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Extended Version of Human Development Index with Millennium Development Goals: A Case Study of Pakistan

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Abstract: The objective of the study is to extend the United Nation's Human Development Index (HDI) with Millennium Development Goals (MDGs) -2015 and construct the new extended version of HDI, called Millennium Development Index (MDI), by considering a case study of Pakistan. **Prior Work** The study extended HDI with MDGs in order to assess country's performance in 7 different dimensions, which previously less utilized in academic and research arena. The actual values of Pakistan's data set is assessed by the progress towards MDGs and constructed the comprehensive index score, which is based upon 7 quantitative goals as assigned by the United Nations in the year 2015. The MDI score for each goal is calculated as follows, i.e., poverty index value is 0.128, educational index value is 0.421, empowerment index value is 0.458, life expectancy is 0.729, HIV/AIDS value is 0.10, maternal index value is 0.200, and clean water index value is 0.744. The stated index values indicate that Pakistan's economy weakly perform in 5 out of 7 goals, where the index value is less than the 0.50 threshold, while in the case of life expectancy and clean water access, the index value is more than the threshold value and correspond that the economy is progressing efficiently in both of the dimension factors. The overall MDI value is 0.444, which is less than the threshold value as designated by the United Nation's HDI and conclude that Pakistan's economy was low progress towards MDGs that need significant economic reforms to combat poverty, hunger, and other socio-economic and environmental factors for sustained growth. The calculated MDI score value is the first initiative to extend the HDI values with MDGs, which should be consider for food-of-thoughts to the policy makers to rank the economies on the basis of MDI instead of existing HDI values.

Keywords: Human development index; Millennium development goals; Millennium development index; Pakistan.

JEL Classification: I31; O15

1. Introduction

Human development is a central issue in modern economics. A glance at the economics map of the world realizes that about 1/3rd human race have attained very high level of income. Due to the industrial revolution in 18th and 19th centuries, human development in some nations shows remarkable economics progress and achieved their goals in different sectors of the economy. The recent research findings point to a strong connection between productivity growth and human development. The human development affected by educational policies, health programs and investment in human development that boost up the economy and human development productivity[4]. The most ambitious effort to analyze the human

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[4] See (Ogundari & Awokuse, 2018; Raheem et al., 2018; Croes et al., 2018, etc).

development of world's economies by UNDP with annuals series of human development reports, including, Human Development Index (HDI) and Millennium Development Goals (MDGs). The basic HDI has three dimensions, i.e.

(1) Longevity is measured by life expectancy at birth,

(2) Knowledge is measured on average years of schooling, and

(3) Income is measured as the real GDP per capita income of the nations.

Source: UNDP, 1990

It is glance that the different economies earned different human development index values likes, Australia, Germany, and the United States has stood 2nd, 4th and 10th place respectively, while Srilanka and Lebanon has 73 and 76 HDI ranks respectively. Pakistan has 147th HDI ranks as per 2015 estimates among world economies and have an index value of 0.550, which shows Pakistan is amid in medium HDI category (UNDP, 2015). There is a markable increase in Pakistan's HDI values during the period of 1990 to 2015 and confirmed that Pakistan's HDI values substantially increases from 0.404 in 1990 to 0.550 in 2015, while the significant increase in life expectancy from 1990, i.e., 60.1 years to 2015, i.e., 66.4 years correspond that the Pakistan's healthcare infrastructure considerably improved between the given time periods. In the year 1990, the expected years of schooling, average schooling years, and GNI per capita increases from 4.6 years, 2.3 years, and US$ 3,194 respectively, while in 2015, there is significantly increase in the above stated factors, i.e., 8.1 years, 5.1 years, and US$5,031 respectively (UNDP, 2015).

The human development index has the linkage with different economic indicators. The area of MDGs investigated by many experts and researchers. Yakunira and Bychkov (2015) investigated the correlation analysis of the component of the human development index across countries. The finding of the study revealed that the socio-economic development is based on the knowledge across countries that directly affect the main feature of HDI value score. Chaudhary et al. (2012) analysed different approaches to women empowerment in the context of Pakistan and found that economic development has a positive and significant effect on women empowerment as measured by empowerment measurement index. Antony and Laxmaiah (2008) investigated the relationship between human development, poverty, health, and nutrition in india by using univariate, bivariate, and multivariate data analysis and found that of the paper indicated that India's HDI value has improve but not up to the desired level as compared to other developing countries. Razmi et al. (2012) investigated the effect of government health expenditure on Iran's HDI score by using ordinary least saqure method. The finding of the study indicated that there is a positive and significant relationship between government health expenditure and human development index. Bhutta et al. (2013) invertigated the reproductive child healthcare in Pakistan and foudn that there is a slow progress in achieving the MDGs 4 and 5 and most of the population live at below life risk.

Sudarlan (2015) invertigated the contribution of HDI on per capita income and poverty alleviation in Indonesia and found that per capita income was not significant effect to poverty headcount, while changes in price level and educational expenditures signfcantly redcued poverty in a country. Ranis et al. (2000) discussed the viability of human development and economic growth, which need substanial

economic refors to reap economic benefist from human development across countries. Harttgen and Vollmer (2013) discussed the strong relationship between human development and reduction in fertility rate, which provoked the need of strong healthcare infrastructure for healthy living across countries. Kovacevic (2010) confirmed the high correlation between the huan development index components that confirmed the soundness of HDI score across the globe. Ustubici and Irdam (2012) substantiated the positive correlation between international remittances and human development that indicate the viability of international remittances in human development process across countries. Muhammad et al (2010) considered the case study of Pakistan in order to assess the impact of globalization on country's human development pricess and found a strong positive correlation between them under the mediating factor of FDI inflows in a country. Boutayeb (2009) considered the case study of African counrteis and conclude that HIV/AIDS substanially negatively impact on healthcare infrastructure and demographic factors that need long-term health policy for healthy living. Chibba (2009) argued that MDGs are not compatible with different socio-economic challenges that need to expand for shared properity. Onda et al (2012) concluded that MDGs related with safe drinking water and sanitation facility is achived in most of the developed and developing countries that is imperative for healthy living.

On the basis of significant debate on the said topic, the study confirmed the viability of HDI value that should be interlinked with the MDGs goals, thus this study is the first study that took an inititative to utilized MDGs golas and extended HDI scores to make Millenium Development Index (MDI) that account for 8 dimesnion index. The study considered a case study of Pakistan and assess the country's perfromnace in terms of MDGs via the dimesnion index of HDI for robust inferneces.

2. Data and Methodology

The study extended the HDI with 8 MDGs. The minimum and maximum threshold for each dimension index is used for given MDGs. The Millenium development index (MDI) is the key dimension for the human development indicators.There are two main steps for the calculating of MDI, at first to construct the dimesion index with minimum threshold value, maximum threshold value and actual achived target value of MDGs, i.e.,

$$\text{Dimension Index: } \frac{actualvalue - \min imumvalue}{\max imumvalue - \min imumvalue} \quad (1)$$

The threshold vlaues are taken from United Nations targets that assigned to the countries to achive MDGs, i.e.,

i. Eradicate Extreme Poverty and hunger

$$\text{Poverty index: } \frac{Actualvalue - 1.90\$}{33\$ - 1.90\$}$$

ii. Achieve Universal primary education

Education MDI index: $\frac{\sqrt{Meanyearsof Schooling \times Expectedyearsofschoding}}{.971-0}$

a) Means year of schooling= $\frac{actualvalue-0}{13.3-0}$

b) Expected year of schooling= $\frac{actualvalue-0}{18-0}$

iii. Gender equality and women empowerment

Empowerment MDI index: $\frac{\sqrt{PRF \times SEF + PRM \times SEM}}{2}$

Where, PRF shows female parliament representation, PRM shows male parliament representation, SEF shows female attainment at secondary and high school enrolment, and SEM shows male attainment at secondary and high school enrolment.

iv. Life expectancy and Health

Life expectancy index: $\frac{actualvalue-20}{83.6-20}$

v. Maternal mortality index

$$: (\sqrt{\frac{10}{MMR} \times \frac{1}{AFR} + 1}) \times 2$$

Where MMR shows maternal mortality rate and AFR shows Adolescent fertility rate.

vi. HIV/AIDS and others diseases

HIV/AIDS index= $\frac{actualvalue-0}{1-0}$

vii. Environmental Sustainability

Water sustainability index: $\frac{actualvalue-50}{100-50}$

The second step is to take a geometric means of all seven dimensions, i.e.,

[MDI= 8√Poverty ×Education× Empowerment× Life expectancy ×Maternal Health ×HIV/AIDS × Water Sustainability]

Table 1 shows the actual values that Pakistan economy achieved in MDGs against the assigned values.

Table 1. Pakistan's Economy Progress towards MDGs

Indicators	**Actual values**
Poverty	6.1US$
Means years of schooling	5.1 years
Expected year of schooling	8.1 years
Female parliament representation	20
Male parliament representation	80
Female attained in schooling and higher education	26.5
Male attained in schooling and high education	46.1
Life expectancy	66.4 years
Maternal mortality ratio(MMR)	178/1000000
Adolescent fertility rate (AFR)	38.7
AIV/HD	0.1
Clean water facilities	74.4% of total population
GNI per capita	US$5031, PPP

Source: UNDP (2016)

3. Results

The following calculations represent the MDI progress in Pakistan, i.e.,

i. Poverty MDI index (PMDI)

$$PMDI = \frac{actualvalue - 1.90\$}{33\$ - 1.90\$}$$

$$PMDI = \frac{6.1\$ - 1.90\$}{33\$ - 1.90\$}$$

$$PMDI = \frac{4.2\$}{31.1} = 0.1286$$

The PMDI score shows the low progress of poverty reduction, as the index value is far less than the acceptable target. The Pakistan's government should strive hard to combat poverty with rationale income distribution and high per capita income.[1]

Education MDI index (EMDI)

$$EMDI = \frac{\sqrt{Meanyearsofschooling \times Expectedyearsofschoding}}{0.971 - 0}$$

a. Means years of schooling

[1] See (Zaman et al., 2012; Zaman & Ahmad, 2008; Zaman et al., 2009; Khan et al., 2014a,b; Zaman & Khilji, 2014; Zaman & Rashid, 2011; Zaman et al., 2014, etc).

$$= \frac{actualvalue - 0}{13.3 - 0}$$

$$= \frac{5.1 - 0}{13.3 - 0} = 0.383$$

b. Expected years of schooling

$$= \frac{actualvalue - 0}{18 - 0}$$

$$= \frac{8.1 - 0}{18 - 0} = 0.4475$$

$$EMDI = \frac{\sqrt{.383 \times .4475}}{0.971 - 0}$$

EMDI = 0.421

The EMDI value is 0.421, which indicates the low human development in educational factors, thus it is imperative to device sound educational policy that reap economic gains by educational reforms in a country.[1]

ii. Empowerment MDI index (EMPMDI)

$$EMPMDI = \frac{\sqrt{PRF \times SEF + PRM \times SEM}}{2} \times 100$$

$$EMPMDI = \frac{\sqrt{20 \times 26.5 + 80 \times 46.1}}{2} \times 100$$

EMPMDI= 0.458

The low empowerment MDI score confirmed that the female representation in parliament and attainment of secondary school enrolment is biased against the male counterpart, which needs more policy reforms to reduce gender inequality in all traits.[2]

[1] See (Qureshi et al. 2012; 2014; Akhmat et al., 2014; Riasat et al., 2011; Zaman, 2015 etc).
[2] See (Khan et al. 2017, Perugini and Selezneva 2015, De Paola and Scoppa 2015, etc)

iii. Life expectancy MDI index (LEMDI)

$$LEMDI = \frac{actualvalue - 20}{83.6 - 20}$$

$$LEMDI = \frac{66.4 - 20}{83.6 - 20} = 0.729$$

The high value of life expectancy MDI stated that Pakistan substantially increases life expectancy at birth, which is due to healthy reforms in healthcare industry in a country.[1]

iv. HIV/AID MDI Index (HIVMDI)

$$HIVMDI = \frac{actualvalue - 0}{1 - 0}$$

$$HIVMDI = \frac{0.1 - 0}{1 - 0} = 0.1$$

The HIVMDI value is 0.1, which shows that Pakistan's economy substantially responses against HIV/AIDS through massive information sharing in a country (see, Khan and Hyder 2001, Ruxrungtham et al. 2004, Schwartländer et al. 2011, etc).

v. Maternal Health MDI index (MHMDI)

$$MHMDI = (\sqrt{\frac{10}{MMR} \times \frac{1}{AFR}} + 1) \times 2/100$$

$$= \sqrt{\frac{10}{178} \times \frac{1}{38.7}} + 1 \times 2/100$$

MHMDI=0.200

The low value of MHMDI shows that Pakistan's economy slow progressing their assigned targets related with maternal mortality ratio and adolescent fertility rate, thus its need to spend more investment on

[1] See (Qureshi et al., 2015; Mustaq et al., 2013; Hassan et al., 2014, etc).

healthcare infrastructure in a country (see, Soofi et al. 2017, Sherwani et al. 2017, Batool et al. 2017, etc).

vi. Clean Water MDI index (CWMDI)

$$CWMDI = \frac{actualvalue - 0}{100 - 0}$$

$$= \frac{74.4 - 0}{100 - 0}$$

CWMDI = 0.744

The index value of CWMDI is 0.744 that shows high progress in improved water sources in Pakistan's economy. The policy to device free flow of safe water is imperative for healthy living in a country.[1]

Income MDI Index (IMDI)

$$IMDI = \frac{\ln actualvalue - \ln(100)}{\ln(87478) - \ln(100)}$$

$$IMDI = \frac{\ln 5031 - \ln(100)}{\ln(87478) - \ln(100)}$$

IMDI=0.570

The medium level of development been reported in terms of increase per capita income, PPP, which needs more growth policies for long-term development in a country.

The MDI is calculated on the basis of above stated MDGs score, i.e.,

MDI= 8√Poverty ×Education× Empowerment× Life expectancy ×Maternal Health ×HIV/AIDS × Water Sustainability

$$MDI = \sqrt[8]{0.1286 \times 0.421 \times 45.88 \times 0.729 \times 0.1 \times 2.0013 \times 0.744 \times 0.57}$$

$$MDI = \sqrt[8]{0.001536} = 0.4449$$

The MDI score value is 0.4449, which shows the low level of economic development in a form of progressing MDGs up to 2015. The country need effective economic targeting programmes that uplift the poor, reduced hunger, improve education, health benefits, increase life expectancy, reduce malaria, HIV/AIDS, maternal mortality ratio, and providing clean access to water and sanitation facilities.

4. Conclusions

[1] See (Kirby et al., 2017; Baig et al., 2017, etc).

The real contribution of the study is to extend the United Nation's HDI with MDGs by utilizing the Pakistan's economy data, which is used as a bench mark values towards progressing MDGs, 2015. The results show that Pakistan's economy was significantly progress in life expectancy and clean water access to the population, where the index value is more than 0.50, while the remaining five MDGs, the Pakistan's economy was slow progressing, as the index value was less than the 0.50. The overall MDI value is 0.444, which is considered Pakistan's economy as a low economic development country in the form of achievement MDGs, 2015. The study concludes with the fact that the United Nation's HDI value should be extended with the MDGs to form MDI that ranked the countries in more appropriate manner as compared to the existing ones, hence it is imperative to sustained economic factors by appropriate economic policies for broad-based growth.

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