Determinants of Human Development Index: A Cross-Country Empirical Analysis

Smit Shah
Student, PGDM – Banking & Financial Services,
National Institute of Bank Management, Pune, India

Abstract

The Human Development Index is a statistical tool used to measure countries overall achievements in its social and economic dimensions. This paper tried to find out major factors affecting Human Development Index like health index, education index and income index. The objective of this study is found out the empirical findings and trend of human development across countries, regression analysis of determinants factors and region wise analysis of human development index.

Keywords — *Human development index (HDI), A cross country analysis.*

I. INTRODUCTION

The Human Development Index (HDI) is a composite statistic of life expectancy, education, and per capita income indicators, which are used to rank countries into four tiers of human development. A country scores higher HDI when the lifespan is higher, the education level is higher, the GDP per capita is higher, the fertility rate is lower, and the inflation rate is lower.

II. LITERATURE REVIEW

HDI is the abbreviated as Human Development Index. It was developed and launched by Pakistani economist Mahbub-ul-Haq, followed by Amartya Sen, an Indian economist, in 1990. Human Development Index, HDI, is a comprehensive tool devised by the United Nations for measuring the levels of social and economic developments of the different countries and ranking them accordingly. It is a comparative measure of life expectancy, education, literacy and standard of living. Essentially, Human Development Index, HDI, makes use of four parameters for measuring and ranking countries according to their social and economic development which includes the Life Expectancy at Birth,

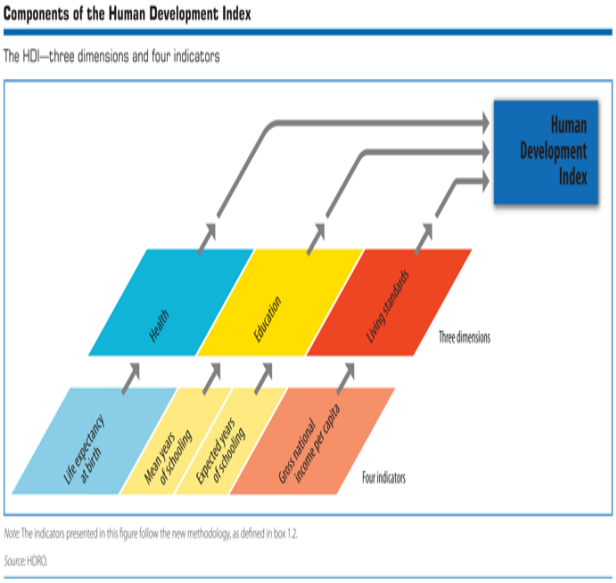

Figure 2.1 [HDI: Three dimensions and four indicators]

Expected Years of Schooling, Mean Years of Schooling and Gross National Income per Capita.Older versions of the HDI were calculated using the following indicators: I) Health – Life expectancy at birth, II) Education – measured by adult literacy and the combined primary, secondary and tertiary enrolment ratio and III) Income – measured by GDP per capita (PPP US$).Newer versions in 2010 Human Development Report (HDI) combines three dimensions: I) A long and healthy life: Life expectancy at birth, II) Education index: Mean years of schooling and Expected years of schooling and III) A decent standard of living: GNI per capita (PPP US$).There are six basic pillars of human development: equity, sustainability, productivity, empowerment, cooperation and security. The 2010 Human Development Report (HDI) combines three dimensions

III. DATA AND METHODOLOGY

Countless factors affect Human development index at the individual level (e.g. health, income, education, inequalities, inflation etc). Education should have a positive effect on HDI because as education increases so does the knowledge of how to lead a healthier life. This knowledge might, for example, take the form of improved nutrition or reduced exposure to various health risks, such as

indoor pollution exposures. Education is measured by the education index. In these analysis, Total literacy rate has been taken as proxy of Education index.

Disposable income is expected to be positively related to HDI for diverse reasons. As disposable income increases people have more resources for better shelter, food, and medical care. Again, countrywide data might offer some advantages over individual data: a wealthy person living in a poor country is unlikely to have the same access to quality food and medicine as a wealthy person living in a wealthy country. Since income is highly correlated with many other categories that would affect HDI (e.g. education, life expectancy), it is also held constant to estimate, without bias, the specific effects of those variables.

Countries with similar average GDP per capita often have large variance among individuals, hence greater or lesser inequality. Holding GDP per capita constant, greater inequality should have a negative effect on life expectancy. This expectation stems from diminishing return of income on health. People who have extremely low incomes are much more likely to have compromised health due to poor nutrition and sanitation, a limited supply of basic vaccines, and so on. Since a country with high inequality may have a large poor population and a small wealthy population the number of people dying at young ages greatly outweighs the number of people dying at old ages in determining the aggregate life expectancy. The Lorenz curve would be the better proxy for inequality but, due to lack of data, the gini coefficient is used instead. Gini index, fertility rate, Co2 emission and Inflation rate have negative relationship with HDI, while GDP per capita, life expectancy and Literacy rate have positive impact on HDI.

The variables described above were acquired from the Human Development Report. The HDI, which is commissioned by the United Nations Development Program (UNDP), supplies numerous statistics for 188 countries. Seven variables for cross country analysis have been extracted like GDP per capita, literacy rate, life expectancy, Inflation rate , Co2

1. Life Expectancy Index (LEI) $= \frac{(LE-20)}{(85-20)}$
2. Educational Index (EI) $= \frac{(MYSI+EYSI)}{2}$

✓Mean years of schooling Index $= \frac{MYS}{15}$

✓Expected Years of schooling Index $= \frac{EYS}{18}$

3. Income Index (II) $= \frac{[\ln(GNIpc)-\ln(100)]}{[\ln(75000)-\ln(100)]}$

$$HDI = \sqrt[3]{(LEI * EI * II)}$$

Figure 4.1 [Human development Index classification and mean value of determinants]

Variables	Coefficient	Std. Error	P-Value (95% Confidence Interval)	t-ratio
Constant	-1.44099	0.2561308	0.00	-5.63
lnGDP	0.088486	0.0070102	0.00	12.62
lnLifeExpectancy	0.278475	0.0625461	0.00	4.45
lnLiteracyRate	0.085201	0.0198828	0.00	4.29
lnGini	-0.0363	0.0175368	0.042	-2.07
lnFertilityRate	-0.047018	0.0161863	0.005	-2.9
lnCo2	-0.004866	0.0020017	0.018	-2.43
lnInflationRate	-0.000334	0.0004542	0.464	-0.73
R- Squared	0.9613			
Adjusted R-Squared	0.9571			
F - statisics	230.71			

Human development groups	Very high human development(44)	High human development (47)	Medium human development(42)	Low human development(54)
HDI(2011)	0.8696	0.7478	0.6465	0.4337
Life expectancy (2014)	80.257	75.1402	71.087	62.371
Adult (15+) literacy rate (%). Total	97.225	95.5565	89.3187	68.1507
GDP per capita(2010)	34814.4	13039.97	5541.81	4258.18
Fertility rate(2015)	1.7036	1.9515	2.6714	3.8949
GINI index(2008)	37.0528	41.0617	42.4811	39.58
Inflation (annual %)(2010)	2.5751	6.8899	7.5126	8.4212

Figure 4.2 [Regression Analysis]

emission, fertility rate, Gini Index. The descriptive statistics of the variables, regression analysis and variable key for the empirical analysis have been explained in the following section.

IV. RESULTS AND EMPIRICAL FINDINGS

Here following model has been used to explain variation in Human development index (HDI) The natural log of the all variables helps account for their diminishing marginal return to Human Development Index (HDI). Inflation rate is left out of this model because it is reasonably proxied by other variable like GDP per capita. It is dropped due to lack of significance.

Variable description:

Human Development Index (HDI): Human Development Index is an index used to rank countries by level of "human development". It contains three dimensions: health level, .educational level and living standard.

Life expectancy at birth (years) (lnLifeExpectancy) : The average number of years a newborn child would live if current mortality patterns were to stay the same.

Adult (15+) literacy rate (%).(lnLiteracyRate) (% of people ages 15 and above): Adult literacy rate is the percentage of people ages 15 and above who can, with understanding, read and write a short, simple on their everyday life.

Total Fertility rate (Children per woman) (lnFertilityRate): The number of children that would be born to each woman with prevailing age-specific fertility rates.

GINI index (lnGini) : Gini index measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

Inflation (annual %) (InInflationRate) : Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.

CO2 emission total (inCo2) : kg per 2005 PPP $ of GDP Real GDP per capita PPP (lnGDP):GDP per capita, by Purchasing Power Parities and adjusted for inflation. 2005 international dollars

among sample countries

HDI = b0 + b1* lnGDP + b2* lnLifeExpectancy + b3 * lnLiteracyRate + b4 * lnGini + b5 * lnFertilityRate + b6 * lnCo2 + b7 * lnInflationRate

Figure 4.3 [Analysis of Human development Index region wise]

Regions	Human Development Index (HDI)	Life expectancy at birth	Expected years of schooling	Mean years of schooling	Gross national income (GNI) per capita
	Value	years	years	years	(2011 PPP $)
	2014	2014	2014	2014	2014
Arab States	0.686	70.6	12	6.4	15,722
East Asia and the Pacific	0.71	74	12.7	7.5	11,449
Europe and Central Asia	0.748	72.3	13.6	10	12,791
Latin America and the Caribbean	0.748	75	14	8.2	14,242
South Asia	0.607	68.4	11.2	5.5	5,605
Sub-Saharan Africa	0.518	58.5	9.6	5.2	3,363

*Source: Human Development Report - 2014

HDI (Human Development Index) can be categorized into four categories like Very high HDI, High HDI, Medium HDI and Low HDI based on Index. In figure 4.1, the mean value of all determinants factors are given based on four categories. It can be observed that higher the life expectancy, Education index and GDP per capita of the countries, higher the HDI. Similarly higher the fertility rate, Gini index (more inequality), inflation rate and Co2 emission (environmental factor), lower the HDI.

In figure 4.2, the result of regression analysis has been given in the table. Apart from inflation rate, all variables are significant at 95% confidence interval, which can be observed from p-value and t- ratio of respective all independent variables. The sign of coefficient of independent variables shows either positive or negative relationship with dependent variable. R-squared is a statistical measure of how

close the data are to the fitted regression line. It is also known as the coefficient of determination, or the coefficient of multiple determination for multiple regression. The R- squared value and adjusted R-squared value are 0.9613 and 0.9571 respectively. The interpretation of R – squared represents as 96.13% of HDI can be explained by explanatory variables like GDP per capita, literacy rate, life expectancy, Gini index, fertility rate and Co2 emission. Higher value of R- squared, more goodness of fit.

In figure 4.3, HDI can be classified into worldwide regions. Europe & central Asia and Latin America & the Caribbean have highest 0.748 human development index, while south Asia and Sub-Saharan Africa have lower HDI 0.607 and 0.518 respectively. Education index is combination of expected years of schooling and means years of schooling. HDI is a geometric mean of Life expectancy at birth, Education index and Gross national income (GNI) per capita.

V. CONCLUSION

In this paper, we conclude about determinant factors of human development index (HDI) like GDP per capita, Literacy rate, life expectancy at birth, Gini index, fertility rate and Co2 emission are significant in empirical regression analysis. In region wise analysis, we can observe that Europe & central Asia and Latin America & the Caribbean have higher human development index, while south Asia and Sub-Saharan Africa have lower human development index. The improvement in HDI can be achieved through three dimension – Education index, Income index and Health index.

REFERENCES

[1] Vous consultez, "Measuring human progress: the contribution of the Human Development Index and related indices" *Revue d'économie politique*, 2011/1 (Vol. 121)

[2] Audrey Baer, Philip E. Graves, "Predicting Life Expectancy:A Cross-Country Empirical Analysis," *Department of Economics CUB 256 ,University of Colorado*, June-2002

[3] Ashish Dhar Mishra and Rahul Chaudhary, "A COMPARATIVE STUDY OF HUMAN DEVELOPMENT INDEX OF SELECTED INDIAN STATES" *National Monthly Refereed Journal of Research In Commerce & Management* ISSN – 2277-1166 Volume III, February'14

[4] UNDP Human Development Report : http://hdrstats.undp.org/en/indicators/103106.html

[5] World Bank: World Development Indicators: Co2 Emission total: http://data.worldbank.org/indicator/EN.ATM.CO2E.PP.GD.KD

[6] World Bank: World Development Indicators: Inflation rate: http://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG

[7] World Bank: Real GDP Per capita PPP: http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD

[8] The World Bank: World Development Indicators: Gini coefficient: http://data.worldbank.org/indicator/SI.POV.GINI

[9] UNESCO Institute for Statistics: http://stats.uis.unesco.org/unesco/TableViewer/tableView.aspx?ReportId=210