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Determinants of Private Spending in Education in Arunachal Pradesh: A Comparative Study across Selected Districts

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India's expenditure on education is a mix of public and private spending, with both showing significant growth over the past decades. Private spending on education in India has significantly increased over time, driven by factors like rising private sector participation and higher tuition fees. This study aims to assess selected districts of Arunachal Pradesh by examining the private expenditure on education comparing both male and female populations. A sample of three districts has been selected for the study. Additionally, the study will explore how changes in literacy and other variables like parents education and occupation, working status of individual, family income has impact on expenditure on education of individual. Statistical applications like one way Analysis of Variance (ANOVA), Regression Analysis etc. and other related Statistical tools have been used in the study.

Keywords: household expenditure, expenditure on education, work participation rate, anova

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1. Introduction

There are two primary domains of investment in education. These are individual and institutional. Individual investment refers to the expenditure incurred by students and/or their parents, and is commonly known as household investment or private expenditure in education. In contrast, institutional investment typically denotes public spending, more precisely defined as government investment in education. While public investment can provide educational facilities, only household investment will enable its utilization. (Jandhyala B. G. Tilak, 2002). Although, there is reasonably reliable database on public expenditures on education in India, information on household expenditures is limited, particularly, in remote and distant areas of the country. Subsequently, insufficient detail on these factors leads to misguided assumptions about the scale, nature, and quality of household investments in education. It has been a common tendency to presume that since the elementary education is free of cost, households bear minimal expenses for it. Such misconceptions can lead to poorly designed policies related to fees, scholarships, and subsidies etc. Therefore, examining household investment in education becomes critically important. This study is concentrated only on household/private expenditure on individual education. It refers to the money spent by families or individuals to support their own or their children learning. This includes costs such as tuition fees, school supplies, private tutoring, transportation, and extracurricular activities. It has been observed that wealthier families often invest more in education, which can lead to disparities in educational opportunities and outcomes. (Jandhyala B. G. Tilak, 2002). While private expenditure can enhance learning through additional resources and personalized support, it also highlights the importance of ensuring equitable access to education for all, regardless of financial background.

The present study is focused on such Household expenditure for the three districts of Arunachal Pradesh. District Keyi Peniyor, Kamle and Lower Subansiri are the area of the study, where the first two districts are curved out from the third district. This study specifically explores the questions: (i) How the three districts are comparable in respect of expenditure on education of individuals, classifying male and female population with certain age category and,

(ii) Which socio-economic parameters have the most significant impact on household or private expenditure on individual education, separately for each of the three districts.

Extensive research has examined the socioeconomic determinants of household education expenditures, consistently highlighting the positive correlation between household income and investment in education. Studies conducted across various countries—including Turkey (Acar et al., 2016; Bayar & Ilhan, 2016), Cyprus (Andreou, 2012), Sudan (Ebaidalla, 2018), and India (Lakshmanasamy, 2021)—demonstrate that higher-income households tend to allocate more resources toward education. This trend suggests that income not only facilitates access to education but also influences the quality and extent of educational opportunities available to children.

Parental education, particularly the educational attainment of the household head, emerges as another significant factor shaping education spending. Households with better-educated parents are more likely to invest in their children's education, underscoring the intergenerational transmission of educational values and opportunities (Andreou, 2012; Maritim, 2017; Tilak, 2002). In the Indian context, recent research by Gangavath and Katta (2024) highlights how, despite the provision of free elementary education for children aged 6–14 in Telangana, private household expenditures remain substantial and are unevenly distributed across socio-economic strata.

Demographic characteristics further contribute to variations in household educational expenditures. Factors such as family size, the number of school-going children, and gender composition significantly influence how families prioritize their spending. Larger families and those with more school-aged children typically allocate a greater share of their budget to education (Donkoh & Amikuzuno, 2011; Maritim, 2017). Moreover, gender biases in educational investment persist, with evidence pointing toward a preferential allocation of resources for boys over girls (Maritim, 2017; Mukherjee & Sengupta, 2021; Tilak, 2002).

Regional disparities also play a critical role in shaping household education expenditure patterns. Andreou (2012) and Lakshmanasamy (2021) observe marked differences in spending behavior across geographic areas.

Urban households are generally found to invest more in education than their rural counterparts, a disparity attributed to higher income levels, improved access to educational infrastructure, and elevated costs of living in urban areas (Ebaidalla, 2018).

Understanding the multifaceted determinants of private education spending is essential for fostering equitable and efficient education financing. Insights into how socioeconomic, demographic, and regional factors influence household investment in education can inform the design of targeted public policies aimed at promoting inclusivity and equal access. In light of this, the present study seeks to explore the drivers of private education expenditure in three districts of Arunachal Pradesh. By situating the local context within broader national and international findings, this investigation aims to contribute meaningfully to the discourse on educational equity and financing.

2. Operational Terms

Literacy: Any person aged 7 and above who can both read and write in any language with understanding, through any formal or non-formal educational system or even if through adult literacy classes is taken as literate.

Work: Here the definition of work is participation in any activity which is economically productive, with or without wages, profit or compensation.

Other Worker: The type of workers that come under this category include all government servants, municipal employees, teachers, factory workers, those employed in trade, commerce, business, transport, banking, etc.

3. Objective of the Study

To examine household expenditure on education for individuals aged 7 to 24 in the selected districts by collecting data on those attending educational institutions, along with their working status and other relevant dependent variables.

4. The Administrative Structure of the Study Area

In May 1980, the erstwhile Subansiri District in Arunachal Pradesh was bifurcated into Upper Subansiri and Lower Subansiri districts. Subsequently, in September 1992, Lower Subansiri was further divided to create Papumpare District. In April 2001, Kurung Kumey District was formed. Later, in October 2017, Kamle District was created by reorganizing administrative circles from both Lower and Upper Subansiri districts. Most recently, in February 2024, Keyi Panyor District was carved out from Lower Subansiri, with its headquarters at Yachuli**.** According to the 2011 Census: Lower Subansiri comprised 8 administrative circles and 579 villages with a population of 83,030 (41,843 males and 41,187 females). Following the Arunachal Pradesh (Reorganisation of Districts) (Amendment) Act, 2017, Kamle District was created, with its headquarters at Raga. It comprises of Upper Subansiri and Lower Subansiri. In February 2024, Keyi Panyor District was established with its headquarters at Yachuli. Therefore the number of villages after the creation of new districts, reorganizing Census 2011 village list are as follows:

District Name	Number of Villages
Lower Subansiri	164
Kamle	231
Keyi Penyor	184

Social and Demographic Indicators: (2011 Census)

The Primary Census Abstract (PCA, 2011) data have been reorganized following the jurisdictional changes happened after 2011 Census to find the social and demographic indicators of newly created districts.

Sex Ratio

District	Sex Ratio	Child Sex Ratio(0-6)
Kamle	1016	992
ke Peniyor	975	919
lower subansiri	984	976

Among the three districts, Kamle has the highest overall sex ratio (1016) and a high child sex ratio (992), indicating a relatively balanced gender distribution. Lower Subansiri follows with an overall sex ratio of 984 and a child sex ratio of 976, also showing a relatively good balance. Ke Peniyor has the lowest figures in both categories, notably lower child sex ratio of 919.

Literacy Rate

District	Overall	Male	Female
Kamle	62%	68%	55%
ke Peniyor	71%	79%	64%
lower subansiri	81%	86%	76%

Across all districts, male literacy rates exceed female literacy rates, with Lower Subansiri showing the smallest gender gap. Kamle has the lowest overall and female literacy

Work Participation Rate (WPR) –Overall and Genderwise

District	WPR (T)	WPR (M)	WPR (F)
Kamle	38%	40%	37%
ke Peniyor	35%	39%	31%
lower subansiri	37%	44%	30%

Kamle has the highest overall WPR (38%) and the smallest gender gap, with male WPR at 40% and female WPR close behind at 37%. Ke Peniyor shows the lowest overall WPR (35%), with a noticeable gender gap: male WPR is 39%, while female WPR is 31%. Lower Subansiri reports the highest male WPR (44%) but the lowest female WPR (30%), resulting in the widest gender disparity.

District	WPR (T)	% Agriculture	% Non Agriculture
Kamle	38%	29%	9%
Ke Peniyor	35%	21%	14%
Lower Subansiri	37%	14%	23%

Lower Subansiri has the lowest agriculture participation (14%) and highest in non-agriculture (23%), indicating a shift towards non-agricultural employment like services or industry. There's a clear shift from agriculture to non-agriculture as we move from Kamle → Ke Peniyor → Lower Subansiri.

Number of Educational Institutes in the Districts

District	Primary school		Middle School		Secondary School		H.S. School		Colleges		University	
	Govt.	Other	Govt.	Other	Govt.	Other	Govt.	Other	Govt.	Other	Govt.	Other
Kamle	18	1	46	7	2	0	4	1	-	-	-	-
Lower Subansiri	29	4	50	17	12	13	4	4	1	2	-	1
Ke Peniyor	Not available											

Source: Statistical Abstract of Arunachal Pradesh–2023

5. Methodology

From each selected district, 2% of the villages are chosen as First Stage Units using Simple Random Sampling without Replacement. Subsequently, 5% of households are selected from each of these sampled villages through Random Sampling without Replacement.

District Name	Number of Villages	Number of Villages
Lower Subansiri	164	3
Kamle	231	5
Keyi Penyor	184	3

After selecting the villages, the number of households in each village was estimated by applying a multiplier to the 2011 figures. This multiplier was derived from the percentage increase in the 2022 population compared to 2011. As per the Sample Registration System Statistical Report 2011 and 2022, the population covered in statistically selected 60 sample unit, are 36,000 and 53,000 respectively. (https://censusindia.gov.in/census.website/data/SRSSTAT). The percentage increase, which is around 47%, has been applied in the selected villages of this study.

Subsequently, 5% of households from each selected village were surveyed for this study. The sample population, which are in the age group 7-24 are enumerated. As such, 55 individuals from Kamle district, 96 from Lower Subansiri district, and 78 from Keyi Penyor district were enumerated for data collection.

6. Data Collection / Variables

Variables required for the study is as follows:

1. Name.	6. Mother's Education (for individuals aged 5-19).
2. Sex.	7. Expenditure on Education.
3. Age	8. Family income
4. Literacy Status (Number of years of schooling)	9. Father's occupation
5. Father's Education (for individuals aged 5-19)	10. Mother's occupation

Now for analytical purpose, the variables have been re coded as follows:

Sex: Female-0, Male-1 ; **Literacy Status**: 1. Illiterate; 2. Literate without formal education; 3. Below Class 4; 4. Above class 4 but below class 8; 5.

Above class 8 but below class 10; 6. Above class 10 but below class 12; 7. ITI / Diploma / Certificate; 8. Bachelor / Undergraduate; 9. PG Diploma; 10. Master/Post graduate; 11 M.Phil/Doctorate & above; alongwith the codes, absolute numbers for Number of years of schooling have also been collected - for individuals as well as for parents. The total number of years of education of both the father and the mother has been combined to represent parental education.

Occupation: Occupational Sector (i)Agricultural worker; (ii) Cultivator; (iii) HH Industry worker, and (iv) Other worker

Here it can be observed that except 'expenditure on education' and 'family income', all the variables are categorical variables which have been coded for the sake of analytical purpose. Now, the dependent variable and independent variables are not directly related in a linear way, but rather in a multiplicative way.

Here we transform the dependent variable 'expenditure on education' and 'family income' to natural log values, whereas other independent variables are kept as it is. Thus, outcome variable and one predictor variables are log transformed in the model, which is as follows:

$$Ln(y_i) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 Ln(x_6) + e_i$$

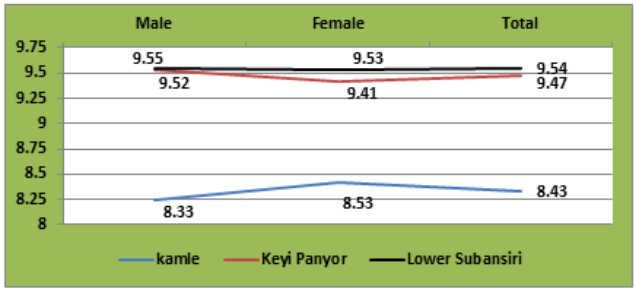
$$Where\ y_i = Expenditure\ on\ Education\ for\ any\ individual\ in\ the\ age\ group\ 7-24$$

$$x_1 = Sex;\ x_2 = Age;\ x_3 = Literacy\ Status;\ x_4 = Parental\ education;\ x_5 = parental\ occupation\ \ x_6 = family\ income\ ;\ e_i = Error\ term$$

Each coefficient (β_1 through β_6) reflects the marginal effect of the corresponding predictor on the predicted expenditure, holding all other variables constant.

7. Results and Discussion

As already mentioned, the dependent variable 'expenditure on education' has been transformed to logarithmic scale. A descriptive analysis of the data is shown in the graph where it compares mean values of 'expenditure on education' for three regions—Kamle, Keyi Panyor, and Lower Subansiri—across three categories: Male, Female, and Total.



Lower Subansiri consistently shows the highest values across all categories. The difference between male and female values is minimal, indicating near parity, whereas Keyi Panyor shows a slight drop in the value from males to females, leading to a total that is slightly lower than the male value but follows closely Lower Subansiri. It is reflected that Kamle has the lowest values among the three regions across all categories. But at the same time, the value for females is slightly higher than that for males. In contrast, in case of other districts, expenditure on Male is higher than female.

One Way Analysis of Variance (ANOVA)

One way Analysis of Variance (ANOVA) has been used here to determine whether there are statistically significant differences in the mean gender distribution (likely proportions of males/females) across the three regions.

One way Analysis of Variance (ANOVA)		
District	**F**	**Sig. (p value)**
Kamle	0.17	0.68
Keyi Panyor	0.26	0.62
Lower Subansiri	0.03	0.86

In all three cases, p-values (Sig.) are all well above the typical threshold of 0.05, indicates that there is no statistically significant difference in gender distribution among the groups in any of the three districts. Therefore, it can be stated that gender is evenly or similarly distributed across Kamle, Keyi Panyor, and Lower Subansiri.

8. Regression Results

1.Kamle District

Model Summary			
R	R Square	Adjusted R Square	Std. Error of the Estimate
0.71	0.50	0.43	1.38

Model	Unstandardized β	Sig.	VIF	Transformed β
Sex	0.30	0.44	1.09	35.31
Number of years of schooling	0.21	0.00	1.16	23.89
Parental schooling	0.01	0.77	2.68	1.14
Parental occupation	0.01	0.99	2.0	1.15
LN_family Income	1.00	0.04	1.89	1.00

The variable "age" has been removed due to severe multicollinearity (VIF>8).

Number of years of schooling (literacy Status) and in family income are the most influential factors. Literacy status shows statistical significance, suggesting that individuals with higher literacy might spend more on education. Family income also appears to have a significant effect. Sex, and parental factors (father's and mother's education, and occupation) do not significantly affect educational expenditure in this model.

2. Keyi Panyor District

Model Summary			
R	R Square	Adjusted R Square	Std. Error of the Estimate
0.747	0.558	0.521	0.686

Model	Unstandardized β	Sig.	VIF	Transformed β
Sex	0.05	0.78	1.14	4.78
Age	-0.06	0.05	2.25	-5.59
Number of years of schooling	0.19	0.00	2.33	20.83
Parental schooling	-0.01	0.31	1.38	-1.21
Parental occupation	0.37	0.36	1.52	44.40
LN_family Income	0.58	0.00	1.48	0.55

The results indicate that number of years of schooling and family income are the most significant predictors in the model. The coefficient for number of years of schooling ($\beta = 0.19$, $p < 0.01$) shows that higher schooling years are associated with a substantial increase in the dependent variable. Similarly, the positive and statistically significant coefficient for family income ($\beta = 0.58$, $p < 0.01$) suggests that individuals from higher-income families tend to have higher values of the dependent variable.

Age, Parental background variables (education and occupation), while not significant, show some variation and may influence spending under different conditions or when interacting with other variables.

3. Lower Subansiri District

Model Summary			
R	R Square	Adjusted R Square	Std. Error of the Estimate
0.782	0.611	0.590	0.441

Model	Unstandardized Coefficients beta	Sig.	VIF	Transformed Beta
Sex	-0.04	0.63	1.01	-4.28
Number of years of schooling	0.09	0.00	1.35	9.90
Parental schooling	0.01	0.19	3.64	1.21
Parental occupation	0.08	0.70	3.15	8.10
LN_family Income	0.72	0.00	1.89	0.72

In Lower Subansiri, income again has the strongest influence, followed by individual's own schooling. Parental characteristics do not significantly impact spending once income is included.

9. Discussion

The analysis of educational expenditure across the districts of Kamle, Keyi Penyor, and Lower Subansiri reveals notable spatial and gender-based variations. Among the three districts, Kamle exhibits the lowest average educational expenditure for both males and females, alongside the pronounced gender disparities. Interestingly, female expenditure on education in Kamle surpasses that of males, which deviates from the trend observed in the other districts. In contrast, Lower Subansiri reports the highest and most stable levels of educational expenditure, coupled with minimal gender differences, indicating a relatively equitable and consistent investment in education across the population. Keyi Penyor falls in between, with moderately high and stable expenditure levels, and a slight male advantage in spending.

When comparing the mean and consistency of male educational expenditure, a progressive improvement is observed in the order of Kamle followed by Keyi Penyor followed by Lower Subansiri. A similar pattern is evident for females. Overall, both educational spending and its consistency demonstrate a gradual upward trend from Kamle to Lower Subansiri. Despite these observable differences, statistical tests indicate that the gender-based differences in expenditure are not significant across the districts, suggesting that while expenditure patterns vary, gender may not be a strong determinant in this context.

The regression analysis reveals notable district-level variations in the determinants of educational expenditure among individuals aged 7–24 years. Across all three districts, Kamle, Keyi Panyor, and Lower Subansiri, the log-transformed models indicate that family income and the individual's years of schooling emerge as the most consistent and statistically significant predictors of education expenditure. The elasticity of the estimated income, ranging from 0.58 to 1.00, suggest that a 1% increase in family income leads to approximately a 0.6–1.0% increase in spending on education, highlighting the income-sensitive nature of educational investment.

In contrast, sex, parental education, and parental occupation show no significant effects, implying that household economic capacity and individual educational attainment are more decisive than parental background in influencing expenditure patterns. The models explain between 43% and 59% of the variation in education expenditure across districts, with the Lower Subansiri district exhibiting the strongest explanatory power. These findings collectively underscore the central role of household income and schooling level in shaping educational spending behavior in the region, while demographic and parental characteristics exert relatively limited influence.

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