A Comparative Analysis of Financial Inclusion Index: Core v/s Advanced Index

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***Abstract*—The foundation of financial sector development starts with ensuring access to financial services. To achieve the complete development of the financial sector in the real economy, all sections of society must have complete access to financial services. For inclusive growth of any economy, financial access is necessary, which results in financial inclusion and unleashes the accelerating effect of financial development on economic growth. Financial inclusion is measured by the improvement in the penetration, availability, and usage of financial services. Most of the studies found in the literature have constructed financial inclusion index specifically for the banking sector. The present study has proposed two sets of indices to measure how far financial inclusion in the financial institutions and financial markets has improved over a period. The first index covers the banking services provided by banks and post offices, the second index is a broader index, and it covers both financial institutions and markets along with technology. It makes a comparison of the two sets of indices to emphasize the qualitative aspects of financial inclusion that has occurred in India. The study uses the indicators of the banking sector, post offices, insurance sector, small savings, mutual funds, stock market and technology. The proposed indices cover the period of 11 years from 2010 to 2020. The findings of the study reveal that financial inclusion has increased in India over the years. The comparative result of indices confirms that the increased usage of technology-based services can further improve the financial inclusion of the country.**

***Index Terms*—Advance Financial Inclusion Index, Banking Penetration, Core Financial Inclusion Index, Financial Access, Financial Inclusion.**

I. INTRODUCTION

The foundation of financial development starts with ensuring access to financial services. It forms the foremost and elementary foundation of the financial sector development. To achieve the complete development of the financial sector in the real economy, all sections of society must have complete access to financial services. Financial access means that households and businesses should be able to provide financial services with ease. For inclusive growth of any economy, financial access is necessary, which results in financial inclusion and unleashes the stimulating effect of financial development on economic growth.

Financial Inclusion is defined "as the process of ensuring access to financial services and timely and adequate credit where needed by vulnerable group such as weaker and low-income groups at an affordable cost" (Rangrajan Committee 2008). The central bank in India along with the Government of India has taken various initiative and approaches to improve financial inclusion such as relaxation of KYC norms, simplification of forms, self-help group, micro finance, etc. Financial inclusion is measured by improvement not just in the penetration and availability financial services but also in terms of use of the same for depositing money and borrowing. Enough penetration and easy availability of financial services is expected to improve utilization of savings and facilitate borrowings.

The construction of the index of financial inclusion is a comprehensive way to measure the magnitude of improvement in financial access. This paper involves construction of an index on a broader coverage of financial institutions as well as markets. Over and above banking services providing institutions like banks and post offices, there are many formal sectors of finance such as non-bank financial companies, insurance sector, equity and stock market, whose services are equally important. The study has incorporated more sophisticated variables such as number of saving accounts of post offices, small savings, life insurance offices and premium, stock market capitalization and mutual funds.

The paper is organized into five sections. The second segment covers the review of related literature, and the third segment presents the

dimensions and indicators used to measure financial inclusion index. The fourth segment demonstrates the methodology used to construct an index. The analysis and interpretation of the indices are discussed in fifth part. The sixth segment presents the findings and conclusions, and last section shows the limitation and scope of the study.

II. REVIEW OF LITERATURE

In the context of India, many studies in the literature have developed financial inclusion index encompassing a wide range of dimensions. These include studies like Sarma (2008), Sarma and Pais (2008), Sethy (2016), and RBI (2021) which have used common measures as indicators of Financial Inclusion Index over a different period, with varying scope and indicators.

Sarma (2008) has constructed the Financial Inclusion Index for country comparisons using three dimensions namely penetration, availability and usage of financial services. Banking penetration is measured by using indicators such as number of credit accounts and deposit accounts with banks. These accounts are calculated as a population of 1000 adults. The availability of financial services is measured in terms of number of branches and ATM of banks per 1 lakh adults, and usage is measured by the amount of bank credit and bank deposit to GDP. The two sets of indices were constructed; the first index is constructed using all three dimensions for 55 countries and second set is constructed for 100 countries by dropping one dimension namely banking penetration. The results reveals that many countries show low levels of financial inclusion among which India ranks 29th position in the three-dimensional index with low level of financial inclusion.

Sarma and Pais (2008) has constructed an extended index developed by Sarma (2008) to examine the effect of macroeconomic factors that may be linked with financial inclusion. The study does a comparative examination of the link between Financial Inclusion Index (FII) and Human Development Index (HDI) for 49 countries in the year 2004. The result reveals that India ranks at the 29th position in FII and 42nd in the HDI. The study carries out three set of regression which alternatively use social and economic factors, physical infrastructure, and factors related to the banking sector. The study reports financial inclusion and human development are positively associated with each other.

Arora (2010) has studied the level of financial access across countries with different levels of development. This study distinguish itself from others in that it has by calculating the Financial Access Index (FAI) instead of the FII including indicators related to banks and non-bank companies. The study focuses on bank outreach, cost of penetration and quality which are necessary for supply-side indicators encompassing both bank and non-bank companies. It has been constructed FAI for 98 developed and developing countries depending on the availability of data. India with low level of Financial Inclusion ranks 29th position.

Sarma (2012) has extended the country comparison study to 154 countries to examine the level of financial inclusion attained by them over the period 2004 to 2010. The study has composed the index of financial inclusion for all the 154 countries, however, the data availability for the countries varies for this year and across the indicators. Therefore, it has constructed index for various numbers of countries in different years. The study uses the average of the Euclidean distance and the inverse of Euclidean distance, to construct the index for different countries, which provides the correct picture of financial inclusion. The findings indicate a high degree of variation among countries. The study has classified countries based on the degree of financial inclusion. The Countries are said to have high financial inclusion whose index value is ranging from 0.6 to 1, medium level of financial inclusion if its ranging from 0.3 to 0.6, and poor financial inclusion if its value is less than 0.3. The study reveals that there is positive correlation between financial inclusion and the state of development of the country. Mostly the high-income OECD countries are found to have high level of financial inclusion. However, the findings show some mixed results, some countries with middle level of income show high level of financial inclusion and high-income countries fall under medium level of financial inclusion and vice versa. Most of the African countries were found to have low level of financial inclusion. India is found to lie in the middle range of financial inclusion.

Credit Rating Information Services of India Limited (CRISIL, 2013) has constructed the Financial Inclusion Index for India 'Inclusix' for the year

2013 and thereafter, for 2014, 2015 and 2018, which however, is based on only six measures of penetration related to branch, credit, deposit and insurance penetration. The index is different from all previous studies on the aspect that it focuses on number of people who have been included in the formal financial sector rather than the monetary aggregates. These indices are computed for all different level such as India level, regional level and district level to provide a comprehend picture of ground level and remote areas. The findings reveals that India scores 40.1 out of 100, which shows a low level of financial inclusion, overall, the score shows an improvement over previous year. Regarding state-level conclusion, the results unite with those of other studies which find Kerala, Chandigarh, Goa, and Delhi to be among the better performers.

Ambarkhane, Singh and Venkataramani (2016) have constructed state-level financial inclusion index for the year 2011, which cover three dimensions. These are demand, supply and physical infrastructure. While the first two dimensions includes the common parameters used in most of the studies and the index with financial infrastructure include variables like literacy, irrigation, health, transport, and power. The study has constructed a comprehensive Financial Inclusion Index including population size and the situation related to law and order for each state as control variables. The study concludes that Goa ranks first state with highest level of Financial Inclusion followed by Kerala and Tamil Nadu, whereas Chhattisgarh and Jammu & Kashmir are among the lowest ranking states.

Sethy (2016), for instance, in his study on the role of financial inclusion in inclusive growth has proposed two composite financial inclusion indices using two data sets, the demand side index for the year 2004 to 2012 and supply side FII for the year 1975 to 2012. The study constructs first FII in terms of demand side factors by using three dimensions, namely, penetration, availability and use of banking system. The first dimension is calculated by using three variables namely, number deposit accounts per 1000 adults, the number of ATMs and bank branches per one lakh population, and the of ratio of outstanding volume of deposits to GDP. The second FII is constructed in terms of supply side based on three variables, namely, number households with access to savings, insurance and number of loan accounts of small entrepreneurs. The finding reveals that the India is having high financial inclusion in terms demand side index and low level of financial inclusion in supply side index.

Adhikary, Bagli and Dutta (2017) have measured state-wise FII for the year 2010 based on the concept of spread, width, and depth, although, the measures are the usual as found in the literature. The spread dimensions include the geographical spread and demographic spread of bank branches; breadth dimension measures the number of persons with deposit and credit accounts; and deepness of financial inclusion has been measured by the ratio of total savings and credit to GDP. The findings converge with the state level comparison studies.

The index by Goel and Sharma (2017) is based only on two dimensions, penetration and availability, and spans over ten-year period from 2005-2015. The researchers find that the level of financial inclusion in India ranged from low to high till 2014-2015.

Singh (2018) has analysed whether the CRISIL Inclusix Index was effective in measuring the extent of financial inclusion, particularly, in term so of number of basic savings bank accounts opened under the *Jan Dhan Yojana.* The study shows that there is improvement in financial inclusion index, and it finds that microfinance institutions and the "National Mission on Financial Inclusion" have made more contribution in improvement of financial access as both focused majorly on weaker sections of the society.

To represent the qualitative aspects of financial inclusion, The Reserve Bank of India (2021) has developed the FII with a comprehensive concept of financial inclusion, including penetration, availability and usage along with qualitative facets such as quality of financial services, equal distribution of financial services, financial literacy, and consumer protection. It has constructed index for the period of 2017-2021. To show which dimensions have contributed more to achieving higher financial inclusion, RBI has constructed sub-indices of selective dimensions. It has given more weightage to usage and quality dimension and less weightage to the supply side dimension of access. The RBI had Incorporated in total 97 variables across all three dimensions, namely, access, usage and quality. The reason to assign low weightage to access because it represents the supply side and the higher weightage to other two dimensions usage and quality to "make the index forward-looking" (RBI,

2021). The RBI FII examines the Gini coefficient at district level to assess the inequality in financial inclusion.

Parvez (2022) examines the status of digital financial inclusion in India. The study also focuses on the key factors which helped in the development of digital financial inclusion and its barriers and challenges in their adoption. The finding shows that digital financial inclusion has improved significantly driven by Pradhan Mantri Jan Dhan Yojana and fintech.

Chandrasekhar, Prasad and Chauhan (2023) examine the impact of digital finance on financial inclusion. The paper has used both primary and secondary data, primary data is collected through questionnaires including urban, semi-urban and rural areas of different cities, and secondary data is collected through annual reports. It focuses on financial services like online banking and digital payment through different wallets. The paper also focuses on the factors that influence the adoption and use of digital financial services by different groups of populations. The results reveal that the increasing adoption and use of digital financial services is due to the user-accessible nature of online banking and easy accessibility of online banking services.

Das and Dutta (2024) focused on the evolution of the digital financial services in India. The study examines the impact of Demonetization on digitalization in India. It compares the digital payment system in terms of value and volume pre and post demonetization. The analysis shows that there is increased in the total digital transaction from 24.2% in 2016 to 55% in 2017, it is seen that the use of digitalization has increased post demonetization. The study also talks about the obstacle faced in accessibility of digital -+financial inclusion. It suggests that through financial literacy these obstacles can be overcome. The analysis on the countries digital adoption index shows a that India's Score of Digital Inclusion have increased 90% over the period of 2014 to 2017

Ozili (2025) provides an overview of the digital financial inclusion around the world. The study has divided the world into different regions like Africa region, Asian region, European region, Australia and Oceania regions, regions of the America. The results shows that in African regions digital financial inclusion has increased through mobile phones and money wallets which stimulates the use and access of digital banking services along with increase in the economic growth and improvement in the bank stability by reducing the size of informal financial sector. There is imbalance in the different regions of Europe showing high level of digital financial inclusion in western European countries and OECD countries and low level of digital financial inclusion in southern European regions. The major reason for this imbalance is the ease of financial literacy in western regions and most of the people are underserved. In Asian region with the increased numbers of mobile and internet users there is more increase in the level of digital financial inclusion. Digital financial inclusion has prominently increased in Australia with fintech innovation and over 1000 of fintech companies providing more accessible and affordable fintech services. In the oceanic region New Zealand shows the significantly high improvement in the digital financial inclusion. The American region shows uneven development in the digital financial inclusion with high level of digitalization in U.S and Canada, and significant improvement in Latin America and Caribbean countries. The study concludes that there is uneven positive development seen all over the world, emphasizing more innovative ways to increase the level of digital financial inclusion overcoming the challenges faced by different regions.

Most of the studies in literature so far have used almost same indicators to construct the Financial Inclusion Index and are confined to only banking sector. Over and above banking sector there are many formal sectors of finance such as post offices, non-bank financial companies, insurance sector, equity and stock market. The aim of the present study is to construct a more sophisticated and broader Financial Inclusion Index including the dimensions of both financial institutions as well as financial markets. The present study has proposed two sets of indices to measure the extent of financial inclusion in financial institution and financial market as well. First index covers the formal banking services provided by banks and post offices, the second index is a broader index, and it covers both financial institution and markets along with technology. It makes a comparison of the two sets of indices to highlights the qualitative aspects of financial inclusion that has occurred in India. It includes the variables of banking sector, post

offices, small savings, insurance sector, equity and stock markets. The proposed index is constructed for 20 years period from 2001 to 2020. The index of financial inclusion comprises three dimensional indices namely, penetration, availability and sage of financial services.

The data related to banking sector, population and GDP are collected from the Reserve Bank of India. The data related to insurance sector is collected from the Annual Report of IRDAI. The data on post offices is extracted from the Annual Report of India post Ministry of Communication and Technology, and data on stock market is taken from the website of Security Exchange Board of India. The methodology used is the simple average of the Euclidean distance and inverse Euclidean distance to calculate the dimensional and composite index.

III. DIMENSIONS AND INDICATORS

The Financial Inclusion is multi-faceted in nature and encompasses various dimensions in index. The penetration, availability, and usage indices are combined to compute a composite financial inclusion index. All three dimensions are measured by numerous indicators based on the availability of data. The three dimensions are penetration, availability of financial services, and usage of financial services.

3.1. Penetration

Penetration captures how wide financial services have spread among households and firms. It means making financial services obtainable to a greater section of the population in an economy. Penetration is measured using the variables such as bank deposit and credit account, savings account of post offices, market cap and insurance premium. The increase in the number of such accounts, greater is the increase in the penetration of financial sector amongst the people.

3.2. Availability of Financial Services

Availability measures the ease with which financial services are available to all populations. This dimension is necessary because even though the people have bank accounts and post office accounts, they may not be easily available. As is commonly known, often in the remote areas, the nearest bank branch may not be in close locality but may be found several kilometers away. In this way, the availability dimension serves as a proxy for ease of availability of the financial services. The availability is measured using indicators related to physical infrastructure such as number of branches, post offices, life insurance offices, and listed companies.

3.3. Usage of Financial Services

A developed financial sector is not merely penetration and availability; the usage dimension is equally important. Usage measures the extent of use of financial services. Merely having a bank account or other services does not indicate an active Financial Inclusion, an adequate use of the services is accounted as actual Financial Inclusion.

Following are the summary of the indicators used to measure the dimensional index and composite Financial Inclusion Index.

Table 1: Dimensions and Variables used in the construction of Financial Inclusion Index

Dimensions	Variables
PENETRATION OF FINANCIAL SERVICES	Number of bank deposit accounts per 1000 adults
	No. of bank credit accounts per 1000 adults
	No. of post office deposit accounts per 1000 adults
	Market capitalization per 1000 adults
	Insurance premium per 1000 adults
	No. credit cards per 1000 adults
	No. of debit cards per 1000 adults
	No. of electronic transactions per 1000 adults
AVAILABILITY OF FINANCIAL SERVICES	No. of bank branches per 100,000 adults
	No. of bank branches per 1000 sq. km.
	No. of ATMs per 100,000 adults
	No. of ATMs per 1000 sq. km.
	No. of Post offices per 100,000 adults
	No. of insurance offices per 100,000 adults
	No. of listed companies per 100,000 adults
	No. of internet users per 100,000 adults
USAGE OF FINANCIAL SERVICES	Bank deposits to GDP
	Bank credits to GDP
	Post office savings deposits to GDP
	Small savings to GDP
	Life insurance premium to GDP
	Public deposits of NBFC to GDP
	Stock market total value traded to GDP
	Net resources of mutual funds to GDP
	Value traded outside top ten traded companies to total value traded
	Market capitalization excluding top 10 companies to total market capitalization
	Volume of total electronic payments to GDP

Source: Author's Work

The study highlights that to achieve financial inclusion, it does not only require penetration and availability of financial services but also the effective use of the services. Accordingly, the variables are selected across the three dimensions for various financial sectors. To assess penetration in banking sector, the variables included are number of bank deposit accounts, credit account, credit card, debit card, electronic transaction, all measured per 1000 adult population. For availability, the study uses demographic density (per 100,000 adults) and geographic density (per 1000 sq. km) of branches and ATM. For measuring the technology-based inclusion a special variable is used namely, number

of internet users per 100,000 adult population. For usage, it uses the ratio of bank deposit, bank credit, small and volume of total electronic payments to GDP of a country for respective years.

Likewise for measuring the financial inclusion in post offices, number of post office deposit accounts per 1000 adult population is used for penetration, number of post offices per 100,000 adults for availability dimensions, and post office saving to GDP for usage dimensions.

To evaluate financial inclusion in Stock market, the study uses specific variables for all the three dimensions likely for penetration, market capitalization per 1000 adults is measured, for availability number of listed companies per 100,000 adult population is assessed, and for usage the ratio of total value traded and net resource of mutual funds to GDP, and the ratio of value traded outside top ten traded companies to total value traded and market capitalization excluding top 10 companies total market capitalization is used.

Similarly, measures are taken for assessing the state of financial inclusion in Insurance sector. For measuring penetration, it has used insurance premium per 1000 adults, for availability it has used number of insurance offices per 100,000 adult population and lastly for usage it has used ratio of life insurance premium and public deposits of NBFC to GDP. An increase in the values of all the variables generally indicates an improvement in each respective metric.

IV. METHODOLOGY TO CONSTRUCT FINANCIAL INCLUSION INDEX

The present study uses the methodology used by Sarma (2012). The Financial Inclusion index is constructed at two different levels. First, the dimensional index is computed for each of the three dimensions separately and, secondly, all the three-dimensional index is used to calculate the composite index. The construction of index includes three steps. The same methodology will be used to construct dimensional and composite index. The three steps are as follows:

- Normalisation of Indicators
- Calculation of Distance index
- Calculation of Final index

Step 1: Normalization of Dimensions

Each of the variables used to compute the index are measured in separate units, and so it is not possible to directly combine all of them to arrive at an index value. Thus, to make all the variable units free the first step is to normalize all the variables before computation. The variables are normalized using following formula:

$$D_x = W_i \frac{x - x_{min}}{x_{max} - x_{min}} \quad (1)$$

W`here,

$W_i = Weight\ attached\ to\ variables$

$x = actual\ value$

$x_{min} = minimum\ value$

$x_{max} = maximum\ value$

$D_x = normalised\ value$

The variables are normalized using the given formula, which will make all the dimensions unit free. After normalization all the variables will be lie Within the range of zero to one, where zero represent the dimension's worst position and one will represent the ideal position with maximum value. The higher value represents the better and improvement in the dimension.

Step 2: Construction of the Distance Index

The second step includes the computation of distance index. The distance index is calculated using a simple average of two distance indices namely Euclidian Distance method and inverse Euclidian Distance Method. The first Euclidian distance is calculated from the worst point that is zero. It measures the improvement of the variables from their worst points. The following formula is of first distance index of Euclidian distance method

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2 + \cdots + d_n^2}}{\sqrt{n}} \quad (2)$$

where,

$d_i = Normalised\ value\ of\ indicators$

$W_i = weights\ assigned\ to\ each\ indicators$

The first distance index value will convert the value between zero to one. Higher values will be assigned

to the indicators with higher and better magnitude. The first distance index will measure the improvement achieved from the worst point towards financial inclusion.

The only drawback in the first distance index shows only the progress achieved from worst point and does not highlight the distance yet to be attained to achieve the complete financial inclusion. Therefore, the proposed index uses inverse Euclidian distance method along with Euclidian distance method, which will show the path yet to achieved to reach the ideal goal post. It is calculated as follows:

$$X_2 = 1 - \frac{\sqrt{(1-d_1)^2+(1-d_2)^2+\cdots+(1-d_n)^2\ }}{\sqrt{n}} \qquad (3)$$

The ideal goal post is one, as all the indicators of dimensional index are given equal weightage in the computation. All the normalized values of the indicators are subtracted from the one and after the required summation, under roots and ratios, the whole value is subtracted again from the one. The two-distance method is used only when all the variables are treated equally. The above two methods are used when all indicators are treated equally.

Step 3: Calculation of the Dimensional Index

The last step of calculation includes the simple average of the two-distance index calculated above and named as X_1 and X_2, that is, the distance index and the inverse distance index.

$$DI = \frac{1}{2}(X_1 + X_2) \qquad (4)$$

The lower value of dimensional index would be zero and upper limit would be one. The better the improvement in the dimension, the higher the value. All the three-dimensional indices are calculated using the above-mentioned methodology.

Step 4: Calculation of the Financial Inclusion Index

To construct a composite index of financial inclusion, all the three steps mentioned above are repeated for dimensional indices. All the three-dimensional indices are renormalized using the formula number (1). Different weights are allocated to all three dimensions to construct the FII. Penetration has been assigned the more weightage of 50 percent, being the most elementary aspects of financial inclusion, while availability and usage dimensions have been assigned weightage of 25 percent each. According to the weights assigned, the distance formula will slightly change. formula for distance and inverse distance method will change slightly. In formula (2) the denominator the square root of the number of dimensions will be replaced by the square root of the sum of weights assigned to each dimension, as follows

$$X_1 = \frac{\sqrt{d_1^2+d_2^2+\cdots+d_n^2}}{\sqrt{W_1^2+W_2^2+\cdots+W_n^2}} \qquad (5)$$

Similarly, formula (3) will be modified by changing the numerator, where one the ideal post will be replaced by the weights assigned to each dimension. The ideal post for the dimensions will vary according to their weights assigned, thus normalize value of all dimensions will be deducted from their respective weights, the formula will be

$$X_2 = 1 - \frac{\sqrt{\{(w_1-d_1)^2+(w_2-d_2)^2+\cdots+(w_n-d_n)^2\ \}}}{\sqrt{w_1+w_2+\cdots w_n}} \qquad (6)$$

The final step in the computation will remain same, the simple average of both distance and inverse distance method.

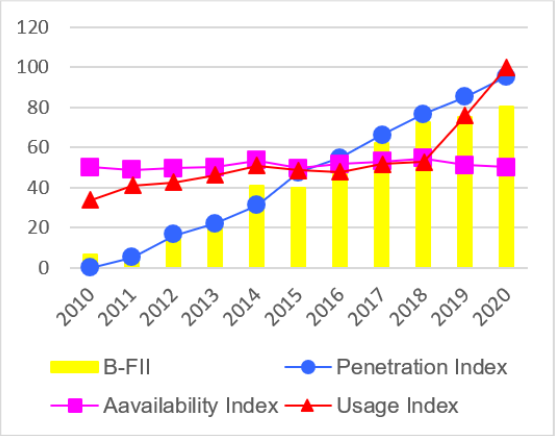
$$FII = \frac{1}{2}(X_1 + X_2) \qquad (7)$$

V. ANALYSIS AND INTERPRETATION

The first banking oriented Financial Inclusion Index (B-FII) focuses on the inclusion of the population in the formal banking services offered by banks and post offices and is therefore, called banking services-oriented financial inclusion index (B-FII). It is based on people's traditional financial behavior which is mostly bank and post office oriented.

The penetration dimensional index is indicated by number of bank savings accounts and post office deposit accounts and credit accounts; both measured per 1000 adult population. The second dimensional index is availability of financial services constructed by using the demographic density of bank branches and post offices per 100,000 population. The third usage dimension is measured using the amount of savings in bank and post offices and the amount of credit to GDP.

Fig. 1 Dimensional and Composite Index of Bank oriented Financial Inclusion.



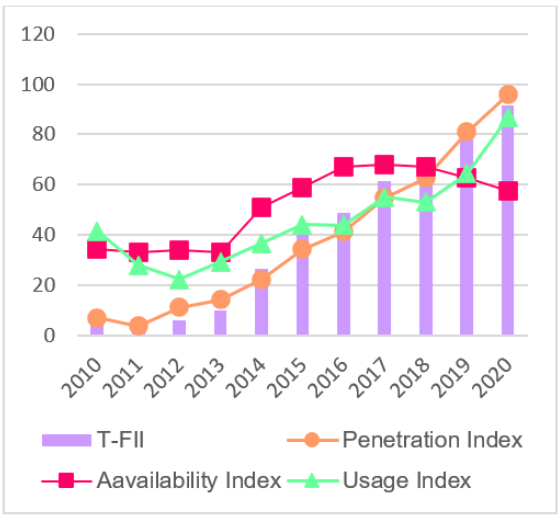
Source: Author's calculation based on Data sourced from RBI and Annual Report of India post Ministry of Communication and Technology

Fig. 1 shows the trend in the three-dimensional indices and a composite index of banking services-oriented index of core Financial Inclusion. The penetration dimensional index shows a continuous increase over the period and has increased at a compound annual growth rate of 38.6%. Among the indicators the deposit accounts show more growth, it has increased more than 2.5 times from 2010 to 2020. After the launch of Pradhan mantra Jan Dhan Yojana scheme there is acceleration in the opening of bank deposit accounts. The other two dimensions too show an improvement over the period. The second dimension, availability index, is quite stagnant, that is because there is not much difference in the minimum and maximum value of bank branches, and the number of post offices has been reduced over the period.

The third usage dimensional index shows a steady improvement over the years. The index value of usage has increased from 33% in 2010 to 99% in 2020 almost by three times. All the indicators' usage shows improvement. Among all the three dimensions the penetration dimensional index shows much more improvement than other two indices.

The bar graph in Fig. 1 depicts the composite financial inclusion index. It shows that the financial inclusion index has progressed constantly over the period. It has increased from the low index value of 6.4 percent to 80.18 percent till 2020.

Fig. 2 Dimensional and Composite Index of Technology based Financial Inclusion Index (T-FII)



Sources: Author's calculation based on Data sourced from RBI and Annual Report of India Post Ministry of Communication and Technology, Annual Report of Insurance Regulatory and Development Authority of India, Security Exchange Board of India

The second Financial Inclusion Index as shown in figure 2 uses all the previously used indicators along with financial market, insurance, geographical density of banking infrastructure and technology-based access to financial services. Technology has significantly prompted how claims are settled down. More people are gradually adopting electronic payment modes. Therefore, the third index is named as Technology based financial inclusion index T-FII incorporates all the above listed variables in section II. They include, amount of market capitalizations and insurance premium, number of debit cards, credit cards and electronic transactions per 1000 adult population as measures of penetration; geographic availability as number of branches per 1000 sq. km., number of ATMs per one lakh adult population and number of ATMs per 1000 sq. km., and number of internet users per 100,000 adult population; and volume of total electronic payments to GDP along with mutual funds, total value traded, insurance premium, etc., as an indicator of usage.

The penetration index involves electronic access; stock market and insurance show remarkably compound annual growth rate of 30 percent. All the variables used to construct penetration index have doubled over the period, among these variables the most remarkable increase is seen in the number of debit cards and electronic transactions.

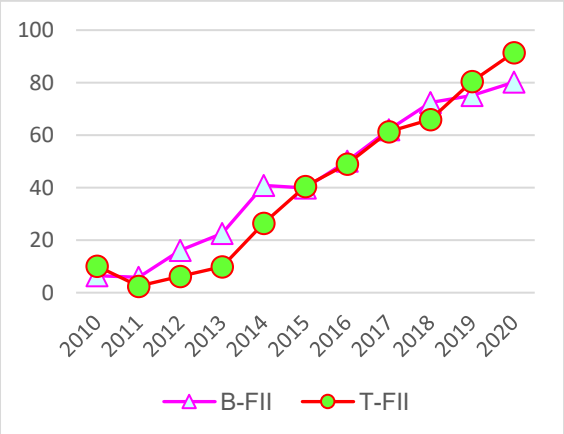
The availability index has grown at the CAGR of five percent on inclusion of geographical and technological penetration. The most important contributor in the availability dimension is the ATM per one lakh population which has increased at the CAGR of 12.62 percent. Additionally, the geographical density of ATM has also grown at a rapid rate of 17 percent on compound annual basis.

The usage index has increased at a CAGR of 7.6 percent, it includes the electronic transaction which shows a major contribution. The number of electronic transactions shows more improvement since 2013-14, and so the usage index shows more improvement. The usage index grows at a CAGR of -3 percent till 2014, which shows a great improvement after 2014, and has increased at a CAGR of 15 percent from 2014 to 2020. The advanced financial inclusion has increased at a CAGR of 24.66 percent with a low value of 10 percent in 2010 to 91 percent in 2020.

5.1. Comparison of the Financial Inclusion Index

A comparison of the FIIs has been carried out to bring the qualitative aspect of financial inclusion that has occurred in India. Two different indices were constructed due to the non-availability of data.

Fig. 3 Comparison of Core and Advanced Financial Inclusion Indices



Source: Author's Calculation

Fig. 3 presents the two composite indices together. As visible from the figure 3, Both the indices have similar line and unite with each other, more detailed observation can be made. It is visible in the figure that for majority of the years B-FII has been on the higher side. This indicates that banking-oriented services still play an important role in financial inclusion. The second index T-FII includes other financial institutions such as mutual fund assets, insurance companies, listed companies, NBFCs and stock market capitalization and trading activity excluding top ten companies along with technology access along with the indicators of banks and post offices. It is visible from the figure that in the early stage the T-FII is lower than the B-FII, that is because India's financial sector is still in its initial stages of development mainly in terms of banking services, where surprisingly there is lower Financial Inclusion in the institutions and markets.

In the later years 2016 the technology based FII is surpassing the banking oriented FII. This reveals the expansion in the adoption of technology based financial inclusion with growing number of people using internet-based financial services, results in the expansion of the stock market capitalization outside of top ten companies. Following the demonetization in 2017, digital financial inclusion in has more than doubled, (Das and Dutta 2024) driven by the emphasis on the cashless economy through the Cashless India Movements contributing to significant overall increase in financial inclusion. Thus, the analysis reveals that there is more improvement in digital financial inclusion, mostly post demonetization further it also states that increased use of technology-based usage can further improve financial inclusion.

VI. CONCLUSION

Financial inclusion with reference to India exhibits an improvement over the years in both the indices. This improvement can be credited to the number of actions taken by the government to improve financial inclusion. The government has introduced numerous schemes including farmer's pension, MNREGA, Kisan credit card. And Basic Savings Bank Accounts under the PMJDY, etc. With this initiative the banking sector is efficiently including the excluded population within the official financial sector. The government has been distributing benefits in an efficient manner through JAM trinity, which links the bank accounts with their Unique Identification Number. T-FII incorporate all formerly used indicators along with technology-based access to financial services and geographical density of banking infrastructure covering the period of ten years from 2010 to 2020. Technology has greatly shaped the financial sector with increased adoption of electronic payment methods.

VII. LIMITATION

Though meticulous attempts have been made to carry out the existing research work, some limitations are foreseeable. The most important limitation is related to the use of proxy variables. There are some other important finer aspects of the financial sector such as business correspondent, self-help groups, micro finance, different schemes of pension, etc, that remain unexplored on account of the focus on the banking sector.

The index is majorly based on the supply-side indicators of financial services, and it uses limited indicators of the demand side which is an important aspect of financial inclusion. Moreover, it also excludes the Quality aspect of financial inclusion which captures the efforts made by the Reserve Bank of India and the government of India to create awareness regarding the different financial services available and their ways to use them.

Lastly, the study concludes at the point when the global covid-19 pandemic broke out. The present study uses a wide range of indicators to measure the financial inclusion index, and due to non-availability of the data on the used indicators, the study is limited to the year 2020. The banks and government have actively worked to overcome and survive the pandemic situation through many measures, which is out of the purview of present study. Moreover, the financial market has also seen major changes due to pandemic, which is not studied within the purview of this study. A comprehensive study can be carried out which over comes all the mentioned limitations of this study

VIII. FUTURE SCOPE IN RESEARCH

The present study predominantly emphasizes the supply side factors of financial inclusion neglecting the important aspects of demand side factors. Further study could incorporate the demand side factors such as digital literacy, financial literacy, social and other barriers. Additionally, the study concludes in 2020, a period of COVID-19 Pandemic, future investigation in the same field can extend their analysis by including the post pandemic data. A comparative pre and post pandemic effect on financial inclusion can be undertaken to elucidate the role of pandemic in accelerating digital financial inclusion there by contributing to overall improvement in financial inclusion.

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