Financial Inclusion and its Determinants:
A Study of Bangladesh

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Abstract

Despite the present focus of policies devoted to promote financial inclusion in Bangladesh, the issue of its comprehensive and robust measurement, which can be used to assess the extent of financial inclusion across the country is outstanding. This study attempted to fill this gap first, by proposing a multi-dimensional index and then identifying the determinants of financial inclusion. Following similar methodology used to construct the Human Development Index (HDI), data on several dimensions of financial inclusion were used to develop an index lying between 0 and 1. The Euclidean distance formula was applied to extract the normalized indicators. The findings of the study showed that only one district in Bangladesh, that is, Dhaka achieved high stated financial inclusion, and five districts achieved medium stated financial inclusion during 2009-2013, while very low financial inclusion was observed across the remaining 58 districts out of 64 districts of Bangladesh. The empirical findings also showed that 47 districts out of 64 witnessed an improvement in the IFI score of financial inclusion. However, the extent of progress of financial inclusion in these 47 districts was found to be insignificant to change their status from low financial inclusion to medium or high financial inclusion. Among the socio-geographic variables, rural population, household size, and literacy rate; among the infrastructure variables, paved road networks, Internet ; and among the banking variables, deposit penetration were found to be the significant determinants of financial inclusion. One of the major contributions of this study is that it will invoke the governments and policy makers across the world to develop a financial inclusion index for their respective countries, and thereby undertake such policies to promote financial inclusion.

Keywords: financial inclusion, multi-dimensional index, normalized inverse Euclidean distance, Human Development Index

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In recent times, financial inclusion has been given priority as an important policy objective around the world. A number of governments, Central banks, and regulators have taken initiatives and have initiated new regulations to foster financial inclusion in their respected countries. In the United States, the Community Reinvest Act, 1997 was initiated to provide credit to every segment of the country and the 'Financial Inclusion Task Force' was founded by the U.K Government to monitor development of financial inclusion of the country. At the international level, Consultative Group to Assist the Poor (CGAP), The IMF, Alliance for Financial Inclusion (AFI), G20, and many others are playing an active role to promote financial inclusion (Amidžić, Massara, & Mialou, 2014).

In addition to the policymakers, the issue of financial inclusion has also attracted a growing interest from academicians and researchers across the world. For instance, in the context of rural India, Burgess and Pande

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(2005) observed that the expansion of bank branches had a significant impact on poverty alleviation. With respect to savings products, Brune, Giné, Goldberg, and Yang (2011) conducted a field research in rural Malawi with the objective of identifing and analyzing the avenues through which access to formal financial services improves the people's living, especially of the poor.

While the role of financial inclusion in promoting economic growth and alleviating poverty is well recognized, there is a relative dearth of studies addressing the measurement issues of financial inclusion. Even though there are some, most of those studies have focused on measuring financial inclusion for all countries at a national level, and did not focus on the extent of financial inclusion within different regions, provinces, and cities of a specific country. In particular, there is no such robust index of financial inclusion in Bangladesh, which could be used to assess the inclusiveness of the financial system of the country. This study attempts to fill this research gap by proposing a multi-dimensional index of financial inclusion.

The main contribution of the study is to add to the literature of measurement issues of financial inclusion. This robust and comprehensive measurement can be used by policy makers to ascertain the recent state of affairs related to financial inclusion, can be helpful for the policy making process, and to keep an eye on the improvement of the policy programs undertaken to foster financial inclusion.

Literature Review

⍒ **Defining Financial Inclusion :** While a plethora of studies exist on the issue of financial inclusion, there is no single commonly agreed definition of financial inclusion. Karmakar (1999) stated that the financial inclusion process facilitates timely and adequate credit to all people of a country, including vulnerable groups such as weaker sections and low-income groups, at an affordable cost. This definition emphasizes that sufficient credit should be provided to all sections of people, whenever they demand. Sarma (2008) considered banks as a gateway to the formal financial system, and defined financial inclusion as a process through which all members of an economy, including the weaker and disadvantaged sections, could be brought under the umbrella of a formal financial system.

From a practical viewpoint, the term "financial inclusion" should be defined in terms of its indicators and/or dimensions. Financial inclusion could entail three dimensions, namely the outreach, usage, and quality of financial services. The outreach dimension refers to the (physical) ability to easily reach a point of service. For example, the number of bank branches per 1000 square kilometer or per 1,00,000 people could be used to assess the outreach dimension. The more the value of this dimension, the more is the financial inclusion. The usage dimension measures the use of financial services by the people, while the quality dimension measures whether the needs of the consumers are being addressed by the financial services they use and to what extent. Indicators such as financial literacy, dispute resolution, and so forth could be used to measure the quality dimension. Data on such indicators of quality dimension are scarce and thus, this makes it difficult to measure this dimension.

On the basis of the above-mentioned definitions, the overall concept of financial inclusion, in the context of this study, is building an inclusive financial system which ensures access and availability and usage of financial services to all people of the country. In other words, we define and measure in this study, financial inclusion as the optimal combination of its several dimensions. Since banks are considered as the gateway to the fundamental types of financial services (Sarma, 2008), we used banking inclusion as equivalent to financial inclusion.

⍒ **Measurement of Financial Inclusion - The Research Gap :** Different approaches have been proposed to measure the extent and progress of financial inclusion. Recognizing the need for measurement of financial inclusion, several researchers have proposed different approaches. For example, Beck, Demirguc-Kunt, and Martinez Peria (2007) designed and used three indicators, namely deposits, loans, and payments to measure access and uses of financial services. Honohan (2008) used the percentage of households having access to formal financial services for roughly 160 countries. These single indicators might provide useful information on a single

aspect of financial inclusion, but might produce contradictory results when combined together (Sarma, 2008). To avoid such contradictory results, Sarma (2008, 2010, and 2012) proposed a comprehensive index of financial inclusion that encompasses different indicators. The main advantage of such a composite index is that it produces a single value for every region or country or within the geographic region of a particular country and thus, one can observe the status of a particular region of interest and then compare it with any other regions easily.

In particular, to date, there have been very few research studies that have been conducted on financial inclusion with respect to scheduled banks operating in Bangladesh. Islam and Mamun (2011) theoretically studied financial inclusion and the role of Bangladesh Bank. The study showed descriptive statistics of geographic and demographic penetration of financial services. The study lacked in that it has provided data on some individual indicators, but failed to develop any comprehensive index of financial inclusion for the country. Rahman (2009) highlighted the drawbacks and initiatives taken to promote financial inclusion, described the overall status of financial inclusion in Bangladesh considering several individual indicators such as a number of bank accounts, member in MFIs, cooperatives, and the adult population ratio. These studies are descriptive in nature and used a single indicator to explain the status of financial inclusion.

With an attempt to fill these gaps, the objective of the present study is to develop a comprehensive index of financial inclusion and thereby measure the extent of financial inclusion across all districts of Bangladesh. Also, the study aimed to empirically identify and analyze the determinants of financial inclusion.

Methodology

✥ **Construction of the Proposed Index :** In order to construct the present comprehensive financial inclusion index, we employed a similar methodology used by the United Nation Development Programme (UNDP's computation of such indices as Human Development Index (HDI) [1], Human Poverty Index (HPI)). At the first step, the dimension index value for the ith dimension d_i is calculated as follows:

$$d_i = \frac{(A_i - m_i)}{(M_i - m_i)} \quad \text{.............................. (1)}$$

where,
d_i = value of i th dimension index,
A_i = Actual value of i th dimension,
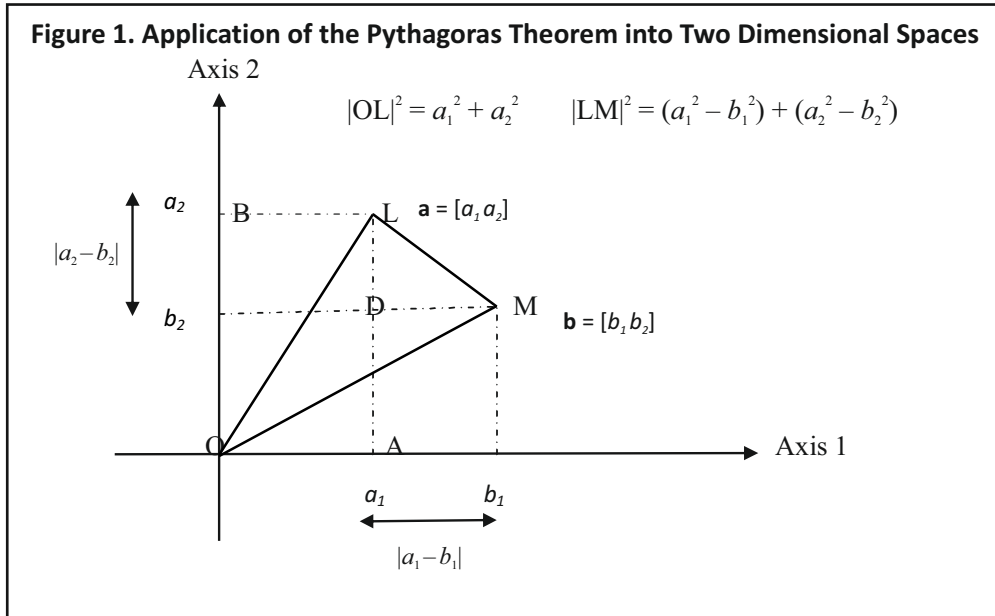m_i = Minimum value of i th dimension, and
M_i = Maximum value of i th dimension.

Equation (1) ensures $0 \leq d_i \leq 1$. Accordingly, in equation (1), the more the value of d_i, the more is the district's accomplishment in dimension i. For n dimensions of financial inclusion, a specific district i will be symbolized by a point $D_i = (d_1, d_2, d_3 ... d_n)$ on n-dimensional Cartesian space. In the n-dimensional space, the point $O = (0,0,0,…0)$ stands for the point indicating the worst condition, while the point $I = (1,1,1,…,1)$ stands for the uppermost achievement in all dimensions. This formula to calculate the dimension index (equation 1) is similar to the formula used in HDI construction. However, in equation (1) we differ from HDI in that we use empirically observed minimum and maximum values, while HDI involves the use of pre-fix values for maximum and minimum.

In the second step of construction of our proposed index, rather than using geometric mean (as used in the computation last step of HDI index), we resort to displaced ideal (DI) method suggested by Zeleny (1974) based on the Euclidean distance formula. In the following paragraphs, we show and discuss how we have derived our final index and thus computed financial inclusion.

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[1] For details of HDI, please see Technical Note in UNDP's Human Development Reports available at <www.undp.org>.

Figure 1. Application of the Pythagoras Theorem into Two Dimensional Spaces

$$|OL|^2 = a_1^2 + a_2^2 \qquad |LM|^2 = (a_1^2 - b_1^2) + (a_2^2 - b_2^2)$$

Mathematically, the Euclidean distance, also called the Euclidean metric, is the simple distance between two points that one would measure with a ruler and is given by the well known Pythagorean formula (i. e. $A^2 = B^2 + C^2$). Applying Pythagorean formula, the Euclidean distance between two points (a and b) is line segment connecting them $(\overline{ab})$. In Cartesian coordinates, if $a = (a_1, a_2, a_3...a_n)$ and $b = (b_1, b_2, b_3...b_n)$ are two points in Euclidean n space, then the distance (d) between these two points can be determined as follows:

$$d(a,b) = d(b,a) = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 + ... + (a_n - b_n)^2}$$

$$d(a,b) = d(b,a) = \sqrt{\sum_{i=1}^{n}(a_i - b_i)^2} \quad .... (2)$$

According to equation (2), in a single dimension, the absolute numerical difference is simply the distance between two points a and b. In this case,

$$\sqrt{(a - b)^2} = |a - b| \quad .... (3)$$

The two dimensional Euclidean distance for $a = (a_1, a_2)$ and $b = (b_1, b_2)$ is then the equivalent to the Pythagorean formula and is explained as follows :

In the Figure 1, the squared length of a vector $a = [\, a_1\, a_2\,]$ is the sum of the squares of its coordinates ($|OL|^2$) and is represented by the distance between points O and L, and the squared distance between the two vectors $a = [\, a_1\, a_2\,]$ and $b = [b_1\, b_2]$ is the sum of squared differences in their coordinates. As shown in the Figure 1, $|LM|^2$ is the distance between points L and M. Therefore, the distance between vector a and b can be determined as follows:

$$d^2(a,b) = (a_1 - b_1)^2 + (a_2 - b_2)^2 \quad .... (4)$$

where,
$d^2 (a,b)$ refers to the distance between vectors a and b. Taking the square root of each side we get,

$$\sqrt{d(a,b)} = (a_1 - b_1)^2 + (a_2 - b_2)^2 \quad .... (5)$$

Figure 2. Application of the Pythagoras Theorem into Three Dimensional Spaces
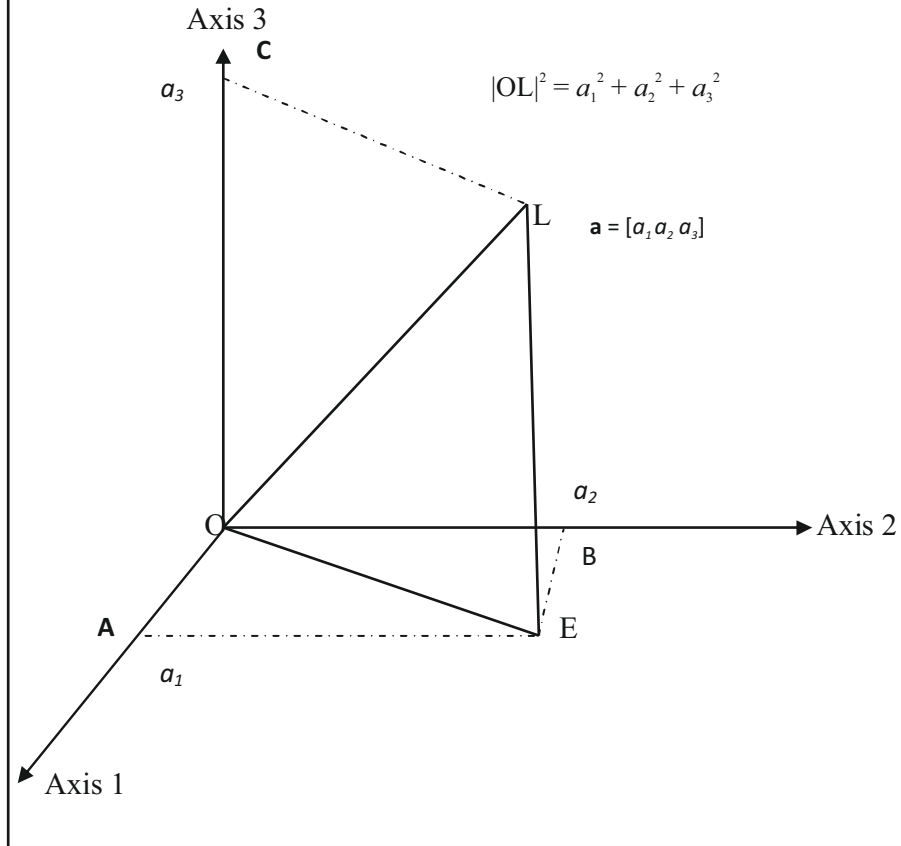
In a similar fashion, the theorem can be extended to vectors having three dimensional point $a = [a_1 a_2 a_3]$ and $b = [b_1 b_2 b_3]$. To do the same, first, we consider the Figure 2. We consider this figure as a room where corner point 'O' is the origin. Points A, B, and C represent the three coordinates along the axis 1, axis 2, and axis 3 respectively. AOB, AOC, and COB angles are represented by 90°. Now, we use the Pythagoras theorem as follows :

$$|OL|^2 = |OE|^2 + |LM|^2$$
$$|OE|^2 = |OA|^2 = |AE|^2$$

We use the Pythagoras theorem twice since for $|OL|^2$, it is right angled at point 'E' and for $|OE|^2$, it is right angled at point 'A'. Therefore, from the Figure 2, we can write :

$$|OL|^2 = |OA|^2 + |AE|^2 + |LE|^2$$

Thus, we see squared length of 'a' is the sum of its three squared coordinates and thus,

$$d_a = \sqrt{a_1^2 + a_2^2 + a_3^2}$$

Now, in the Figure 2, if we place a point, say 'M' to depict another vector 'b', this will lead us to determine the distance between a and b as follows:

$$d(a, b) = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

Which follows that in general, for n - dimension, the Euclidean distance could be determined as follows:

$$d(a,b) = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_n - b_n)^2} \text{...} (7)$$

This equation (7) is equivalent to equation (2).

Now, we apply the displaced ideal (DI) method provided by Zeleny (1974). The DI method assumes that the lower is the distance from the ideal point, the better is the performance of a system. Usually, the ideal point is 1.00 and in our proposed index, the ideal point is also 1.00, which indicates complete or full financial inclusion. Applying the displaced ideal (DI) method, we proceed as follows:

$$D_n = \sqrt{(1 - d_1)^2 + (1 - d_2)^2 + ... + (1 - d_n)^2} \text{...} (8)$$

Then, using normalized inverse Euclidean distance of the point D_i from the ideal point $I = (1, 1, 1....1)$. The Index of Financial Inclusion, IFI_i for the i th district, then, is measured by equation (9):

$$IFI_i = 1 - \sqrt{\frac{(1 - d_1)^2 + (1 - d_2)^2 + ... + (1 - d_n)^2}{\sqrt{n}}} \text{...} (9)$$

In equation (9), the inverse normalized distance is found by normalizing the Euclidean distance of D_i from the ideal point I, the numerator of the second component by n, and then subtracting by 1. The purpose of normalization is to make the value lie between 0 and 1, and the inverse distance is measured to reflect that the upper value of the IFI reflects the higher financial inclusion.

The Proposed Financial Inclusion Index (IFI)

According to Sarma (2008), a comprehensive and robust financial inclusion index should be developed on the basis of several criteria as: it should include as many dimensions of financial inclusion as possible; it should be easy and uncomplicated to calculate, and should be equivalent across countries or regions. To develop the present financial inclusion index, we considered three fundamental dimensions: Access and availability of the banking services, input of the banking system, and output of the banking system.

These dimensions are mostly inspired by two issues - reliable data availability for all districts of Bangladesh and early development of literature in this area. Theoretically, a number of variables could be used to measure each of the three dimensions mentioned. However, since the data on these variables are not readily available, particularly in the context of Bangladesh, we decided to use proxies to compute the value of each dimension. We assigned equal weight to each indicator and each dimension on the argument that the variables considered to develop the proposed index have an equal impact on financial inclusion in Bangladesh. Each of the dimensions and their measures are discussed as follows:

(1) Coverage Dimension (Dimension 1) : An inclusive financial system is required to make financial services available to all users. The coverage dimension measures the extent to which financial services are provided by the institutions, here in scheduled banks, to the users of such services. A widely used proxy to measure the coverage dimension is the number of bank branches per 1000 population and/or number of ATMs per 1000 population (Amidžić et al., 2014; Chithra & Selvam, 2013; Kuri & Laha, 2011; Sarma, 2012; Yorulmaz, 2013). Data on the number of ATMs per 1000 population is not available. Thus, based on the available district-wise data of Bangladesh, the number of bank branches per 1000 population was used to measure the coverage dimension.

(2) Input of the Banking System (Dimension 2) : Another most important and widely used dimension is the usage dimension, which constitutes input and output of the banking system. Deposit is considered as the input to banks based on which banks can run their business smoothly. It also reflects whether the banks are able to attract customers and collect deposits. This dimension - input of the banking system - is measured by the amount of deposits (Chithra & Selvam, 2013). Based on the availability of reliable data, we used per capita deposits to measure the input of the banking system.

Table 1. Grades for Financial Inclusion

Value of Index of Financial Inclusion (IFI)	Financial Inclusion Grade
0 < IFI ≤ 0.2	Low stated financial inclusion
0.2 < IFI ≤ 0.5	Medium stated financial inclusion
0.5 < IFI ≤ 1	High stated financial inclusion

Source: Laha & Kuri, 2014.

(3) Output of the Banking System (Dimension 3) : This dimension is very crucial to both the banks and the customers. If the banks are unable to lend money, then their profitability will be decreased. On the other hand, the most crucial aspect is if the customers do not get a loan or are unable to receive a loan, then it could be said that the customers do not have easy access to the banking services. The dimension is measured by volume of credit in the banking system (Chithra & Selvam, 2013; Sarma, 2012; Yorulmaz, 2013). Since district-wise data was available, which serves our purpose, we used per-capita credit as a proxy to measure this dimension.

Thus, considering the above explained dimensions - coverage, input of the banking system, and output of the banking system -The IFI value for the district i is measured by the normalized inverse Euclidean distance of the point (c_i, i_i, o_i) from the ideal point $(1, 1, 1)$. Mathematically,

$$IFI_i = 1 - \sqrt{\frac{(1-c_i)^2 + (1-i_i)^2 + \ldots + (1-o_i)^2}{3}} \quad \ldots\ldots\ldots\ldots (10)$$

The proposed index theoretically takes values between zero(0) and one (1). The value zero could be described as the status of 'no financial inclusion' and the value 1 as 'complete financial inclusion'. For analytical purposes, in line with Laha and Kuri (2014), districts are given categories of low stated financial inclusion group, medium stated financial inclusion group, and high stated financial inclusion group depending on their IFI values, which are presented in the Table 1.

✤ **Data Sources :** In order to determine the extent of financial inclusion in 64 districts in Bangladesh, the present study compiled data from reliable sources. One of the major sources of secondary data is Scheduled Banks Statistics (SBS), a quarterly publication of the Central Bank of Bangladesh. We collected and compiled district-wise year end data on several indicators of financial inclusion over the period of 2009-2013. Data on several factors associated with financial inclusion were collected from district statistics report, socioeconomic and demographic reports, and population and housing census reports produced by Bangladesh Bureau of Statistics (BBS) and published in June 2014.

Results and Discussion

✤ **Status and Progress of Financial Inclusion in Bangladesh :** The Table 2 exhibits the computed IFI values and their rank and status as well as progress of financial inclusion across 64 districts of Bangladesh over the period of time from 2009-2013.

According to the findings depicted in the Table 2, across 64 districts in Bangladesh, during the period from 2009-2013, only one district, Dhaka with an IFI value of 1.00 belongs to the high financial inclusion group and is ranked as 1st (number one) along with other five districts, namely, Chittagong, Sylhet, Khulna, Feni, and Narayanganj that are highly ranked. It is interesting to note that Dhaka district always retained its 1st rank with an IFI score of 1.00. Similarly, Chittagong, Sylhet, Khulna, and Feni, remained at the 2nd, 3rd, 4th, and 5th positions, respectively. However, their IFI score varies. Among other medium stated financial inclusion districts, Khulna observed a positive growth in IFI score. In 2009, Khulna's rank was 6th with an IFI score of 0.181, while in 2013, it stood at the 4th rank with an IFI score of 0.229. On the other hand, Narayanganj's financial inclusion score

decreased slightly from 0.203 in 2009 to 0.202 in 2013, and also, its rank decreased from 4th to 6th in the same period. However, in 2010, Naranyanganj experienced relatively better financial inclusion activities. Another interesting finding is that, although these medium stated financial inclusion districts were performing well, still, they were far from the full financial inclusion state with a score of 1.00. Overall, during the period from 2009-2013, only these six districts' financial inclusion was in a state of medium and high financial inclusion and as stated above, all these districts are basically economic activity oriented and / or industrial zones.

All other 58 districts belonged to the low financial inclusion group, indicating that their IFI score is greater than zero but lower than 0.20. Among these low stated financial inclusion districts, four districts observed no changes in their ranking. Particularly, during the period from 2009-2013, Netrokona, Sherpur, Maulvibazar, and Kurigram remained at the rank of 63rd, 62nd, 7th, and 64th positions, respectively. Although their IFI scores changed over this period, but the changes were insignificant to bring about a shift in their rankings. Among the remaining low stated financial inclusion districts, 24 districts observed positive changes in their rankings. Meanwhile, some other 27 low stated financial districts observed negative changes measured in terms of their respective rankings. However, looking at the IFI scores over the period of 2009-2013, we can say that in most cases, the IFI scores improved, which indicates that the extent of financial inclusion in the districts was gradually increasing over time. It may be that the improvement was not significant to change the respective district's ranking or status of financial inclusion, but it was gradually moving to the ideal point of 1.00. Specifically, the following 47 districts observed a progress, while the remaining districts observed a negative change in their IFI score during 2009 -2013.

According to the findings exhibited in the Table 2, those districts which observed progress are Faridpur, Gopalganj, Jamalpur, Kishoreganj, Madaripur, Manikganj, Munshiganj, Mymenshing, Narshingdi, Rajbari, Shariatpur, Tangail, Brahmanbaria, Chandpur, Rangamati, Comilla, Cox's Bazar, Khagrachhari, Lakshmipur, Noakhali, Barguna, Barisal, Bhola, Jhalokati, Patuakhali, Pirojpur, Bagerhat, Chuadanga, Jessore, Jhenaidah, Kushtia, Magura, Narail, Satkhira, Sunamganj, Bogra, Joypurhat, Chapai Nawabganj, Pabna, Rajshahi, Sirajganj, Dinajpur, Lalmonirhat, Nilphamari, Rangpur, and Thakurgaon. This finding has an important implication because it shows the progress of financial inclusion across districts, but this progress was not significant to change the districts' ranking or status, and also, at the same time, some districts' IFI score was found to be negative, meaning that policymakers should rethink and redesign their policies to adopt innovative channels or methods, which will accelerate financial inclusion across all districts of the country. The possible reasons that could be attributed to such observed results are explained below:

(1) The empirical results exhibited in the Table 2 reveal that only six districts' financial inclusion was medium and high during the period of the study. However, other districts are observed to have low level of financial inclusion. One of the reasons for this result is that, these six districts are economically developed and industrial zones, hence, the literacy rate is higher, and so on. In addition, Dhaka is the capital of Bangladesh, and thus, most of the economic activities are concentrated in and around this district. Therefore, in order to experience more financial profits, all banks are more willing to serve the people of these areas.

(2) The results inferred from the Table 2 could also imply that much emphasis has been given to these six districts; meanwhile, for most of the other districts, no significant efforts have been taken to include hitherto excluded people into the formal financial system. In other words, due to lack of strict inclusive policies provided by the Central bank, the scheduled banks were reluctant to serve the poor people.

(3) Banks are usually profit oriented organizations. In addition to cover the operating costs, they need to earn a profit for their shareholders. So, doing business in the rural areas, where generally poor infrastructure exists, and people have less money to deposit/save, might not be feasible for the banks. In addition, the banks might feel insecure while doing business in these remote areas. Thus, banks were reluctant to serve the rural and remote areas where mostly poor people live, and so we observed very low financial inclusion among 58 districts out of 64 districts of Bangladesh.

Table 2. District-wise Status and Progress of Financial Inclusion in Bangladesh (2009-2013)

District: Dhaka					
Year	Dimension 1	Dimension 2	Dimension 3	IFI Value	Overall Rank	Status
2009	1.000	1.000	1.000	1.000	1	High
2010	1.000	1.000	1.000	1.000	1	High
2011	1.000	1.000	1.000	1.000	1	High
2012	1.000	1.000	1.000	1.000	1	High
2013	1.000	1.000	1.000	1.000	1	High

District: Chittagong					
2009	0.655	0.298	0.372	0.421	2	Medium
2010	0.653	0.296	0.372	0.419	2	Medium
2011	0.639	0.300	0.367	0.417	2	Medium
2012	0.808	0.365	0.444	0.500	2	Medium
2013	0.785	0.374	0.434	0.497	2	Medium

District: Sylhet					
2009	0.817	0.210	0.062	0.284	3	Medium
2010	0.802	0.176	0.052	0.266	3	Medium
2011	0.775	0.178	0.049	0.263	3	Medium
2012	0.788	0.184	0.044	0.264	3	Medium
2013	0.753	0.177	0.043	0.258	3	Medium

District: Khulna					
2009	0.352	0.094	0.122	0.181	6	Low
2010	0.332	0.090	0.133	0.178	6	Low
2011	0.319	0.091	0.111	0.167	6	Low
2012	0.490	0.122	0.154	0.237	4	Medium
2013	0.471	0.122	0.145	0.229	4	Medium

District: Feni					
2009	0.555	0.100	0.032	0.195	5	Low
2010	0.584	0.092	0.035	0.198	5	Medium
2011	0.566	0.099	0.036	0.198	5	Medium
2012	0.640	0.125	0.043	0.223	5	Medium
2013	0.604	0.123	0.041	0.216	5	Medium

District: Narayanganj					
2009	0.357	0.123	0.150	0.203	4	Medium
2010	0.390	0.125	0.148	0.212	4	Medium
2011	0.385	0.134	0.132	0.208	4	Medium
2012	0.384	0.135	0.125	0.206	6	Medium
2013	0.383	0.135	0.117	0.202	6	Medium

District: Faridpur					
2009	0.205	0.029	0.023	0.082	23	Low
2010	0.227	0.029	0.028	0.090	20	Low
2011	0.232	0.032	0.027	0.092	18	Low
2012	0.318	0.043	0.033	0.121	17	Low
2013	0.308	0.045	0.033	0.119	16	Low

						District: Gazipur		
2009	0.296	0.090	0.036	0.133	9	Low
2010	0.333	0.097	0.042	0.148	8	Low
2011	0.341	0.103	0.041	0.152	8	Low
2012	0.221	0.088	0.033	0.111	22	Low
2013	0.243	0.090	0.034	0.118	17	Low
				District: Gopalganj		
2009	0.187	0.014	0.006	0.065	38	Low
2010	0.176	0.014	0.005	0.062	38	Low
2011	0.185	0.017	0.005	0.065	38	Low
2012	0.278	0.027	0.008	0.096	29	Low
2013	0.294	0.029	0.007	0.100	28	Low
				District: Jamalpur		
2009	0.111	0.008	0.016	0.044	56	Low
2010	0.106	0.008	0.014	0.041	55	Low
2011	0.111	0.008	0.012	0.043	56	Low
2012	0.175	0.013	0.016	0.065	48	Low
2013	0.188	0.016	0.017	0.070	48	Low
				District: Kishoreganj		
2009	0.062	0.015	0.009	0.028	60	Low
2010	0.068	0.014	0.009	0.030	58	Low
2011	0.077	0.015	0.008	0.033	57	Low
2012	0.106	0.020	0.010	0.044	58	Low
2013	0.118	0.021	0.009	0.048	59	Low
				District: Madaripur		
2009	0.132	0.024	0.012	0.054	47	Low
2010	0.139	0.025	0.011	0.057	44	Low
2011	0.138	0.028	0.011	0.057	45	Low
2012	0.229	0.042	0.016	0.091	35	Low
2013	0.241	0.042	0.016	0.094	35	Low
				District: Manikganj		
2009	0.133	0.034	0.004	0.056	45	Low
2010	0.132	0.032	0.004	0.054	47	Low
2011	0.129	0.032	0.004	0.054	49	Low
2012	0.180	0.046	0.006	0.075	42	Low
2013	0.213	0.048	0.006	0.084	39	Low
				District: Munshiganj		
2009	0.288	0.051	0.017	0.110	14	Low
2010	0.294	0.049	0.013	0.110	13	Low
2011	0.308	0.051	0.012	0.114	12	Low
2012	0.438	0.069	0.015	0.153	8	Low
2013	0.427	0.080	0.019	0.156	8	Low

District: Mymenshing						
2009	0.018	0.013	0.011	0.014	62	Low
2010	0.027	0.014	0.012	0.018	61	Low
2011	0.036	0.014	0.012	0.021	60	Low
2012	0.052	0.019	0.015	0.028	61	Low
2013	0.072	0.021	0.015	0.036	60	Low
District: Narshingdi						
2009	0.206	0.059	0.044	0.100	16	Low
2010	0.216	0.054	0.045	0.102	16	Low
2011	0.219	0.059	0.041	0.103	15	Low
2012	0.284	0.071	0.052	0.129	12	Low
2013	0.305	0.069	0.050	0.134	10	Low
District: Netrokona						
2009	0.030	0.000	0.007	0.012	63	Low
2010	0.024	0.000	0.006	0.010	63	Low
2011	0.022	0.000	0.004	0.009	63	Low
2012	0.023	0.000	0.005	0.010	63	Low
2013	0.030	0.001	0.005	0.012	63	Low
District: Rajbari						
2009	0.153	0.012	0.010	0.056	44	Low
2010	0.146	0.013	0.009	0.054	48	Low
2011	0.155	0.013	0.009	0.057	46	Low
2012	0.195	0.017	0.012	0.071	47	Low
2013	0.213	0.019	0.012	0.077	44	Low
District: Shariatpur						
2009	0.143	0.016	0.005	0.052	49	Low
2010	0.174	0.015	0.004	0.061	39	Low
2011	0.199	0.019	0.004	0.070	33	Low
2012	0.277	0.027	0.006	0.095	31	Low
2013	0.277	0.031	0.008	0.097	31	Low
District: Sherpur						
2009	0.086	0.002	0.014	0.033	58	Low
2010	0.030	0.002	0.012	0.015	62	Low
2011	0.030	0.002	0.011	0.014	62	Low
2012	0.056	0.004	0.014	0.024	62	Low
2013	0.060	0.004	0.015	0.026	62	Low
District: Tangail						
2009	0.123	0.030	0.005	0.051	51	Low
2010	0.137	0.028	0.005	0.055	45	Low
2011	0.138	0.029	0.005	0.056	47	Low
2012	0.195	0.041	0.009	0.078	41	Low
2013	0.207	0.043	0.008	0.082	41	Low

District: Bandarban						
2009	0.475	0.016	0.011	0.139	8	Low
2010	0.436	0.015	0.008	0.130	10	Low
2011	0.425	0.016	0.008	0.128	9	Low
2012	0.430	0.014	0.008	0.128	14	Low
2013	0.376	0.014	0.042	0.128	14	Low
District: Brahmanbaria						
2009	0.158	0.044	0.006	0.067	35	Low
2010	0.173	0.040	0.008	0.071	34	Low
2011	0.202	0.041	0.009	0.080	25	Low
2012	0.233	0.051	0.011	0.093	34	Low
2013	0.243	0.053	0.011	0.097	30	Low
District: Chandpur						
2009	0.205	0.037	0.006	0.078	27	Low
2010	0.208	0.034	0.007	0.079	25	Low
2011	0.204	0.036	0.006	0.078	27	Low
2012	0.288	0.050	0.009	0.107	23	Low
2013	0.290	0.050	0.008	0.107	23	Low
District: Rangamati						
2009	0.415	0.025	0.006	0.128	11	Low
2010	0.427	0.024	0.005	0.130	9	Low
2011	0.406	0.026	0.004	0.126	10	Low
2012	0.466	0.029	0.007	0.141	9	Low
2013	0.433	0.027	0.005	0.133	11	Low
District: Comilla						
2009	0.203	0.052	0.012	0.085	20	Low
2010	0.195	0.047	0.013	0.082	23	Low
2011	0.196	0.049	0.013	0.082	22	Low
2012	0.236	0.061	0.015	0.099	27	Low
2013	0.262	0.062	0.015	0.107	26	Low
District: Cox's Bazar						
2009	0.171	0.040	0.019	0.074	31	Low
2010	0.176	0.040	0.020	0.076	29	Low
2011	0.167	0.042	0.022	0.075	31	Low
2012	0.193	0.043	0.021	0.083	40	Low
2013	0.189	0.042	0.020	0.080	42	Low
District: Khagrachhari						
2009	0.129	0.009	0.000	0.044	55	Low
2010	0.116	0.009	0.000	0.040	56	Low
2011	0.203	0.010	0.000	0.066	35	Low
2012	0.130	0.009	0.000	0.045	57	Low
2013	0.188	0.010	0.000	0.062	53	Low

			District: Lakshmipur			
2009	0.205	0.037	0.014	0.082	24	Low
2010	0.197	0.035	0.015	0.079	26	Low
2011	0.203	0.037	0.015	0.081	23	Low
2012	0.261	0.048	0.017	0.102	26	Low
2013	0.273	0.047	0.016	0.105	27	Low
			District: Noakhali			
2009	0.272	0.052	0.021	0.108	15	Low
2010	0.273	0.048	0.020	0.107	15	Low
2011	0.266	0.053	0.021	0.107	14	Low
2012	0.292	0.061	0.024	0.118	20	Low
2013	0.290	0.059	0.023	0.116	19	Low
			District: Barguna			
2009	0.139	0.012	0.011	0.052	50	Low
2010	0.124	0.011	0.010	0.047	52	Low
2011	0.110	0.012	0.011	0.043	55	Low
2012	0.159	0.018	0.016	0.062	50	Low
2013	0.175	0.020	0.018	0.068	49	Low
			District: Barisal			
2009	0.205	0.039	0.019	0.084	22	Low
2010	0.203	0.037	0.017	0.082	24	Low
2011	0.205	0.039	0.017	0.083	21	Low
2012	0.335	0.058	0.026	0.128	13	Low
2013	0.338	0.058	0.025	0.129	12	Low
			District: Bhola			
2009	0.071	0.009	0.007	0.029	59	Low
2010	0.071	0.009	0.006	0.028	59	Low
2011	0.075	0.010	0.007	0.030	59	Low
2012	0.127	0.014	0.010	0.049	55	Low
2013	0.135	0.016	0.010	0.052	57	Low
			District: Jhalokati			
2009	0.227	0.023	0.007	0.080	26	Low
2010	0.206	0.021	0.007	0.073	32	Low
2011	0.207	0.023	0.007	0.075	32	Low
2012	0.345	0.036	0.011	0.118	19	Low
2013	0.323	0.038	0.011	0.113	21	Low
			District: Patuakhali			
2009	0.192	0.012	0.009	0.067	36	Low
2010	0.190	0.011	0.010	0.067	35	Low
2011	0.177	0.013	0.010	0.064	39	Low
2012	0.272	0.020	0.015	0.094	32	Low
2013	0.281	0.022	0.014	0.097	29	Low

			District: Pirojpur			
2009	0.251	0.021	0.003	0.085	21	Low
2010	0.249	0.021	0.004	0.085	21	Low
2011	0.233	0.023	0.004	0.081	24	Low
2012	0.370	0.037	0.007	0.123	15	Low
2013	0.362	0.038	0.008	0.122	15	Low
			District: Bagerhat			
2009	0.195	0.016	0.005	0.068	34	Low
2010	0.176	0.017	0.004	0.062	36	Low
2011	0.188	0.017	0.003	0.066	37	Low
2012	0.314	0.029	0.007	0.106	25	Low
2013	0.320	0.031	0.005	0.107	24	Low
			District: Chuadanga			
2009	0.205	0.017	0.014	0.074	32	Low
2010	0.194	0.016	0.015	0.071	33	Low
2011	0.175	0.016	0.016	0.066	36	Low
2012	0.245	0.019	0.020	0.088	38	Low
2013	0.232	0.021	0.019	0.085	38	Low
			District: Jessore			
2009	0.256	0.041	0.053	0.111	13	Low
2010	0.256	0.040	0.055	0.111	12	Low
2011	0.244	0.041	0.054	0.108	13	Low
2012	0.319	0.054	0.062	0.136	11	Low
2013	0.310	0.054	0.049	0.129	13	Low
			District: Jhenaidah			
2009	0.140	0.014	0.011	0.053	48	Low
2010	0.130	0.014	0.012	0.051	50	Low
2011	0.116	0.014	0.012	0.046	53	Low
2012	0.151	0.016	0.016	0.059	52	Low
2013	0.167	0.018	0.016	0.064	50	Low
			District: Kushtia			
2009	0.226	0.029	0.043	0.095	17	Low
2010	0.233	0.029	0.047	0.098	17	Low
2011	0.233	0.028	0.045	0.097	17	Low
2012	0.282	0.036	0.059	0.118	18	Low
2013	0.275	0.037	0.053	0.115	20	Low
			District: Magura			
2009	0.247	0.014	0.004	0.081	25	Low
2010	0.234	0.014	0.004	0.078	27	Low
2011	0.231	0.014	0.004	0.077	28	Low
2012	0.270	0.018	0.006	0.090	37	Low
2013	0.264	0.019	0.005	0.088	36	Low

District: Meherpur						
2009	0.155	0.015	0.007	0.056	43	Low
2010	0.139	0.013	0.007	0.051	49	Low
2011	0.125	0.012	0.008	0.047	52	Low
2012	0.153	0.015	0.010	0.057	53	Low
2013	0.148	0.016	0.009	0.055	55	Low
District: Narail						
2009	0.231	0.014	0.006	0.078	29	Low
2010	0.222	0.015	0.005	0.075	31	Low
2011	0.201	0.015	0.004	0.069	34	Low
2012	0.285	0.022	0.007	0.096	30	Low
2013	0.281	0.023	0.005	0.094	33	Low
District: Satkhira						
2009	0.119	0.021	0.009	0.048	52	Low
2010	0.127	0.021	0.008	0.051	51	Low
2011	0.130	0.021	0.009	0.052	50	Low
2012	0.190	0.030	0.012	0.074	43	Low
2013	0.195	0.030	0.013	0.076	45	Low
District: Habiganj						
2009	0.215	0.020	0.005	0.075	30	Low
2010	0.240	0.019	0.006	0.082	22	Low
2011	0.226	0.020	0.006	0.079	26	Low
2012	0.260	0.025	0.007	0.090	36	Low
2013	0.250	0.027	0.007	0.088	37	Low
District: Maulvibazar						
2009	0.479	0.078	0.020	0.167	7	Low
2010	0.439	0.071	0.018	0.155	7	Low
2011	0.425	0.072	0.017	0.152	7	Low
2012	0.491	0.087	0.020	0.172	7	Low
2013	0.465	0.086	0.017	0.166	7	Low
District: Sunamganj						
2009	0.123	0.017	0.003	0.046	54	Low
2010	0.126	0.014	0.002	0.046	54	Low
2011	0.135	0.015	0.002	0.049	51	Low
2012	0.132	0.016	0.002	0.049	56	Low
2013	0.141	0.016	0.001	0.051	58	Low
District: Bogra						
2009	0.285	0.035	0.040	0.112	12	Low
2010	0.270	0.033	0.041	0.108	14	Low
2011	0.248	0.033	0.040	0.102	16	Low
2012	0.302	0.041	0.049	0.122	16	Low
2013	0.284	0.040	0.048	0.117	18	Low

District: Joypurhat						
2009	0.248	0.015	0.022	0.088	19	Low
2010	0.254	0.015	0.021	0.090	19	Low
2011	0.231	0.016	0.023	0.085	20	Low
2012	0.317	0.021	0.029	0.112	21	Low
2013	0.297	0.022	0.029	0.107	25	Low
District: Natore						
2009	0.227	0.014	0.010	0.078	28	Low
2010	0.222	0.013	0.010	0.077	28	Low
2011		0.014	0.011	0.075	30	Low
2012	0.285	0.018	0.015	0.097	28	Low
2013	0.274	0.019	0.015	0.094	32	Low
District: Naogaon						
2009	0.167	0.018	0.018	0.065	37	Low
2010	0.157	0.017	0.019	0.062	37	Low
2011	0.151	0.017	0.019	0.060	40	Low
2012	0.222	0.022	0.023	0.085	39	Low
2013	0.215	0.022	0.023	0.082	40	Low
District: Chapai Nawabganj						
2009	0.157	0.018	0.014	0.061	39	Low
2010	0.158	0.016	0.016	0.061	40	Low
2011	0.142	0.016	0.019	0.057	44	Low
2012	0.181	0.020	0.022	0.072	45	Low
2013	0.185	0.021	0.023	0.073	46	Low
District: Pabna						
2009	0.249	0.028	0.021	0.093	18	Low
2010	0.241	0.029	0.022	0.091	18	Low
2011	0.236	0.029	0.021	0.090	19	Low
2012	0.277	0.037	0.029	0.107	24	Low
2013	0.279	0.039	0.029	0.108	22	Low
District: Rajshahi						
2009	0.298	0.061	0.048	0.128	10	Low
2010	0.286	0.053	0.049	0.122	11	Low
2011	0.270	0.052	0.047	0.117	11	Low
2012	0.325	0.060	0.062	0.140	10	Low
2013	0.319	0.060	0.060	0.138	9	Low
District: Sirajganj						
2009	0.154	0.018	0.008	0.057	42	Low
2010	0.156	0.017	0.009	0.058	42	Low
2011	0.153	0.020	0.008	0.058	42	Low
2012	0.189	0.024	0.011	0.071	46	Low
2013	0.190	0.026	0.010	0.072	47	Low

			District: Dinajpur			
2009	0.193	0.019	0.019	0.073	33	Low
2010	0.199	0.019	0.021	0.076	30	Low
2011	0.194	0.024	0.023	0.077	29	Low
2012	0.242	0.030	0.027	0.094	33	Low
2013	0.245	0.026	0.029	0.094	34	Low
			District: Gaibandha			
2009	0.061	0.004	0.009	0.024	61	Low
2010	0.056	0.004	0.008	0.022	60	Low
2011	0.048	0.003	0.007	0.019	61	Low
2012	0.087	0.004	0.009	0.033	60	Low
2013	0.084	0.003	0.008	0.031	61	Low
			District: Kurigram			
2009	0.0001	0.001	0.006	0.002	64	Low
2010	0.0001	0.001	0.005	0.002	64	Low
2011	0.0001	0.002	0.003	0.002	64	Low
2012	0.0001	0.002	0.004	0.002	64	Low
2013	0.0001	0.002	0.002	0.001	64	Low
			District: Lalmonirhat			
2009	0.093	0.001	0.010	0.034	57	Low
2010	0.089	0.001	0.009	0.032	57	Low
2011	0.085	0.000	0.008	0.030	58	Low
2012	0.106	0.000	0.009	0.037	59	Low
2013	0.164	0.000	0.007	0.054	56	Low
			District: Nilphamari			
2009	0.118	0.009	0.020	0.048	53	Low
2010	0.110	0.009	0.021	0.046	53	Low
2011	0.112	0.009	0.019	0.046	54	Low
2012	0.126	0.011	0.023	0.052	54	Low
2013	0.144	0.011	0.022	0.057	54	Low
			District: Panchagarh			
2009	0.174	0.002	0.012	0.059	40	Low
2010	0.176	0.002	0.012	0.060	41	Low
2011	0.167	0.002	0.013	0.057	43	Low
2012	0.192	0.001	0.014	0.065	49	Low
2013	0.184	0.001	0.013	0.062	52	Low
			District: Rangpur			
2009	0.142	0.019	0.019	0.058	41	Low
2010	0.137	0.017	0.022	0.057	43	Low
2011	0.140	0.019	0.024	0.059	41	Low
2012	0.173	0.024	0.031	0.073	44	Low
2013	0.182	0.024	0.032	0.077	43	Low

District: Thakurgaon					
2009	0.150	0.008	0.013	0.055	46	Low
2010	0.148	0.007	0.015	0.054	46	Low
2011	0.145	0.008	0.016	0.054	48	Low
2012	0.166	0.008	0.020	0.062	51	Low
2013	0.173	0.008	0.019	0.064	51	Low

Source: Calculated by the authors on the basis of Scheduled Banks Statistics, 2009-2013.

Table 3. Results of Regression Analysis of Index of Financial Inclusion (IFI) on Socio-Geographic Variables

Variable	Coefficient.	Std. Err.	t	P(t)
Density	0.0000188	0.000104	0.18	0.857
Rural Population	-0.025507**	0.0108353	-2.35	0.022
Size of household	0.5261066***	0.172905	3.04	0.003
Literacy	0.0514478***	0.0110764	4.64	0.000
_cons	-5.285512***	1.516698	-3.48	0.001

R-squared   = 0.5033, Adj R-squared = 0.4696

Number of obs =   64

F (4, 59) = 14.95, Prob (F) = 0.0000

Note: *** indicates variable significant at the 1% level ; ** indicates variable significant at the 5 % levels

Sources: Bangladesh Bank (2013) and Bangladesh Bureau of Statistics (BBS) ; computed by using STATA.

(4) Another imperative finding is that most of the districts' IFI score improved, though not significantly. This means that policy makers of Bangladesh have taken efforts to improve the financial inclusion goal of the country. However, these efforts have not been enough to make any significant positive changes in the IFI scores across all districts of Bangladesh. Thus, a rigorous inclusive policy framework is needed to include these poor people into the formal financial system.

✧ **Factors Associated with Financial Inclusion :** Factors that affect the process of financial inclusion are possible to be numerous and interactions among them are complex. For simplification, we attempted to identify those factors that were correlated with financial inclusion of Bangladesh. To do the same, we used three sets of variables categorized as socio-geographic factors, physical infrastructure, and banking variables, which are independent of each other. In addition, data on all variables were not available for all the 64 districts. So, if we included all variables in a single regression model, it would have reduced the number of observations, which would have impacted the statistical precision (Chithra & Selvam, 2013 ; Sarma & Pais, 2008). For such a realistic reason, we carry out three sets of regression on the IFI on three different sets of variables.

The first regression attempts to observe the association between IFI and a set of socio-geographic variables such as population density, rural population, literacy, size of household, and so on [2]. The second regression attempts to examine whether physical infrastructure such as paved roads, Internet facilities, newspaper readers, and so on are associated with the financial inclusion process of the country. The third regression endeavors to examine the relation between banking variables such as deposit penetration, credit penetration, and so forth, and financial inclusion.

In our model, the dependent variable is a logarithmic transformation of the value of financial inclusion index

[2] District-wise GDP data is collated by Bangladesh Bureau of Statistics. But they have not collated the same since 2000. As such, due to non-availability of reliable data, it was not possible to include 'income' in the present study.

Table 4. Results of Regression Analysis of Index of Financial Inclusion (IFI) on Infrastructure Variables

Variable	Coefficient	Std. Err.	t	P(t)
Paved Road	.922507***	.031026	3.85	0.000
Newspaper	-.0000999	.0009859	-0.10	0.920
Internet	.1039156***	.0282741	3.68	0.001
_cons	-3.214282 ***	.2455682	-13.09	0.000

Number of obs = 61

R - squared = 0.3478, Adj R-squared = 0.3092

F(3, 57) = 9.95, Prob (F) = 0.0001

Note: *** indicates variable significant at 1 % level

Sources: Bangladesh Bank (2013) and Bangladesh Bureau of Statistics (BBS) ; computed by using STATA.

developed earlier. We take logarithmic transformation of the values of IFI because the transformed value of the variable IFI lies between -∞ and ∞, whereas the IFI value which we calculated lies between 0 and 1. This procedure permits us to perform the classical ordinary least square regressions.

The general form of the regression model is :

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots. \beta_n X_n + \varepsilon$$

where,

X_1, X_2, X_3, and so on are the independent variables (i.e. regressor variables) and β_1, β_2, β_3, and so on are the parameters to be estimated, and ε is error term following classical OLS assumptions.

$$\ln IFI = \alpha_0 + \beta_1 (Density) + \beta_2 (Ruralpopul) + \beta_3 (Sizeofhousehold) + \beta_4 (Literacy) + \varepsilon$$

Variables depicted in the Table 3 are:

IFI	= Logarithmic transformation of IFI,
Density	= Number of population per square kilometer,
Rural Population	= Percentage of total population living in rural areas,
Size of household	= Number of persons (average) belonging to a household,
Literacy	= Percentage of literate people aged 7years and above in the total population.

As we can infer from the Table 3, all socio-geographic variables are significant, except density and F value observed as 14.95, for which significance Prob (F) is 0.000, which means that the null hypothesis that there is no relationship between socio-geographic variables and financial inclusion is rejected at the 1% level of significance. Similar to the findings of Sarma and Pais (2008), we find that the coefficient of rural population is negatively associated with financial inclusion, and the association is significant ($p = .022$). This supports our hypothesis that a greater rural population is negatively associated with financial inclusion. Hence, people living in the rural and remote areas have fewer chances to be included in the formal financial centers as these centers are mostly situated in the urban areas. Thus, it is to be concluded that due to more percentage of people living in rural areas, the financial inclusion status is lower in Bangladesh.

The Table 3 also reveals that the variable - average size of the household is significantly positive (as expected) to financial inclusion, which implies that the more the number of persons in a household, it is likely that the financial inclusion will be higher. The reason could be that the more the number of people in a house, the more is the probability that they would be included in the formal system in order to manage their daily finances. Another imperative finding is that, literacy rate is found to be significantly positive (as expected), which implies that the

Table 5. Results of Regression Analysis of Index of Financial Inclusion (IFI) on Banking Variables

Variable	Coefficient	Std. Err.	t	P(t)
Deposit penetration	0.0032477*	0.0018112	1.79	0.078
Credit penetration	-0.0023161	0.0022332	-1.04	0.304
Credit-Deposit Ratio	-0.117911	0.4046301	-0.29	0.772
_cons	-2.689437***	0.3244791	-8.29	0.000

Number of obs =   64

R - squared   =   0.3605, Adj R - squared = 0.3285

F (3,60) = 11.27, Prob *(F)* = 0.0000

Note: *** indicates variables significant at the 1 % level ; * indicates variables significant at the 10% levels

Source: Various scheduled bank statistics data from Bangladesh Bank & computed by using STATA.

literacy rate of a country is an important determinant of financial inclusion - the higher is the literacy rate, the greater the financial inclusion will be. This finding is similar to the findings of Sarma and Pais (2008) and Chithra and Selvam (2013). In addition, contrary to our expectation, we found no significant association between density per square kilometer and financial inclusion.

$$\ln IFI = \alpha_0 + \beta_1 (PaveRD) + \beta_2 (Newpaper) + \beta_3 (Internet) + \varepsilon$$

Variables in the Table 4 are:

IFI = Logarithmic transformation of IFI,
Paved Road = Paved roads (in km) per square kilometer of land area,
Newspaper = Number of newspaper readers per 1000 people,
Internet = Number of Internet users per 1000 people.

The Table 4 indicates that the *F* value is found to be 9.95, for which Prob *(F)* value is equal to 0.0001, which implies that the null hypothesis is rejected and ,therefore, the alternative hypothesis - that there is a relationship between infrastructure and financial inclusion - is accepted at the 1% level of significance.

According to the Table 4, the basic physical infrastructure variable, paved road network is significantly positively associated with financial inclusion, which means that the more are the paved roads (in km) per square km in a country/region, the more the financial inclusion will be. This supports our hypothesis that a paved road network plays a positive role in fostering financial inclusion. Thereby, it emphasizes to the government to make a strong road network in the country so that financial inclusion could be accelerated. Similarly, as expected, the Internet is also observed to be one of the significant positive determinants of financial inclusion, which signifies the importance of connectivity and information on the financial inclusion of a country. Our findings are similar with those of Sarma and Pais (2008) and Chithra and Selvam (2013). As expected, we observed a negative, though not a significant relationship, between newspapers and financial inclusion. This finding is similar to the findings of Chithra and Selvam (2013). Thus, we can say that newspapers are not a significant determinant of financial inclusion.

$$\ln IFI = \alpha_0 + \beta_1 (Depositpentr) + \beta_2 (Creditpentr) + \beta_3 (CDRatio) + \varepsilon$$

Variables in the Table 5 are:

IFI = Logarithmic transformation of IFI,

Deposit penetration   = Deposit amount per 1000 population,
Credit penetration   = Credit amount per 1000 population,
Credit-Deposit Ratio = Credit-Deposit ratio per 1000 people.

Empirical findings in the Table 5 indicate that the *F* value of this regression model is 11.27, for which Prob *(F)* is found as 0.000, which means that the null hypothesis - there is no significant relationship between banking variables and financial inclusion - is rejected at the 1% level of significance. The Table 5 also reveals that deposit penetration is significantly positively associated (as expected) with the financial inclusion level of the country. As expected, empirically, we found a negative - but statistically insignificant - association between credit penetration and financial inclusion since its *p* - value is more than the value at the 10 % significance level. Similarly, coefficient of credit-deposit ratio (-0.117911) is found to be negative - but statistically insignificant - which, in turn, implies that the association between credit penetration and financial inclusion index is statistically insignificant. Here, are findings are similar to the findings of Chithra and Selvam (2013).

Conclusion

In this study, we have measured the extent and progress of financial inclusion in 64 districts of Bangladesh and then identified the factors associated with financial inclusion. To measure the financial inclusion, we developed a comprehensive, three-dimensional financial inclusion index for the country which is similar, but not same, to the popular and useful development indexes such as HDI, HPI, and GDI. Categorizing the districts into low, medium, and high financial inclusion groups, we found that only one district, namely Dhaka, which is the capital city of the country, belonged to the high financial inclusion group over the period of 2009-2013 and five districts, namely Chittagong, Sylhet, Khulna, Feni, and Narayanganj belonged to the medium financial inclusion group over the same period except 2009 and 2010. The remaining 58 districts belonged to the low financial inclusion group. The empirical findings also revealed that most of the districts' financial inclusion improved over the period of 2009-2013, though that improvement was not significant to change their status/ranking. The present study also reveals that there was a wide variation among the districts; the lowest IFI score is .001 for Kurigram district, whereas the highest IFI score is 1.00 for Dhaka district during the period of the study.

After measuring financial inclusion, we developed a regression model to identify the determinants of financial inclusion. Empirical findings of our study show that among the socio-geographic variables, rural population, size of the household, and literacy rate are the significant determinants of financial inclusion ; while, population density is found to be insignificant. We also found that among the infrastructure variables, paved road networks and the Internet have a significant positive association with financial inclusion. With respect to banking variables, we observed deposit penetration to be a significant determinant of financial inclusion of a country.

We recommend that while making any policy or legislation with respect to financial inclusion programs of the country, the policymakers should take into consideration the results we have found in this study. On the basis of the empirical findings of this study, they should primarily focus on the districts which belong to the low financial inclusion group. They should also focus on the determinants of financial inclusion and thereby, design policies in order to ensure easier access to and use financial services by the poor.

Research Implications, Limitations of the Study, and Scope for Further Research

The main implication of this study is that it will invoke the attention of policy makers of a country to measure region-wise progress of financial inclusion across the country. The determinants of financial inclusion identified and analyzed in this study would help policy makers to undertake such policies to promote financial inclusion.

Although, this study made an extensive effort to examine the issues related to financial inclusion, however, like other studies, it has some limitations, which are actually areas of future research. Here, we mention some areas, which could be investigated by other researchers interested in the same or related issues.

Firstly, to develop the financial inclusion index, we considered only data of scheduled banks operating in Bangladesh and thus, data of microfinance, insurance, or other financial institutions were not incorporated in this study. Therefore, it would be a more comprehensive financial inclusion index if one can include data from these institutions to develop a composite financial inclusion index.

Secondly, we developed our index of financial inclusion on the basis of available data for the years from 2009-2013 and measured the extent and progress of financial inclusion. However, as we mentioned in our study, the more the number of indicators could be used, the more comprehensive the measurement of financial inclusion will be. Unavailability of regular and periodic (annual) data on different indicators of financial inclusion such as district-wise number of ATMs, district-wise GDP, district-wise number of mobile banking service providers, and mobile agents seems to be the biggest issue to develop such a comprehensive index. In addition, data on affordability, timeliness, and quality of financial services were not available from any source. Therefore, based on the availability of data, other researchers could also add indicators or dimensions to the index that will make the index more inclusive. In a similar fashion, researchers could use more number of variables to identify the determinants of financial inclusion.

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