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Is Public Health Expenditure Converging? Evidence from the North Eastern States of India

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Abstract

The notion of convergence was established since the neoclassical Solow growth model (1956) which indicates that countries with similar economic features eventually drive to a steady-state. There may be an increase or a decrease in income, however, with time, the state's income will come to a steady-state, or in other words, the states will converge. Likewise, public expenditure may increase or decrease depending upon the requirement and capacity of the states; but will ultimately converge. Unquestionably, a vast difference exists among the states and countries in terms of total expenditure and income (GSDP) given the economic potential, capacity, and requirement of the states. The north eastern states (NES), in particular, share a similar economic and social feature which is therefore anticipated that the public spending pattern among the states will be analogous. However, the results derived from the analysis were contradictory to our expectations. Methodology: Given the two prominent methods of convergence; σ- convergence and β- convergence, the study has used this method to analyze if public health expenditure among the NES is converging and that if the dispersion in public health expenditure among the NES is lowering down during the period from 1990-91 to 2015-16. Findings: the difference in per capita health expenditure, with Mizoram at Rs 2414 and Assam with Rs 563 in the year 2015-16, has therefore made the results of σ- convergence, and β- convergence obvious. The cross-sectional dispersion in the proportion of health expenditure to GSDP is found to lower down, hence σ- convergence is observed. However, the dispersion in per capita health expenditure was found to grow with time, hence, no σ- convergence. Also, there is no β- convergence in per capita health spending however, the divergence was insignificant.

Keywords: North Eastern states (NES), σ- convergence, β- convergence.

1. Introduction

India has attained a high growth rate in the recent decades but this growth has not been able to bring much change in the disparity among the regions and the states within its boundaries. There is a vast difference among the states in terms of Gross State Domestic Product (GSDP) and the differences occur due to several economic, political, social, demographic factors. Throughout the development process, several technological changes take place which the states either develop at a faster rate and the reverse on the states with limited technological advancements. The idea of convergence was initially developed by Solow in 1956; in essence the model predicts that the initially poorer countries grow at a faster rate than the initially rich countries and eventually catch up to richer countries. This prediction is based on the principle of diminishing returns to capital and assuming similar parameters

across the countries; the countries which start at a higher level of state of technology will automatically grow at a slower pace and on the other hand, the initially poor countries will catch up by growing at a faster rate. This is termed as convergence or specifically β convergence. Another type of convergence is the σ convergence which detects the dispersion among the data or states. It thus shows that if the states are getting to a steady-state, it would show a declining standard deviation among the states and hence possess σ convergence, or else the reverse would depict no σ convergence.

One of the main recommendations of the World Bank is the maintenance of 15% of a country's total budget to the health sector (WHO 2010). On considering the importance of health and easing the burden in less developed or developing countries, external assistance was made a rational option. However, external assistance for health has remained as low as 4.7% of total health expenditure in the less developed countries or developing countries (including India) [Durairaj& Evans (2010)]. Health is doubtlessly a necessity for human well-being and overall development, the improvement in health status in a country requires augmenting of public health expenditure. However, public health expenditure in India has remained at a more or less constant proportion of the GDP in recent years. Berman and Ahuja (2008) observed that before 2005, public expenditure on health had shown a declining trend; the cause behind the decline was found to be the States' share and not the Centre's allocation. Out of the total health expenditure, the Government health spending was 22.5 percent in 2004-05 and increased to 30.6 percent in 2015-16 (National Health Estimates for India 2015-16).

The Sample Registration System (2016) categorized Indian states into two –21 bigger states, 9 smaller states in which the majority of the NES are included (excluding Assam), and 6 union territories. Given the format of categorization, it is apparent that the states are not comparable unless they are from the same category. The income inequality among the states (within the same category) has been documented and several studies have found growing inequality and divergence in income distribution among the states. Nagaraj, Varoudakis &Veganzones (1998) found the Indian states are highly unequal in terms of income, infrastructure, and institutional arrangements. The inequalities in India have grown over the years since 1960 wherein the per capita State Domestic Product (SDP) of Maharashtra was always found to be three times larger than the poorer state, Orissa.

The growth of income of a state highly depends on its initial growth level; the growth of per capita SDP and the initial level of income are positively correlated. Post-liberalization, the divergence in the income among the states was found to be significant. Therefore, it is expected the states with identical development and growth should converge to a steady-state (Rao, Shand &Kalirajan, 1999). At the sub-national level, the per capita income showed diverging trend except in the periods with structural breaks (Kalra &Sodsri Wiboon 2010). Several works of literature have also brought to light the presence of inequality and divergence in incomes among the Indian states-[Shingal (2014); Shahzad & Abdul (2010); Bandyopadhyay (2011); Mohanty (2011); Deshamukhya& Roy (2016); Lolayekar& Mukhopadhyay (2020].

Several studies have pointed out the vast difference in public health expenditure among the Indian states regardless of the various efforts towards improving the healthcare system. The possibilities for improving the healthcare system begin with increasing the health expenditure in the states. However, given the vast economic differences among the Indian states, health expenditure is exceptionally

dependent on the Gross Domestic Product of the states. Expectedly, states with higher GSDP have higher health expenditure than the states with lower GSDP [Rao and Choudhury (2008); Srinath, Kotasthane, Kher, Chhajer (2018)]. Therefore, there is also a high correlation between GSDP and health expenditure. There exists a high inter-state variation in public health expenditure although the implementation of the National Rural Health Mission has brought about an improvement in the delivery of health services that have improved health indicators and coverage [Hooda (2015); Hooda (2013)].

2. Significance of the study

The NES, in particular, comprised of eight states, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. The majority of the NES are small category states, except for Assam. Being categorized as small category states, the states are featured with limited capacity for revenue generation, low revenue base, and limited infrastructural development. In the presence of weak economic factors, the northeastern states are highly dependent on central funds and grants for carrying out even the regular activities in the states. Notably, major studies on convergence have excluded NES as the states are incomparable with the rest of India. Therefore, given the similar economic conditions (low Gross Domestic Product, low per capita income, constant revenue account, limited revenue-generating capacity, low revenue base) prevailing in the states; the study was initiated to analyze if health expenditure in the northeastern states is converging or diverging. Through this study, we believe that, it will disclose the importance placed by the governments towards health spending. Another significance of the study is that, it will provide defensible arguments regarding the need to keep tabs on neighboring states that will assist government's spending pattern.

3. Literature review

It is worth noting that the notion of convergence was initially developed to analyse income convergence among the states. Several studies in the Indian context have analysed income convergence and found a highly unequal income among the Indian states. Club convergence was however established due to obvious economic and even social reasons [Rao, Shand & Kalirajan (1999); Kalra & Sodsriwiboon (2010); Bandyopadhyay (2011); Lolayekar & Mukhopadhyay (2020)]. Later, the theory was extended towards analyzing convergence in public expenditure. In the Indian context, following the differences in the GSDP of the states, a divergence in expenditure or an insignificant convergence is expected [Mohanty (2011); Shingal (2014); Deshamukhya & Roy (2016)]. In contrast to the no convergence state in the Indian context, the growth of income and public expenditure was found to converge among the OECD countries [Long (1988); Sanz & Velazquez (2001); Starke, Obinger & Castles (2008)].

Public health expenditure forms the base beyond which better health outcomes could be attained. Given the health status of India, public health expenditure forms the first and foremost element to achieve growth and development. However, public health expenditure varies across the Indian states as different studies have substantiated the existing reality. Rao and Choudhury (2008) in the study on inter-state equalization of health expenditure in the Indian Union have found that per capita health expenditure across states has a significant positive correlation with per capita GSDP. The analysis also shows that the correlation has shown a steady increase from 0.75 in 1995-96 to 0.88 in 2003-04

before declining marginally to 0.86 in the next year. Over the years, the inequality in per capita health expenditure across states has created an increasing trend which shows the failure of the spending mechanism to equalize public expenditures on healthcare services. Rao and Choudhury, (2012) have found that India's health expenditure has remained stagnant over the years which has caused low heath status while analyzing the UNDP-Human Development Index, NSSO, and NHA-Infant Mortality Rate, Maternal Mortality Rate, and Life Expectancy ratio. In addition, there is high fiscal imbalance among the states and a wide disparity in total health expenditure and per capita health expenditure. Although programs were implemented, yet a wide gap exists between the actual spending and the required spending.

The implementation of the National Rural Health Mission 2005 has led to an improvement in the delivery of health services. Through the decentralization of healthcare agencies, health indicators and coverage was evident. Although the objective of increasing health expenditure to 2-3percent of GDP remained unaccomplished due to non-utilization of funds to the required level; this resulted a huge gap between the required level of health expenditure and the actual level (Hooda, 2013). There is also a high inter-state variation in public healthcare expenditure across the states. The responsiveness of healthcare spending is sensitive (with elasticity less than one) to change in the per capita income of the state. The fiscal capacity and participation of people in politics in a particular state and health policy reforms such as the NRHM 2005 have played a significant role in positively influenced public healthcare expenditure. However, the study finds that the demographic factors are less likely to influence the healthcare spending in the states (Hooda, 2015). Srinath, Kotasthane, Kher, Chhajer (2018) found that India spends only 1.41percent of its GDP on health and allied activities in 2005-06 which further increased to 1.62 percent in 2010-11 and eventually reduced back to 1.4 percent in 2014-15. There is a high correlation between per capita health expenditure to per capita GSDPs and the states with poor health indicators continue to have low levels of per capita expenditures. Inequality between states in health outcomes has increased over the years. The Centrally Sponsored Schemes on health and allied fields has substituted States' own expenditure on health instead of stimulating the states' own expenditures on health.

Given the literature on the application of convergence theory, a number of literatures have also analyzed convergence of public health expenditure in the Indian context and abroad. Mahal & Rajaraman (2010) finds the mean share of development expenditure to health and education expenditure in India has remained stable throughout the period 1960-61 to 2006-07. However, the mean of cross-state share shows large variation among the states but the share to development expenditure does not vary. The mean of the cross-state shows no tendency for convergence. Purohit (2012) in the analysis on the convergence of health expenditure in the Indian states has found a wide difference among the special category states and non-special category states of India. In terms of health expenditure as a percentage of the total state's expenditure, the results found a convergence in the non-special category states with the speed of convergence at 2.208 for the period 2005-06 and 2.033 for the period 2010-11. On the other hand, there was divergence among the special category states. Per capita revenue expenditure was found to converge among the rich states while statistically insignificant for the poor states.

Garg (2015) examined the convergence of per capita public expenditure on education, health, and development expenditure in the states of India using the Baro and Martin σ and β convergence

technique. There is a vast difference in state expenditure pattern which causes high disparity among the Indian states. The σ and β convergence has found a conditional convergence in the expenditure and health expenditure was found to converge quicker than education and development expenditure. Additionally, total transfers and discretionary transfers were found to have a positive association with the components. σ convergence has also added towards the results wherein there was a declining standard deviation which therefore supports conditional β convergence. However, in the sub-periods, there was a declining inequality only in the total and development expenditure, whereas education and health expenditure were rather diverging in the sub-periods. Youkta & Paramanik (2020) has found two club convergence among the Indian states; however, Bihar was found to be the only state that does not converge along with any of the two groups of states. The per capita health expenditure has not converged over the years.

Nixon 1999 has used σ-convergence and β-convergence to analyze the presence of convergence of health expenditure in the European Union. Initially, the σ-convergence technique has found a convergence of health expenditure among the European Union witnessed by the declining standard deviation of the share of health expenditure to GSDP from 32.2 during the period 1960 to 16. 3 during the period 1995; and per capita health expenditure, from 50.23 during the period 1960 to 30.61 in 1995. This convergence was possible as several countries reduced their health spending and few increased and therefore retain the EU mean. There was also both absolute and conditional convergence among the Union without a significant difference among the low-income countries and higher-income countries.

Chen (2013) in the analysis on the convergence of healthcare financing in 9 OECD countries (Austria, Finland, Iceland, Ireland, Japan, Norway, Spain, the United Kingdom, and the United States) firstly found that there has been an overall increase in health expenditure in all the countries. Most importantly, the share of public healthcare financing has shown a remarkable share with 78% post-1990. There were several structural breaks in different countries that clearly depict the major changes in the economic structure such as post-war, oil-crisis period, privatization, globalization which has therefore caused a significant change in the public expenditure pattern. Nonetheless, in terms of convergence, United States has been kept as the benchmark, and the majority of the countries excluding Spain have experienced a convergence in healthcare expenditure.

Pan, Wang, Qin& Zhang (2013) have examined the existence of disparities ad convergence of government health expenditure in China. The declining standard deviation and coefficient of variation of government health expenditure in China depicted σ convergence. The cross-provincial deviation was high pre-2004 and has dramatically declined post-2004. The F- test has found that government health expenditure possessed σ convergence post 20004 and the tendency for convergences was quicker than the GDP of the Chinese provinces. There exists a strong negative correlation between the initial level of expenditure and the average growth of health expenditure which therefore allows for β convergence to be carried out. The analysis has found the non-existent absolute convergence such that health expenditure was found to be unequal with an annual rate of 5.57%.

The idea of convergence was initiated to see how economies with similar parameters move towards a steady-state. The NES are assumed to share similar characteristics and are in close proximity of each

other in terms of geographical location. However, the literature has not provided a significant study on the northeastern states in particular though they have been examined as a group belonging to Special Category which included other states not belonging to the NE region. Therefore, we intend to fill this gap in the study by analyzing if public health expenditure in the states of the region is converging or diverging.

4. Objective of the study

- To find the cross-sectional difference in health expenditure across the NES
- To examine β- convergence across NES

5. Hypothesis of the study

- There is σ- convergence in per capita health expenditure and the proportion of health expenditure to GSDP
- There is β convergence in per capita health expenditure and the proportion of health expenditure to GSDP

6. Data and Methodology

Given that the NES of India became full-fledged states in different years post 1947, the development and growth of the states differ vastly from other states of India. For instance, the latest state Mizoram became a full-fledged state in 1987. Therefore, the present analysis has taken into account the period from 1990-91 to 2015-16 due to the availability of data for all states post-1990-91. The period has also witnessed certain fluctuations in terms of macroeconomic and fiscal structure which therefore provides us the incentive to find that over the period, how public health expenditure pattern progressed across the states. The data on public health expenditure has been taken from the Reserve Bank of India, State Finance Reports 1992-93 to 2017-18. The GSDP current data has been taken from the series 1980-81, 1993-94, 1999-00, 2004-05, and 2011-12 of the Central Statistics Office. A constant GSDP was then constructed using a deflator to construct the real public health expenditure. The population data has been taken from census reports of 1981, 1991, 2001, and 2011.

Table 1(a). Descriptive statistics of per capita health expenditure (1990-91 to 2015-16)

States	Mean	Median	Standard Deviation	Kurtosis	Skewness	Range	Minimum	Maximum
Arunachal Pradesh	854.7	767.2	277.6	3.1887	1.74691	1103.4	588.25	1691.6
Assam	173.9	171.3	101.8	7.8791	2.28032	498.62	64.63	563.2
Manipur	491.2	361.8	232.4	0.0750	1.21830	753.40	259.74	1013.1
Meghalaya	528.4	471.6	153.7	0.4712	1.28686	540.12	366.53	906.6
Mizoram	982.9	849.2	515.3	1.1392	1.18469	2066.7	346.99	2413.7
Nagaland	685.3	605.3	339.1	3.5558	1.67766	1591.3	190.24	1781.5
Sikkim	1145.6	1016.	399.9	0.6540	0.83597	1738.9	451.37	2190.2
Tripura	466.9	336.3	257.6	2.8171	1.76224	971.4	252.98	1224.4

Certainly, there are undoubtedly various methodologies for analyzing convergence from which the known methods are regression approach and distributive dynamic approach [Bandyopadhyay (2011) &Magrini (2007)]. However, we have chosen the regression approach: σ and β convergence technique [Barro & Sala-I Martin (1992); Martin (1995); Nixon (1999) & Rao, Shand &Kalirajan (1999); Shingal (2014)] for analyzing if health expenditure in the NES is converging or diverging given the similar economic conditions prevailed. σ convergence is a basic cross-sectional technique, wherein convergence across the states is observed if the coefficient of variation or standard deviation is declining over the years. On the other hand, β- convergence is a regression technique wherein we find if the initially poorer states are catching up with the richer states. Note that the necessary condition for σ convergence is the existence of β convergence [Martin (1995)] which is the reason that these two estimates are required to test the existence of convergence of a data set. These two approaches have been taken as an improvement to adopting the coefficient of variation. [Rymbai &Thangkhiew (2020)] has employed the coefficient of variation to point out the differences and inequality in health expenditure among the states. However, the method is not statistically sufficient to draw a significant conclusion on the inequality of health expenditure among the states.

The approach of the study follows the following sequence. First of all, we have found the per capita health expenditure and the share of public health expenditure to GSDP. Secondly, the σ-convergence method was employed to find the cross-sectional difference in health expenditure across the NES. The steps for constructing the indexed score of per capita health expenditure are referred to as the methodology used by Nixon 1999. Firstly, we take the means of per capita health expenditure across the states for different years. Secondly, to calculate a suitable multiplier, the method used is 100/mean for all years. Thirdly, the multiplier is used to find the indexed score of per capita health expenditure for all the states. Lastly, for obtaining σ- convergence, the standard deviation was taken across the states for all years. On obtaining mean equals 100 would fulfil the condition coefficient of variation equals standard value of in indexed values. This therefore avoids misinterpretation of data and also avoid Galton's fallacy.

To statistically test for σ- convergence, a one-sided F-test has been used to test for σ- convergence [Nixon 1999 and Pan, Wang, Qin, & Zhang (2013)]. The method followed are:

- Squaring of the coefficient of variation and standard deviation.
- The F-statistic value= $\frac{CV_{1991}^2}{CV_{1992}^2}$.
- The null hypothesis: $CV_{1991}^2 \leq CV_{2015}^2$
- The alternative hypothesis: $CV_{1991}^2 \geq CV_{2015}^2$ at a 10% level of significance.
- If the null hypothesis is rejected, it would imply convergence
- If the null could not be rejected, it would indicate divergence.

The same method is used by taking logarithm of per capita health expenditure and the proportion of health expenditure to GSDP. On availing the standard deviation, the F-test was carried out further for log per capita health expenditure and the share of health expenditure to GSDP.

The methodology employed for β- convergence is also called 'regression to mean' (Barro & Sala-i-Martin 1995). The method for β- convergence used in the analysis was adopted by [Martin (1995); Rao, Shand &Kalirajan (1999); Nixon (1999); Sanz& Velazquez (2001); Mohanty (2011); Pan, Wang, Qin, & Zhang (2013); Shingal (2014); Garg (2015)]. Martin (1995) has stated that β convergence exists when poorer economies tend to grow faster than the richer economies. The regression equation could be estimated

The β- convergence linear regression is as follows

$$gr^{pche} = \alpha + \beta(lnpche)_{it-1} + \varepsilon_t$$

$$gr^{HE/GSDP} = \gamma + \vartheta(\ln HE/GSDP)_{it-1} + \varepsilon_t$$

Where 'gr' implies growth, pche- per capita health expenditure, HE/GSDP- Proportion of health expenditure to GSDP, ln- natural log, i- states, t-1 denotes time, ε_t- error term.

The hypothesis for β convergence would hold if $\beta \geq 0$ and $\vartheta \geq 0$. On the other hand, a divergence would hold if $\beta \leq 0$ and $\vartheta \leq 0$ (Xavier, Sala-i-Martins 1995). Note that the foundation of the concept of convergence was initially started by Solow 1956, Barro & Sala-I Martin (1992) has extended the method to estimate how economies converge with time. Although the model was originally formulated for estimating income convergence, it could also be extended to study the existence or non-existence of convergence in other longitudinal observations. [Mohanty (2011)]

7. Results and Discussions

Evidently, per capita, health expenditure in the NES has increased over the years (Table 2a). Taking a reference of the year 2015-16, per capita health expenditure was the highest in Mizoram with Rs 2414 and the lowest was in Assam with Rs 563. This depicts a huge difference between the per capita health expenditure in the NES. The plausible reason in the case of Assam is the demography and populace inhabiting the state. Given the census data and while taking a constant population growth for the next 10-year period, we have found that during the period 2015-16, the population of Assam is almost 52 times more than Sikkim. It is probable that per capita health expenditure will differ among the states with different populace.

Table 2(b). Per capita health expenditure in the NES

Year	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
1990-91	612	191	342	482	347	283	451	366
1995-96	694	193	364	422	536	724	1121	253
2000-01	736	159	376	471	871	673	888	288
2005-06	596	65	302	416	750	473	936	435
2010-11	1017	94	761	717	1905	508	1383	546
2015-16	1692	563	889	861	2414	1782	1796	1119

Table 2(b) shows the share of public health expenditure to GSDP. The share of health expenditure to GSDP clearly shows a declining trend. For instance, in the year 1990-91, the highest share was 4.55

percent observed in Mizoram, whereas, the lowest share was 1.21 percent observed in Assam. In the year 2015-16, the highest share was 3.47 percent in Mizoram and the lowest share was in Sikkim with 1.73 percent. Nonetheless, there is no big difference in the share as it ranges between 0.60 – 6.05 percent.

Table 2(b). Share of public health expenditure to GSDP

YEAR	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
1990-91	3.53%	1.21%	2.38%	2.71%	4.55%	4.34%	4.32%	2.94%
1995-96	3.12%	1.17%	2.36%	2.22%	3.12%	3.28%	5.28%	1.85%
2000-01	3.35%	0.97%	2.14%	2.03%	3.68%	2.62%	3.43%	1.57%
2005-06	2.02%	0.69%	1.45%	1.53%	2.59%	1.84%	3.00%	1.57%
2010-11	2.66%	1.20%	3.33%	2.04%	4.28%	1.73%	2.03%	1.39%
2015-16	3.11%	1.96%	2.73%	2.22%	3.47%	2.88%	1.73%	1.95%

Results of the σ- convergence

Table 2(c) depicts the indexed score of per capita health expenditure in the NES. Evidently, the indexed score has been constructed to avoid any imbalance or superfluous difference in the data. Most importantly, this will provide us a standardized data such that our analysis would not be misleading. Clearly, the results for per capita health expenditure depict an increasing standard deviation over the years that imply no σ- convergence among the NES. In addition, the share of the share of GSDP to health expenditure also shows no σ- convergence among the states. Thus, it depicts no equalization of priority on health even among the small category states (Table 2d).

However, the significance of the results required a suitable regression technique after which the σ-convergence results could be considered. Therefore, the β- convergence has been used to find if the divergence of health expenditure among the NES is significant or no.

Table 2(c). Indexed score of Per Capita Health Expenditure

Year	1990	1990	1995	1995	2000	2000	2005	2005	2010	2010	2015	2015
Arunachal Pradesh	611.58	159.18	694.04	128.95	736.49	132.02	595.81	119.96	1016.71	117.36	1691.65	121.75
Assam	190.74	49.65	192.97	35.85	159.31	28.56	64.63	13.01	93.55	10.80	563.26	40.54
Manipur	341.84	88.97	363.66	67.57	375.88	67.38	301.62	60.73	761.12	87.85	888.56	63.95
Meghalaya	481.64	125.36	421.63	78.34	471.02	84.43	416.36	83.83	716.93	82.75	861.09	61.98
Mizoram	347.00	90.32	535.74	99.54	870.63	156.06	750.48	151.10	1904.90	219.88	2413.73	173.72
Nagaland	283.45	73.78	723.91	134.50	673.49	120.72	473.23	95.28	507.82	58.62	1781.57	128.23
Sikkim	451.37	117.48	1120.74	208.23	888.14	159.20	936.11	188.48	1383.24	159.66	1796.21	129.28
Tripura	366.01	95.26	252.99	47.01	288.04	51.63	435.13	87.61	546.44	63.07	1119.13	80.55
Mean	384.20	100.00	538.21	100.00	557.87	100.00	496.67	100.00	866.34	100.00	1389.40	100.00
Multiplier	0.260		0.186		0.179		0.201		0.115		0.072	
SD		31.449		52.664		45.898		50.478		60.941		42.163

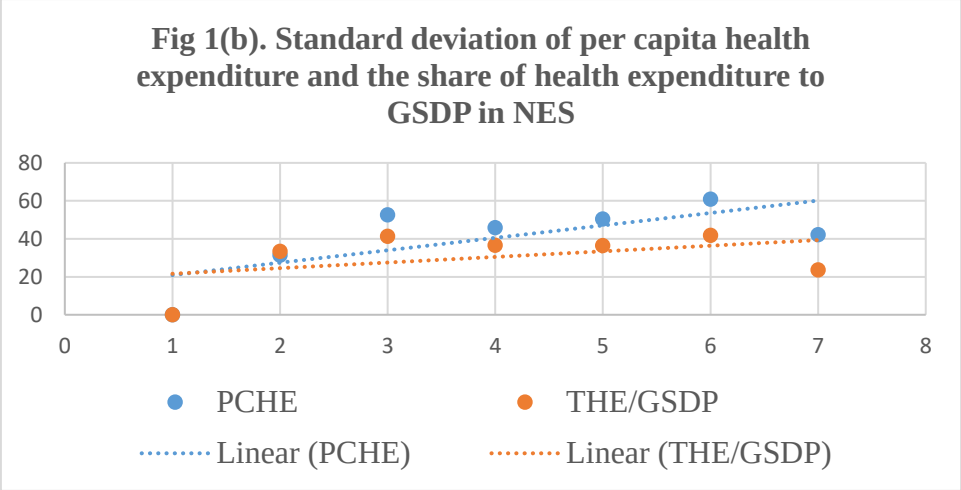
Calculated by Authors

Table 2(d). Indexed Score of the Share of Health Expenditure to GSDP

State	1990	1990	1995	1995	2000	2000	2005	2005	2010	2010	2015	2015
Arunachal Pradesh	0.035	108.749	0.031	111.511	0.033	135.496	0.020	110.027	0.027	114.019	0.031	124.315
Assam	0.012	37.181	0.012	41.718	0.010	39.059	0.007	37.656	0.012	51.371	0.020	78.073
Manipur	0.024	73.173	0.024	84.227	0.021	86.595	0.015	78.943	0.033	142.856	0.027	108.910
Meghalaya	0.027	83.497	0.022	79.220	0.020	82.131	0.015	83.312	0.020	87.376	0.022	88.603
Mizoram	0.046	140.122	0.031	111.368	0.037	148.851	0.026	141.019	0.043	183.644	0.035	138.577
Nagaland	0.043	133.780	0.033	117.099	0.026	105.874	0.018	100.164	0.017	74.052	0.029	114.837
Sikkim	0.043	132.942	0.053	188.682	0.034	138.535	0.030	163.338	0.020	87.037	0.017	68.873
Tripura	0.029	90.557	0.019	66.174	0.016	63.459	0.016	85.542	0.014	59.645	0.019	77.812
Mean	0.032	100.000	0.028	100.000	0.025	100.000	0.018	100.000	0.023	100.000	0.025	100.000
Multiplier	3079.24		3574.38		4044.69		5440.70		4289.67		3992.53	
SD		33.429		41.292		36.596		36.422		41.868		23.587

Calculated by Authors

Clearly, Fig.1 (b) depicts a clear divergence of per capita health expenditure and the share of health expenditure to GSDP among the NES on having an increasing standard deviation. This thus shows a growing inequality existing among the special category states. However, standard deviation on the share of health expenditure to GSDP has reduced in the year 2015. Fig 1(b) also shows the absolute gap widening between per capita health expenditure and the share of health expenditure o GSDP. This thus represents a clear divergence hypothesis (Nixon 1999).



The results however required a statistical test in order to be accepted. Therefore, the one-sided F-test (Nixon 1999 and Pan, Wang, Qin, & Zhang (2013) was applied. The increase in the coefficient of variation or the standard deviation would imply the increasing inequality or divergence among the states. The use of F-test thus helps us to analyze if there was a significant change (increase or decrease) in the variation. The null hypothesis stating $CV_{1991}^2 \leq CV_{2015}^2$ for the proportion of health expenditure to GSDP was rejected at a 10% level of significance. Therefore, this confirms σ-convergence in the proportion of health expenditure to GSDP (Table 2e). Through table 2(d), throughout the different reference period we observed an increasing standard deviation but a fall in the deviation in the year 2015-16. This thus indicates a tendency to converge post 2010-11.

Given that the 14th Finance Commission has laid emphasis on inclusive growth and development that included health as a major element, there is a significant effort to increase health expenditure in the states of India; that includes the Centre and the state. The targets to maintain a certain amount of health expenditure to total budgetary allocation have therefore stimulated the states to prioritize health sector spending.

Table 2(e)- F-test for Coefficient of Variation and Standard Deviation

Year	Per Capita Health Expenditure				Health expenditure/GSDP			
	CV		SD		CV		SD	
	F-stat	P-value	F-stat	P-value	F-stat	P-value	F-stat	P-value
1991-92	0.776	0.613	0.722	0.654	0.893	0.527	1.252	0.313
1995-96	0.357	0.919	0.372	0.91	0.655	0.707	0.965	0.477
2000-01	0.469	0.847	0.343	0.926	0.834	0.569	0.935	0.497
2005-06	0.388	0.9	0.187	0.986	0.842	0.563	0.982	0.466
2010-11	0.266	0.961	0.152	0.992	0.637	0.721	1.05	0.423
2015-16	0.556	0.784	0.523	0.809	2.009	0.094	3.016	0.019

Calculated by authors

Results of the β- convergence

The σ analysis has provided a clear divergence in per capita health expenditure and a converging proportion of health expenditure to GSDP. To substantiate the results of the σ- convergence analysis, the β- convergence analysis is a necessary condition for σ- convergence on which the following

inferences could be drawn. On using the growth-log linear model of β- convergence [Martin (1995)], the coefficient for the overall period (1991-2015) is negative implying no β- convergence in per capita health expenditure but a β- convergence in the proportion of health expenditure to GSDP. However, the convergence was insignificant (Table 2f).

It is expected that the growth of the initially high expenditure or proportion would grow faster than the states with initially lower expenditure or proportion of expenditure. Nonetheless, the notion of convergence states that the growth of the expenditure of richer states grows at a slower pace than the growth of the poorer states. The equation was then estimated for the period 1991-90 to 2015-16 taking a different base year (1991, 1996, 2001, 2006, and 2011) [Nixon 1999].

The estimated model has revealed no convergence in per capita health expenditure across the states although we have taken the different base periods. However, the divergence was not significant. There was a convergence in the period 1996-2015 and 2001-2015 but was insignificant. The proportion of health expenditure to GSDP depicts a convergence in the period 1991-2015 and 2001-2015 but is insignificant. The overall no convergence status thus proves the neoclassical theory wrong, although the NES share a similar economic pattern, yet failed to converge. The results are also in line with the studies of Mahal & Rajaraman (2010); Youkta & Paramanik (2020) which have also established no convergence in health expenditure among the Indian states. Certainly, the NES are subjected to different economic and political instability which thus causes instability in the allocation of budget to all sectors. Youkta & Paramanik (2020) has pointed out how political factors such as party continuation, political unanimity and centre-state relationship have a significant impact on public health expenditure.

Table 2(f). β- convergence analysis

Year	Variable	Coefficient	P-value
1991-	β	-0.00319	0.955663
2015	ϑ	0.054753	0.514785
1996-	β	-0.00018	0.996354
2015	ϑ	0.076847	0.471738
2001-	β	-0.00047	0.991377
2015	ϑ	0.068786	0.613204
2006-	β	0.046763	0.438514
2015	ϑ	-0.1107	0.606625
2011-	β	-0.0145	0.961937
2015	ϑ	-0.26555	0.57786

Calculated by Authors

On the economic front, a divergence in public spending pattern is no surprise as there is a vast difference in their capacity-building and economic aspects among the NES. There is a huge difference between Assam and the rest of the NES for which the main reason is the exceptional development of the industrial sector, private sector, agriculture, and allied activities existing in Assam; whereas the reverse is observed in the other NES. The revenue-generating capacity of Assam is exceptionally advanced. Remarkably, Assam accomplishes the highest GSDP among the NES and no states could twin with Assam. The majority of the NES primarily depend on agriculture as the

main source of income, however contradicting the increasing income from the tertiary sector (Singh 2009).

8. Conclusion

The NES although categorized as special category states, there are differences in the economic, political, social, and demography aspects. The study was carried on in anticipation that health expenditure in the NES will converge. The results attained from the regression approach were contrary. Firstly, there was an increasing standard deviation in per capita health expenditure, implying no convergence. On the other hand, there was also an increasing standard deviation in the proportion of health expenditure to GSDP but a fall in deviation post 2010-11 implying a tendency to converge. To validate the results of the σ- convergence analysis, the F-test proved the σ-convergence in the proportion of health expenditure to GSDP. The results of β- convergence regression analysis exhibited an insignificant divergence in the per capita health spending. Besides, the proportion of health expenditure to GSDP was also found to converge; however, the convergence was insignificant. The convergence in the share of health expenditure to GSDP was found post 2010-11 which could be due to the recommendation of the 14Th Finance Commission to maintain a certain amount of health expenditure for inclusive growth and development. The overall analysis thus concludes no convergence in health expenditure in the NES, however, a tendency to converge post 2010-11. To the best of my knowledge, this particular work has been done at the national level and others were focused among the big states of India. There has not been done on the special category states (Northeastern states). Although, many other factors determine public health expenditure besides GSDP of a state, we were not able to incorporate in the study which is therefore, the main limitation of the study.

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