# ECONOMICS OF EDUCATION: INEQUALITY IN PRIMARY EDUCATION IN DISTRICTS OF ANDHRA PRADESH

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### Abstract:

Each person's education is an investment in her human capital which allows her to contribute to her society in a productive way. Equal access to education is a basic human right. But gaps in education among various groups are staggering.

This paper analyses the factors behind inter-district educational inequality in the State of Andhra Pradesh. Empirical analysis on the accessibility and attainment of primary and upper primary education in the districts of Andhra Pradesh is done using principal component analysis and composite parameter ranking. The method of Principal Component Analysis has been applied separately for each of the four parameters selected for the study. This method has helped to reduce sub-parameters of education to selected Components summarizing the data without any loss of information. These extracted Principal Components then, have been used to build up index for each parameter separately. The educational development index will be worked out.

### Key words:

Inequality, Education, Primary, Upper Primary, Principal components, Composite parameter Ranking, educational Developmental Index

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### **1.INTRODUCTION**

Each person's education is an investment in her human capital which allows her to contribute to her society in a productive way. Consequently, the education of the people forms a crucial determinant of an economy's capability to achieve high growth with high wages, low unemployment and strong social cohesion. Equal access to education is a basic human right. But gaps in education among various groups are staggering. This paper is an attempt to understand how inequality persists in education at district levels for the state of Andhra Pradesh and to analyze the reasons for it.

In the post-Independence era, India witnessed concerted efforts on the part of the government to promote education in the country. This has resulted in the continuous quantitative as well as qualitative up gradation of education at all levels. The kind of attention, the education sector received and the outcome of the progressive government policies during this period, manifested in turn, in the country, in the form of higher literacy rates and growth at various levels of education. But in this process, the pace of growth of education lost its track in many parts of the country. The issues like disparities in education among different states, regions, and male/female education started surfacing. With time, these gaps assumed serious dimensions, requiring immediate attention and relevant policy interventions. The disparities in different sections of the society are more glaring at the primary level. The formulation of requisite policies to rectify these imbalances, however, requires the diagnosis of the strong and weak areas in the field of primary education.

There is an imperative need to change the education pattern to achieve universal primary education in India. Even after 60 years of Independence, India faces obstacles in providing Education For All. An attempt had been made to compare the growth of primary education among various segments of the society. The diagnostic exercise has been carried out by constructing an educational development index for assessing growth of primary and upper primary education in various districts of Andhra Pradesh.

The work of Anil K. Yadav, Madhu Srivastava, Chaitali Pal on 'Disparities in the growth of Primary education': An interstate Comparison' provided the inspiration for this work. at district level for the state of Andhra Pradesh with little more extensions into the theoretical backgrounds for the empirical results obtained and to list out various reasons as to why inequalities in education arise, possible solutions to combat it and improve the attainment of higher primary and upper primary education levels are suggested.

### Methodology

To analyze accessibility of primary and upper primary education at the grass roots level, the districts of Andhra Pradesh because of the availability of the real time data, was purposively chosen. The analysis has been done for the state of Andhra Pradesh having total population of 762.10lakh according to 2001 census. The educational development index has been worked out for the year 2005-06, as per the statistics provided by the directorate of economics and statistics, is the nodal department for all statistical activities in the state of Andhra Pradesh. The study was conducted during January 10 - April 20, 2008.

Firstly empirical analysis on the accessibility and attainment of primary and upper primary education in the districts of Andhra Pradesh is done. This analysis is done in two methods namely, principal component analysis and composite parameter ranking. The principal component analysis for determining the number and nature of the underlying variables among larger numbers of measures was adopted. This yields a mathematically unique solution of a factor problem. As each of the factors is calculated maximum of the variance is extracted. The first factor extracts the first most variance, the second factor extracts the second most variance and so on. In short principal component analysis with orthogonal rotations is used. The second method used is the much simpler composite parameter rank. Here the rank assigned to a district is an average of ranks for each of the parameters considered. The data of the parameters used for both the methods is obtained from the book, "Statistical Abstract Of Andhra Pradesh 2007".

The methods used for developing educational development index for districts are principal component analysis and composite parameter rank.

### 3. Principal component analysis

The Principal Component analysis method has been used for developing educational development index for districts. The method of Principal Component Analysis seeks to reduce large number of parameters into few categories known as Principal Components, which explains maximum amount of variance among the parameters. The data on educational parameters, by using Principal Component analysis, is reduced to much smaller size without losing the

properties of the data. The method of Principal Component Analysis has been applied separately for each of the four parameters selected for the study. This method has helped to reduce subparameters of education to selected few Principal Components summarizing the data without any loss of information. These extracted Principal Components then, have been used to build up index for each parameter separately. The educational development index will be worked out using the formulae;

Index =  $\left[\sum_{i=1}^{6} Vi \sum_{j=1}^{6} FijEij\right] / \sum_{j=1}^{6} FijEj$ 

Where Fij = Factor loading (Parameters i, Principal Component j)

Ej = Eigen Value (Principal Component j)

Vi = Parameters I

i,j = 1,2,3,4,5,6

### 3.1 Eigen vector and eigen values:

Let A be a square matrix. A non-zero vector C is called an eigenvector of A if and only if there

exists a number (real or complex)  $\lambda$  such that  $AC = \lambda C$ ... If such a number  $\lambda$  exists, it is called an eigenvalue of A. The vector C is called eigenvector associated to the eigenvalue  $\lambda$ . The principal factors method actually involves the solution of simultaneous linear equations. The roots obtained from the solution are called eigenvalues. Eigen vectors are also obtained after suitable transformation.

### **3.2 PRIMARY EDUCATION DEVELOPMENT PARAMETERS**

The growths in the field of primary education in different districts are evaluated on two counts \* How many children among the school going age group were actually enrolled in the schools? \* How many children among those who were enrolled, completed the primary level of education and entered the next level i.e., the Upper primary level of education?

From the point of view of identifying growth in the field of primary education, it is not only important to study whether all children in relevant age group have joined the mainstream of education but also it is equally important to know that how many of these children, not only completed the primary level of education, but also had moved to the next level of education. To

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review, the growth at primary educational level by various states, four parameters have been selected. They are:

- Male Dropout ratios
- ← Female Dropout ratios

The enrolment ratio is defined as the percentage of enrolment classes' I-V and VI-VII to the estimated population in the age groups of 6-10 years and 11-12 years respectively. Enrolment in these stages include under age and over age children. Hence the total age may be more than 100% in some cases. Ranks for enrolment ratios are in decreasing order of the values and dropout ratios are in increasing order of the values. The gross enrolment ratios and drop out rates are obtained during the year 2005-2006.

### 3.3 Relationship among parameters

The correlation-matrix developed for above selected parameters reveals that there is a significant relationship between the male and female enrolment rates which implies that wherever the male enrolment rate is high, the female enrolment rate is also high and vice versa. Upper education development parameters are developed in an analogous manner.

Parameters		Primary Education(classes I-V)									
1	Overall Male	Overall Female	Dropout	ratios							
	Enrolment Rate	Enrolment Rate									
	F AY	A K	N/1								
	<i>J</i> / Y		Male	Female							
Overall Male	1	0.963	0.2126	0.2387							
Enrolment Rate											
Overall Female	0.963	1	0.205	0.2137							
Enrolment Rate											
Male dropout ratio	0.2126	0.205	1	0.9106							

Table1: Correlation Matrix for Growth Parameters of primary education

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Volume 3, Issue 12

ISSN: 2249-0558

Female dropout ratio	0.2387	0.2137	0.9106	1

Table2: Eigen Values for Growth Parameters of Primary Education

Principal	Standard	Proportion of	Cumulative
Component	deviation	Variance	Proportion
First	26.52	0.81	0.81
Second	12.432	0.178	0.987
Third	2.69028	0.00833	0.99571
Fourth	1.92987	0.0042	1.00000

Our aim is to rank the states based on their attainment levels of primary education. The relevant data is gathered in the form of four parameters Male Enrolment Rate, Overall Female Enrolment Ratio, Male Dropout ratios, Female Dropout ratios but these parameters are correlated with each other causing the problem of multicollinearity. So we use principal component analysis to develop principal components for these parameters. The principal components are linear combinations of original variables. They can capture as much as original variance in the data as possible. The advantage of these principal components is that they are uncorrelated to each other. Orthogonal rotations maintain the independence of factors, that is, the angles between the axes are kept at 90 degrees, implying zero correlation between factors. The necessary coding for obtaining principal components and the relevant principal components (Eigen vectors) for the four parameters are shown in the appendix .The first principal component itself is explaining 81% of the variance of data so the states are ranked based on the values of that principal component itself.

States	Index	Rank
Srikakulam	21.2067	8
Vizianagaram	2.430388	12
Visakhapatnam	22.40747	6
East Godavari	33.48026	4
West Godavari	42.2164	1

Table 3: Principal Component Index for Growth Parameters of Primary Education

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Krishna	36.5977	2
Guntur	33.75276	3
Prakasam	3.796669	11
Nellore	24.56425	5
Chittoor	21.79616	7
Kadapa	-7.10511	13
Anantapur	7.269058	10
Kurnool	-23.5865	18
Mahbubnagar	-29.4308	21
Ranga Reddy	-57.336	23
Hyderabad	-13.5326	15
Medak	-26.4803	20
Nizamabad	-19.7999	17
Adilabad	-30.962	22
Karimnagar	-7.55564	14
Warangal	-23.6302	19
Khammam	7.760981	9
Nalgonda	-17.8599	16

Table4: Correlation Matrix For Growth Parameters of Upper Primary Education

Parameters		Upper Primary Education(classes VI-VII)										
	Overall Male	Overall Female	Dropout	ratios								
	Enrolment Rate	Enrolment Rate	-									
		1	Male	Female								
Overall Male	1	0.8522	0.0428	0.0272								
Enrolment Rate			5									
Ov <mark>erall Female</mark>	0.8522	1	0.0019	0.0183								
En <mark>rolment Rate</mark>												
Male dropout ratio	0.0428	0.0019	1	0.9173								
Female dropout ratio	0.0272	0.0183	0.9173	1								

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ISSN: 2249-0558

Principal	Standard	Proportion of	Cumulative
Component	deviation	Variance	Proportion
First	21.603	0.518	0.518
Second	20.524	0.467	0.985
Third	3.5389	0.0139	0.9989
Fourth	1.00593	0.00112	1.00000

Table 5: Eigen Values for Growth Parameters of Upper Primary Education

For upper primary education, the principal component analysis has extracted two PC's for analysis. The first PC explains 51% percent of the variation where as the second PC explains 46% percent variations. The two PC's together explain 98% of the variation among parameters for upper primary education. The indices are developed based on the values of these two parameters taken together and the states are ranked based on these indices.

States	Index	Index	Rank as	Rank as per	Rank(Average)	
	according to	according to	per PC-I	PC-II		
	principle	principle		1.00	_	
	component I	component II		-		
Srikakulam	9.609728	1.842361	11	8	8	
Vizianagaram	14.11936	-7.26444	9	15	13	
<mark>Visakhapatna</mark> m	18.41343	-0.28649	6	10	4	
<mark>East Godavar</mark> i	16.44639	-0.83313	7	11	6	
West Godavari	30.41018	-1.56288	1	12	3	
Krishna	28.09031	-9.55703	2	17	9	
Guntur	27.06643	-26.9782	3	21	14	
Prakasam	11.87297	-33.5209	10	23	17	
Nellore	21.7408	-4.0464	4	14	7	
Chittoor	14.40288	28.87111	8	2	2	
Kadapa	5.138138	13.96382	12	5	5	
Anantapur	2.594634	10.74523	13	6	10	
Kurnool	-1.87758	-15.4162	14	20	19	
Mahbubnagar	-19.1719	-29.863	17	22	23	
Ranga Reddy	-34.2833	27.71454	22	3	15	

Table6: Principal Component Index For Growth Parameters of Upper Primary Education

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Volume 3, Issue 12

### ISSN: 2249-0558

Hyderabad	18.57354	60.36378	5	1	1
Medak	-20.8494	-13.9698	19	19	22
Nizamabad	-18.6968	-9.72037	16	18	20
Adilabad	-37.4238	1.584356	23	9	16
Karimnagar	-20.1528	14.26975	18	4	11
Warangal	-29.1368	-7.37645	21	16	21
Khammam	-13.2636	3.046779	15	7	12
Nalgonda	-23.6229	-2.00646	20	13	18

### 3.4 Observations:

December

2013

- 1. Female enrolment ratio and male enrolment ratio are highly correlated for primary education than for upper primary education implying that gender disparity is more in upper primary education in primary education.
- 2. The gender disparity is further more in backward districts in regards to upper primary education.
- 3. West Godavari districts, Krishna, Guntur, East Godavari district, Nellore are the leading districts in Andhra Pradesh in providing primary education. Hyderabad, Chittoor, West Godavari, Visakhapatnam are the leading districts in Andhra Pradesh in providing upper primary education.
- 4. Adilabad, Mahbubnagar, Ranga Reddy are backward districts with regards to primary education. Mahbubnagar, Medak, Warangal are backward districts with regards to upper primary education.
- 5. Dropout rates of girls on an average are higher than drop out rates of boys at both primary and upper primary education levels.

### 1. Composite parameter rank:

To build up composite parameters rank, the district ranks have been worked out for each subparameter separately. These ranks for each of these sub-parameters then have been combined together to arrive at the composite parameters rank. The parameters ranks thus arrived at would help to study the status of the districts for the respective parameters. The composite parameters rank on the other hand, provides consolidated position of the district in respect to all the parameters.

To estimate Composite Parameter Rank, each parameter is ranked first. The Composite rank for a district is estimated by talking average of ranks of all parameters. The parameters chosen here are same as those chosen for principal component analysis

### ✓ Male Enrolment Ratio(MER)

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<u>ISSN: 2249-0558</u>

- ✓ Female Enrolment Ratio(FER)
- $\checkmark\,$  Dropout rates of males
- $\checkmark\,$  Dropout rates of females.

Table	7:	Composite	parameter	ranks f	for the	states	of .	Andhra	Pradesh	regarding	primary	and
upper	pri	mary educa	tion									

S	Districts of				Prima	ry edu	catior	u Upper Primary Education							
Ι	Andhra	Gross	s Enrol	ment	Drop	out rat	es in	Comp	Gross			Dropout rates			Comp
	Pradesh	Ratio	Ratio classes(I- classes(I-V) osite Enrolment						in classes(I-			osite			
N		V)						Para	Ratio			VII)			Para
0					meter			classe	es(VI-V	VII)				meter	
		10 C - 10 C						rank							
		Boy	Girl	Tot	Boy Girl To				Boy	Girl	То	Boy	G	То	
		S	S	al	S	s	tal		S	s	tal	s	irl	tal	
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		. 1						1000							
1	<mark>Srikakula</mark> m	100	100	100	12.	10.	11.	7	85.	78.	81.	41.	4	43.	11
		.54	.42	.48	8	18	18		49	06	73	76	5.	38	
													0		
		÷											3		
2	Vizianagaram	114	111	113	14.	15.	14.	6	80.	70.	75.	42.	5	46.	17
		.99	.58	.3	34	51	92		86	29	53	51	0.	64	
													7		
						UT1							1		
3	Visakhapatnam	94.	97.	96.	19.	21.	20.	21	78.	72.	75.	38.	4	41.	10
		51	78	12	84	74	79		69	95	83	72	3.	18	
													6		
													3		
4	East Godavari	88.	92.	90.	16.	10.	13.	13	75.	77.	76.	44.	4	42.	12
		56	48	49	47	83	68		87	34	61	39	1.	99	
													5		
													5		
4	East Godavari	88.	92.	90.	16.	10.	13.	13	75.	77.	76.	44.	4	42.	12
		56	48	49	47	83	68		87	34	61	39	1.	99	
													5		
													5		
5	West Godavari	80.	85.	82.	18.	14.	16.	22	67.	68.	68.	38.	3	37.	13

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International Journal of Management, IT and Engineering

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Volume 3, Issue 12

# <u>ISSN: 2249-0558</u>

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		85	02	91	13	5	33		61	78	19	78	6.	70	
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													2		
6	Krishna	85.	89.	87.	16.	15.	16.	19	66.	66.	66.	42.	4	43.	19
		22	18	16	6	68	14		72	05	39	70	3.	16	
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7	Guntur	83	86	8/	26	28	27	23	62	57	60	51	5	53	22
'	Guiltui	05.	00. 04	04.	20.	20. 76	27. 05	23	02. 20	70 70	00.	25	5	50	22
		08	94	97	92	/0	83		50	/8	05	23	э. 7	30	
		10-	110	100				1.0					3		
8	Prakasam	107	110	108	23.	25.	24.	16	70.	62.	66.	60.	6	63.	23
		.22	.7	.91	12	07	09		38	16	32	61	5.	19	
					_								8		
													3		
9	Nellore	96.	97.	97.	14.	13.	13.	10	74.	70.	72.	40.	4	42.	15
		55	66	09	34	22	79		55	14	35	43	3.	15	
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	10 C							100					0		
1	Chittoor	101	101	101	8.0	7.8	7.9	4	93.	86.	89.	22.	2	25.	3
0		.49	.14	.32	3	2	3		54	28	93	21	8.	45	
													7		
									1				5		
1	Kadapa	122	122	122	10	96	99	1	93	85	89	35	4	37	4
1	Ixudupu	37	37	37	18	8	1	1	17	42	33	13	0	97	
1		.57	.57	.51	10	0			1/	72	55	15	0. Q	71	
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1		100	100	107	14	24	10	11	00	00	00	20	/	41	6
	Anantapur	106	109	107	14.	24.	19.	11	90.	88.	89.	39.	4	41.	0
2		.26	.68	.92	43	39	66		39	26	45	98	2.	31	
													1		
													9		
1	Kurnool	127	127	127	27.	31.	29.	8	89.	73.	81.	53.	6	57.	20
3		.16	.99	.57	62	3	44		77	46	73	39	1.	38	
													5		
													6		
1	Mahbubnagar	130	125	128	38.	41.	40.	14	95.	76.	85.	70.	7	72.	21
4		.13	.87	.05	4	85	05		62	00	91	69	4.	71	
													9		
													6		
1	Ranga Reddy	153	154	153	26.	28.	27.	5	120	114	11	45.	4	46.	2
1	<u> </u>		1	1	1	1	1	1	1	Î.	1	1	1	1	

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International Journal of Management, IT and Engineering

http://www.ijmra.us

December 2013



Volume 3, Issue 12

# <u>ISSN: 2249-0558</u>

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													2		
1	Hyderabad	110	132	125	17	10	14	2	9/	105	99	91	2 1	68	1
6	Tryderabad	24	132 64	65	$\frac{17}{24}$	83	08	2	7 <del>.</del> 16	105 //1	ייע. דד	3	<del>т</del> . 1	0.0	1
0		.24	.04	.05	24	05	08		40	.41	//	5	4	0	
1	N/ 11	102	107	105	10	41	4.1	17	06	00	02	64	5	65	10
	Medak	123	127	125	42.	41	41.	1/	96. 16	90. oz	<i>93</i> .	64.	6	65. 10	18
1		.58		.25	74		9		16	05	13	15	5.	19	
													6		
													7		
1	Nizamabad 🛛	123	120	121	37.	36.	37.	15	98.	88.	93.	61.	6	61.	16
8		.2	.71	.96	39	64	02		23	87	49	58	1.	60	
													6		
													3		
1	Adilabad	135	134	134	24.	24.	24.	3	113	104	10	61.	6	62.	9
9		.4	.54	.97	41	63	52		.23	.84	9.0	41	3.	56	
						-					4		7		
						-							4		
2	Karimnagar	119	118	118	21	19	20	9	105	102	10	49	4	48	5
0	Ituriningui	12	38	75	64	8	20.74	, I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.	64	37	4.0	50	7	58	5
Ŭ		.12	.50	.75	01	0	<i>,</i> ,		.01	.57	0	50	6	50	
											0		0		
2	Warangal	122	125	124	38	38	38	18	103	97	10	64	6	64	14
1	vv draligai	76	81	25	50. 66	72	<i>6</i> 0	10	22	05	0.6	13	5	73	14
1		.70	.01	.23	00	12	0)		.22	))	0.0	15	J. 3	15	
	11										1		5		
2	Vhommore	107	100	107	19	10	10	12	08	02	05	50	5	51	7
	Nnammam	107	108	107	18.	19.	19.	12	98.	92.	95.	50. 10	2	51.	/
2		.14	.41	./6	96	31	16		92	24	61	18	3.	99	
													8		
													5		
2	Nalgonda	119	120	119	37.	40.	38.	20	103	95.	99.	57.	6	59.	8
3		.35	.24	.78	8	06	91		.54	58	61	86	0.	08	
													3		
													8		

### 4.1 Observations:

1. Hyderabad inspite of gender disparity in both enrolment rates and dropout rates is still leading in both primary and upper primary education because of the relatively high magnitude of enrolment rates and low magnitude of dropout rates compared to many other districts.

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- 2. Guntur in primary education and Prakasam in secondary education are severely lagging because of the extremely high dropout rates especially in the case of Prakasam in upper primary education.
- 3. Most of the leading states had very low drop out rates.
- 4. In this method gender disparity didn't matter much, districts having high gender disparity still managed a good rank than the districts with low gender disparity, the magnitude of the rates seemed to have deciding the impact here.
- 5. Mahbubnagar, Prakasam, Medak, Guntur, Adilabad, Warangal districts witness high dropout ratios. This may be due to high child labor prevailing in those districts.



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58 For further analysis of why working children drop out of school, see Child Labour Surveys: Results of Methodological Surveys in Four Countries 1992-93 (Geneva: ILO/IPEC, 1996)

59 The Philippines is an exception: it was found that rural working children had higher school attendance (67 percent) than urban working children (33 percent). See "Education of the Working Children: Are Working Children Going to School?" fact sheet from Survey of Children 5-17 Years Old: July 1995 (Manila: National Statistics Office, July 1995)

80 The State of the World's Children 1997 (New York: UNICEF, 1997)

103. Interview with S. Ray, Principal Secretary, Department of Social Welfare, Andhra Pradesh, by U.S. Department of Labor official (May 14, 1998). See also Important Government Orders and Guide Lines on Back to School Programme during April 1997 and 1998 (Hyderabad: Commissioner of Social Welfare, Andhra Pradesh, undated) 2 [hereinafter Important Government Orders and Guide Lines].

104. Important Government Orders and Guide Lines at 3 and 36. Teachers are paid 1,000 rupees (US\$ 25.00) for the two-month duration of the camp.

106. Ibid. at 26, 32, and 40. An evaluation of the program at the conclusion of the first year found that 98.8 percent of the children attending rated the camps as "very good" or "good," and 88 percent of the parents thought the program was "very good and useful" to their children; 71 percent of teachers rated the program as "very successful" while 28 percent considered it "moderately successful."

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