	Honduras	53	Uganda	83
Estonia	24	El Salvador	54	Moldova	84
Thailand	25	Lebanon	55	Mexico	85
Montenegro	26	Costa Rica	56	Philippines	86
Greece	27	Zimbabwe	57	Bangladesh	87
Latvia	28	Algeria	58	Tanzania	88
Mauritius	29	Kosovo	59	Uruguay	89
Czech Republic	30	West Bank and Gaza	60	Nicaragua	90
				Cameroon	91

The next quartile was mainly dominated by the upper-middle and some lower-middle income countries. However, the exceptions here are some Latin American countries like Brazil and Costa Rica. In Brazil the success of the BC model and recognizing that financial inclusion is much more than access to credit has been the mainstay of their uprising financial inclusion status. Brazil exhibits the best performance, in terms of financial inclusion, among Latin American countries. Its success can be seen in the existence of social support programs sponsored by the government through the formal financial system and the Financial Citizen Program which combines the three financial inclusion, financial education and financial protection.

The lower sets of countries mainly included countries from Asia, Africa, some Latin American and some European countries. These were predominantly the low income and less developed countries that are still in the initial stages of financial inclusion. Though India hasn't been a good performer in financial inclusion initially, of late there is a lot that has been done in this field.

Over the two benchmark years there have been significant changes in the ranks of the some of the countries. Though the upper half was still being dominated by the developed and high-income countries, some middle income countries were performing really well such as Latvia, Lebanon and Brazil. In Latvia, greater emphasis on financial literacy as the main obstruction to financial inclusion in the National Financial Literacy strategy has helped a lot. In Lebanon, the government has created a sound institutional framework and the Central Bank has given greater support to finance startups, venture capital firms, incubators and accelerators working in the knowledge economy.

Though African countries have low ranks, in Sub-Saharan Africa, mobile money accounts can drive financial inclusion. While just 1 percent of adults globally say they use a mobile money account and nothing else, in Sub-Saharan Africa, 12 percent of adults (64 million adults) have mobile money accounts (compared to just 2 percent worldwide), 45 percent of them have only a mobile money account.

Table-2. Ranks of financial inclusion index for countries in 2014.

Country	Rank	Country	Rank	Country	Rank
Singapore	1	Italy	31	South Africa	61
Luxembourg	2	Hungary	32	Algeria	62
Japan	3	Slovak Republic	33	Slovenia	63
France	4	Estonia	34	Nigeria	64
Croatia	5	Costa Rica	35	Moldova	65
Australia	6	Greece	36	Zimbabwe	66
Belgium	7	New Zealand	37	El Salvador	67
Denmark	8	Czech Republic	38	Saudi Arabia	68
Mongolia	9	Romania	39	Bangladesh	69
Austria	10	Georgia	40	Uzbekistan	70
Sweden	11	Venezuela, Rb	41	Malaysia	71
Netherlands	12	Vietnam	42	Ghana	72
Canada	13	Kazakhstan	43	Albania	73
Ireland	14	Macedonia, Fyr	44	West Bank and Gaza	74
Israel	15	Jordan	45	India	75
Russian Federation	16	Colombia	46	Guatemala	76
Spain	17	Dominican Republic	47	Nepal	77
Latvia	18	Ukraine	48	Finland	78
Poland	19	Uruguay	49	Honduras	79
Brazil	20	Chile	50	Kenya	80
Thailand	21	Argentina	51	Botswana	81
Lebanon	22	Rwanda	52	Uganda	82
Malta	23	Sri Lanka	53	Nicaragua	83
Bosnia And Herzegovina	24	United Arab Emirates	54	Malawi	84
Mauritius	25	Armenia	55	Jamaica	85
Serbia	26	Peru	56	Angola	86
Montenegro	27	Panama	57	Tanzania	87
Bulgaria	28	Kosovo	58	Cameroon	88
Portugal	29	Mexico	59	Turkey	89
Cyprus	30	Azerbaijan	60	Philippines	90
				Indonesia	91

Table-3. Variable summary.

Variable	Ob.	Mean	Std. Dev.	Min	Max
Financial Inclusion class	118	2.475	1.010	1	4
Multidimensional Poverty Index	118	0.764	0.115	0.497	0.933
Unemployment Ratio	118	9.103	6.351	0.6	31
Expected Years of Schooling	118	14.35	2.587	8.5	23.3
GDP Growth	118	2.567	2.422	-2.264	11.25
Capital Output Ratio	118	10.05	3.639	2.913	20.67
Consumption Expenditure	118	63.06	13.947	27.155	94.85
Female Workforce Participation	118	45.47	13.103	12.2	84.4
Value Added in Industry	118	29.64	8.696	10.55	65.58
Value Added in Agriculture	118	8.738	7.890	0.03	31.47
Value Added in Service	118	61.57	11.144	29.03	87.10

Source: Original data compiled from "Human Development Reports" UNDP, Various Years. <http://hdr.undp.org/en/data>, World Bank Data Bases, <https://data.worldbank.org/>.

For the first specification in Model A Table 4, all the explanatory variables except per capita GDP growth rate were significant with their expected signs. The agricultural, industrial and service value added all were positive and

significant showing that as value added in each of these sectors increases there was growth in the economy which in turns implied a greater push for financial inclusion.

However, consumption expenditure was negatively significant with our given proxy for financial inclusion. Additional consumption expenditure brings out dissaving in the same period when gross income is not changing at individual level. . Both bank non-performing loans and bank capital to asset ratio were negatively significant. As the capital asset ratio estimates financial strength of a bank towards bearing the risky assets and thus financial inclusion weakens the bank's financial vigor and short-run stability. On the other hand, the greater the number of non-performing loans the lesser the banks' willingness and capacity to give more loans and hence the lesser will be the financial inclusion. Financial inclusion can bring in inefficiency in the banking sector.

. The negative relationship is mainly based on the rationale that banks perceive financial inclusion as a burden upon them and have to be motivated or forced to participate in financial inclusion. For the second specification of Model I [Table 4](#), herein per capita GDP growth rate was removed from the list of explanatory variable and all the considered variables along with the constant term became significant with their expected signs.

Table-4. Model a panel fixed effects.

Variables	Fixed Effects	
	(1)	(2)
Value added in Primary Sector	1.971**	1.949**
	(0.887)	(0.870)
Value added in Industrial Sector	1.825**	1.803**
	(0.883)	(0.866)
Consumption Expenditure	-0.0791***	-0.0801**
	(0.0293)	(0.0309)
Non-performing Loans	-0.0229***	-0.0230***
	(0.00839)	(0.00819)
Capital to asset ratio	-0.130***	-0.132***
	(0.0398)	(0.0394)
GDP growth	-0.00546	
	(0.0323)	
Constant	-185.3**	-183.1**
	(87.83)	(86.09)
Observations	118	118
R-squared	0.322	0.321
Number of Country	59	59

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

For model II [Table 5](#) the reverse causality between bank capital to asset ratio and financial inclusion was examined. The study found that there exists a negative and significant relationship between bank capital asset ratio and the financial inclusion index value as found earlier. In the developing countries, the regulated banking sector experiences mounting risky assets to the banks' capital in order to sustain with the mandate of the priority sector lending process for poverty reduction. In order to make financially inclusive as well as stable banking system, banks require to follow an efficient risk management method and also need to assess creditworthiness of the borrowers ([Acharya et al., 2006](#)). Industrial, agricultural, service value added were positively significant parameters in determining banks' capital asset ratio. This refers to the indirect causality between gross turnover and gross capital formation. The greater the value added in each sector, the greater generation of the banking capital as well. The banks' capital asset ratio is was positively related to the bank non-performing loans too. The non-performing loans are the undesirable output of banking system. The banks should have sufficient capital support to face all the risks of such undesirable outcome. Non-performing assets in the system means more capital towards risk-weighted assets which weakens financial health of the banks.

Table-5. Model B panel fixed effects.

Variables	Fixed Effects
	(1)
Financial Index	-0.859*** (0.300)
Value added in Primary Sector	1.665** (0.823)
Value added in Service Sector	1.721** (0.845)
Consumption Expenditure	-0.160 (0.134)
Non-performing Loans	0.0895*** (0.0236)
Constant	-144.8* (78.67)
Observations	118
Number of Country	59
R-squared	0.279

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table-6. Frequency of financial inclusion class year wise.

Financial Inclusion Class	Year	
	2011	2014
1	18	3
2	25	19
3	4	25
4	12	12
Total	59	59

The results of model III Table 7 and model IV Table 8 have shown two different specifications of panel ordered probit models along with respective marginal effects with respect to three levels of financial inclusion class.

Table-7. Ordered probit model for financial inclusion class (1 to 4) for specification 1.

Financial Inclusion Class	Coefficient (SE)	Marginal Effects Fin_class=1 (predict)	Marginal Effects Fin_class=2 (predict)	Marginal Effects Fin_class=3 (predict)
GDP Growth	-0.2246*** (0.0506)	0.0231*** (0.0079)	0.06581*** (0.01836)	-.06347*** (0.0186)
Expected Schooling	0.0853 (0.1064)	-0.0088 (0.01118)	-0.025 (0.0315)	0.02411 (0.03039)
Multi-dimensional Poverty Index (Subsequent year)	8.8743*** (2.4582)	-0.9110** (0.34123)	-2.6008** (0.835)	2.5083** (0.83637)
Female Workforce Participation	0.0303** (0.0088)	-0.0031** (0.00119)	-0.0088** (0.00302)	0.0085** (0.0029)
/cut1	7.1584 (1.12)			
/cut2	8.9335 (1.202)			
/cut3	10.394 (1.301)			

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table-8. Ordered probit model for financial inclusion class (1 to 4) for specification 2.

Financial Inclusion Class	Coefficient (SE)	Marginal Effects Fin_class=1 (predict)	Marginal Effects Fin_class=2 (predict)	Marginal Effects Fin_class=3 (predict)
Primary Sector	-0.087*** (0.0176)	0.0104*** (0.0032)	0.02415*** (0.0064)	-.02254*** (0.0065)
Industrial sector	-0.1082*** (0.0183)	0.01298*** (0.0036)	0.03*** (0.0074)	-0.028*** (0.0075)
Consumption Expenditure	-0.0599*** (0.0126)	0.00719*** (0.0022)	0.0166*** (0.0046)	-0.016*** (0.005)
Capital to Asset Ratio	-0.0029 (0.0342)	0.00036 (0.0041)	0.0008 (0.0095)	-0.0008 (0.0089)
/cut1	-9.325 (1.227)			
/cut2	-7.693 (1.166)			
/cut3	-6.319 (1.081)			

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

In this segment the study included few more important explanatory variables to analyse the causality of financial inclusion with multi-dimensional poverty index, expected years of schooling, and female participation in workforce. In ordinal log-linear models, marginal effects can be computed to learn about the partial effects of a small change in explanatory variable with respect to three different values of dependent variables. The study computed the marginal effects on the predicted probabilities along the same principles. It gave the predicted value of likelihood of y if x_j is discrete. Theory specifies that the partial effect of x_j on the predicted probability of the highest outcome has the same sign as β_j and the lowest outcome has the opposite sign to β_j. However, intermediate outcomes can't, in general, be inferred from the sign of β_j. In general, partial effects for intermediate probabilities are trivial and often statistically insignificant. As probit regressions are "inherently interactive" the marginal effect of one variable is contingent always on the value of the other values in the regression. There are three types of different margins that can be computed. Therefore, margins are the accurate tools to compare the OLS coefficients to the results of an (ordered) probit regression.

The results signified that a higher level of financial inclusion led to a comparatively higher likelihood of increasing GDP growth and lowering multi-dimensional poverty, and a higher female workforce participation for the countries having lowest and medium levels of financial inclusion. Interestingly, marginal effects with respect to highest level of financial inclusion class coefficient values of marginal effects became lower for multi-dimensional poverty index and female workforce participation and the results appeared with opposite signs.

This indicated that the determining probability of getting positive outcomes from financial inclusion on poverty reduction and female employment becomes complicated. However, the expected years of schooling for current year and subsequent year had no significant change with a high degree of financial inclusion which raises a question about the role of education in inclusion principle. In the second specification of the ordered probit model, growth variables like primary sector outcome, industrial outcome, and the consumption expenditure of households were significantly associated with financial inclusion determination.

Interestingly, totally opposite signs and different values of cut points arose in model III and model IV. Cut points are certain threshold values of the latent variable where the outcome changes and these reflect the predicted cumulative probabilities at covariate values of zero. Here inclusion of a few independent variables shifted the cumulative probability distribution.

6. CONCLUSION

This study as opposed to the exogenous weights assigning system in measuring Financial Inclusion Indices used two-stage Principal Component Analysis to measure the degree of financial inclusion in a country disaggregating financial inclusion into three dimensions: usage, access and barriers. The study pointed out that the high-income and developed countries occupied the best ranks amongst others in financial inclusion. They showed the highest degrees of financial inclusion. However, there were some middle income and low income countries that are also doing very well in terms of financial inclusion like Mongolia and Thailand. The lower income and less developed countries were the ones that occupy the lower rungs of the financial inclusion ladder mostly the sub-Saharan African countries and the Asian countries.

Emerging countries like India can adopt the best practices of the developed countries as well as countries like Brazil in their endeavor towards a greater financial inclusion. The dimension-wise ranks of the countries provide important policy considerations. The banks' efficiency is lowered by their pursuit of financial inclusion and not many banks want to pursue it. Therefore, it is important to identify the factors on the demand side as well as supply side constraints and fix it through proper policy prescription. Government has to take into account emerging banking inefficiency in current period to pursue priority sector lending for better financial inclusion and thus bring out some kind of incentive based technology so that banks also cooperate and participate effectively in making the transformation from financial sector to the integrated financial sector. Augmenting financial literacy in targeted population and structural reforms in banking sector are the two main driving factors to achieve complete financial inclusion for an economy.

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