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Threshold Dynamics of Public Expenditure on Human Development: Reflections from India

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Abstract

The study investigates how changes in public expenditure affect human development across India and its six distinct regions (North-Eastern, Northern, Western, Southern, Eastern, and Central) using Hansen's panel threshold regression model. Analyzing data from 1999–2000 to 2018–19, the research uncovers significant differences among regions in the threshold impacts of public spending on human development. The results for pan India, North-Eastern, Central and Southern regions exhibit a singular threshold impact, meaning that exceeding this very threshold level may not positively influence human development and could lead to fiscal imbalances. In contrast the Northern, Western and Eastern regions illustrate no threshold effect. Furthermore, the study identifies that the optimal expenditure threshold is higher for the North-eastern region (81.9%) compared to the Central region (77.2%) and Southern region states (68.4%), reflecting higher expenditure requirements to enhance human development levels. In the case of combined data of all regions (pan India), the optimal level exists at (80.5%), indicating effective government measures in education, entrepreneurship, and health. The findings highlight the diverse impact of budgetary policies on human development across Indian regions, emphasizing the need for policymakers to consider regional differences in social infrastructural needs while formulating budgetary strategies. Recognizing the varying optimal expenditure levels is crucial for addressing long-term budgetary imbalances and promoting sustainable development initiatives.

Keywords: Public expenditure; human development; threshold; fiscal policy; asymmetric non-linear relationship.

JEL: H50, O15, C24, E62, O23

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Introduction

A robust nation represents a blend of advantages, necessitating the simultaneous fulfillment of diplomatic international boundaries and the provision of essential social infrastructure to its citizens i.e. health, housing and education. In the current global landscape, the paramount focus lies on fostering sustainable development across nations worldwide. Therefore, both emerging and developed nations are collaboratively striving to enhance human development indicators as a foundation for achieving the Sustainable Development Goals (SDGs). Now, in order to bolster human development in countries, a critical priority involves the enhancement of fiscal policy instruments, where public expenditure emerges as a pivotal strategic tool (Gupta et al., 1998).

Human capital is regarded as the heart of the nation; at present, the welfare of mankind is the main focus of the government in countries all over the world. The economic policy structures of the country are acting as the lungs, holding the whole working mechanism; which would further ensure the effective directions for the smooth functioning of the nation. The role of government spending is to promote the human development of a country's citizens along with the country's economic progress. Managing economic growth and human development on a sustainable foundation is always a priority, especially for emerging countries like India. Here comes the ultimate importance of public expenditure, which is seen as a vital instrument in the hands of governments (Sharma et. al., 2022). The economic expansion merely shows the enhancement in the production of goods and services, and therefore rises in per capita income, and may not always lead to an upgrade in human development, which is generally defined to encompass not just the consumption of goods and services, but also access to the fundamental requirements necessary for maintaining a constructive and socially fulfilling life (Ghosh, 2006; Sharma et. al., 2022).

At present human wellbeing is one of the most important indicators for assessing the human development levels of any nation. This concept has emerged as a measure of well-being worldwide. In line with the Human Development Report of the United Nations, (UNDP 2015), *"human development focuses on expanding people's choices and the richness of human lives".* Human development promises people's well-being and so as happiness, but they are separated in the ways that they have chosen to realize these promises. In all of this, economic growth is required but not solely sufficient for the achievement of human development levels. Economic growth shows only the pathway for desired human development, "*growth is the means, not the end itself"* is the popular tagline of development economics (UNDP 2020). Human development is the advancement of people through the enhancement of human capabilities and through active participation in the processes that affect their lifestyles. Dr. Mahbub ul Haq and Dr. Amartya Sen conceptualized the concept of human development, which emerged in the late 1980s and early 1990s. Human development prioritizes people over economic growth and wealth, whereas economic growth is the wealth-viewed meaning of growth, therefore, growth is a means to an end rather than an end itself. A country's government would ensure economic growth to protect its people's rights and to provide certain fundamental services and amenities such as national defense, police, public health, education, roads,

electricity, and other critical infrastructures, etc. As the saying goes, excess of everything is harmful- and this holds true in the present context as well. Excessive public spending can hinder human development levels and this can lead to inflation and a misallocation of resources when projects are politically motivated. High taxes to support spending may reduce economic activities, while persistent deficit financing can result in a burdensome public debt, limiting the government's crisis response capabilities. Balancing necessary public spending with fiscal discipline is vital for human well-being (Ahuja, & Pandit, 2020).

As the first step in this approach, India started to emphasize on its people's quality of life. India's development strategy now includes ease of living as the next step approach (Kapoor & Debroy, 2019). It has been observed that growth has been steady, placing the country among the fastest-rising economies in the world. Talking about the human development status, we are still struggling to achieve the desired goal. Further to capture the micro picture, Indian regions are taken into consideration individually. As a result, the current study is conducted to assess the impacts of public expenditure on human development where a threshold level is being assessed at the regional level.

Accordingly, the current study aims to investigate firstly, whether an asymmetric non-linear relationship exists between public expenditure and human development in India or not. Secondly, if such a relationship exists, then the study seeks to determine the optimal level (threshold) of public expenditure. For the same Hansen's (1999) advanced panel threshold regression model is used. Further, to delve into a more granular perspective, the study takes into account six distinct regions of India namely, Northern, Western, Southern, Central, Eastern, and Northeast. It is assumed that the optimal level of public expenditure may vary among these regions based on their economic factors, density, employment, topography, government policies, socio-economic conditions, and other factors. Thus, both these objectives are also examined across these six Indian regions.

The structure of the paper is as outlined below: Section 2 offers a thorough review of the research regarding any potential connections between public expenditure and human development. The research methodology, model formulation, and variables used for the study are all covered in Section 3. Then sections 4 and 5 analyze the empirical results and the discussion of the study which is explained in detail. Finally, the conclusion and policy implications as well as the study's future scope are the last part i.e. section 6.

Review of Literature

Human capital is a vital component for economic growth in countries. The economic theory known as endogenous growth theory contends that, the internal variables—such as the creation of knowledge, technological innovation, and human capital accumulation are much more important rather than just external variables like capital accumulation and advancement in technology. These are the main forces behind long-term sustainable growth. Endogenous growth theory emphasises the significance of internal dynamics within an economy, in contrast to the previous neoclassical growth theory, which focused on the influence of external variables like population expansion and technological advancement. The theory was popularized by economists Paul Romer and Robert Lucas in the late 20th century (Goldin,

2016). It was highly acknowledged that public expenditure as an input has a significant impact on achieving economic growth and human development levels in the country. The federal spending by the government is affirmed to be an essential responsibility of the nation (in order to achieve the ultimate vision of human welfare), and it has been observed that government expenditure has a positive association with the country's economic growth as well as human capital development levels (Sen, 2000; Suri et al. 2011; Kumar, 2020).

In human development index, the first concept is the core social phenomenon and is considered as *health is the greatest wealth* for any nation. The relationship between health and well-being is the most documented one among the past literature and undoubtedly health has evolved into the most important concept of the present as well as future decades (Preston, 1975; Fogel, 1994; Pritchett & Summers, 1996; Casas, et al., 2001; Pellegrini, 2009). The state of health plays a substantial role in the growth and development process. A study for the developed countries was conducted in the year 2004 by Nobel Prize winner (Economics) Robert Fogel; he demonstrated that health plays an important role to achieve human development levels. His research on how nutrition affects human development was one of his most important achievements; in 1993, he was granted the Nobel Prize in Economic Sciences in recognition of this work. By proving that advances in nutrition and health were both important causes and effects of economic growth, Fogel's study refuted traditional thought. He emphasized the role of human capital in economic growth by demonstrating how investments in public health and nutrition may improve productivity and economic outcomes. The nexus between human growth, health, and economic success has been profoundly impacted by Fogel's work overall. His studies stated that the health and nutritional status of the countries have a positive impact on the per capita GDP and human capital development levels of the countries. Furthermore, a disease control program that allows previously undeveloped areas to be populated and developed will increase output and employment (Fogel, 1994 & 2004; Pineda, 2012). On the other hand, some studies raise the issue in both developed as well as developing economies, the issues related to health parameters are found to be different in both types of economies of the world. The developing economies are facing poor sanitation and a lack of access to safe drinking water are major issues causing illness and the number of people is increasing, not decreasing facing such problems in developing countries. The shortage of these facilities has far-reaching consequences on the health and wellness of the developing world's economies. Therefore, substantial government expenditure is required to ensure the provision of all these services. Whereas on the other side, lifestyle diseases are the most common health issues prevailing in developed nations. The health care facilities have a positive influence on human development level and this has resulted in almost every study mentioned (Gupta & Damania, 2004; August & Sorkin, 2010; Edeme, 2014; Wekullo et al. 2018; Adamczyk, et al, 2019; Ruzimaa and Veerachamy 2021; Behera & Dash, 2020). Furthermore, the current literature highlights the significance of health care and human development, which are still very much in the spotlight given the epidemic that the globe has experienced currently (Mukherjee et al., 2020; Mohanty & Behera, 2023).

The second dimension of human development covered knowledge, the other most significant parameter, calculated via education criteria within the nation's environment. *Education is a way of life* therefore, the educational enhancements are very important to improve one's quality of life. However the numerous provision and social benefits at the individual, societal and global levels are associated with this knowledge parameter at large. Education enhances productivity and creativity, fostering entrepreneurship and driving technological progress (Myrdal, 1968; Sen, 1999). Education enhances employment, productivity and earnings levels. Moreover, the knowledge base among human capital is the primary engine of growth and a disparity in the level of education among human beings is the primary source of disparities in living standards between nations. The new growth theories attempted to demonstrate that with the development of human resources, the achievement of an optimal and self-sustaining path is possible (Sen, 1999; Rajkumar and Swaroop, 2008).

Sen explained in the development debate that education is the primary end and primary means of development and enlarging human freedom, which in turn empowers people to make choices and live lives they have reason to value (Sen, 1999; 2000). Therefore, people's abilities and skills improve as a result of education and training, propelling them to the forefront of a country's economic and human development levels (Agarwal & Panda, 2007). Chattopadhyay and Jha et al. investigated the impact of public spending on education, health and other development activities on poverty reduction in India in 2007 and 2014; they revealed that public spending on education is beneficial to poverty reduction in India and education attainments lead to enhancing the level of employment as well. They continued by stating that public spending on higher education is more effective in reducing poverty because it provides people with immediate income-earning opportunities and that the government should spend more on higher education than on overall development in order to reduce poverty in the country. In a developing country like India, education policy must prioritize basic school infrastructure in order to promote economic growth (De & Endow, 2008; Cooray, 2009). An educated society is either developed or developing. It progresses steadily toward economic, social and infrastructure development, striving to address the financial and social needs, of all of its citizens. With education, individuals secure employment and confidently embrace scientific and technological advancements. This leads towards high levels of per capita income as leading to higher living standards and a higher quality of life (Kumar et al., 2020).

The third very dimension is the standard of living or can say income levels. "*Wealthier is healthier*" has long been a known slogan over the years. Wealthier nations can afford better health and education facilities to the citizen at large (Pritchett & Summers, 1996). Many studies supported this connection between economic well-being and human development. The study by Mays and Smith in the year (2011) examined that better facilities can increase productivity and therefore can lead to sustainable development. Pink et al. (2014) described it as a straightforward metric that integrates life expectancy, education, and per capita income to rank countries according to their Human Development levels. Later in 2015, Lenuta examined the potential connection and proposed a correlation

between a nation's income and Human Development. A path goes from national income towards human development. Then in 2016, Mohapatra and Giri discovered a noteworthy positive long-term influence of economic well-being on human development in India. The study suggested the major scope in the area of human development in the coming times. Consequently, the primary focus of human development is to achieve sustainable human development, which stands as its foremost objective (Anand & Sen, 2000). The latest studies were done by Biswas and Chakraborty, 2017 Ogboru et al., in 2018, Omodero & Dandago, 2019 and Ruzima & Veerachamy, 2021 proposed that public expenditure has a positive influence on human development through infrastructural provisions and social services. According to the findings, public policies on health and education and income enhancement have significant positive impacts on the economic growth and human development levels of the country.

At present, the emerging market economies (including India) are facing a huge shift in government spending. For more than two decades, the increasing government spending through public investment has created a space for significant improvements in national income and human development (Mukherjee & Badola, 2021; Sharma et al., 2022). Moreover, the regional pattern of growth provides an estimate of the quality of public policies, implementation and their impact on macroeconomic welfare. The various facets of the growth experience of states in India are critical for developing an understanding of the growth pattern. On the other hand, the situations on the development platform may differ from state to state and country to country. However, public issues in each revolve around the same fundamental matters (economic welfare, equity and social justice). Furthermore, if we talk only about India three issues were being raised *viz.*, fiscal, infrastructure and human resources development (World Bank, 2000; Aahluwalia, 2000; Gordon, 2010; Mkandawire, 2011).

To the best of the authors' knowledge, no studies have previously explored the asymmetric nonlinear relationship between public expenditure and human development for India and its various regions. To address the gap, we attempted to shed light on the asymmetric nonlinear relationship between public expenditure and human development for India and its various regions (namely, Northern, Western, Southern, Central, Eastern and Northeast). While previous studies have made substantial contributions, they have not addressed the potential threshold level of public expenditure on human development. Our research diverges from existing literature by examining the potential threshold impact on the relationship between public expenditure and human development in India, analyzing its various regions individually.

Research Methodology

In the present investigation, the panel threshold regression model is used to examine the impact of public expenditure dynamics on human development levels. The panel threshold model is chosen because in it the individual observations can be split into various categories depending on the value of a continuous observed variable (i.e. expenditure in this case) unlike the Ordinary Least Square regression model which is identical across all observations in the selected data set. Adding to this, the model is also used when the value into which the sample is to be divided is unknown (Hansen, 1999; Hansen, 2000;

Greenidge et al., 2012; Khanna et al., 2016). In addition, this model also investigates the characteristics of panel data by enabling the coefficient to vary at random across time and cross-sectional groups (Hsiao, 2003 & Khanna et al., 2016). The investigation is carried out using the open-source software-gretl 1.10.1.

Variable and Data Sources Used

In the present study, three variables are employed - outcome variable, threshold variable and control variable.

Here the outcome variable is human development for which the Subnational Human Development Index (SHDI) is used as a proxy. Though there are many aspects to measure human development, however, UNDP's Human Development Index is the most widely used measure worldwide. Talking about HDI and its calculations, it is a geometric mean of the normalized indices in individual dimensions measuring the welfare and achievement of countries and different regions in three specific dimensions of human well-being: namely health, education, and standard of living. First, life expectancy at birth is determined by taking the average number of years a newborn can expect to live. Second, mean years of schooling are calculated by averaging the number of years of education received by adults in the population. Third, expected years of schooling are estimated based on the current enrolment rates for children and the duration of education. These three components are then adjusted to a scale between 0 and 1, with higher values indicating higher levels of human development. Finally, the HDI is obtained by taking the geometric mean of the normalized values and this index provides a comprehensive measure of human development (Pineda, 2012; Permanyer & Smits, 2020; Assa, 2021; Sharma et al., 2023 & 2024). Further, in order to explore the asymmetric threshold effect on human development, public expenditure (ratio of development expenditure by total expenditure) is used as the threshold variable (Chindengwike & Tyagi, 2022). Also it is evident from the literature that the investment component, i.e. Gross Fixed Capital Formation, has an impact on the country's human development; but being interested only in investigating the effects of public expenditure on human development, Gross Fixed Capital Formation serves as the control variable to strengthen the model's fitness (Gibescu, 2010; Meyer & Sanusi, 2019).

Let's talk about the variables used along with its computation and data sources utilized; for the threshold variable; Public Expenditure (PE), the ratio of capital expenditure by total expenditure (total expenditure=capital expenditure+ revenue expenditure) has been used. For the dependent variable, Human Development (HD), Subnational Human Development Index (SHDI) has been used and for the control variable, Capital Formation (CF), Gross Fixed Capital Formation (GFCF) has been taken as the measure. The data sources mostly used here are the Reserve Bank of India (RBI) for Public Expenditure (PE) and Capital Formation (CF) whereas the United Nation Development Program (UNDP) website and the global data lab (GDL) database altogether have been used for Human Development (HD).

Sample

The prevailing study utilized data for India and its various regions from fiscal year 1999-2000 to 2018-2019. Furthermore, these states have been first grouped together to form a pan-India panel and are also categorized into six

main regions as per the State Reorganization Act of 1956. These regions are:

1. North-Eastern Region (Assam, Meghalaya, Nagaland, Tripura and Manipur).
2. Northern Region (Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana and Rajasthan).
3. Western Region (Maharashtra, Goa and Gujarat).
4. Southern Region (Karnataka, Kerala, Tamil Nadu and Andhra Pradesh).
5. Eastern Region (Bihar, Jharkhand, Orissa and West Bengal).
6. Central Region (Uttar Pradesh, Uttarakhand, Chhattisgarh and Madhya Pradesh).

For this research, statistics for UTs, as well as four states namely, Telangana, Mizoram, Arunachal Pradesh and Sikkim, were missing; so they have been dropped.

Objective

The study pursues two primary objectives: firstly, to examine the presence of an asymmetric non-linear relationship between public expenditure and human development across India, and secondly, if such a relationship is identified, to ascertain the optimal threshold level of expenditure. This involves identifying the value from where the increased expenditure may cease to positively impact human development and could potentially contribute to fiscal imbalances. The second is to test the same for six different Indian regions.

Model

The advanced panel threshold regression model proposed by Hansen (1999) has been utilized in order to obtain the response of public expenditure (PE) on human development (HD) (equation 1).

$$y_{it} = \mu_i \beta_1 PE_{it} I_{it}(PE_{it} < PE^*) + \beta_2 PE_{it} I_{it}(PE_{it} > PE^*) + \theta C_{it} + e_{it} \quad (1)$$

$$y_{it} = \mu_i \beta_1 (1 - I_{it})(PE_{it} - PE^*) + \beta_2 I_{it}(PE_{it} - PE^*) + \theta C_{it} + e_{it} \quad (2)$$

$$I_{it} = \begin{cases} 1 \; if \; PE_{it} > PE^* [PE_{greater} = I_{it}(PE_{it} - PE^*)] \\ 0 \; if \; PE_{it} < PE^* [PE_{less} = (1 - I_{it})(PE_{it} - PE^*)] \end{cases} \quad (3)$$

Further, Hansen's (1999) model was modified in the work done by Greenidge et al. in 2012 (equation 2). In the above equations, the subscript indexes i and t are used for the individual state and time respectively; y_{it} is the outcome variable - SHDI for sub-nations/ states; θC_{it} represents the controlled variable i.e. capital formation, the input variable PE_{it} is the public expenditure as well as the threshold variable PE^*. Furthermore, the residual e_{it} has a normal distribution with a mean of zero and a finite variance and is independent in nature: $\therefore (e_{it} \sim N(0, \sigma^2)$.

I_{it} is a dummy variable that assigns the value one when the threshold is higher than PE^* and zero else (equation 3)

Here, the interpretations are split into two regimes based on the value of the threshold variable PE_{it}, i.e. whether it is higher or lower than the threshold level (PE^*): β_1 is estimated when the expenditure is lower than the threshold level, and β_2 is estimated when the expenditure exceeds the threshold level (Khanna et al., 2016).

After that, to identify the value of PE^* an exploration is done over the range 0.001-9.999, in increments of 0.001, i.e. the expenditure threshold is amongst the succeeding values of PE^* (0.001, 0.002, 0.003...0.999). The optimal point of threshold expenditure is chosen based upon the minimum Sum of Squared Residuals (SSRs).

The model is built on the assumption of a particular threshold effect, and to ascertain whether or not that threshold effect is statistically significant (at that specific value), the following null hypothesis is tested:

H_0:β_1=β_2 (i.e. there is no threshold, PE^*= 0)

The model (from equation (2)) becomes equation (4), under the null hypothesis of no threshold. As this model is designed for non-dynamic panels with individual-specific fixed effects, so after applying the fixed effect transformation, equation (4) becomes equation (5), in which the regression parameter β_1 estimated by utilizing OLS, generating the SSRs i.e.

$$S_0 = e'_{it} \sim N(0, \sigma^2)$$

$$y_{it}=\mu_i+\beta_1 PE_{it} + \theta C_{it} + e_{it} \quad (4)$$

$$y'_{it}=\beta_1 PE'_{it} + \theta C'_{it} + e'_{it} \quad (5)$$

Thereafter, Hansen (1999) computes the likelihood ratio (equation (6)) to estimate the threshold level and test against the null hypothesis (H_0). In which S_0 and $S_1(PE^*)$ are SSRs, under H_0:PE^*= 0 i.e. without a threshold effect (from equation (5)) and H_1=$PE^*\neq 0$, i.e. with a threshold effect respectively; and σ^2 is the residual variance under H_1. Hence, S_0 is SSR without a threshold effect and $S_1(PE^*)$ is SSR with a threshold effect (from equation (2)).

$$F_1 = \frac{S_0 - S_1(PE^*)}{\sigma^2} \quad (6)$$

Here F_1 has a non-standard distribution and depends on the moment of the data set, the critical values cannot be determined (Hansen, 2000). So, he simulates the empirical distribution of the likelihood ratio test statistic and uses the *p*-value constructed from a bootstrap technique. In the bootstrap technique, the first bootstrap sample is constructed by adding a random resample residual e'_{it} to the dependent variable y'_{it} (from equation (5)). Thereafter by using this, hypothesis equation (2) is estimated and a bootstrap value of the likelihood ratio statistic-F_1-is calculated (from equation (6)).

The mentioned bootstrap sample is replicated 10,000 times, and the proportion of iterations where the bootstrap-derived likelihood ratio statistic surpasses the observed value is calculated. The bootstrap estimate of the asymptotic *p*-value for F_1 under H_0 is given here. Therefore, if the p-value falls below the designated critical value, we reject the null hypothesis positing no threshold effect.

The significance level for all tests is established at 5%.

Hypothesis of the study

The study intends to examine the asymmetric non-linear relationship between public expenditure and human development for pan India and for six different regions separately (namely, Northern, Western, Southern, Central, Eastern and Northeast). Thus, the following hypotheses are tested here:

H1: Public expenditure has an asymmetric non-linear relationship with human development.

The above hypothesis has been examined for pan India as well as for the six different regions independently.

H2: There is an inter-regional variation in the effect of public expenditure on human development.

These hypotheses were tested against the null hypothesis, which posits that no relationship exists between the dependent

(human development) and independent variables (public expenditure).

The statistical significance for all hypotheses has been established at a 5% level.

Data analysis and results

The results of the analysis for India as a whole and the panel of six regions are discussed in this section.

To test for the existence of a threshold effect, the asymptotic *p*-value for *F*1 is computed for all the values of expenditure threshold (0.001, 0.002, 0.003...0.999), in all the seven cases (pan India and six regions). The optimal level of threshold (*PE**) is preferred when the asymptotic *p*-value for *F*1 is less than the desired critical value and the SSR is the smallest.

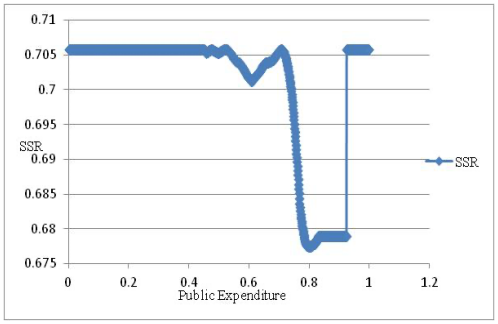
Figure 1 depicts the relationship of the SSR as a function of the expenditure threshold, with the point at which the SSR is lowest being the threshold level.

Figure 1 shows the sum of squared residuals as a function of public expenditure.

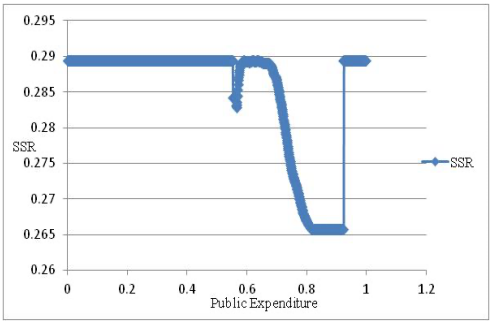
The graphs in Figure 1 (a) (b) (c) & (d) shows that a single threshold effect of expenditure ratio on human development has been found in the case of pan India (80.5%), northeastern (at 81.9%), central (at 77.2%) and southern (at 68.4%) regions meaning that there is an asymmetric non-linear relationship between expenditure and human development (rejecting the null hypothesis of Hypothesis 1), whereas a symmetric linear relationship is observed for the northern, western and eastern region cases; showing that there is no threshold effect between public expenditure and human development (failing to reject the null hypothesis of Hypothesis 1; Figure 1 (e) (f) (g)).

Further, Tables 1 and 2 show how the region's public expenditure and capital formation (independent variables) affect human development (dependent variable).

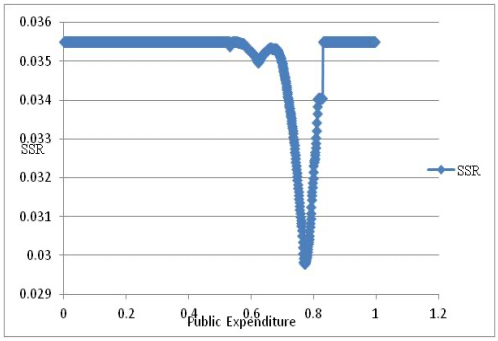
Table 1 shows that the expenditure ratio has a direct relationship with human development in the northern, western, and eastern regions. A symmetric linear relationship can be seen in all of these cases (where we fail to reject the null hypothesis of H1). On the contrary, an asymmetric non-linear relationship of public expenditure with human development is observed in the case of pan India, the northeastern region, the central region, and the southern region (from Table 2) (where the null hypothesis H1 is rejected). A threshold exists at 80.5% for pan India, 81.9 % for the north-eastern region, at 77.2 % for the central region and 68.4 % for the southern region of India. Thus, splitting all the observations into two regimes, suggests that increasing the expenditure ratio beyond the threshold value (80.5%, 81.9 %, 77.2% and 68.4%, respectively) would have no effect or a negative impact on human development and would just add to the existing level of the debt burden; as a result, the country may begin to suffer from debt overburden. So, an optimal expenditure ratio exists for the southern region at 68.4%, the central region at 77.2%, the northeastern region at 81.9%, and for Pan India at 80.5%, respectively. Here, it is also seen that an inter-regional variation exists in the effect of budgetary decisions on human development (the null hypothesis of Hypothesis 2 is rejected). The northeastern region has a high threshold level of expenditure (at 81.9%) in comparison to the threshold level of the central region (at 77.2 %) and the southern region (at 68.4%) respectively.



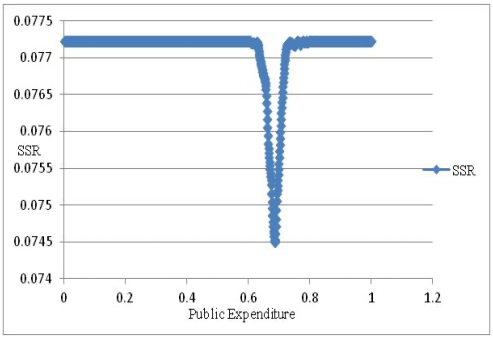
(a) Pan India



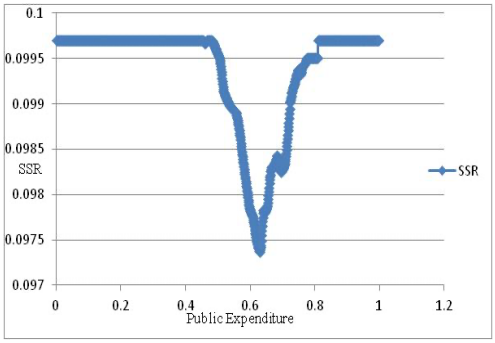
(b) Northeastern region



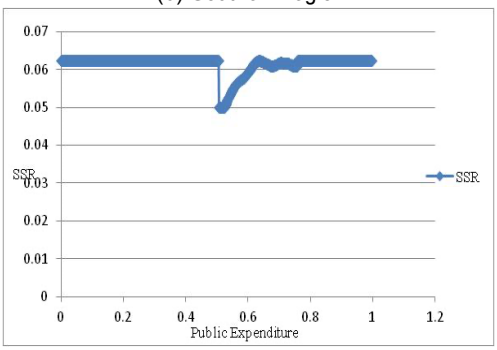
(c) Central region



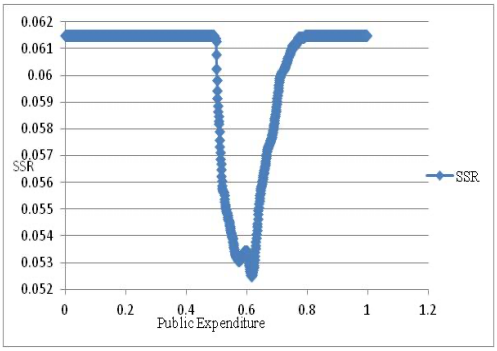
(d) Southern region



(e) Northern region



(f) Western region



(g) Eastern region

Table 1. Regression estimates of Northern region, Western region and Eastern region (where threshold does not exist)

	Northern region states		Western region states		Eastern region states	
Independent variable	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
Const.	0.330535	5.97e-012 ***	0.393820	1.02e-08 ***	0.278279	8.75e-013***
Public Expenditure ratio	0.396639	1.02e-07 ***	0.310805	0.0008 ***	0.389444	4.26e-011***
Capital Formation	0.0006752	1.86e-010 ***	0.000150	1.82e-08 ***	0.000167	0.0033 ***

Note: *** indicates that the values are significant at 1%.

Source: Authors' calculation

Table 2. Regression estimates of pan India, Northeastern, Central and Southern region (with a single threshold existence)

Pan India @ 80.5%, Northeastern region @81.9, Central region @77.2, and Southern region @68.4

	Pan India @ 80.5%		Northeastern region @ 81.9%	
Independent variable	**Coefficient**	**Probability**	**Coefficient**	**Probability**
Const.	0.644059	0.0000 ***	0.689103	3.79e-047 ***
PEless	0.473339	2.11e-033 ***	0.582341	9.74e-05 ***
PEgreater	-0.984746	0.0024 ***	-1.25194	0.0319**
Capital Formation	0.000202	9.78e-020 ***	0.000803	0.1595
	Central region @ 77.2%		**Southern region @ 68.4%**	
Independent variable	**Coefficient**	**Probability**	**Coefficient**	**Probability**
Const.	0.552699	1.33e-062***	0.556849	9.31e-061***
PEless	0.247962	0.0008 ***	0.344231	0.2239
PEgreater	-0.834061	0.0037***	0.834598	0.9869***
Capital Formation	0.000513	1.86e-011***	0.000272	0.0002***

Note: ***indicates that the values are significant at 1%.

Source: Authors' calculation

The results for northern regions including western and eastern regions, illustrate no threshold effect in any manner. Furthermore, the results indicate that, despite of the region to which the state belongs, capital investment has a direct connection to human development (as expected).

Discussion

Since independence, the Indian economy has been undergoing constant transformations in different sectors. The government has launched many programs to strengthen India especially investments in the social sector, which aims to enhance people's capacities, providing them with higher labor productivity, which in turn, promotes economic growth as well as people's quality of life i.e. human development (Sinha et. al., 2022). To rebuild better, government has launched several measures targeted at increasing people's monthly average income as well as living

standards. Some among them include Mahatma Gandhi National Rural Employment Guarantee (2006), Pt. Deen Dayal Upadhyaya National Rural Employment Guarantee (2006), Prime Minister's Employment Generation Programme (2008), Aajeevika-National Rural Livelihoods Mission & National Urban Livelihoods Mission (2011), Pradhan Mantri Jan Dhan Yojana (2014), Make in India (2014), and Grameen Kaushalya Yojana (2014), Pradhan Mantri Mudra Yojana (2015), Stand up India Scheme (2016) etc. These schemes are beneficial for providing employment assurances, fostering investment measures, labor reforms, land acquisition amendments, socio-economic equalities, gender equality, insurance provisions, microcredit benefits (small and medium-sized scale industries), and entrepreneurial expansion, etc. Furthermore, it has been seen that the boost obtained from these development projects leads to a rise in human development levels in the country (Sathiyan & Panda, 2016). In recent years, India has progressed from a low to a medium human development index (HDR, UNDP 2021). However, India still has a long way to go in order to reach the very high category of human development.

The results demonstrate that there exists an asymmetrical relationship for pan India (80.5%) (from Table 2) and a regional variation has been found in the effect of government expenditure on human development. It is evident that public expenditure requirements differ for each state and as a result, separate state governments are executing initiatives from the grassroots level (Meyer et al., 2011; Hota & Behera, 2019).

Starting with the Northeastern region, the results showed that there exists a threshold effect of public expenditure at 81.9% at which human development is optimum; beyond this level, the expenditure done by the government will not give productive results at all (on human development). Further, a direct relation has been found between public expenditure and human development, below the threshold levels also.

The northeastern region is still characterized as one of India's backward regions due to poor per capita income, lack of private-sector investment, limited capital formation, insufficient physical infrastructure and remoteness. Let us focus on the region's demography; it was exposed that the region is rich in human capital, with a literacy rate that is significantly higher than the national average. Nevertheless, the majority of the people in this region live in rural regions (excluding Assam). Even when we look at the GGI, we could see that it has a comparative disadvantage. As a result, the EODB is found less in this particular region especially, meaning that the companies/businesses are less likely to establish themselves locally in this very region (RBI, various handbooks of statistics on Indian states, 2015, 2016 and 2017). However, the region has a tremendous potential in terms of tourism, small-scale enterprises, and hydroelectric power, which has yet to be utilized for the region's progress.

Many initiatives have been taken by the government to ensure the region's smooth and trouble-free development, one of them is the State Tribal Sub-Plan (TSP), besides this special central assistance has been provided to the majority of the states under initiatives of the Ministry of Development of the North Eastern Region (DONER). Certain initiatives have already been put into action by the central government, such as the Self Help Groups (SHGs), North East Rural Livelihood Project (NERLP), Rural Business Hubs (RBH) and National Bamboo Mission (NBM) being

established to boost up the sustainable livelihood and incomes of the localities. Other development projects like 'HIRA','Digital North East Vision 2022' and 'Make in Northeast', which emphasizes Digital Infrastructure, Digital services, Promotion of IT and ITes including BPOs, Innovation & Startups and Cyber security in the region (Ministry for Development of the North-East Region report, 2022). These programs envision excellent rural products like as handloom, handicrafts, agro products, herbal items, bio-fuels, and so on finding a market and competing against products from large and established corporations (Hussain & Kalita., 2015; Ministry of DoNER and the North Eastern Commission report 2021).

Thus, it could be said that the government is on its front foot to build up the region in every aspect. However, the region has still a huge requirement of public expenditure which is at its highest level of threshold point i.e. 81.9%, meaning that it needs the highest development expenditure compared to the other regions. It indicates that there is an enormous requirement for developmental expenditure in NER.

Now coming to the central region of India, the results revealed that there is a single threshold effect of public expenditure at 77.2 %, at which human development is optimum. A direct relationship between public expenditure and human development has been found below the threshold level. Starting with the demographic characteristics of the central region, it has a high density of population, while the density per sq km is less than the national average (exceptions are Uttar Pradesh). Other significant demographic indicators include a large rural population and a low literacy rate (except in Uttarakhand) (Census of India 2011, 2021). Furthermore, in terms of GDP per capita, this area is grouped with the bulk of impoverished states (excluding MP). However, this region is India's largest producer of vegetables. Talking about the state of Utter Pradesh (the largest state of the region in terms of people and size), the FDI inflows and merchandise exports, are found good and fast improvements have been evident from GGI and FDI inflows (11th rank in India) (Department for Promotion of Industry and Internal Trade (DPIIT) report, 2021). Therefore, the state is on the right path to achieve growth and development. Further, if we talk about Madhya Pradesh; agriculture is the most important source of income for the people here; it is the highest producer of pulses. The primary sector's contribution has been seen from the expansion of the textile industry, cotton and silk production enterprises. The region has also taken several sector-specific initiatives to encourage specific sectors IT & ITES, dairy, electronics, tourism, manufacturing, renewable energy, and agro-food processing firms/businesses to establish within the region (especially in UP and MP, somewhat in the state of UK and CT as well). Secondly, this region has a large number of SEZs (13 functioning SEZs and 24 legally approved SEZs). Nevertheless, GGI showed improvement in the region that is above the national average rank, and EODB also scored well in this region (RBI, various handbooks of statistics on Indian states, 2015, 2016 and 2017). On the other hand, in the states of Uttarakhand and Chhattisgarh (constituted in 2003), the per capita GDP is found low there. As a result, in comparison to others, these states are younger and are still fighting to compete with the established ones.

Talking about the Southern region of India, the result showed that there exists a single threshold effect of public expenditure at a

68.4 % level, at which human development is optimum. The region shows a direct relationship between public expenditure and human development lower than the threshold level. Now coming to the democratic characteristics of the region, the per capita GDP is found good in most of the states of this region. The average decadal growth rate of the population is less than the national average. The literacy rates are higher than the national average in southern states (excluding Karnataka and Andhra Pradesh; Kerala and Tamilnadu come under the top performer states) (Census of India 2011). However, the states have improved their position in some socio-economic metrics like literacy rate, GGI and per capita GDP; whereas poverty remains the issue affecting the region during the last decades (much like the rest of the country), although it has considerably decreased over the years. On the other hand, the coastal zone of this region is performing well in the area of tourism and additionally, the IT & ITES industries have been flourishing in this region (since the last decade). Besides this, the region has 60% of operational SEZs. Furthermore, the Sagarmala project of GOI provided an improved industrial trade platform (import & export) not only to the region but to the country as a whole (Malik, 2013; CII, 2014; Report on Sagarmala (Vol.I), Ministry of Shipping, Indian Ports Association report, 2016). Moreover, the EODB and GGI indices are found very high in this very region (the exception is Kerala) (CII, 2014, 2017, 2018). Therefore from the results, it could be concluded that the expenditure done by the government has a positive impact on human development. The region got the lowest public expenditure requirement to attain human development levels as compared to other regions (at 68.4 %).

On the other hand, for the northern region there exists no threshold of public expenditure at which human development is maximum; instead, a positive linear relation of expenditure is seen. Starting with the characteristics of the region, the average decadal growth rate of the population is greater than the national average (excluding Himachal Pradesh and Punjab); the per capita GDP of the region is above the national average (excluding Rajasthan); the economy is predominantly agrarian here. The literacy rate of the region is found to be above the national average (excluding Rajasthan and Jammu Kashmir). Besides this, the GGI shows better results for the region that is above the national average rank (excluding Jammu Kashmir) (Census of India 2011; RBI, various handbooks of statistics on Indian states, 2015, 2016 and 2017). Further, the region is characterized by mostly rural living populations in hilly areas, as well as in the area of Rajasthan (excluding Haryana and Punjab), also the density per sq km is less than the national average (exceptions are Haryana and Punjab). Consequently, the EODB is also found less in this very region (exceptions are Haryana and Rajasthan). Further, if we talk especially about the states of Haryana and Punjab, it is evident from the statistics that these states are the agricultural base of India and they've shown better performance in the green revolution as well (in the 1960s and 70s) but the decline can be traced in the last two decades where GDP per capita, child mortality rate, farmer suicide along with the sex ratios have become the critical issues (Census of India, 2011, 2021). Therefore, for these reasons, the government has introduced various initiatives to directly promote human development. These include the National Skill Development Program (launched in 2008), Pradhan Mantri Kaushal

Vikas Yojana (2015), Pradhan Mantri Yuva Yojana (2016), and Self-Help Groups. All of these programs receive financial assistance through the MUDRA scheme to provide initial business funding for startups. As a result public expenditure is showing a positive association with human development in this region; however, a lot of growth programs are still required to uplift the region in terms of human development. The government should come up with more policies related to agriculture and horticultural development for the region (especially for Jammu and Kashmir and Himanchal Pradesh). This will not only improve the economy but will also result in human development. Further, these states should also set up more industries, small and medium-scale enterprises and enhance tourism potential within them.

Coming to the western region of India, the result shows that there exists no threshold effect of public expenditure at which human development is maximum; instead, a positive linear relation of expenditure is seen. Starting with the demographic distinctiveness of the region; a density per sq km is more than the national average and the average decadal growth rate of the population is less than the national average (excluding Gujarat). The average literacy rate of these states is around 83%, which is higher than the national average. The length of roads is greater than the average of the country (excluding Goa). Consequently, the EODB (other than in Goa) and GGI are high in this very region (Census of India 2011). The per capita GDP in this region is higher as compared to the other regions of India. The region contributes around 24% of the national GDP and about 23% of the tax revenue of the country. In this region, most of the people are engaged in agriculture work, besides the fact that services account for largest share of the total GDP of the region. All these factors show that the region is economically sound whereas the present results showed no threshold impact of public expenditure on human development. The reason could be due to the socio-economic imbalances due to the rich-poor gap in the prevailing states (mainly in Mumbai (Maharashtra).

Therefore, the threshold level has not been found among public expenditure and human development in this region till now. The policy makers of the region are facing policymaking challenges of refinement of socio-economic disparities (poor-rich gap). The government should come up with more policies related to agriculture and MSME programs to cope with the challenges. This will progressively enhance the economy and will also affect human welfare surroundings within the region.

Talking about the Eastern region of India, the results portray no threshold effect of public expenditure and yet again a linear direct relation of expenditure has been seen with human development. This region lags behind in all the development indicators like per capita GDP, birth and death rates, infant mortality rate, literacy rate, life expectancy, etc. as compared to other major regions/states of India (Basu & Maertens, 2007; Economic survey, 2018). Moreover, this region has a high density of population with a larger amount of rural population (Census of India 2011, 2021). Additionally, this region has a high density per sq km and a high decadal growth rate of the population as well (especially in Bihar and Jharkhand). Besides, having good EODB (excluding Bihar) ranking, the region is still not able to attract business maybe due to a poor GGI (RBI, various handbooks of statistics on Indian states, 2015, 2016 and 2017).

To improve the conditions of the people living there, the government is investing a lot

on policies like the self-help groups (SHGs), Garib Kalyan Yojna, Fasal Bima Yojna, Kaushal Vikas Yojana, Land Reform policies and Mid Day Meal program to uplift the growth parameters in the region. Talking about Orissa and West Bengal, these two states are endowed with immense natural resources viz., fertile soil, plenty of water, good rainfall and minerals. If we talk about Bihar, there is an agricultural base and around 80% of the population is employed in agricultural production (higher than the national average). While, it was once classified as a BIMARU (non-performing) state, it has since made significant strides in overcoming these challenges, fostering its own development over time. Public expenditure shows a positive association with human development in this region; however, a lot of growth programs are still required to uplift the region.

Conclusion

Human development serves as an indicator of a nation's overall wellbeing, emphasizing the importance of prudent fiscal policy decisions by governments. It is crucial for policymakers to be mindful of the threshold for public expenditure, beyond which an increase in expenditure may no longer positively impact human development and could potentially contribute to fiscal imbalances. This article builds on fiscal policy literature by incorporating Hansen's (1999) threshold model to recognize the influence of public expenditure on human development.

The study reveals that a fixed threshold is found for India (80.5%), indicating a direct relationship between public expenditure and human development, primarily because governments' overall policies related to health improvement, education enhancement, and entrepreneurship expansion have impacted the overall human development level. India has a diverse social-economic and political environment, showing the high public expenditure requirements to attain human development. On the other hand, the effects of public expenditure on human development vary across the six regions (the North-Eastern, Central and Southern regions exhibit a single threshold impact, while the Northern, Western and Eastern regions show none). Notably, the North-Eastern region has a higher threshold (81.9%) compared to the Central (60.5%) and Southern (50.7%) regions. This is due to the diverse social, cultural, geographical, and political environments across regions, which result in varying public expenditure requirements and consequently, differing the effects on human development. The authors are suggesting that the government policymakers seek an optimal expenditure level balancing benefits with human development up to a certain point. However, such a correlation is not observed in the results for the Northern, Western, and Eastern regions.

Policymakers should tailor policies to the diverse social, cultural, and economic characteristics of each region. Kerala's focus on education levels and Karnataka's emphasis on research and development, particularly in the information technology sector, highlight successful regional approaches. Additionally, investing in infrastructure projects proven to positively impact human development is crucial. Learning from Gujarat's implementation of region-specific policies, such as the Sardar Sarovar Dam and industrial corridors, provides valuable insights. Further, regular monitoring of regional economic dynamics, exemplified by Maharashtra's proactive stance, is essential for informed policy adjustments in response to evolving conditions and insights.

India has also learned that spending too much in the past (as it was seen in late 1980s and early 1990s) leads to problems like inflation and high debt, hindering private investment. Another instance of this was seen in the state of West Bengal; in the late 1970s and early 1980s, West Bengal pursued policies that involved significant public spending, including subsidies and social welfare programs. This led to fiscal imbalances, high debt, and economic challenges for the state. At present the state of Kerala is going through the same situation once again. So, to avoid this, policymakers should prioritize fiscal discipline to avoid excessive public expenditure and high fiscal deficits.

Therefore, in pursuit of maximizing the level of human development, policymakers should make cautious decisions for financing strategies and their implementation especially focusing on its regional and inter-personal disparity. To resolve these issues, an important tool in the hands of policymakers seems to be the provisioning of social infrastructure. The effect of public expenditure decisions on human development levels has also shown inter-regional variation. We believe it could explain the micro levels progress to India in SDGs (Sustainable Development Goals) proposed by the United Nations. Another interesting topic would be to figure out the root cause of inefficiencies in different regions. As a result, depending on the state and recognizing the optimal expenditure ratio, policymakers will be able to articulate the appropriate investment policy based on the necessities and specifications of the state/ region in order to meet the overall goal of human development.

However, it is essential to keep in mind that this research is specific to India, and the results may not be generalizable to countries with different economic structures. The study also acknowledges the limitation, such as relying on nominal values of variables and does not take into consideration the varying accounting practices in Indian public finance. Moreover, it draws attention to the potential for diverse perspectives in research that categorizes nations based their economic structures, such as capitalist and socialist. Further, as it is widely known that many nations grapple with substantial financial obligation, so future research could explore the public debt threshold. Additionally, delving into the consequences of public spending decisions on human happiness would enhance our understanding in this domain.

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