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

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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, Expected Years of Schooling, Mean Years of Schooling and GNI per capita.


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

**Variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>P-Value (95% Confidence Interval)</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-1.44099</td>
<td>0.2561308</td>
<td>0.00</td>
<td>-5.63</td>
</tr>
<tr>
<td>lnGDP</td>
<td>0.088486</td>
<td>0.0070102</td>
<td>0.00</td>
<td>12.62</td>
</tr>
<tr>
<td>lnLifeExpectancy</td>
<td>0.278475</td>
<td>0.0625461</td>
<td>0.00</td>
<td>4.45</td>
</tr>
<tr>
<td>lnLiteracyRate</td>
<td>0.085201</td>
<td>0.0198828</td>
<td>0.00</td>
<td>4.29</td>
</tr>
<tr>
<td>lnGini</td>
<td>-0.0363</td>
<td>0.0175368</td>
<td>0.042</td>
<td>-2.07</td>
</tr>
<tr>
<td>lnFertilityRate</td>
<td>-0.047018</td>
<td>0.00161863</td>
<td>0.005</td>
<td>-2.9</td>
</tr>
<tr>
<td>lnCo2</td>
<td>-0.004866</td>
<td>0.0020017</td>
<td>0.018</td>
<td>-2.43</td>
</tr>
<tr>
<td>lnInflationRate</td>
<td>-0.000334</td>
<td>0.0004542</td>
<td>0.464</td>
<td>-0.73</td>
</tr>
</tbody>
</table>

**R- Squared** 0.9613

**Adjusted R- Squared** 0.9571

**F - statsisics** 230.71
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) (InLifeExpectancy): The average number of years a newborn child would live if current mortality patterns were to stay the same.

Adult (15+) literacy rate (%).(InLiteracyRate): 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 (InGini): 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):GDPP per capita, by Purchasing Power Parities and adjusted for inflation. 2005 international dollars

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

Figure 4.3 [Analysis of Human development Index region wise]

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

*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