International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 5 Issue 6, September-October 2021 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

An Application of Tobit Regression on Socio Economic Indicators in Gujarat

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ABSTRACT

The use of factual estimation frameworks to consider human behavior in a social environment is known as social insights. In this study researcher examined. Socio Economics indicators like Education, Health and Employment in Gujarat he also used Tobit Regression as a statistical tool. It will be found that the most of the Sub Indicators are positively impact on Tobit Regression model.

KEYWORDS: *Tobit Regression, UHDI, Socio Economic Indictors*

How to cite this paper: Dr. Mahesh Vaghela "An Application of Tobit Regression on Socio Economic Indicators in Gujarat" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-5 | Issue-6, October 2021, pp.1-8, URL: www.ijtsrd.com/papers/ijtsrd46309.pdf

IJTSRD46309

1. THE IDEA OF SOCIAL SECTOR AND SOCIAL INDICATORS

Social insights is the utilization of factual estimation frameworks to contemplate human conduct in a social climate. This can be refined through surveying a gathering of individuals, assessing a subset of information perceptions and measurable examination of a bunch of information that identifies with individuals and their practices.

Social specialist have utilized social measurements for some, reasons including

1. The assessment of the nature of administrations accessible to a gathering of individuals.
2. Analyzing practices of gatherings of individuals in their current circumstance and exceptional circumstances.
3. Determining the requirements of individuals through factual testing approach.

Insights and measurable examination have become a critical element of sociology. Insights is of essential significance in every one of the conduct sciences like Economics, Psychology, Political science, Sociology, Education and so on The utilization of measurements is so wide spread in the sociology that numerous establishments, for example, Harvard likewise have created factual organizations which can zero in on the quantitative parts of sociology. In certain spots they have created branches of choice sciences for study and exploration attempts to be executed in various controls.

2. SOCIAL SECTOR

All friendly area measurable exercises for assortment, show and understanding of information at focal and state levels are gathered commonly under the accompanying classifications of characterization. (1) Human Development (2) Education (3) Health administrations (4) Women and kid Development (5) Water supply and Sanitation (6) Rural turn of events (7) Rural Housing (8) Urban turn of events and metropolitan Housing (9) Employment and preparing (10) Welfare of more fragile segments (11) Women Welfare (12) Environment (13) Ecological instruction and so forth

The measurable data under every one of the above heads are gathered, assembled and distributed at state just as at focal levels. Every one of the parts in the above list addresses explicit circumstances and comparing strategies taken by the public authority and they are obviously referenced in the distribution year shrewd.

3. OUTLINE OF ECONOMY FOR ALL INDIA

Gross domestic product at current costs for the year 2012-13 is assessed at Rs.99.9 Lakh crores and that for 2013-14 is assessed at Rs.113.5 Lakh crore. This shows a development of 13.1% and 13.6% during these years. Genuine GDP (i.e., GDP at consistent costs remains at Rs. 92.8 Lakh crores for 2012-13 and Rs. 99.2 Lakh crores for 2013-14). This shows development of 5.1% during 2012-13 and 6.9% during 2014-15 is assessed as Rs. 106.57 Lakh crores, showing a development of 7.4 percent. Per capita at current costs is Rs. 71,593 and Rs. 80,388 for quite a long time 2012-13 and 2013-14 separately. For the year 2014-15 it is assessed to be Rs.88, 538 in this way showing an ascent of 10.1% when contrasted with earlier year. Per capita pay at consistent costs (2011-12) is assessed at Rs. 66,344 and Rs. 69,959 for the years 2012-13 and 2013-14 separately. During the year 2014-15, it is assessed to be Rs. 74,193 in this way showing an ascent of 6.05% when contrasted with earlier year.

4. OUTLINE OF ECONOMY FOR GUJARAT STATE

Net state Domestic Product (GSDP) at factor cost at consistent costs in 2013-14 has been assessed at Rs. 4,52,625 crore as against Rs. 4,16,163 for 2012-13 appearance a development of 8.8% GSDP at factor cost at current costs in 2013-14 has been assessed at Rs. 7,65,638 crores as against Rs. 6,58,540 crores in 2012-13 along these lines showing a development of 16.3% during the year. The portion of essential, optional and tertiary areas has been accounted for as 22.1%, 43.1% and 43.8% separately to add up to GSDP in 2013-14 at current costs. Per capita NSDP at factor cost at steady costs is assessed at Rs. 63,168 of every 2013-14 as against Rs. 59,157 out of 2012-13 in this manner showing a development of 6.8% during the year. Per capita NSDP at factor cost at current costs has been assessed at Rs. 1,06,831 out of 2013-14 as against Rs.93046 in 2012-13 in this way showing an expansion of 14.8% during the year.

5. VARIOUS TYPES OF INDICATORS

Keeping in see the social area some significant markers can be recorded momentarily as under:

1. Human Development Index (HDI) and its positioning (It is for country savvy examination and the equivalent at state level SHDI can be useful for state shrewd correlation).
2. Education (Quality of Education, Education Expenditures, Drop out proportions, understudy/instructor proportion and so on)
3. Health (Different Health Indicators, Health Expenditures, Expenses on wellbeing to GDP, general wellbeing consumption to add up to spending plan and so forth)
4. IMR, MMR, CBR, CDR, Life hope upon entering the world and so on
5. Housing (Urban and Rural) (Average family size, complete number of houses, House inhabitance, Housing account, Affordable lodging needs, Employment
6. Water stock and Sanitation and so on
7. Environment and so forth

6. TOBIT REGRESSION

An application of Tobit regression was a factual model proposed by James Tobin in 50's, it was utilized so as to clarify the linking between a non-negative ward parameters and an self-directed one imagining that there is an inactive parameter which rightly depend on free one trough a variable that adopts the linking to the unrestricted and indolent elements. As per Verbak (2006) tobit deterioration is normally the best exemplary when the explanatory variable is insistent and has a bound ferocity, speaks to a positive parameter. This realistic model has been applied in ponders, e.g., T. rofelsi et al. (2010), Hassian and Nojear (2011), yet in adding the quasi determination of correlation can be registered by Effron, Fodan, Celen and Snoel R Software equally gives quasi purpose of correlation dependent on Feddon's formula, as in this study while smearing the Tobit indorse actions.

The structure of basic tobit model can be signified as follows:

$$\hat{B}_i = y^a X_i + \epsilon_i, \qquad \text{here } i = 1, 2 \ldots m$$

$$B_i = \hat{B}_i = \begin{cases} B_i = \hat{B}_i, & \text{if } \hat{B}_i > 0 \\ B_i = 0, & \text{if } \hat{B}_i \leq 0 \end{cases}$$

It is defined here, ϵ_i = random error of the model, it is shows the unobserved variables are affected the exogenous variable $\hat{B}_i$. The $\hat{B}_i$ is measure for normally affected by independently and identical distributed. In construction of model, $\hat{B}_i$ shows the hidden impact of variables and it can be obtained by using linear regression and follows the condition of $B_i = \hat{B}_i$, if $\hat{B}_i < 0$. On other hand B_i and A_i

represents the independent variables having i = 1, 2 ….m values. Thus, in simple terms it can be represented as:

$$B_i = \begin{cases} Y^a A_i + \epsilon_i, \\ 0, \quad \text{otherwise} \end{cases}$$

White (Hassian, 2003) has rationalized Tobit model and maintained the dependent variable detects B_i for given i = 1, 2 ….m values. The revised model was represented as:

$B_i = \text{maximum}\ (\hat{B}_i, 0)$, It shows the estimated value of latent variables and the errors are estimated as: $\epsilon_i \sim N(0, \sigma^2)$, Thus, $\frac{\hat{B}_i}{A_i} \sim N(Y^a A_i,\ S^2)$

$$U_i = 1, \begin{cases} B_i = \hat{B}_i, & \text{if } \hat{B}_i > 0 \\ B_i = 0, & \text{if } \hat{B} \leq 0 \end{cases}$$

Due to structure of U_i the Maximum Likelihood function can be created as:

$$MLH_i = \prod_{i=1}^{N} p(\hat{B} < W)^{1-U_i}$$

and,

$$\prod_{i=1}^{N} \left[p(\hat{B} < W) . \left(\frac{\hat{B}}{\hat{B} \geq W} \right)^{U_i} \right]$$

Thus the quantified function can be presented as:

$$P(\hat{B} < W) = p(Y^a A_i + \epsilon_i) < W$$

The structure can be separated by modification of error can be:

$$= p\left(\frac{Y^a A_i + \epsilon_i}{S_\epsilon^2} < \frac{W}{S_\epsilon^2} \right)$$

$$= p\left(\frac{\epsilon_i}{S_\epsilon^2} < \frac{W - Y^a A_i + \epsilon_i}{S_\epsilon^2} \right) < \theta\left(\frac{Y^a A_i}{S_\epsilon^2} \right)$$

When, $W = 0$, that:

$$p(\hat{B} < W) = \theta\left(\frac{-Y^a A_i}{S_\epsilon^2} \right) = 1 - \theta\left(\frac{Y^a A_i}{S} \right)$$

$$p(\hat{B} \geq W) = 1 - \left[\frac{W - Y^a A_i}{S_\epsilon^2} \right]$$

When $\omega = 0$, than

$$p(\hat{B} > W) = \theta\left(\frac{Y^a A_i}{S_\epsilon^2} \right)$$

Also,

$$\therefore f\left[\frac{\hat{B}}{B} > W \right] = \frac{\frac{1}{S}\theta\{(\hat{B} - \frac{Y^a A_i}{S_\epsilon^2})\}}{P(\hat{B} > W)}$$

$$= \frac{\frac{1}{S}\theta\{(\hat{B} - \frac{Y^a A_i}{S_\epsilon^2})\}}{1 - \theta\{\frac{(\hat{B} - Y^a A_i)}{S_\epsilon^2}\}}$$

The above design backings the maximum likelihood function as;

$$MLH = \prod_{i=0}^{N} [1 - \theta(\frac{Y^a A_i}{S_\epsilon^2})] . \prod_{i=0}^{N} (S_\epsilon^2)^{-1} . \theta\ (\frac{\hat{B} - Y^a A_i}{S_\epsilon^2})$$

All $\theta(.)$ calculated in functions are signifying probability density functions (PDF) and are verified for normality. The model can be maintained by the above edifice of functions.

If the values of B_i and A_i are not known when, $\hat{B} \geq W$. The results of development indicators can be justify for the final model creation of Tobit regression study.

7. APPLICATION OF TOBIT REGRESSION MODEL TO DEVELOPMENT INDICATORS OF AHMEDABAD DISTRICT:

The multivariate regression model is constructed for listed eleven parameters of secondary data collected for Ahmedabad district for the year 1999 to 2017. One of the objective of the study is focusing to examine the actual execution of secondary data towards the primary information collected by the researcher. For this purpose a method of survey is used and 520 samples are collected for Ahmedabad district. The respondents are academicians, administrators and research scholars. The sample is derive by using stratified sampling and final cluster is defined by using 95% significance level of normal function as follows:

$$\text{Total number of Samples } (n) = \frac{\frac{z^2 \times p\ (1-p)}{e^2}}{1 + \frac{z^2 \times p\ (1 \quad p)}{e^2 N}}$$

The stated form has resulted 514 samples. Thus, this research is determined for round off of 520 samples. An investigational structure of tobit model can be studied for Ahmedabad district for selected 40 variables. The list of defined variables is given below.

Table 1 List of Variable of Data Collection

Code of Variable	Statement	Name of Variable
Primary Education		
PEDU1	Number of Schools providing primary education have improved	A1
PEDU2	Quality of Primary Education has drastically improved	A2
PEDU3	Student-Teacher ratio in Primary school has improved significantly	A3
PEDU4	Drop out ratio at primary school level has reduced drastically	A4
PEDU5	Basic Infrastructure of primary education in Ahmedabad district has improved	A5
Higher Education		
HEDU1	Number of Higher education institution have increased in Ahmedabad district	A6
HEDU2	Higher education has become more pragmatic in Ahmedabad district	A7
HEDU3	Teachers at higher education level are more competitive in Ahmedabad district	A8
HEDU4	All necessary support facilities are available in Higher Education at Ahmedabad district	A9
HEDU5	There is significant improvement in quality courses in Higher Education In Ahmedabad district	A10
Primary Health Care		
PHLT1	Ahmedabad district has witness rapid growth of Primary health Centres	A11
PHLT2	Infrastructural Facilities at Primary Health canters have improved significantly	A12
PHLT3	There is adequate number of medical staff available for primary health care in Ahmedabad district	A13
PHLT4	Government is providing all the necessary support for development of Primary Health Care	A14
PHLT5	The reach of primary health centres have improved in Ahmedabad district	A15
Advanced Health Care		
AHLT1	Ahmedabad district has witness quality hospitals for Advanced Health care	A16
AHLT2	Ahmedabad district has good quality of Infrastructure for Advanced Health care	A17
AHLT3	Good Quality doctors are available in Ahmedabad district in Advanced Health care	A18
AHLT4	All the necessary Medical Resources are available for Advanced Health care in Ahmedabad district	A19
AHLT5	Ahmedabad district has facilities for the treatment of all the life threatening diseases	A20
Skilled Employment		
SEMP1	There is significant growth in rate of skilled employment in Ahmedabad district	A21
SEMP2	Growth of corporatisation and industrialisation have led to growth of skilled employment in Ahmedabad district	A22
SEMP3	Today's Educated Youth in Ahmedabad district is able to find employment easily	A23
SEMP4	Ahmedabad district has all the necessary infrastructure for the growth of skilled employment	A24
SEMP5	Quality of Skilled Employment level in Ahmedabad district has improved significantly	A25
Unskilled Employment		
UEMP1	Level of Employment for unskilled has improved significantly in Ahmedabad district	A26
UEMP2	There are ample opportunities available for the employment of unskilled in Ahmedabad district	A27
UEMP3	Growth of SMEs and MSMEs have contributed largely to the development of Unskilled employment in Ahmedabad district	A28
UEMP4	Growth in Unskilled employment has reduced the rate of unemployment drastically in Ahmedabad district	A29
UEMP5	There are ample Infrastructural facilities available for the growth of unskilled employment in Ahmedabad district	A30

Situational Moderators		
SM1	Frequent changes in environmental factors have played significant role in Social development	A31
SM2	Cultural factors plays significant role in social development in Ahmedabad district	A32
SM3	Ahmedabad district has witness good social harmony amongst all the state in the country	A33
SM4	Changes in Economy plays significant role in Social Development in Ahmedabad district	A34
SM5	Growth of Media and Technology has contributed well in social development in Ahmedabad district	A35
Government Moderators		
GM1	Government Policies are playing significant role in social development in Ahmedabad district	A36
GM2	Ahmedabad district Government is very active at policy implementation for social development	A37
GM3	Government is undertaking adequate awareness programme for Policies for the betterment of people	A38
GM4	Government has adequately played role of facilitator for Social Betterment	A39
GM5	Attitude of Government towards Socio-Economic Development is very much positive	A40
UHDI	Urban Human Development Index	A41

This study is classified and represented as:

$$MLH_i = \theta + W_1A_1 + W_2A_2 + \cdots + W_{40}A_{40} + \epsilon_i$$

The model leads to θ and W for defining their estimated values. The erected model is trails the condition of normal distribution. The data are coded to binary form and are presented for proper cunning of each of the variable studied for development indicators for deriving the results. The listed data are covered by using five point likert scale. Each of the variable for all five scale are coded for binary scale based on the median response given by response. Higher the median value is coded as 1 otherwise 0. The final compiled sheet is presented for GretL to calculate binary forms of models. All 40 selected variables of development indicator are computed for UHDI dependent variable and presented in table 2.

Table 2: Tobit, using observations 1 to 520

Dependent variable: UHDI

	Coefficient	SE	z	p-value	
Const.	0.126	0.18	0.7	0.4837	
PEDU1	−12.63	0.24	-52.43	0.002	
PEDU2	0.849	0.34	2.46	<0.0001	**
PEDU3	0.154	0.18	0.83	0.4064	
PEDU4	12.32	0.164	75.07	<0.0001	***
PEDU5	13.73	0.896	15.33	<0.0001	***
HEDU1	−10.94	0.646	-1.45	<0.0001	***
HEDU2	−3.707	0.786	-4.71	<0.0001	***
HEDU3	1.391	0.726	1.916	0.0554	*
HEDU5	6.133	0.789	7.76	0.0001	***
PHLT1	−16.47	0.654	-25.18	<0.0001	***
PHLT3	10.37	0.684	15.16	<0.0001	***
PHLT4	0.348	0.201	1.73	0.0825	*
PHLT5	3.977	1.36	2.91	0.0036	***
AHLT3	−0.48	0.275	-1.74	0.0806	*
AHLT4	−1.53	0.573	-2.678	0.0073	***
AHLT5	5.37	0.912	5.88	<0.0001	***
SEMP1	−5.21	0.525	-9.93	<0.0001	***
SEMP4	0.246	0.308	0.798	0.4248	

UEMP2	−1.80	0.641	-2.81	0.0049	***
UEMP4	−0.295	0.28	-1.05	0.292	
SM1	−5.13	0.361	-14.22	<0.0001	***
SM2	9.67	0.985	9.83	<0.0001	***
GM5	6.2	0.0127	4.88	0.03	**

Log-likelihood	−487.9925	Akaike criterion	1025.985
Schwarz criterion	1132.331	Hannan-Quinn	1067.645

Error of Model = 0.86257 (0.031769), Left-censored observations: 277

Right-censored observations: 0, Chi –square value 72.14 (2.1E-1)

Total 40 variables are coded for binary modelling based on median. The compiled tobit regression model is presented in table 2. The summery of model is showing standard value of error is found 0.863 (0.86257) with p value 0.032. The p- value is lower than 5% significant level. It shows the best fit of model.

The standard error value is compiled for left-censored observations: 277 and Right-censored observations: 0. It demonstrations the normality of model is continued towards the UHDI. The information is positively skewed. It is required to test the normality of residual with mention to testing null hypothesis that error is normally distributed. The consequences of null hypothesis are verified by taking chi-square test and p-value of the model. The result of chi-square test is obtained 72.14 and p-value is 2.1e-1. The p-value of model shows acceptance of null hypothesis. The constructed model is presented in table 4.9. The constant (θ) defined 0.126 and respective co-efficient of models are shown in table. The formation of tobit model is accumulated as follows:

$$\begin{aligned} UHDI = {} & 0.126 - 12.63\,PEDU1 + 0.849\,PEDU2 + 0.154\,PEDU3 + 12.32\,PEDU4 + 13.73\,PEDU5 \\ & - 10.94\,HEDU1 - 3.707\,HEDU2 + 1.391\,HEDU3 + 6.133\,HEDU5 - 16.47PHLT1 \\ & + 10.37PHLT3 + 0.348\,PHLT4 + 3.977\,PHLT5 - 0.48\,AHLT3 - 1.53\,AHLT4 \\ & + 5.37\,AHLT5 - 5.21\,SEMP1 + 0.246\,SEMP4 - 1.8\,UEMP2 - 0.295\,UEMP4 - 5.13\,SM1 \\ & + 9.67\,SM2 + 6.20\,GM5 \end{aligned}$$

8. CONCLUSION:

The constant of model is positive, thus negative sign of the parameter increase the value of UHDI and negative value of parameter reduce the UHDI. The first co-efficient is derived for statement that number of schools providing primary education have improved. The code of variable is defined PEDU1 and it is computed -12.63. The value is negatively associated with model, shows negative approach of the experts. They are disagreed that the primary education have improved for all schools. On other hand the second parameter of primary schools PEDU2 is recorded with 0.849 value of co-efficient. It shows that the primary education has drastically improved. Lastly the government has executed various method of selection and even twisted teaching policies, modules of teaching, infrastructure. These all are supporting the quality of primary education. The third parameter is also improved with 0.154 shows 15.4% direct impact of PEDU3 i.e. students–teachers' ratio is improved significantly. The experts are agreed that it is improved and it has playing important role to UHDI in Ahmedabad district. The fourth parameter of education is also found significant PEDU 4 that shows dropout ratio at primary schools level has reduced drastically. Total 12.32% experts are agreed with the statement that make positive view about the dropout in schools. The fifth statement is also justify by the binary tobit model. It shows 13.73% impact of derived statement. It is about the basic infrastructure of primary education in Ahmedabad district has improved. The experts are positively stated about the statement. The second parameter is relate to the higher education. The experts opinion about the HEDU1 – Number of higher education institution have increased in Ahmedabad district is negative. The value 10.94 shows negative relativity towards the UHDI. It shows that according to the opinion of experts the higher secondary level schools are not met the requirement of the students of Ahmedabad district. The second parameter also stated about pragmatic of higher education in Ahmedabad district. The experts have negative opinion for the same. Third parameter of higher education is also given priority by the model. HEDU3 is a derived statement about the teachers at higher education level are more competitive in Ahmedabad district. The experts are agreed at certain level. The value of co-efficient (1.39%) shows lower impact of the statement to the development of education in Ahmedabad district. The fifth listed variable is shorted by the tobit model. It has positive

impact of 6.13% to the UHDI model. The statement is about significant improvement in quality courses in higher education in Ahmedabad district. The experts are agreed that the quality of courses in higher education improved and it will play important role in development.

The second important parameter is health for testing the development. The first parameter of primary health care is listed by the model. The parameter PHLT1 is criticized by the experts. It has negative impact to growth and development. It shows 16.47% negative impact to the model. The statement derived for rapid growth of primary health centers developed in Ahmedabad district. The third statement is relate to adequacy of medical staff available for primary health care. The experts are agreed that the centers are improved. The model indicates impact of 10.37% for the statement effect. The fourth parameter is determined by the model of primary health care. The third statement inquired was about government support given to the primary health care centers. The experts are positively response towards the statement. The fifth statement is also retrieve by the model. It is PHLT5 and the statement is about the resources to reaching the primary health centers is improved or not. The experts are positively reply about the statement. An examining the statements derived for primary health care. Majority statements are positively concerned by the experts. It indicates that the primary health status of the district is improved. The improvement shows direct support to UHDI of district.

The second resource for maintaining health status is advanced health care resources. The third, fourth and fifth statements are listed by the model. Amid them third and fourth statement is assigned negative sign whereas the fifth statement is getting positive response towards the model. The third statement was inquired about the availability of good quality doctors – as per experts' opinion it required to be improve. It has negative approach to the development. Similarly, the experts are not fully agree about the availability of all the necessary medical resources' to health care centers. The fifth statement is determined for facilities for the treatment of all the life threatening diseases. The experts are positively concerned about the statement. It shows 5.37% impact of the variable. The overall experts' opinion about advanced health care is not found positive. It clearly indicates that for better output of advanced health care the authorities should work hard. It is indirectly affected to the growth of UHDI of district.

In inquiry of skilled employment only first and fourth statements were occupy by the model. The first statement is stated about significant growth in rate of skilled employment in the district. The experts view is recorded negative. On other hand they have positive approach towards the fourth statement that the district is graced with necessary infrastructure for the growth of skilled employment. The second side of the employment is also inquired in terms of unskilled employment. The experts are reviewed negative approaches to it. The second statement and fourth statement are given priority by the model. For listed parameters in model the experts' opinion is recorded negative. It is discussed about the ample opportunities available for the employment of unskilled mass in Ahmedabad district. The fourth statement – growth in unskilled employment has reduced the rate of unemployment drastically in district is also criticized by the experts.

The situational moderators' level statements are also defined by the model. It justify the first two statements out of total five statements. The first statement is derive about the frequent changes in environmental factors have played significant role in social development. The experts are not agreed with the statement and it shows negative approach to the model of development of UHDI. On other hand the second statement – cultural factors plays significant role in social development in district has been appreciated by the experts and it has positive impact to the model. The outcomes of model statistics are make clearer overview of consequent model. The model testing parameters are listed last to the model. The values of testing the model are Akaike criterion (AIC), Schwarz criterion (BIC), Log-likelihood, and Hannan-Quinn. All said assessments have least values compare to other tobit edifices. It is also perceptible here the error term of the model is figured least.

REFERENCES:

[1] Abhishek T. (1992). Implication about the Variables of a Factor model with changing alteration. Metrical 36-49.

[2] Abusaleh Shariff (1995) health Transition in india, NCAER, Oct 1995

[3] Adnan (1984) Approximation of OLS based on robust testing. Math-Statistics, 67-85.

[4] Bagchi, K.K. (2011). Regional Disparities in India's Socio-economic Development. New Century Publications. New Delhi. India 6)

[5] Bajpai, N, Sachs, J.D. (1996). Trends in Inter-State Inequalities of Income in India. Development Discussion Paper No. 528. Harvard Institute for International Development, Harvard University.

[6] BRICS (2012). Joint Statistical Report, 2012, BRICS.

[7] Bunge, M. (1981). Development Indicators. Social Indicators Research, 9(3), 369- 385. 11)

[8] Carr-Hill, R. (2013). Missing Millions and Measuring Development Progress. World Development, 46, 30–44. 29

[9] Cetaler, S. Miranda (1997): Principle Component Analysis, NY, Alabama.

[10] Dubey, A. (2009). Intra-State Disparities in Gujarat, Haryana, Kerala, Orissa and Punjab. Economic and Political Weekly, 44(26&27), 224–230.

[11] Dutta, S. (2011). Efficiency in Human Development Achievement: A Study of Indian States. Margin: The Journal of Applied Economic Research, 5(4), 421–450.

[12] Grene William (2003), Econometric Analysis, Prentice Hall New York.

[13] Harris, R. J.: A Primer of Multivariate Statistics. New York, Academic Press, 1975.

[14] Huberty, C. J., and J. D. Morris. 1989. Multivariate analysis versus multiple univariate analyses. Psychological Bulletin 105:302–308.

[15] International Encyclopedia of the Social Sciences

[16] Jha, R. (2014). Welfare Schemes and Social Protection in India. International Journal of Sociology and Social Policy, 34(3/4), 214–231.

[17] Luc Anselin, Sheri Hudak, Spatial econometrics in practice A review of software options, September 1992, Regional Science and Urban Economics

[18] Lutz, M. (1988). On Criteria of Socioeconomic Development. Paper presented at the annual meeting of the Allied Social Science Associations, New York, 1988.

[19] Myrdal, G. (1972). Asian Drama: An Inquiry into the Poverty of Nations. Vintage Book, New York.

[20] Nagaraj R.A., Varoudakis, A., Veganzones, M. (1998). Long-Run Growth Trends and Convergence across Indian States. Working Paper No. 131. OECD Development Centre.

[21] Rakesh Shrivastava (2011) Statistical Evaluation of socioeconomic development some recent technique. Sankhyavignan NSV 7, No.1 & 2

[22] Raymond J.G.M. Florax, Vrije Universities Amsterdam and University of Amsterdam; Peter Nijkamp, Vrije Universities Amsterdam, Misspecification in Linear Spatial Regression, Models, 2004

[23] Sanjay G. Raval And Mahesh H. Vaghela (2016), "Brief Review for Quality of Education In Institutions of Gujarat State", presented in Quest for Excellence and Efficiency in Higher Education, organized by H. L. Commerce College and A. G. Teachers College, 30th Sept – 1st Oct. – 2016.