Measuring Financial Inclusion in India : An Approach

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Abstract

In light of the COVID-19-induced financial crisis, the need for robust financial services and networks has become more apparent than ever, which necessitated the accurate measurement of the breadth of financial inclusion in India. First, the study conducted a detailed critical review of the current indices and their construction methodology. Then, we created a financial inclusion index for India by accounting for the flaws existing in the current indices. The primary contribution of this study to the existing literature is the new approach it proposed for the assignment of weights in the financial inclusion index. Based on this new financial inclusion index, the study concluded that India's Southern states and union territories showed better financial inclusion. In contrast, the traditionally backward BIMARU states of Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh, and a few of the North Eastern states of India, lagged. The study also provided a refined and inclusive definition of financial inclusion based on its new approach to index creation.

Keywords : **financial inclusion, financial inclusion index, financial literacy, financial institutions, financial development**

JEL Classification Codes : C43, G2, O1

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Financial inclusion, an empowering concept and a critical precondition to inclusive growth and development, is painfully miscalculated and is often understood as the result of a dangerously limited number of factors. Correspondingly, the doles of economic growth have not been equitably distributed, raising a need to impart formal access to payments, savings, and insurance to the unbanked and under-banked sections of society. Moreover, the COVID-19 pandemic has brought to light the issues and the unsustainability of our existing financial system. Remittances, which accounted for 3.1% of the Indian GDP in 2020 (The World Bank, 2021), have been hard-hit. One of the limiting factors has been the restricted access to banking networks that could have buffered Indian remittance receivers from the stoppage of inflows caused by the shutting down of cash money-transfer shops around the globe during the lockdown.

The World Bank report published in 2008 titled *Finance for All? Policies and Pitfalls in Expanding Access* argued that financial reforms are essential for economic development. It linked poverty alleviation and economic development to access to financial services, thereby supporting the hypothesis that financial inclusion is vital for economic growth. Furthermore, it broadened the definition of financial inclusion to include the poor and the non-poor and recognized that financial exclusion could be voluntary or involuntary. This dichotomy allows for price

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and non-price barriers to be studied simultaneously instead of creating a hierarchy between supply and demand-side indicators and barriers to financial inclusion (Manji, 2010). Other studies also highlighted the role of factors such as age and gender (Yadav & Sharma, 2018). For instance, financial literacy becomes even more critical for citizens over 45, as they have difficulty handling debit cards and mobile banking technologies (Shukla, 2017). Enhanced financial and technological literacy, apart from addressing the issues of system failures and lacking infrastructure (Kakkad & Jadhav, 2021), will only better India's position to receive the gains from the Industry 4.0 phenomenon (Patanjali & Subramaniam, 2019).

In India, over 50% of small and medium farmers have been facing financial exclusion from both formal and informal sources of credit. Of the total farmer-households, only 27–30% avail the formal credit (Rabo Foundation, 2020; World Bank Group, 2020). It is also worth noticing that these numbers exist despite financial inclusion being a significant project of the Government of India, thereby throwing light upon the dire need to expand the provision and use of financial services. Furthermore, despite an increase in account ownership, there is severe inequality in access to financial services due to unaccounted factors such as a lack of financial literacy (Tandon & Singh, 2021). Studies have also indicated that a 1% rise in financial inclusion leads to an approximately 0.142% rise in the human development index; in the case of Indian states, it resulted in a 0.139% rise in HDI (Kablana & Chhikara, 2013). Another study found the correlation coefficients between financial inclusion and HDI values and ranks were 0.82 and 0.85, respectively (Raichoudhury, 2016).

Defining financial inclusion is a rather tedious and demanding task, as it determines the approach to measure it. The Rangarajan Committee's report on Financial Inclusion provided one of the most well-known definitions for financial inclusion. The Committee defined financial inclusion as guaranteeing vulnerable population access to financial services and timely and adequate credit wherever needed at an affordable cost (Rangarajan, 2008). However, some other definitions are too broad and dysfunctional or too narrow and microscopic. The Planning Commission of India (2009) provided a more inclusive idea of financial inclusion, defining it as universal access to a wide range of financial services at a reasonable cost, including banking products and other financial services, such as insurance and equity products (Shettar, 2016).

According to Thorat (2007, 2008), financial inclusion means the provision of affordable financial services (viz., access to payments and remittance facilities, savings, loans, and insurance services) provided by the formal financial system for those who tend to be otherwise financially excluded. A critical view of such definitions reveals the vagueness or absence of essential factors and ignorance towards the demand side dimension of financial inclusion. Financial inclusion can be voluntary or involuntary (International Bank for Reconstruction and Development and The World Bank, 2014), and one must account for both. While this dimension has been touched upon by select few papers like Ambarkhane et al. (2016), there lies much scope in this arena.

Furthermore, it is also essential to acknowledge the role played by bank officials in bringing financial inclusion. The bank-level staffs are the first line of response to any policy on financial inclusion. Thus, bank employees can become the most significant asset by playing a vital role in encouraging the use of financial tools (Kaur & Pasricha, 2019). It is also critical to note that various indices (such as Beck et al., 2007) have used bank penetration in terms of area to understand the financial inclusion level of citizens. However, this approach is a significant flaw since large regions of India, considering its topography, are uninhabited; on the other hand, some areas are densely populated. Thereby, the better methodology would be to incorporate statistics based on population (CRISIL, 2013).

Credit Rating Information Services of India Limited (CRISIL) bases its calculations of financial inclusion on the definition and the extent of access by all sections of society to formal financial services, such as credit, deposit, insurance, and pension services (CRISIL, 2013). Furthermore, Mor and Ananth (2007) laid out three critical questions as guidelines for the development of effective financial systems :

- If access to financial services is universal;
- If the quality of services is of acceptable standards;
- If the provision is sustainable and in place of the government's norms.

An analysis of the existing literature on creating a financial inclusion index will highlight that no comprehensive index provides deserved attention to the various factors affecting financial inclusion (see Appendix Table A1). Most of the statistics regarding financial inclusion are created based on the perceived indefinite definitions, which are relatively dynamic and ambiguous. Furthermore, the very cause of previously identified discrepancies within a single nation has not been explored to its potential, lending to a valley of researchable gaps.

It is in this context that the present study is conducted with the following objectives:

- To create a comprehensive financial inclusion index that considers the existing indices' flaws.
- To identify the social and political indicators that contribute to financial inclusion or act as drag factors.
- To recognize the causes of discrepancies in exclusion within the country and possibly to isolate a pattern, thereby promoting efficient policy implications.

Methodology

Selection of Variables

Based on the review of existing literature and considering the problems associated with financial exclusion, the present study has examined financial inclusion in three dimensions. Figure 1 depicts the same.

The study then identifies the proxy variables of the relevant factors representing each of the three dimensions. The list of factors and variables chosen for creating a new index is given in Table 1.

Figure 1. ***Dimensions of Financial Inclusion***

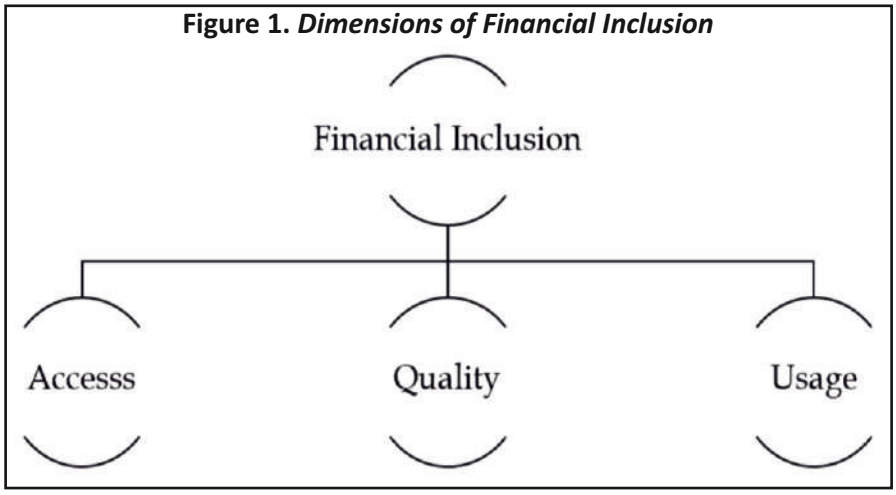

Table 1. ***Factors and Variables Chosen for the Creation of the Index***

Dimensions	Access	Quality	Usage
Parameters	Number of Primary Agricultural Credit Societies (PACS) per state ÷ Total habitable area of the state	Availability • Number of ATMs ÷ The total habitable area of the state	Credit Penetration • Credit to agriculture ÷ Registered electors • Credit to industry ÷ Registered electors • Personal credit ÷ Registered electors • Microfinance institution clients per state ÷ Registered electors • PACS borrowers ÷ PACS per state
Post offices with POSB facilities ÷ Total habitable area of the state No. of banked centers ÷ Total habitable area of the state		Barriers • Literacy rate • Connectivity through roads	Deposit Penetration • Deposits in SCBs ÷ Registered electors

Justification for Select Variables

↳ ***Post Offices.*** The Indian financial landscape is unique and challenging. It caters to a population of over 1.3 billion individuals spread across 728 districts (Integrated Government Online Directory, 2020). The high levels of illiteracy and the vast geographical expanse of the Indian subcontinent worsen the rural population's inaccessibility to formal financial infrastructure. It is, therefore, wise to use the existing infrastructure in the most effective way to reach the masses. The vast existing network of post offices, with as many as 154,965 post offices, as of March 2017, with 139,067 of them in rural areas (India Post, 2020), provides a fertile ground for the penetration of financial services. In addition, most post offices in India also offer savings bank facilities. In addition, most post offices in India also provide Post Office Savings Account facilities. Given the importance of this parameter, it is surprising how overlooked it has been in the numerous previous attempts made at measuring financial inclusion in India.

↳ ***Literacy.*** The Rangarajan Committee, in 2008, has justifiably argued the need for demand-side measures and investments in human development to better the status of financial inclusion in the nation. Researchers (Ambarkhane et al., 2016; Kohli, 2013) have also proven that literacy is an essential factor behind the geographic inclusion of states. The results were significant, statistically and economically, and lend credence to the assumptions about literacy exerting a significant beneficial effect on banking outreach.

↳ ***Microfinance Institutions (MFI).*** This parameter has been garlanded with thorough evidence as it is a relatively recent addition to the literature on financial inclusion, and its importance is still highly debated. The Reserve Bank of India has defined a non-banking financial company MFI as a company other than those licensed under Section

25 of the Companies Act, 1956, which provides financial services predominantly to low-income borrowers with loans of small amounts for short-terms, on an unsecured basis, mainly for income-generating activities, with repayment schedules which are more frequent than those normally stipulated by commercial banks and which further conform to the regulations specified in that behalf. The RBI that regulates the MFI has laid down an array of norms that make it a vehicle of financial inclusion. The loans forwarded by MFIs have increased significantly, rising from 10.04 million to 26.7 million between March 2007 and 2010 alone, with outstanding loans rising from 3,800 crores to 18,344 crores in the same period. Through its most extensive program in the world, the Self Help Group Bank Linkage Program (SHG-BLP), NABARD touched an annual loan outstanding of over ₹ 103,289 crores, involving 13.8 crore poor households (NABARD, 2021). Attainment of higher levels of political empowerment and economic progress (Sonam et al., 2019) through such bank linkages further highlights the need for inclusion.

Of course, there are concerns regarding the use of Indian MFIs as a carrier of the goals of the government, which include apprehensions related to the unjustified high rates of interest, coercive methods of recovery, over-borrowing, multiple lending, and lack of transparency in interest rate determination. However, even with these concerns, the literature agrees on the effectiveness of social banking in achieving financial penetration and its ability to bridge supply-demand gaps in the financial system (Mahadeva, 2009).

Banks have been allowed to use the services of self-help groups (SHGs) and MFIs as financial intermediaries and to use the existing infrastructure to percolate formal banking services effectively. A few cases in point are the joint-liability groups supported by NABARD, the Rythu Mitra groups in Andhra Pradesh, and the Kudumbasree Programmes in Kerala. However, the success stories of the groups, especially in the Southern region, need to be replicated in other states in India.

While the presence of MFIs in rural areas is a drastic improvement from the exploitation of moneylenders, governments should initiate more MFIs and other financial institutions to increase competition and reduce the high-interest rates in rural areas.

↳ ***Other Variables.*** Kumar (2013) concluded that branch networks significantly impact the situation of financial inclusion in a country. In a similar study, Chakravarty and Pal (2013) also deduced that credit penetration and geographic branch penetration were two of the most effective strategies for attaining financial inclusion in India. Other authors (Amidžić et al., 2014; Arora, 2010; Demirgüç-Kunt & Klapper, 2013; Sarma, 2008, 2012; Yorulmaz, 2013) also used indicators that are similar and primarily distinguishable from one another in the methodology applied.

A review of various studies and indices has us dividing the parameters into usage, access, and quality of financial services. Additionally, the study incorporated the parameter on the roads per square kilometer as Mor and Ananth (2007) found that the bank branch or financial institution must not be more than 30 minutes away from the client to ensure usage and adequate access.[1]

Creation of the Index

We created the proposed index through a series of distinct processes that are corrective to the shortcomings of the existing indices. The foremost task at hand was to empirically determine the weights associated with each of the 12 parameters considered crucial in assessing the situation of financial inclusion in a state.

Assuming that $X_1, X_2, X_3 \ldots X_k$ represent the variables considered contributing factors to financial inclusion in a state; the values $S_1, S_2, S_3 \ldots S_p$ represent the states for which the variables are considered. In the case of this index, in

[1]A list of all the variables under each parameter has been provided in Table 1.

particular, the values for S_p will range from S_1 to S_{35}, as Telangana has not been considered a separate state[2], and the Republic of India consists of 28 other states and seven union territories.

The aim of generating the weights was to determine the relative importance of the variables in the total financial inclusion of a state. The CRISIL Inclusix index uses normalization with ideal maximum values to select the perfect level of financial inclusion to be reached by any state (CRISIL, 2014). However, since empirically determining such a perfect maximum is difficult, this paper uses the actual maximum values of each of the parameter estimates. These values determine a comparative way to measure the levels of financial inclusion attained by each state, given the currently available infrastructure and financial services in the nation as a whole. While CRISIL uses normalization as the deterministic step that allows for the direct calculation of financial inclusion, this paper uses normalization first to determine the weights assigned to each parameter.

Data Cleaning

In the earlier studies, relevant variables were divided either by the state's total geographical area or by the state's total population. However, the present study acknowledged that this needs revision and used the total habitable area or total adult population. The total habitable area of a state was obtained by subtracting the total forested area from the state's total geographical area. We did this in light of the understanding that in a country like India, vast uninhabited forest areas are available, and hence, considering the total geographical area may not be the right approach in the context of financial inclusion, as expecting the construction of roads or banking infrastructure inside forested areas is impractical and often illegal. For instance, each state's total ATMs were divided by its total habitable area instead of its geographical area. Likewise, the present study also acknowledges that legally being an adult is imperative in obtaining access to a broad range of financial services and products available for use. Therefore, the approach of earlier studies to use the total population in the calculation of per capita measurement is meaningless in the context of financial inclusion. In the present study, the adult franchise was considered to define adulthood, and the data were obtained from the database of the Election Commission of India. Thus, the per capita agricultural credit, industrial credit, personal loans, etc., were obtained by dividing with the total electorate in the state, the proxy for the total adult population, and not the total population. An example of the display of such data is presented in Table 2.

Table 2. ***Display of Data***

	X_1	X_2	X_3	X_k
S_1	$A_{S1,X1}$	$A_{S1,X2}$	$A_{S1,X3}$	$A_{S1,Xk}$
S_2	$A_{S2,X1}$	$A_{S2,X2}$	$A_{S2,X3}$	$A_{S2,Xk}$
S_3	$A_{S3,X1}$	$A_{S3,X2}$	$A_{S3,X3}$	$A_{S3,Xk}$
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
S_p	$A_{Sp,X1}$	$A_{Sp,X2}$	$A_{Sp,X3}$	$A_{Sp,Xk}$

Note. Each A value is of the form A_{ij} that captures the value of each parameter for the respective state, where i represents states $S_1 \ldots S_p$ and j represents variables $X_1 \ldots X_k$.

[2] The erstwhile State of Andhra Pradesh was bifurcated into current-day Telangana and Andhra Pradesh in 2014.

Normalization

The next step in determining the appropriate weightage of every variable was to normalize the variables. It was to nullify the magnitude effect caused by the size of a state and the difference in units different factors may cause, thereby avoiding the distortion of the final results. This step is represented mathematically as in equation (1).

$$P_{ij} = \frac{A_{ij} - m_j}{M_j - m_j} \qquad (1)$$

where, i is representative of each state $S_1 \ldots S_p$, and j represents each variable $X_1 \ldots X_k$. Here, m refers to the minimum value of j ; whereas M refers to the maximum value of j.

Normalization makes all the values of a particular variable fall between 0 and 1, both inclusive, and thus can reduce data inconsistency and also allow flexibility in index design. For instance, for the calculation of $P_{S1,X1,}$ which is the normalized value of $A_{S1,X1,}$ the formula would be as in equation (2).

$$P_{S1,\,X1} = \frac{A_{S1,\,X1} - m_{X1}}{M_{X1} - m_{X1}} \qquad (2)$$

Table 3 displays the values obtained after following this step. In the table, all P_{ij} values, where i represents states $S_1 \ldots S_p$ and j represents variables $X_j \ldots X_k$, depict the normalized values.

After all the values are normalized, we sum up each variable's normalized values. A factor ratio is then obtained by dividing the normalized value of a factor for a state with the total of the normalized values of the same factor for all the states. For instance, for calculating the factor ratio Q of a given parameter X_1 for State S_1, using the normalized values of P, the formula would be as in equation (3).

$$Q_{S1,\,X1} = \frac{P_{S1,\,X1}}{P_{S1,\,X1} + P_{S2,\,X1} + \cdots + P_{Sn,\,X1}} \qquad (3)$$

Table 4 displays the value matrix that is obtained after following this step. The next step is to horizontally sum up the factor ratios of all the variables for a select state. Following this summation, the factor ratio Q of a given factor of a state is divided by the summation of Q for all the factors of the same state. This gives us the relative

Table 3. ***Results after Normalizing***

	X_1	X_2	X_3	X_k
S_1	$P_{S1,X1}$	$P_{S1,X2}$	$P_{S1,X3}$	$P_{S1,Xk}$
S_2	$P_{S2,X1}$	$P_{S2,X2}$	$P_{S2,X3}$	$P_{S2,Xk}$
S_3	$P_{S3,X1}$	$P_{S3,X2}$	$P_{S3,X3}$	$P_{S3,Xk}$
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
S_p	$P_{Sp,X1}$	$P_{Sp,X2}$	$P_{Sp,X3}$	$P_{Sp,Xk}$

Note. Each P value is of the form P_{ij} that captures the value of each parameter for the respective state, (i.e., the normalized value of A_{ij}), where i represents states $S_1 \ldots S_p$ and j represents variables $X_1 \ldots X_k$.

Table 4. ***Calculation of Factor Ratio***

	X_1	X_2	X_3	X_k
S_1	$Q_{S1,X1}$	$Q_{S1,X2}$	$Q_{S1,X3}$	$Q_{S1,Xk}$
S_2	$Q_{S2,X1}$	$Q_{S2,X2}$	$Q_{S2,X3}$	$Q_{S2,Xk}$
S_3	$Q_{S3,X1}$	$Q_{S3,X2}$	$Q_{S3,X3}$	$Q_{S3,Xk}$
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
S_p	$Q_{Sp,X1}$	$Q_{Sp,X2}$	$Q_{Sp,X3}$	$Q_{Sp,Xk}$

Note. Each *Q* value is of the form Q_{ij} that captures the factor ratio, where *i* represents states $S_1 \ldots S_p$ and *j* represents variables $X_1 \ldots X_k$.

contribution made by each factor in the state's total scores. For instance, in the case of State *S*1, the formula would be as in equation (4).

$$R_{S1,\,X1} = \frac{Q_{S1,\,X1}}{Q_{S1,\,X1} + Q_{S1,\,X2} + \cdots + Q_{S1,\,Xm}} \qquad (4)$$

The next step is to summate all the $R_{i,j}$ values of a given variable for all the states, where *i* represents states $S_1 \ldots S_p$ and *j* represents variables $X_1 \ldots X_k$, as shown in equation (5). The summation would provide a value V_j for each of the factors considered in the index. Then, the values obtained for all the factors can be displayed in Table 5.

$$V_j = \sum R_{ij} \qquad (5)$$

Calculation of Weights

The final step in determining the weights for the individual variables is to find the relative importance of each of them among all the chosen variables by dividing the V_j value of the variable by the maximum V_j value (V_{max}) that was attained among all the variables considered for the index. This step can be mathematically written as in equation (6), where W_j is the weight for variable *j*.

$$W_j = \frac{V_j}{V_{max}} \qquad (6)$$

Calculation of the Factor Index Values

The next step in the development of the index is to multiply each of the individual values of a state with its

Table 5. ***The Penultimate Step in Determining Weightages for Each Parameter***

X_1	X_2	X_3	X_k
V_1	V_2	V_3	V_k

Note. Each *V* value is of the form V_j that captures the contribution of each parameter to the states' total scores, where *j* represents variables $X_1 \ldots X_k$. This is the penultimate step to calculating the weightage of each criterion for the creation of the index.

corresponding weight for a given variable. This step is mathematically defined as in equation (7). The individual SW_{ij} values can therefore be referred to as the 'weighted values for each of the factors.'

$$Sw_{ij} = W_j \times A_{ij} \quad (7)$$

Calculation of Final Financial Inclusion Scores

All the weighted values received for SW_{ij} can now be summed up to derive a state's final financial inclusion score. Therefore, this score is a tabulation of 12 SW_{ij} values for Index 1 and 8 for Index 2. One might also normalize these summed-up values to attain a range of values between 0 and 1, such that the state with the highest financial inclusion shall attain the index value of 1.

Index 1 was created with all 12 parameters of utmost importance in determining the extent of financial inclusion within a state. But due to the unavailability of data, this includes only 27 out of 35 states and union territories. Since many states were not included in Index 1, Index 2 was also created following the generation of renewed weights. However, this led to the reduction of variables from 12–8, with factors on microfinance institution clients, primary agricultural credit borrowers, primary agricultural credit societies, and post offices being unaccounted for in the second index due to the unavailability of data. The complete list of variables incorporated in both indices can be found in Appendix Table A2.

Analysis and Results

Based on the methodology provided in the previous section, the weightage for each factor was estimated first. The weights for the factors for the two different indices are provided in equations (8) and (9) (see Appendix Table A2 for the expansion of the abbreviations used in the equations):

Index 1 : $Financial\ Inclusion = 0.93\ POSB + 0.86\ PACS + 0.71\ BPACS + 0.96\ LIT + 0.88\ R + 1\ MFI + 0.69\ ATM + 0.96\ AC + 0.89\ IC + 0.96\ PC + 0.43\ BC + 0.94\ SCBD$ (8)

Index 2 : $Financial\ Inclusion = 0.35\ AC + 0.49\ IC + 0.87\ PC + 0.66\ R + 0.095\ BC + 1\ LIT + 0.29\ ATM + 0.68\ SCBD$ (9)

The index mentioned above was then subjected to data from Indian States and Union Territories from the financial year 2014–15. The ranks obtained by the states from both indices are displayed in Table 6. The States of India are displayed in descending order of ranking. Therefore, those appearing at the top of both tables are more financially included than those at the bottom.

Table 6. ***Comparative Ranks of Financial Inclusion Calculated from Index 1 and Index 2***

State or Union Territory	Rank in Index 1	State or Union Territory	Rank in Index 2
Karnataka	1	Chandigarh	1
Andhra Pradesh	2	Delhi	2
West Bengal	3	Goa	3
Tamil Nadu	4	Daman and Diu	4
Tripura	5	Maharashtra	5
Odisha	6	Lakshadweep	6
Assam	7	Haryana	7

Mizoram	8	Sikkim	8
Kerala	9	Kerala	9
Chhattisgarh	10	Puducherry	10
Uttarakhand	11	Tamil Nadu	11
Bihar	12	Dadra and Nagar Haveli	12
Madhya Pradesh	13	Karnataka	13
Maharashtra	14	Punjab	14
Sikkim	15	Uttarakhand	15
Rajasthan	16	Gujarat	16
Manipur	17	Himachal Pradesh	17
Himachal Pradesh	18	Andaman and Nicobar Islands	18
Goa	19	Meghalaya	19
Uttar Pradesh	20	West Bengal	20
Meghalaya	21	Andhra Pradesh	21
Gujarat	22	Mizoram	22
Haryana	23	Jammu and Kashmir	23
Punjab	24	Tripura	24
Arunachal Pradesh	25	Arunachal Pradesh	25
Nagaland	26	Madhya Pradesh	26
Jammu and Kashmir	27	Odisha	27
		Rajasthan	28
		Assam	29
		Nagaland	30
		Jharkhand	31
		Chhattisgarh	32
		Uttar Pradesh	33
		Manipur	34
		Bihar	35

The complete list of values attained after calculating the index is shown in Appendix Table A3 and Appendix Table A4. According to the results obtained via Index 1, Karnataka, Andhra Pradesh, West Bengal, and Tamil Nadu are the top performers in terms of financial inclusion in the country. These results coincide with the results obtained by the CRISIL Inclusix Index, which states that most of the top-performing states are from the Southern region of India (CRISIL, 2015). In this same regard, it can be noticed that all four Southern states feature in the list of top 10 financially included states in the country, given all the 12 parameters.

The low rank of Jammu and Kashmir may be viewed in the light of it having the lowest road-to-area ratio and one of the lowest levels of literacy, at a meager 67%. However, when the study excluded factors such as primary agricultural credit societies and MFI clients in Index 2, the rank of Jammu and Kashmir increased significantly. On the other hand, the economically backward '*BIMARU*' states of Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh find themselves in the bottom 10, unlike in Index 1.

The procedure mentioned above can be applied to data from districts or to compute national-level financial inclusion. This method allows for flexibility and the addition or deletion of any parameters as and when their use is

altered. There exists a vast difference in the ranks generated by indices based on the parameters considered and the weights attached to the same. It can be concluded that selecting variables and adopting a relevant and empirically sound methodology must retain the spotlight in calculating financial inclusion in any region.

Furthermore, given the understanding of the dynamics of financial inclusion derived through the current study, the definition of financial inclusion can be broadened. The study thus provides a revived definition of financial inclusion as :

> The state in which all sections of society have an understanding and the ability to use primary banking and financial services; to have access to such services through all formal, organized, and regulated forms of banking systems; and to make use of such services in managing their personal finances.

This definition recognizes the importance of social parameters in determining the demand for financial services while retaining the responsibility of providing quality services.

Conclusion

The Index hitherto created and discussed allows for the objective measurement of financial inclusion in the country. It will enable policymakers and regulatory bodies to evaluate each state's performance level and determine the different prudential levels of law enforcement and policy generation in the states. Furthermore, it emphasizes the social indicators contributing to financial inclusion and allows the reader to recognize its comprehensive and dynamic nature. The index, therefore, has implications not just for researchers and scholars but also for banking institutions, regulatory bodies, policymakers, and other providers and intermediaries of financial services.

An important implication of the proposed Index is that the considered variables can vary over time. The weights prescribed for each variable are also subject to change based on their changing practical relevance. It reflects that socioeconomic factors and influencers may alter the relative importance of different parameters over time. A functional index must be comfortable to adapt to and incorporate these changes. The index is, therefore, dynamic. The most important contribution made by this study is the introduction of an empirical method to calculate the weights that must be attached to each of the variables rather than relying on subjective, malleable knowledge. This study does not measure a state's financial inclusion based on any perceived ideal value. Instead, the index measures the extent to which the states have incorporated existing infrastructure to attain the best possible financial inclusion standards compared with other states.

Policy Suggestions

The Index generated in the preceding section confirms the findings of various papers that the Southern states are more financially inclusive than the rest of India. Emphasis can be laid on the access and quality dimensions in states such as the *BIMARU* states, and Jammu and Kashmir, where political factors may also deter financial product availability and services.

Conducting a district-level study, upon the availability of consistent data, would further deepen the understanding of the target groups of such policies. Low levels of human development in such regions also seem to lead to exclusion from the formal banking system. Correspondingly, three out of the bottom seven states are from the country's North Eastern areas.

A view at the (normalized) absolute figures presented in Appendix Table A5 will clarify, beyond doubt, the

scant attention paid to the access, literacy, and quality dimensions of financial inclusion in these states. However, these three dimensions also directly impact the possible demand-side factors of financial inclusion. Hence, it is vital to effectively target vulnerable and marginalized regions with individualized policy to ensure the equitable distribution of the bounties of the Indian growth experience.

Limitations of the Study and Scope for Future Research

The study does not delve into a time-series evaluation of the data. Therefore, there is scope to use the proposed methodology to conduct a comparative analysis for future periods. Further, the data for Telangana State was unavailable for the period used in this study due to the bifurcation of Andhra Pradesh in 2014, so the study can be conducted more comprehensively using updated data. Finally, the impact of the COVID-19 pandemic on the creation of long-term infrastructure that is likely to have made digital payments more manageable and accessible can also be accounted for in future studies.

Authors' Contribution

The idea for the research paper evolved through the authors' discussions. Sanjiti Kapoor extracted the research papers with high repute, filtered these based on keywords, and reviewed the literature critically. Dr. Vineeth Mohandas designed the mathematical method for Index creation and weight assigning. The collection of data, estimation of the model using EViews 8, the numerical construction of the index, and ranking of the states were performed by Sanjiti Kapoor. Dr. Vineeth Mohandas verified the results and supervised the study. Sanjiti Kapoor drafted the manuscript in consultation with Dr. Vineeth Mohandas.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

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Appendix

Table A1. ***Existing Reports on the Financial Inclusion Index of India with Their Measurement Methodology and Critique***

Study/ Report	Variables used	Critique
Nandru and Rentala (2016)	• Population • Gender ratio • Branch penetration • Credit deposit ratio • Literacy ratio	• It is incomplete, as it does not attempt to check the number of ATMs or a variety of other such variables. • This model has used weights based on the authors' perceptions.
Ambarkhane et al. (2016)	Use of parameters such as crimes, literacy, life expectancy, and corruption, along with standard measures such as bank penetration or the amount of credit forwarded.	The weights attached to the parameters were not empirically derived. They are subjective as they have been determined by the authors based on a study of existing literature.
CRISIL (2013)	• Branch penetration • Credit penetration • Deposit penetration	•The minimum and maximum values utilized in the normalization process are ideals that are fixed by CRISIL. • It considers agricultural credit while ignoring other forms and sources of credit, putting some states at an inherent disadvantage. • It implies that all three parameters are equally important contributors to financial inclusion.
Global Findex by Demirgüç-Kunt & Klapper (2013)	• Ownership and use Behavior of individuals • Borrowings	It must be studied as a complementary work along with a supply-side index and is not substantial on its own. No social parameters were considered.
Sarma (2012)	• Penetration • Availability • Usage	
Arora (2010)	• Outreach • Ease • Cost (of both banking and non-banking financial institutions)	Did not account for concrete weights.

Table A2. ***List of Variables Used in Both the Indices***

Variables used in Index 1	Variables used in Index 2
Agricultural Credit ÷ Registered electors (AC)	Agricultural Credit ÷ Registered electors (AC)
Industrial Credit ÷ Registered electors (IC)	Industrial Credit ÷ Registered electors (IC)
Personal Credit ÷ Registered electors (PC)	Personal Credit ÷ Registered electors (PC)
Area with roads ÷ Total habitable area in the state (R)	Area with roads ÷ Total habitable area in the state (R)
Banked Centers ÷ Total habitable area in the state (BC)	Banked Centers ÷ Total habitable area in the state (BC)
Literacy Rate (LIT)	Literacy Rate (LIT)
Automated Teller Machines ÷ Total habitable area in the state (ATM)	Automated Teller Machines ÷ Total habitable area in the state (ATM)
Deposits in Scheduled Commercial Banks ÷ Registered electors (SCBD)	Deposits in Scheduled Commercial Banks ÷ Registered electors (SCBD)
Number of Post offices that offer POSB facilities ÷ Habitable area (POSB)	
Number of primary agricultural credit societies ÷ Total habitable area (PACS)	
Number of PACS borrowers ÷ Number of PACS (BPACS)	
Number of microfinance institution clients ÷ Registered electors (MFI)	

Table A3. ***Total Scores Obtained by States Through Index 1, in Ascending Order of Ranks***

State	Total Score
Karnataka	289515.7123
Andhra Pradesh #	261735.7177
West Bengal	227008.3326
Tamil Nadu	225141.9699
Tripura	184482.7997
Odisha	175474.2752
Assam	149416.1809
Mizoram	118959.0321
Kerala	112812.5175
Chhattisgarh	101250.8607
Uttarakhand	93076.6553
Bihar	76465.3172
Madhya Pradesh	75470.2118
Maharashtra	74903.3361
Sikkim	60034.6413
Rajasthan	58250.4094
Manipur	54377.0148
Himachal Pradesh	52480.521
Goa	47906.1096
Uttar Pradesh	43367.0044

Meghalaya	42996.4764
Gujarat	42687.1327
Haryana	37920.5991
Punjab	24187.4005
Arunachal Pradesh	19111.896
Nagaland	15492.4184
Jammu & Kashmir	4792.0204

Note. # denotes undivided Andhra Pradesh.

Table A4. ***Total Score Obtained by States Through Index 2, in Ascending Order of Ranks***

State	Total Score
Chandigarh	1682.2468
Delhi	931.4959
Goa	510.6471
Daman and Diu	376.4140
Maharashtra	364.4363
Lakshadweep	344.5673
Haryana	265.0085
Sikkim	249.5352
Kerala	246.9186
Puducherry	241.5096
Tamil Nadu	235.2606
Dadra and Nagar Haveli	231.4211
Karnataka	229.8516
Punjab	228.9897
Uttarakhand	214.8786
Gujarat	213.8009
Himachal Pradesh	192.5415
Andaman and Nicobar Islands	182.8682
Meghalaya	182.6568
West Bengal	174.9008
Andhra Pradesh	172.1954
Mizoram	171.4570
Jammu & Kashmir	165.0246
Tripura	159.3739
Arunachal Pradesh	157.0772
Madhya Pradesh	137.1018
Odisha	135.1794
Rajasthan	134.1045
Assam	133.5646

Nagaland	133.4288
Jharkhand	132.0829
Chhattisgarh	131.4465
Uttar Pradesh	119.3768
Manipur	108.9333
Bihar	96.0322

Table A5. ***Normalized Values for All Eight Variables Used in Index 2***

STATES	AC	IC	PC	RD	BC	LIT	ATM	SCBD
Andaman and Nicobar Islands	0.0034	0.0053	0.1520	0.0158	0	0.7711	0.0073	0.0722
Andhra Pradesh	0.0190	0.0534	0.1421	0.0237	0	0.1621	0.0094	0.0547
Arunachal Pradesh	0.0025	0.0058	0.1109	0.0313	0	0.1112	0.0002	0.0729
Assam	0.0038	0.0243	0.0743	0.1446	0	0.3226	0.0073	0.0222
Bihar	0.0047	0.0023	0.0232	0.0504	0	0	0.0094	0.0067
Chandigarh	1	1	1	0.6989	0.0033	0.7531	1	1
Chhattisgarh	0.0064	0.0213	0.0556	0.0238	0	0.2634	0.0032	0.0303
Dadra and Nagar Haveli	0	0.0382	0.1368	0.0676	0.0002	0.4484	0.0559	0.1425
Daman & Diu	0	0.0905	0.1440	0.1133	0.0004	0.7857	0.1469	0.3046
Delhi	0.0170	0.6651	0.4074	0.5661	0.0004	0.7581	0.8553	0.7399
Goa	0.0072	0.0576	0.3824	0.2241	0.0039	0.8354	0.0828	0.4572
Gujarat	0.0096	0.0805	0.1169	0.0187	0	0.5040	0.0064	0.0950
Haryana	0.0265	0.0769	0.2126	0.0206	0	0.4270	0.0173	0.1465
Himachal Pradesh	0.0089	0.0165	0.0891	0.0269	0	0.6522	0.0039	0.0941
Jammu & Kashmir	0.0075	0.0131	0.1104	0	0	0.1665	0	0.0769
Jharkhand	0.0031	0.0104	0.0501	0.0131	0.0001	0.1432	0.0065	0.0452
Karnataka	0.0168	0.0533	0.1978	0.0434	0	0.4211	0.0119	0.1152
Kerala	0.0229	0.0261	0.2115	0.2112	0	1	0.0521	0.1135
Lakshadweep	0	0	0	1	1	0.9332	0.3874	0.1232
Madhya Pradesh	0.0112	0.0144	0.0617	0.0245	0	0.2335	0.0036	0.0393
Maharashtra	0.0094	0.1539	0.1886	0.0503	0	0.6378	0.0104	0.2535
Manipur	0.0016	0.0016	0.0433	0.1008	0	0.4702	0.0056	0
Meghalaya	0.0036	0.0134	0.0962	0.0557	0	0.3922	0.0077	0.0938
Mizoram	0.0059	0.0023	0.1303	0.1079	0	0.9171	0.0078	0.0497
Nagaland	0.0014	0.0043	0.0725	0.2393	0.0008	0.5512	0.0089	0.0189
Odisha	0.0057	0.0140	0.0470	0.0579	0	0.3438	0.0059	0.0359
Puducherry	0.0218	0.0245	0.2701	0.1611	0.0004	0.7468	0.1457	0.1097
Punjab	0.0310	0.0597	0.1147	0.0457	0.0001	0.4360	0.0169	0.1175
Rajasthan	0.0140	0.0294	0.0701	0.0131	0	0.1339	0.0018	0.0297
Sikkim	0.0031	0.0382	0.1824	0.0417	0	0.6093	0.0047	0.1523
Tamil Nadu	0.0255	0.0813	0.2105	0.0525	0	0.5680	0.0262	0.0952

Tripura	0.0035	0.0041	0.0724	0.3263	0.0001	0.7894	0.0201	0.0404
Uttar Pradesh	0.0074	0.0127	0.0383	0.0019	0	0.1826	0.0089	0.0244
Uttarakhand	0.0106	0.0170	0.1127	0.3279	0	0.5286	0.0093	0.1139
West Bengal	0.0042	0.0473	0.0503	0.0909	0	0.4491	0.0183	0.0704

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