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# SOCIAL SECTOR EXPENDITURE AND HUMAN DEVELOPMENT IN NORTH EAST INDIA: A CO-INTEGRATION ANALYSIS

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**Abstract**

The qualitative aspects of human life in developing countries, like India, and backward regions, like North East India, leave much to be desired as there has been rapid quantitative addition to the population on the one hand and wider human deprivation on the other. The success of all economic policies and programmes should, therefore, be evaluated in terms of their ability to generate human capability, since all such policies are based ultimately for the betterment of the quality of lives of people. It is in this context the present study tries to explore existence of any short run or long run causality between human development index and social sector expenditure particularly in north east region. On the basis of panel data analysis based on secondary source, the study concludes that the region witnesses lopsided distribution pattern in terms of human development accessibility across its states along with the evidence of co-integration between human development index and public spending on social sector. The study justifies the utility of public spending on social sector to promote human development in the region.

***Keywords:*** Human Capability, Human Development, Human Development Index, Social Sector Expenditure, Co-integration, Short run Causality, Long run Causality, Policy Implication, North East Region, India

# 1. Introduction

The basic objective of development of a nation is to improve the welfare of the people. The efforts of development administration to alleviate poverty through economic growth and redistribution of income and wealth would be meaningless unless it is accompanied by expansion of basic capabilities of human beings in a given society or region, and of the basic amenities that condition such capabilities. The success of all economic policies and programmes should be evaluated in terms of their ability to generate human capability, since all such policies are based ultimately for the betterment of the quality of lives of people.. The studies witness that human development should be given top priority in the development programs particularly in those countries where economic growth is low and income inequality is high (Mbaku, 1997; Alvan, 2009).

Researchers have made several attempts both at national and international level to address the issue that whether social sector expenditure can be instrumental for sustainable human development. Because of extreme poverty and deprivation in backward region, the wellbeing of the people can only be increased by greater involvement of government. Broad-based development policies focused on enhanced and targeted public investment in programmes facilitates improvements in the quality of life of the masses. Government policies and expenditures influence human development. Allocation of resources to improve human development depends on total public sector expenditure and its share to the human development sectors (Borbora, 2010; Ranis et al. 2004). At the policy level the studies recommend for more public expenditure to have a balanced and improved human development. Studies also advocate that prioritising social sector expenditure would ensure not only equity but also sustained development in the long run (Shariff et al, 2002; Razmi, 2012; Mittal, 2016).

Several studies justify that the North east region in respect of human development is highly lagging behind within the country and as compared to many other countries in the world and low level of human development in North-eastern states of India reflects the high human deprivation among its populace (Nayak, 2005; Mahajan, 2009). Moreover, it is also evident that while human development extends opportunity available to the people, in the context of North east region, widening the scope of economic opportunity within the region remains the major challenge to development policy-making. It is in this connection, present study attempts – (i) to analysis whether there is spatial inequality in terms of human development and social sector spending across North Eastern states. (ii) to analysis the efficacy of social sector expenditure per capita on human development in North-east region.

## 2. Data Source and Methodology

To construct State-wise human development index (HDI) for the period 2003 to 2011, Infant Mortality Rate (IMR) and PCNSDP for the period 2002-03 and 2003-04 (at constant 1999-2000 Prices) and 2004-05 to 2011-12 (at constant 2004-05 prices) have been collected from Planning Commission, *Data for use of Deputy Chairman*, Planning Commission, Government of India; 10th April 2012[1]. For uniformity of data constant prices 1999-00 has been converted into 2004-05 by using a deflator. To estimate State wise Intensity of Formal Education for the period 2003 to 2011, data on Gross Enrolment Ratio (I-V) have been collected from State Report Cards, NUEPA. For State wise Total population figures, Census of India 2001, Population Projection for India and States 2001-2026 has been consulted. State Finances: A Study of the Budgets 2011-12 provides State-wise information regarding social sector expenditure as a percentage of total expenditure.

### 2.1 Construction of State level Human Development Index

We have computed Human development Index (HDI) for north eastern states over the period 2003 to 2011 following UNDP (1999) methodology, which is simply obtained as the mean of health, education as well as economic attainment after normalization of dimension indices. Hence, for the $j^{th}$ state

$$HDI_j = \frac{(Health\ Index)j+(Educational\ Index)j+(Income\ Index)j}{3}$$

**Table 1 Goalpost for Calculating HDI**

| Indicators | Maximum Value | Minimum Value |
|---|---|---|
| Infant Mortality Rate (IMR)[1] | 70 | 10 |
| Adjusted Intensity of Formal Education (estimated) (AIFE) [2] | 15 | 10 |
| Per Capita Net State Domestic Product(PCNSDP)[3] (Rs) (at Rs 2004-05prices) | 49000 | 16000 |

*Note: [1]The maximum and minimum values for IMR refer to the highest and the lowest IMR in the region. IMR is the highest (i.e.68) for Assam and lowest (i.e. 11) for Manipur. [2]The Intensity of Formal Education is estimated as weighted average of the enrolled students from class I to class V (where weights being 1 for Class I, 2 for Class II and soon) to the total enrolment in Class I to Class V. This is adjusted by proportion of total enrolment to population in the age group 6-10. The maximum and minimum values for AIFE are 14.16 (Tripura) and 10.83 (Meghalaya) respectively. Accordingly, maximum and minimum values for concerned parameters are adjusted. [3]The maximum and minimum PCNSDP have been recorded for Sikkim (Rs. 48500) and Assam (Rs. 16455) respectively which are being adjusted for estimation purpose.*

[1] http://planningcommission.gov.in

**2.2 Johansen Co-integration Test**

Johansen co-integration test has been used to find out long run equilibrium relationship between two variables namely, social sector expenditure and HDI. Augmented Dickey Fuller test is used to verify if the variables are stationary or not. General form of Augmented Dickey Fuller test (Random walk model with drift and no stochastic trend) has been outlined below:

$$\Delta Yt = \alpha + \delta Y_{t-1} + \beta_i \sum_{i=1}^{m} \Delta Yt - i + u_t$$

where, $\delta = (\rho-1)$, $\Delta$ is the first-difference operator, $u_t$ is a pure white noise error term and $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$

Now, the null hypothesis that the series has unit root, (i.e., $H_0$: $\delta = (\rho-1) = 0$), is tested using tau statistics. If the data is found to be or integrated of order one I(1), i.e., non stationary then difference operator is taken to make it stationary.

After making the data stationary, LR test statistic, Final prediction error (FPE), Hannan-Quinn information criterion (HQ), AIC, Schwarz information criterion (SC) has been used to investigate the optimal lag length.

**2.3 Specifying Co-integrating Equation**

Given the evidence of co-integration, the long-run relationship between two variables $Y_t$ and $X_t$ can be expressed as:

$$Y_t = Y_{t-1} + u_t \ldots\ldots\ldots\ldots\ldots\ldots \text{I (1)}$$

$$X_t = X_{t-1} + v_t \ldots\ldots\ldots\ldots\ldots\ldots \text{I (1)}$$

Now, regression of $Y_t$ on $X_t$ yields the error term as:

$$\varepsilon_t = (y_t - \alpha - \beta x_t) \ldots\ldots\ldots\ldots \text{I (0)}$$

This implies regression of $Y_t$ on $X_t$ is meaningful, i.e., two variables are co-integrated and they have long run equilibrium relationship.

**2.4 VCEM and Causality**

When the variables of a Vector auto regressive (VAR) are cointegrated, we use a vector error-correction (VEC) model. A VEC for two variables might look like

$$\Delta Y_t = \beta_{y0} + \beta_{y1} \Delta Y_{t-1} + \ldots + \beta_{yp} \Delta Y_{t-p} + \gamma_{y1} \Delta X_{t-1} + \ldots + \gamma_{yp} \Delta X_{t-p} - \lambda_y (Y_{t-1} - \alpha_o - \alpha_1 X_{t-1}) + v_t^y$$

$$\Delta X_t = \beta_{x0} + \beta_{x1} \Delta X_{t-1} + \ldots + \beta_{xp} \Delta X_{t-p} + \gamma_{x1} \Delta X_{t-1} + \ldots + \gamma_{xp} \Delta X_{t-p} - \lambda_x (Y_{t-1} - \alpha_o - \alpha_1 X_{t-1}) + v_t^x$$

Where, $\Delta$ = difference operator,

P = lag length

$(Y_{t-1} - \alpha_o - \alpha_1 X_{t-1})$= Error Correction Term (ECT)

$v_t^y$ and $v_t^x$ are assumed to be white noice error term

The negative sign and significance of Error Correction term (ECT) indicates that there exist short run relationships between the variables and takes time to attain equilibrium.

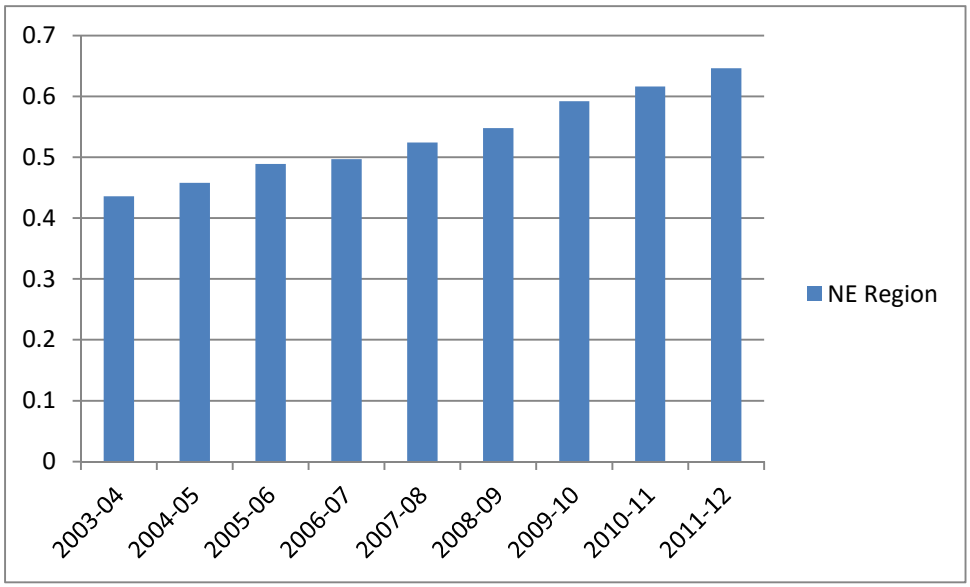
## 3. Empirical Analysis

### 3.1 Performance of North eastern States in terms of Human Development

Estimated results regarding the relative performance of North-eastern States of India on human development attainment during the period 2003-04 to 2011-12 are presented in Table 2. North-east region has recorded about 21 per cent increase in HDI from 0.436 to 0.646 during the period 2003-04 to 2011-12. The region witnesses an annual average percentage increase in HDI of about 1.75 per cent over the period. Overall, North-eastern region has been putting improving performance on human development attainment in recent past (Figure 1).

**Figure 1**

**Performance of NE Region on Human Development Front**




Source: Table 2

However, though HDI value of the region has increased several folds over the years, yet the region witnesses uneven human development across the States in North-eastern region. By latest data (2011-12) as shown in Table 2 North-eastern states have been categorised into two groups on the basis of region's scoring of HDI. One group, viz., Mizoram, Nagaland and Sikkim have scored higher than the region average, while, the rest, i.e. Arunachal Pradesh, Assam, Meghalaya, Manipur and Tripura, comprising another group that scored lower than the region average value of HDI. Human Development Report of North East States (2011) also witnesses similar status of inequalities across North eastern states. Moreover, it is worth noting that Assam has witnessed as the least scorer throughout the period (Human Development Report of North East states, 2011). In the latest year 2011-12, the best performer state (Sikkim) registers a shortfall of about 15 per cent while the poorest state

(Assam) has a shortfall of about 60 per cent in terms of HDI. For the other states, the shortfall in HDI persists between these two ranges which seem disturbing in both regional as well as national perspective.

**Table 2**

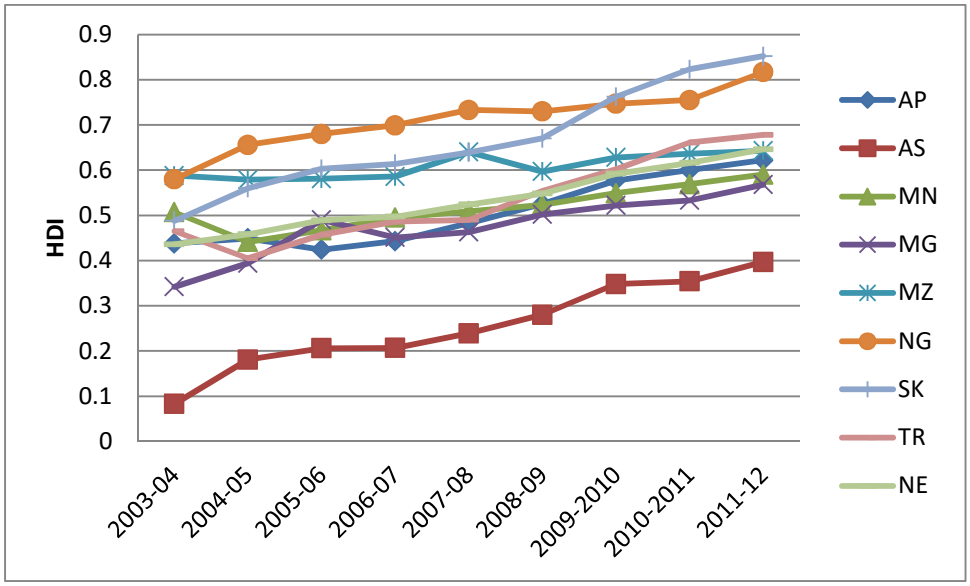
**Trends of HDI for North eastern States over the period 2003-04 to 2011-12**

| | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-2010 | 2010-2011 | 2011-12 |
|---|---|---|---|---|---|---|---|---|---|
| Arunachal Pradesh | 0.438 | 0.449 | 0.424 | 0.443 | 0.483 | 0.525 | 0.577 | 0.6 | 0.622 |
| Assam | 0.083 | 0.181 | 0.206 | 0.207 | 0.239 | 0.28 | 0.348 | 0.354 | 0.397 |
| Manipur | 0.507 | 0.441 | 0.467 | 0.495 | 0.509 | 0.523 | 0.549 | 0.569 | 0.59 |
| Meghalaya | 0.342 | 0.394 | 0.49 | 0.451 | 0.463 | 0.502 | 0.522 | 0.533 | 0.568 |
| Mizoram | 0.588 | 0.579 | 0.581 | 0.586 | 0.64 | 0.597 | 0.628 | 0.636 | 0.643 |
| Nagaland | 0.58 | 0.656 | 0.68 | 0.699 | 0.733 | 0.73 | 0.747 | 0.755 | 0.817 |
| Sikkim | 0.488 | 0.56 | 0.603 | 0.614 | 0.639 | 0.67 | 0.762 | 0.823 | 0.852 |
| Tripura | 0.465 | 0.405 | 0.457 | 0.486 | 0.49 | 0.554 | 0.602 | 0.661 | 0.678 |
| North East | 0.436 | 0.458 | 0.489 | 0.497 | 0.524 | 0.548 | 0.592 | 0.616 | 0.646 |

Source: Author's Calculation

**Figure 2**

**Uneven Growth of HDI across NE States**




Source: Table 2

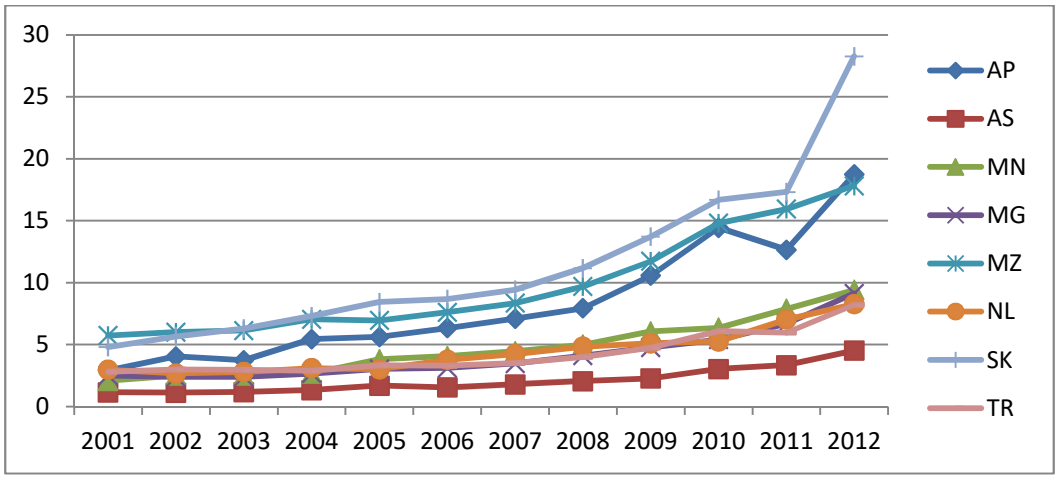
### 3.2 Pattern of Social Sector Expenditure in North East Region

The importance of higher level of social infrastructure for human development and economic growth is well known. The social sector expenditure is defined as the total of expenditure on 'Social Services' and 'Rural Development' as given in central and state budgets. The head 'Social Services' includes, among other things, education, health and family welfare, and water supply and sanitation. The expenditure under the head 'Rural Development' relates mostly to anti-poverty programmes. So the ultimate question about the trends and patterns of social sector expenditure for higher human development attainment in backward region like north east India await dispassionate analysis. Therefore, this section is an attempt in this direction.

The Fig. 3 depicts the trends of per capita social sector expenditure in North Eastern states in recent years. The figure shows that three states, viz., Sikkim, Mizoram and Arunachal Pradesh attain relatively higher per capita social sector expenditure than others over the period 2001 to 2012. Nagaland, Manipur, Meghalaya and Tripura witnessed relatively moderate growth pattern in respect of social sector expenditure per capita. The trend is lowest for Assam throughout the period. So, the fact reveals that wide disparities exist across north eastern states in attaining public spending on social sector front.

**Figure 3**

**Trend of Per Capita Social Sector Expenditure in North East India**




*Source: Calculated by Author based on data collected from State Finances: A Study of Budgets 2011-12 and Census of India, Population Projection for India and States 2001-2026*

**Table 3**

**Ratio of Social Sector Expenditure to GSDP in North eastern States**

| | Arunachal Pradesh | Assam | Manipur | Meghalaya | Mizoram | Nagaland | Sikkim | Tripura | All India |
|---|---|---|---|---|---|---|---|---|---|
| 2004-08[#] | 19.7 | 8.3 | 16.9 | 10.7 | 24.3 | 12.2 | 26.1 | 11.7 | 5.2 |
| 2009-10 | 25.8 | 9.9 | 18.5 | 11 | 26 | 11.3 | 21.3 | 14.2 | 6.1 |
| 2010-11[@] | 20.8 | 13.5 | 23.1 | 13.4 | 26.9 | 15.2 | 23.8 | 13.8 | 6.4 |
| 2011-12* | 13.4 | 11.6 | 21.8 | 14.6 | 19.5 | 13.6 | 22.3 | 12.2 | 6.2 |

*Note: [#]refers average over the period; [@] Revised Estimate; * Budget Estimate*

*Source: State Finances: A Study of Budgets of 2011-12*

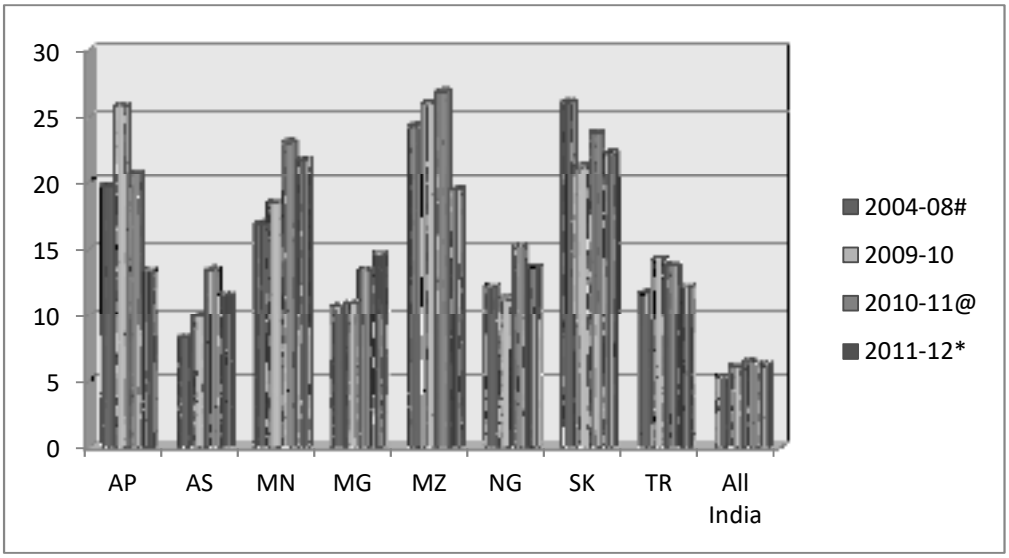
The table 3 gives an overview of social-sector expenditure as percentage of GSDP. It is found that all the North Eastern states spend more than the nation as a whole on social sector as a percentage of GSDP. All India figure shows the nation spends around 5 to 6.4 per cent of its GDP on the social sector, whereas, North Eastern states recorded the lowest percentage of 8.3 (Assam) to the highest of 26.9 per cent (Mizoram). Similar to the pattern of social sector expenditure per capita, Mizoram, Sikkim and Arunachal Pradesh and Manipur prioritise social sector by spending relatively higher proportion of GSDP on it. Throughout the period, social-sector expenditure, in terms of percentage of GSDP, was the lowest in Assam relative to other seven states. Three states, viz., Meghalaya, Nagaland and Tripura, witnessed percentage share of about 10 to 15 per cent of GSDP to social sector (depicted in Figure 4).

But, the fact is that in spite of the huge public investment on social sector, the human development indicators show a contrasting picture. With increase in expenditure on social services and rural development on per capita basis and as a percentage of GSDP, some states particularly Arunachal Pradesh and Manipur witnessed vicious category of human development, which indirectly indicate the quality of governance mechanism in these states. Further, Assam has been continuously witnessing poor expenditure pattern on social sector front either in terms of per capita expenditure or share of GSDP that has slowed down the level of human development of the state. These findings justify the premise that Government policies and expenditures also influence human development. Allocation of resources to improve human development depends on total public sector expenditure and its share to the human development sectors. The relative position of Sikkim and Mizoram both in expenditure and development front supports the strong positive linkage of human

development with social sector expenditure. However, to justify the premise that higher public expenditure on social sector is a pre-requisite to better human development we have regressed human development Index on social sector expenditure in the following sections.

**Figure 4**

**Proportion of Social Sector Expenditure in GSDP across North Eastern States**




### 3.3 Efficacy of Social Sector Expenditure in Determining the Level of Human Development in North East India

Relevant literature regarding efficacy of social sector expenditure on human development suggest that there is a positive functional relationship between public expenditure on social sectors and human development. Higher public expenditure on social sector is a prerequisite to better human development (Subramanian, 2003; Borbora, 2010; Ranis et al. 2004). Due to increase in per capita social sector expenditure, the purchasing power of the people will increase through multiplier effect which will improve their capability by promoting good health and education.

It is supposed that present level of human development depends more on successive lagged values of social sector expenditure than the current level. It is in this respect the present study trace out both long run and short run relationship between variables taking current HDI as dependent variable.

### 3.3.1 A Co-integration between HDI and Per Capita Social Sector Expenditure- Long Run Analysis

Johansen Co-integration test and Vector Error Correction Model have been applied to test both long run and short run association between HDI and per capita social sector expenditure (PCSSE).

For long run relationship Johansen co-integration test has been applied after making the series stationary taking first difference and specifying the optimal lag structure as one. Johansen co-integration procedure is used applying no intercept and trend in specified co-integrating equation.

$$\varepsilon_t = (HDI - \beta PCSSE)$$

For stationary test, the results shows that null hypothesis of unit root are accepted for all variables in the level form. However, it is rejected for all variables in the first differenced form. Our test results show that all variables are stationary at first differenced form, i.e, integrated of order one I(1). Thus, all the variables included for the test have the same order of integration. These results are discussed in table 4. The results of Augmented Dickey Fuller (ADF) allow us to move to the co-integration method to estimate the long run relationship that is presented in table 6.

**Table 4**

**Augmented Dickey-Fuller Test Results for Unit Root**

| Variables At Level | With Drift ADF- Statistics | Variables At First Difference | With Drift ADF- Statistics | Results |
|---|---|---|---|---|
| HDI | 10.13 | ΔHDI | 41.18* | I(1) |
| Per capita SSE | 0.603 | Δ Per capita SSE | 25.43** | I(1) |

*Notes: 1) * and **indicate significance at 1% level and 5% level*

2) *Akaike Information Criterion (AIC) is used to select the optimum lag length*

To specify the lag structure we employed Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC), to investigate the optimal lag length. The appropriate lag length of the VAR is three (see table 5).

**Table 5**

**VAR Lag Order Selection Criteria: Endogenous variables: HDI and Per Capita SSE**

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 146.8688 | NA | 4.01e-07 | -9.054302 | -8.962694 | -9.023937 |
| 1 | 247.8525 | 183.0328 | 9.35e-10 | -15.11578 | -14.84095 | -15.02468 |
| 2 | 253.4794 | 9.495476 | 8.48e-10 | -15.21746 | -14.75942 | -15.06563 |
| 3 | 269.0352 | 24.30596* | 4.16e-10* | -15.93970* | -15.29844* | -15.72714* |
| 4 | 269.6262 | 0.849569 | 5.23e-10 | -15.72664 | -14.90216 | -15.45335 |
| 5 | 273.0988 | 4.557793 | 5.56e-10 | -15.69368 | -14.68598 | -15.35965 |

Source: Calculated by the Author

The results from the Johansen co-integrated test (both Trace test and Max Eigen value test) are presented in table 6. The empirical results show that there exists one co-integrating equation at the 0.05 level. It suggests a long run relationship between the variables.

**Table 6**

**Johansen Unrestricted Co-integration Rank Test**

| Hypothesized No. of CE(s) (Ho) | Trace Statistc | 5% Critical value | Maximum Eigen Statistic | 5% Critical value |
|---|---|---|---|---|
| None* (r=0) | 31.96 | 20.267 | 27.96 | 15.89 |
| At most one (r≤1) | 0.095 | 3.991 | 0.095 | 3.991 |

Note: (a) 'r' indicates number of cointegrating equation

(b) Trace statistic and Maximum Eigen statistic indicate one co-integrating equation at the 0.05 level

(c) * indicates rejection of the hypothesis at the 0.05 level

### 3.3.2 The Short-Run Dynamic Model for Social Sector Expenditure

In present study the following Error Correction Model (ECM) is established using the optimal lags structure as suggested by lag selection criteria (AIC).

$$\Delta HDI_{it} = \gamma_1 \Delta HDI_{it-1} + \gamma_2 \Delta HDI_{it-2+} \gamma_3 \Delta HDI_{it-3+} \beta_1 \Delta PCSSE_{it-1} + \beta 2 \Delta PCSSE_{it-2+} \beta_3 \Delta PCSSE_{it-3} + \delta_2 ECT_{t-1} + \varepsilon_{it}$$

Where, $\Delta$ denotes the first difference operator, $\varepsilon_{it}$ is a random error term, and $ECT_{t-1} = (GRRT_{t-1} - \beta\ NIHDI_{t-1})$, that is, the one-period lagged value of the error from the co-

integrating regression. The results in the table 7 show that the estimated value of Error Correction Term (ECT) is about (-0.012) with (t = -1.77) which is significant with theoretically correct sign. It indicates that 1.2 percent of the disequilibrium in the determination of HDI is corrected immediately i.e. in the next year. Therefore, the null hypothesis of no long-run causality from per capita SSE to HDI is rejected at 10 percent level. In the estimated dynamic error correction model, the coefficients of lagged changes in HDI are positive and significant at 1 percent level successively which show that the changes in successive previous periods in HDI positively affect on short-term changes in HDI itself. It may reflect that the phenomena of human development cannot be treated as the result of present period decision regarding capability expansion only rather on previous decision as well. Another finding of the analysis is that the previous period's changes in per capita public spending on social sector in the form of health, education and rural development also affect the human development attainment positively in short run. However, public spending in recent past, i.e., Per capita $SSE_{it-1}$ and Per capita $SSE_{it-2}$ has turned out to be insignificant. The coefficients of third lagged changes in HDI are positive and significant at 5 percent level. This suggests that the impact of changes in PCSSE on the determination of human development index works through transmission lags. This may be due to the reason that the increase in volume of the public spending on social sector including social services and rural development take gestation period to transmit facilities to enhance human capability. Other studies also find positive and causal relation between social sector spending and human development (Razmi, 2012).

**Table 7**

**Results of Short run Error Correction Model**

| Dependent Variable $\Delta HDI_{it}$ | | |
|---|---|---|
| Explanatory variables | Coefficient | t – statistics |
| $\Delta HDI_{it-1}$ | 0.490759* | 3.52873 |
| $\Delta HDI_{it-2}$ | 0.425836* | 3.36987 |
| $\Delta HDI_{it-3}$ | -0.192181 | -1.56173 |
| $\Delta$Per capita $SSE_{it-1}$ | -5.900784 | -0.72680 |
| $\Delta$Per capita $SSE_{it-2}$ | -22.36656 | -1.01580 |
| $\Delta$Per capita $SSE_{it-3}$ | 24.71357** | 2.15761 |
| $ECT_{t-1}$ | -0.011571*** | -1.76873 |
| $R^2 = 0.34$ | F- statistics = 3.86 | DW statistics = 2.26 |

Note: *, **and *** indicate level of Significance at the 1%, 5% and 10% respectively

Source: Author's Estimation based on Secondary Data

## 4. Conclusion

It is, therefore, imperative that any attempt at enhancing capability of the people in the region calls for investment not only in economic sectors of the economy, but also equally important is that investment should be made in the various social sectors too. The socio-economic components are having positive role in determining the level of human development in the region. Economic performances, in terms of per capita income, urbanisation rate and agricultural production, is found to be crucial for the expansion of human capability. Social indicators have also played positive role in determining the level of human development in the region. Moreover, higher level of human development in the region has been found to be the product of accumulated benefits that accrue to the states from public expenditure on social sector too. The government expenditure on health facilities and education facilities as well as on rural development improves people accessibility to good health and education which ultimately enhances the level of human development. Capability deprivation itself negatively influences human development and capability expansion positively affects human development. Therefore, policies and programmes are to be formulated in such a way that economic growth should strengthen the expansion of human capability and human capability expansion through social sector expenditure should be one of the pre-requisites to determine the level of sustainable human development in the region.

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