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The Human Development Index as a Predictor of Financial Inclusion Level, a cross-Countries analysis

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Abstract

The purpose of this research is to confirm the relationship between the financial inclusion index and the human development index and attempt to forecast it using the latter based on a worldwide sample constituted of countries with various economics and social levels.

The correlations between these important dimensions have been demonstrated in earlier studies using a local sample. Due to the unique characteristics of each sample, this could result in a biased study. We reasoned that the study could not be applied to other contexts because employing a different sample would result in a different outcome. However, a research study's findings based on a particular sample may be wonderful and positive in some environments but unfavorable in others.

the used approach consists to collect secondary data of 49 countries worldwide, with various economic and social levels, to compute the financial inclusion index from international monetary fund's data set, and for Human development index, we gathered its data from Human development report database. We used deductive reasoning and the kernels test, a non-parametric test, to confirm this connection.

By using a cross-country analysis, this research demonstrated the existence of the relationship between the human development index and the level of financial inclusion, and it demonstrated that we can use the human development index to predict the level of financial inclusion by demonstrating a positive correlation, which confirm the previous assumptions. The human development index, however, was able to account for about 26% of the variation in the financial inclusion index, according to R square. that maintain a low percentage.

As a conclusion, the relationship between the Human Development Index and the degree of financial inclusion has always been a problem for researchers, which calls for a particular examination. The analysis gap entails examining the association between these factors using local samples from each nation, which may produce biased results due to the nation's unique characteristics.

To demonstrate that there is a real connection and that we might rely on this relationship to forecast the level of financial inclusion, we examined this relationship using a global sample made up of numerous nations with varying economic and social levels. Although our predictive model's power is still untapped because only 26% of the variance in the level of financial inclusion in our particular case can be explained to the human development index, this study revealed a relationship between these two variables, validating earlier findings.

Keywords

Human Development Index, Financial Inclusion, A cross Countries Analysis

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I. Introduction

Financial inclusion is given significant consideration as the global economies become increasingly interconnected. It quickly rose to the top of the agenda for international organizations, financial sector regulators and public authorities, and it has been acknowledged as a way to include all citizens in the economy and help the nation advance. Many nations have put in place various policies encouraging financial inclusion after realizing the value of an inclusive financial system. According to the World Bank (WB), the capacity of people to access a variety of financial services and products (transactions, payments, savings, credit, insurance) that are affordable, practical, adapted to their needs, and provided by reputable and accountable providers is referred to as financial inclusion.

The accessibility of financial services and products simplifies daily tasks and aids in preparing households and businesses for the funding of long-term projects or unforeseen events. A person having a current account is more likely to use other financial services, such as credit, launch a business or increase their activity, invest in their health or education, manage risks, and recover from financial shocks, all of which will raise their overall standard of living.

Taking these advances into account, the policies makers and regulators putted a lot of efforts to succeed and enjoy the benefits of a high financial inclusion level. In contrast, these attempts were unsuccessful because there are a number of reasons that restrict the goals of financial inclusion from being met, especially in developing nations where high illiteracy rates make it difficult for people to access financial services and products, notably when they become digitalized, low per capita income indicates that people are living below the standard of living. Additionally, long and healthy lives reflect quality of life, so having a good quality of life may encourage people to save money and invest. These three relevant components are used to quantify an index which called, Human Development Index.

The precarious scenario described above prompts us to wonder and pose the following essential question:

How might the degree of education, the per-capita Growth Domestic Product, and the birth expectancy affect the financial inclusion index?

In response to the main issue, we hypothesize that a high Human Development index is produced by factors such as per-capita GDP, birth rate, and education level, which may have an effect on financial inclusion and can be used to predict its level.

This presumption prompts us to consider two important questions, particularly regarding:

1- Is there a relationship between HDI and FII using a cross-country analysis with varying economic and social levels?

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2- Can we forecast the Financial Inclusion Index using the Human Development Index?

Previous studies in this field looked into the relationship between the human development index and the level of financial inclusion. The empirical flaw that we are focused on is that the prior studies' samples were local ones, which gave a positive result, but it can also be biased analysis because every nation has its own unique characteristics.

This research intends to confirm the link and to overcome the empirical gap by examining the effect of the Human Development Index on the level of financial inclusion level using the most recent data (2021), performing an analysis across countries.

In in order to respond to the question, we will first conduct a literature review to see what research has already been done in the field, then we will illustrate the approaches we took to answer the main question and the data collection process, and finally we will evaluate and discuss the findings.

I. Literature review

Researches in this area tend to improve the link between Human development index (HDI), and the financial inclusion index (FII). The relationship that exists between Human development index and the Financial inclusion has been examined by (Sarma M and Paris J, 2020), they investigate the relationship between financial inclusion and development by factually identifying country-specific factors involved in financial inclusion levels. They discovered that a country's level of human development and financial inclusion are inextricably linked. Income, inequality, literacy, urbanization, and physical infrastructure for connectivity and information are all important socioeconomic and infrastructure factors. By the same logic, (Varun Chotia; N V Murali Dhar Rao; Gupta, Anurag; 2017) investigate the extent of financial inclusion in India's 28 states and six regions. According to the authors, an Index for Financial Inclusion (IFI) was created using a multidimensional approach. They used the data for three dimensions, namely penetration, availability, and usage of banking services, as well as IFI for numerous states and regions of India. The empirical results show that the financial inclusion index and the human development index are positively correlated. Despite the fact that various measures have been put in place to increase financial inclusion, a large portion of India's population has no access to the formal financial system.

Financial Inclusion (FI) levels are measured using the Index for Financial Inclusion, according to (Unnikrishnan, R; Jagannathan, 2015). The authors used the multiple regression on their analysis, the relationship between GDP and HDI with FI as a mediator is confirmed on a global scale using data from 162 countries in 2011. They had as a result that financial inclusion is outlined as a mediating factor in an overall global mediation analysis, and partial mediation on human development is validated. In the context of frontier markets, (Ofosu-Mensah Ababio J.; Attah-Botchwey E.; Osei-Assibey E.; Barnor C. 2021) proceeded by an

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empirically investigates whether the level of human development drives greater financial inclusion and vice versa. The dynamic panel generalized methods of moments (System-GMM) methodology is used to analyze data for twenty (20) frontier markets by Standard and Poor's Indices from 2005 to 2014. According to the study, human development is a catalyst for financial inclusion scale-up in the financial sector, which in turn increases development. It provides new evidence that income level, financial literacy, and living a healthy lifestyle are critical factors in the banking industry's scale-up of financial inclusion. It discovers new evidence that the root cause of low financial inclusion is a lack of human development. According to the study, low human development leads to low financial inclusion. leading up Financial inclusion is a crucial development policy problem, and the degree of financial inclusion may be predicted by different combinations and conditions of access to supply and utilization of demand financial services. A current research establishes that financial literacy and human development are conditions of high financial inclusion; supply-side drivers, such as bank concentration and bank branches, represent substitutive conditions for obtaining high levels of financial inclusion. (Gerald's H.S.A.; Gama A.P.M.; Augusto M. 2020). The fuzzy set qualitative comparative analysis was conducted across 61 countries worldwide.

The authors also find that the lack of financial literacy and human development, as demand-side determinants, results in lower financial inclusion for both sets of countries using independent studies of a split sample distinguishing developed and developing countries.

Programs for financial inclusion are a significant economic development strategy in emerging economies. The main factor influencing financial inclusion is human development, which opens up opportunity for people to have easier access to financial services (Singh, BP ; Yadava, AK 2022). The fundamental goal of this study, according to the authors, is to evaluate the technical efficacy of financial inclusion in Indian states using Data Envelopment Analysis with human development as an input. A 3-dimensional Financial Inclusion Index (FII) is created for 28 significant Indian states from 2010 to 2017 in order to meet this goal. According to empirical data, the researchers found that the majority of Indian states fall into the low- to medium-financial inclusion category, whereas states with higher levels of human development have higher FII. Importantly, the results of technological efficiency show that states with higher levels of human development outperform others in terms of Financial inclusion index.

In a panel of 12 Moroccan regions, (Ezzahid, E; Elouaourti, Z 2022) investigated the factors that influence regional financial inclusion and presented a comparative study of interregional and intraregional discrepancies in financial inclusion across Moroccan regions. The authors created a regional financial inclusion index using the principal component analysis approach and identified the factors influencing regional financial inclusion using the panel data estimate method. As a result, they found that the majority of regions have a poor level of financial inclusion, according to the regional financial inclusion index that they computed. They also discovered that, for all regions, the distance from the main city increases intraregional disparities in access to

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bank branches by locality/province or prefecture. According to empirical findings, a region's level of financial inclusion is primarily determined by its population size, amount of industrialization of its economic structure, and level of human development, as measured by the Human Development Index (HDI).

The literature review that was just discussed reveals that every study has discovered a link between the human development index and the degree of financial inclusion. Different samples were used by the researchers to examine the connection. (Singh, BP; Yadava, AK 2022) investigated this relationship based on a local data in India of 28 states and they showed that there is a correlation between HDI and FII. The same findings had been made by (Elouaourti, Z; Ezzahid, E 2022). By utilizing both intra- and interregional Moroccan data, the authors showed that a significant factor influencing the amount of financial inclusion is the level of human development. (Ofosu-Mensah Ababio J., Attah-Botchwey E., Osei-Assibey E., and Barnor C. 2021) studied data from 20 emerging economies obtained from Standard and Poor's between 2005 and 2014, and discovered that income level, financial literacy, and leading a healthy lifestyle are crucial components to raising the level of financial inclusion. Using a qualitative approach across 61 countries, (Gerald's H.S.A., Gama A.P.M., and Augusto M. 2020) discovered that financial literacy and human development are prerequisites for high financial inclusion. This analysis, however, is still wholly subjective and not based on empirical data.

The heterogeneous samples that were used to conduct the analysis are what tie these earlier studies together. This can lead to a biased study because each sample has its own characteristics. If we applied the same analysis to another sample, we might get different result, and we assumed that it couldn't be extended in other contexts. However, a research based on a specific sample could produce a positive and outstanding results in a specific area, and maybe unpleasant ones in other scenarios.

Our original study objective is to fill the analysis gap by demonstrating the relationship between the HDI and FII, using secondary data of 49 different countries with a variety of economic and social levels as the appropriate sample, and use the human development index to forecast the level of financial inclusion.

II. Methods and Data

1. Methods

The first step in our method consists to compute the financial inclusion index, based on three dimensions with equal weight, (The Global Partnership for Financial Inclusion, 2013) which are banking penetration(D1) that contains number of deposit accounts with commercial banks, credit unions and credit cooperatives per 1,000 adults(d1), and number of registered mobile money accounts per 1,000 adults(d2). The second dimension is availability (D3) which is expressed by number of automated teller machines per 100,000 adults(d3), number of commercial banks, credit union, credit cooperative and all microfinance institution branches per 100,000 adults(d4), number of registered mobile money agent outlets per 100,000 adults(d5), and number of scheduled commercial bank per 1000 km(d6). The last dimension is usage(D3) encompasses the Outstanding deposits

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with commercial banks, credit unions and credit cooperatives (% of GDP) (d7), and the value of mobile money transactions (% of GDP) (d8).

The financial inclusion index should be calculated for every single country using the following formulas (Varun Chotia; N V Murali Dhar Rao, Gupta, Anurag, 2017 ; Bhanu Pratap Singh, Anup Kumar Yadava , 2021):

The dimension of the index: $$di = wi\ \frac{Pi-mi}{Mi-mi}\ (1)$$

Pi= the actual value of dimension i

mi = the lower value of dimension i

Mi = the max value of dimension i

wi= the weight of the dimension i

According to the same source, we are obliged to use the Euclidian distance to ensure that the values lie between 0 and 1, by following formulas:

$$X1 = \frac{\sqrt{(d1)^2+(d2)^2+(d3)^2....}}{\sqrt{w1^2+w2^2+w3^2....}/} \quad (2)$$

$$X2 = 1\text{-}\frac{\sqrt{(w1-d1)^2+(w2-d2)^2+(w3-d3)^2....}}{\sqrt{w1^2+w2^2+w3^2....}/} \quad (3)$$

$$IFI = \frac{1}{2}(X1 + X2)\ (4)$$

In general, the financial inclusion index is between 0 and 1. A country is considered financially inclusive when its index is close to 1, and vice versa. (Ayllon, Tonny; Gaspar, Marcelo, 2022),

The second step of our method consists to get an overview about the Human development index (HDI) and how it is computed. According to the Human Development Reports (HDR), A long and healthy life, knowledge, and a good level of living are three essential aspects of human development that the Human Development Index measures in summary form. The normalized indices for each of the three dimensions geometric means make up the HDI.

The life expectancy at birth is used to evaluate the health dimension, while the mean number of years spent in school for persons 25 years and older and the anticipated number of years spent in school for young children are used to evaluate the education dimension. Gross national income per person is used to quantify the standard of living dimension. (Supravat Bagli and Maniklal Adhikary , 2013).

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The HDI employs the logarithm of income to illustrate how income becomes less significant as GNI rises. The three HDI dimension indexes scores are combined using geometric mean to create a composite index.

$$HDI = \frac{\text{Life Exp Index} + \text{Edu Index} + \text{GNI per Cap index}}{3} \quad (5)$$

As the previous index, the Human Development Index is between 0 and 1, a country with an HDI close to 1 is considered a developed one, and vice versa. (Neha Arora & Naresh Kumar, 2021).

2. Data Collection

In order to complete the empirical part of our study, we gathered secondary data of 49 Countries worldwide, across several continents, with varied economic and social level. The Financial Inclusion Index, as a dependent variable, was computed based on the available data on International Monetary Funds (IMF) dataset for 2021, by applying the previous formulas on Excel tables for each country, and using sub-dimensions that we mentioned before. Contrarily, we obtained data for the year 2021 from the Human Development Reports database, where The Human Development Index was already detailed and available.

3. Analytical apparatus

This research seeks to demonstrate the link between the financial inclusion level as a dependent variable, and the human development index, as an independent one. In order to improve it, we were based on a nonparametric statistical test which is Kernels regression method, via SPSS the 23rd version. The choice of this method can be justified by the dependent variable, which does not have a normal statistical distribution (Table 2).

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I. Results and discussions

Table 1: Ranking of countries according to HDI and FII in descending order

Rank	Countries	FII	HDI
1	Norway	0.486125	0.957
2	Irland	0.455678	0.955
3	Switzerland	0.317373	0.955
4	Sweden	0.444097	0.945
5	Netherland	0.46812	0.944
6	Finland	0.416253	0.937
7	Belgium	0.33301	0.931
8	Japan	0.455443	0.919
9	Italy	0.348709	0.892
10	UAE	0.467745	0.89
11	Greece	0.229962	0.888
12	Portugal	0.440433	0.864
13	Croatia	0.266727	0.851
14	Chili	0.208867	0.851
15	Argentina	0.172001	0.845
16	Turkey	0.273797	0.82
17	Oman	0.122356	0.813
18	Panama	0.195121	0.812
19	Albania	0.361068	0.795
20	Ukrain	0.429825	0.779
21	Thailand	0.42251	0.777
22	Colombia	0.121745	0.767
23	Ecuador	0.206316	0.762
24	Algeria	0.075888	0.748
25	Lebanon	0.411154	0.744
26	Fiji	0.133304	0.743
27	Jordan	0.107614	0.729
28	Indonesia	0.446772	0.718
29	Philippines	0.209642	0.715
30	South Africa	0.116474	0.709
31	Egypt	0.202291	0.707
32	Morocco	0.456608	0.686
33	India	0.313591	0.645
34	Honduras	0.313591	0.634
35	Ghana	0.393278	0.611
36	Kenya	0.323014	0.601
37	Zambia	0.313704	0.584
38	Zimbabwe	0.24501	0.571
39	Cameroun	0.169891	0.563
40	Pakistan	0.078097	0.557
41	Mauritania	0.146185	0.546
42	Rwanda	0.303006	0.543
43	Djibouti	0.073064	0.524
44	Haiti	0.040732	0.51
45	Gambia	0.134044	0.496
46	Malawi	0.091301	0.483
47	Liberia	0.434787	0.48
48	Guinea	0.231314	0.477
49	South Sudan	0.008929	0.433

Source: the authors & HDR

The table above lists the positions of various nations as per HDI. As a fast remark, we may note that most countries with strong human development indices also have high financial inclusion indices. This statement will be statistically tested in the table follows.

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Table 2: Normality test of dependent variable "financial inclusion index"

Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistics	Ddl	Sig.	Statistics	Ddl	Sig.
Financial inclusion index	.123	49	.063	.938	49	.013

a. signification Correction of Lilliefors

The dependent variable's normality test is shown in the table above; using two normality tests yields different findings. The dependent variable is normally distributed according to the Kolmogorov-Smirnov test, which produces a P-value of 0.064 > 0.05. However, the Shapiro-Wilk test generates a P-value of 0.013 <0.05, forcing us to reject the null hypothesis that the dependent variable does not follow a normal statistical distribution. In light of these results, we use the Shapiro-Wilk test since it is a reliable test and can be used to small samples. We acknowledge that this variable's statistical distribution is not normally distributed.

Table 3: ANOVA table

ANOVA

	Sums of squares	Ddl	Square's mean	F	Sig.
Regression	.244	1	.244	16.532	.000
Residuals	.694	47	.015		
sum	.939	48			

The independent variable is Human develop index.

Source: the authors

Based on the table (Table3) mentioned above, we can rule out our null hypothesis and confirm that there is a relationship between the human development index and financial inclusion. When compared to previous studies by (Soumyendra Kishore Dattaa , Krishna Singhb, 2019), and (*Unnikrishnan, R. and Jagannathan, 2015),* our results were similar. This table also shows that the statistical significance of our model is less than margin of error 0.05, thus we can assume that we can predict the financial inclusion index based on the human development index using a sample of nations with different economic and social levels

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Table 4: Summary of the model

Summary of the model

R	R-square	adjusted R-square	Estimation Error standard
.510	.260	.244	.122

Source: the authors The independent variable is Human develop index.

Table 4 demonstrates how much data this model can fit and how well it reflects the dispersion of the graph's spots. The abovementioned table demonstrates that the coefficient of correlation (R) is 50% and that R square represents the percentage of variability in the dependent variable (FII) that the regression model accounts for. Therefore, it is safe to conclude that the human development index can explain for around only 26% of the variation in the financial inclusion index.

Table 5: Coefficients table

Coefficients

	Non standardized Coefficients		Standardized Coefficients	t	Sig.
	B	standard Error	Bêta		
Human develop index	.455	.112	.510	4.066	.000
(Constant)	-.058	.083		-.693	.492

Source: the authors

The model's parameters (the Beta values) and their level of significance are shown in Table 5. We can construct the regression line's equation through using unstandardized coefficients. The B value of the constant in the table serves as the intercept, and the Beta value for the independent variable serves as the slope (HDI).

Due to the variable positive connection, the coefficient has now a value of 0.510. According to the result coefficient, the regression model accurately represents the data. We can say that there is a less than 0.0005 chance of having a t-value of 4.066 if the value of the intercept (b) is zero. Based on a sample made up of countries with different economic and social levels, we may infer that the human development index considerably (p 0.0005) influences the prediction of the financial inclusion index since b is not zero.

$$Predicted\ Financial\ inclusion\ index = -0{,}058 + (0{,}455 \times Human\ Development\ index) \quad (6)$$

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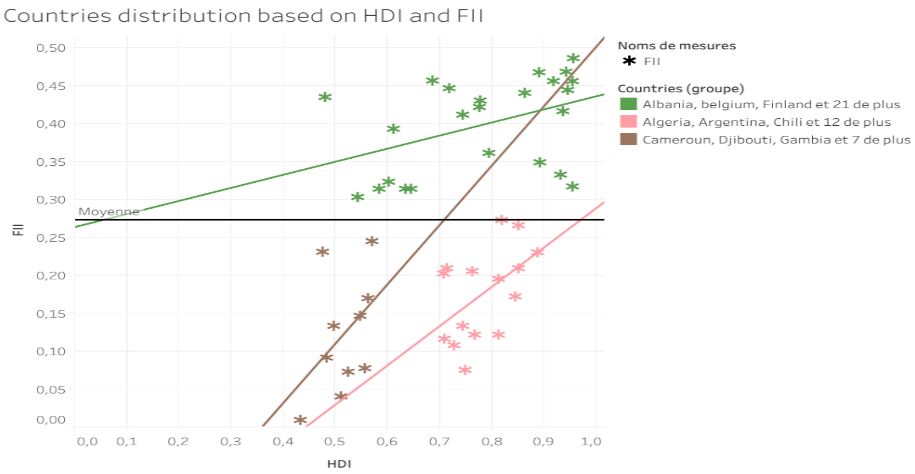
Figure 1: Graphical presentation of countries using the Human development index and Financial Inclusion index.



The distribution of nations based on the Human Development Index is displayed graphically at the left. There are three groups of nations, we observe. The first category is composed primarily of European countries, which are distinguished by the highest human development index and at the same time a high financial inclusion level. This position could be explained by the high birth rate, growing domestic product per person, and level of education in Europe. Consider the highest point on the graph, which is related to Norway. Its GDP per capita is $64.660 annually, its life expectancy at birth is 83.02 years, and its expected years of education are 18.02 years. With the help of all these subdimensions, Norway's HDI, which is considered to be among the highest in the world at approximately 0,96, was produced. At the same time, it has the highest financial inclusion level which is approximatively 0,48. The countries in the second group have low FII and moderate HDI. These nations are primarily found in South America (Chile, Panama, Argentina) and the Middle East (Algeria, Jordan, Oman, etc.). According to Human Development Reports 2021, such nations are distinguished by an estimated life expectancy at birth of between 70 and 78 years, expected years of schooling between 12 and 18, and an annual per capita growing domestic product between 6,000 and 20,000 dollars. We can conclude that changes to these subdimensions might affect the financial inclusion index to deteriorate. Low HDI and low FII are the defining characteristics of the third group of nations. These people reside in sub-Saharan Africa, where they may expect to live to be between 55 and 70 years old at birth, attend school for between 5 and 15 years, and earn between 700 and 20,000 dollars in domestic product growth annually per person

Based on all of these observations, we may deduce that countries with high levels of education, GDP per capita, and life expectancy at birth have nearly high levels of financial inclusion, whereas those with low levels have low levels. We acknowledge that changes in these subdimensions impact changes in the financial inclusion index.

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I. Limitations and perspectives

The following list of limitations for the current study can be summed up:

SME's were not included in the calculation of the financial inclusion index because they are already financially included. They had to be because of the money they traded.

The multidimensional poverty index, which measures poverty in terms of a variety of deprivations that affect people in their daily lives, such as poor health, inadequate education, and low living standards, is one of two crucial dimensions of the human development index that we neglected to include. Instead, we relied on growth product per capita to assess what constitutes a decent standard of living. The second criterion, the gender development index, is used to determine how much human development has been lost as a result of gender disparities in the allocation of advancement and treatment. These two criteria could provide rigorous examination and a strong human development index. After identifying these drawbacks, future research should analyze these indexes to produce a solid study and improve the model's predictive capability to make it as effective as feasible.

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I. Conclusion :

In conclusion, financial inclusion has always been a top priority for policymakers, and because of its significance and advantages, authorities must work more to make it a reality. Despite this, a variety of social and economic challenges limit the realization of financial inclusion. The goal of this study is to examine the relationship between the financial inclusion index, a dependent variable, and the human development index, an independent one that includes sub-variables that represent the social and economic aspects, including GDP per capita, which provides information on the standard of living, life expectancy, which indicates the quality of life, and education level, which indicates the intellectual capacity of individuals. In order to study this connection, we hypothesized that the per capita GDP, life expectancy, and educational attainment can all have an effect on the financial inclusion index and are important variables in its predicting.

Therefore, we were able to establish through non-parametric statistical tests (kernel test) that there is a correlation between the degree of financial inclusion and the human development index, and that we may use this as a basis for predicting the financial inclusion index.

This prediction, however, is not robust because the human development index only adequately explains for 26% of the variation in the degree of financial inclusion. Similarly, through observation, we were able to draw the conclusion that high FIIs, which are typically seen in European countries, are found in countries with high life expectancy, high education, and high per capita Growth Domestic Product. Sub-Saharan African nations with low FIIs are those with low per capita income, low life expectancy, and low education levels, all these observations indicate that variations in these factors affect FIIs.

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