



Mapping Educational Inequality: An Econometric Analysis Of Literacy Gaps In Nuh District, Haryana

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ABSTRACT

This study examines literacy disparities in Nuh district, Haryana, with emphasis on rural-urban divides and the low levels of female child education. Utilising both primary survey and secondary sources (Census 2011, NFHS-5, UDISE + and District Statistical Handbook) and employing econometric tools such as t-tests, ANOVA, and OLS Multiple regression models, comprehensive picture is built to identify key socio-economic and cultural determinants that affect educational outcomes. Block-level stratified random sampling across the district ensures representation of rural villages and urban wards. Finding reveal persistent gender gaps, rural disadvantage, and the role of socio-economic variables like maternal education, income in shaping years of schooling and literacy.

Keywords: Social-Urban Literacy Gap, Female Child Education, Educational Backwardness, Gender Inequality, Socio-Economic Determinants

I. INTRODUCTION

Adam Smith in his famous book 'Wealth of Nations' in 1776 raised the potential importance of education in increasing the productive capacity of society and thus laid the foundation for Human Capital Theory. Other renowned economists like Alfred Marshall, J.S. Mill, extensively spoke about the importance of public investment on education, rate of return on education, human capital formation, etc. during eighteenth and nineteenth century. In 1848, J.S.Mill built upon Smith's notion (human effort lies at the root of all wealth) considered 'human abilities as means of wealth'. During 1960's, a number of highly influential economists like Gary Becker, Jacob Miner and Theodore Schultz made the theoretical and empirical developmental research by applying economics to educational questions. In the special Issue of 1962, 'Journal of Political Economy' edited by Schultz entitled 'Investment in Human Beings' were the early instances of the rise of Economics of Educations. Human Capital Approach given by Becker in 1964 in his classic book 'Human Capital' became central to the economics of education. And explained why individuals invest in education and training in a manner similar to investment in Physical capital. Schultz. W.T (1961), in his paper 'Investment in Human Capital' published in the American Economic Review argued that education, training and other forms of human capital investment are crucial for economic growth and development. According to Psacharopoulos and Patrinos (2002), economists have revealed a consistent positive relationship between investment in education and increased earning for individuals with an estimated of the average rate of return to an additional year of schooling of about 10 percent.

Banerjee. A and Duflo. E. (2011), in their famous book 'Poor Economics' delve into the complex relationship between education, poverty alleviation and the role of government, particularly in developing economies like India. The author discusses the debate on supply-demand war, where 'supply wallahs' advocate for construction of more school while 'demand wallahs' argue to focus on generating strong underlying demand for education. The debate argues that both supply and demand factors must be addressed to improve educational outcomes. Demand side factors include high absentee ratio, children's unwillingness to go to school, parental resistance, etc. Their work emphasises on enhancing teaching quality (reducing teacher absenteeism, better instructional methods, etc.), parental engagement, utilising conditional cash transfers and community-based programs to motivate students to attend school on a regular basis.

This article collects relevant primary data related to elementary education in the Nuh district, establishes a model and conducts an econometric analysis of persistent gender gaps, rural female disadvantage, urban rural literacy gap and the role of socio-economic variables like religion, maternal education, household income in shaping years of schooling and literacy.

Nuh district of Haryana with majority of the population are Meo Muslims (the largest concentration of Muslims in any district of North India) is found to have one of the lowest literacy rates in the country at 56.1 percent (75.55 percent state average). Female literacy is mere 37.6 percent (65.9 percent state average) while male literacy is 69.9 percent (84.04 percent). Male-female literacy gap of 35.7 percent reflects deep rooted and persistent educational inequality. In April 2018, NITI Aayog identified it as the most backward district of the country. As per the Multidimensional Poverty Index (MPI) released by in 2023 by NITI Aayog, based on NFHS 5th round (2019-21), Nuh district is one of the poorest districts of Haryana and shelters around 40 percent of the population who are multi-dimensionally poor.

II. REVIEW OF LITERATURE

Dreze and Sen (1995), in their seminal work *India: Economic Development and Social Opportunity*, emphasized that disparities in education are closely linked with broader issues of social opportunity, gender inequality and human development.

Govinda and Bandyopadhyay (2011) studied educational access in rural India and the research highlighted that rural and especially minority-dominated districts face higher dropout rates, lack of qualified teachers, and inadequate infrastructure.

Kingdon and Sipahimalani-Rao (2010) analyzed the public-private divide in Indian education and found that in poor districts, even low-cost private schools outperformed government schools in terms of learning outcomes—though access remained limited for the ultra-poor.

Siddiqui, Z.S and Khan, A.S (2022), in their article 'Educational Status of Muslim Women in India' based on NSS reports and 2011 Census present a stark disparity in educational attainment among Muslim women in comparison to other religions in the country. Literacy rate among Muslims is 57.28 %, far below than the national average (63.07%) while Muslim women are facing an even higher illiteracy of 48.11%. When compared to other religious communities, smallest percentage of them attain higher education with only 1.90% of Muslim women reach University level and a mere 0.14% attain technical education indicating significant underrepresentation. Despite the presence of minority institutions like Aligarh Muslim University and Jamia Millia Islamia, enrolment of Muslim women remains disproportionately low due to various socio-cultural barriers like traditional patriarchal norms, early marriages and societal expectations and thus calls for urgent need for community-specific policy interventions.

III. STUDY AREA

Mewat District was carved out as an independent district after dividing Gurgaon and Faridabad on April 4, 2005, three decades after the formation of Haryana state i.e. on 1st November 1996 and was later renamed Nuh in 2016. It is mostly inhabited by a numerically preponderant ethnic group called Meo, who embraced Islam during the reign of Tughlaq in the 14th century AD and subsequently during Aurangzeb's time in 17th century. According to Census 2011, Nuh district has total population of 10.89 lakh, 88.62 per cent of its population is rural while only 11.39 percent reside in urban areas. Muslim population account for 80.4 per cent of the total population. The Muslims living here are called Meo and are listed under the Other Backward Class (OBC) category. The district has the lowest literate population at 56.1 percent compared to 75.55 percent in Haryana. Only 37.6 percent of females in the district are literate against the state average of 65.9. Male literacy in the district is slight better at 69.9 percent but much lower in comparison to state average of 84.06. As per the Socio-Economic and Caste Census 2011, rate of rural illiteracy is nearly double as that of rural Haryana and India. The male female gap in literacy rates within the district was about 35.7 per cent. The Sex Ratio of the district was 906 against the state average of 877 but much worse in comparison to the national average of 940. (Census 2011).

IV. OBJECTIVES

- To measure rural–urban literacy differences in Nuh district.
- To do a comparison of female literacy to male literacy
- To analyse the socio-economic factors influencing female literacy rates

V. RESEARCH QUESTIONS

1. What is the difference between literacy rate in rural vs. urban areas of Nuh district?
2. What is the female literacy compare to male literacy in this district?
3. What and how do socio-economic factors influence female literacy rates?

VI. HYPOTHESIS

1. H₁: Urban literacy is significantly higher in urban areas than in rural areas
 - *Null Hypothesis (H₀):* No difference in literacy between rural/urban areas.
2. H₂: Household income and mother's education positively impacts child's literacy
 - *H₀:* Income and mother's education has no effect on child's literacy.

3. H₃: There exists gender-based differences in literacy outcomes
 - (H₀): No gender-based differences exist in literacy outcomes.
4. H₄: The interaction of being female and rural (Female × Rural) has a negative effect on years of schooling.
 - (H₀): Being a rural female has no significant effect on years of schooling.

VII. DATA AND METHODOLOGY

The study is primarily based on Primary data which was gathered through pre-tested structured questionnaires, field visit conducted across all blocks of Nuh district i.e. Punhana, Ferozpur Jhirka, Nuh, Nagina, Tauru and Pinangwan. Respondents included Parents, School-going and drop out children (special emphasis on female child), teachers, principals and Madrasa Heads. Tools for analysis included descriptive statistics, t-tests, ANOVA and OLS multiple regression.

VIII. SAMPLING DESIGN

The study comprises the entire geographical region of Nuh district including both rural and urban areas with an adoption of multi-stage stratified random sampling method to ensure adequate representation from different stakeholder categories. The whole district was divided into blocks and further into rural and urban areas and then randomly the villages and urban wards were selected. For statistically significant results, following Cochran's Sample size formula was used:

$$no = \frac{Z^2 \cdot p \cdot (1 - p)}{e^2}$$

Where:

no = Sample size for large population

Z= Z-score (based on confidence level)

p = estimated proportion of the population

e = margin of error (0.05 i.e. 5%)

Since the population was known, finite population correction method was used and 1200 respondents were selected with adequate representation of females.

IX. MODEL ESTABLISHMENT

Explanation of Variables and the Establishment of the Model

Years of Schooling is taken as the Dependent Variable while 6 independent variables are taken for analysis i.e., Gender, Location, Socioeconomic status (Income and Mothers education), Interaction Terms (Female x Rural) and Control Variable (Religion) including the random error term.

$$\text{Years of Schooling} = \beta_0 + \beta_1 \text{Female } i + \beta_2 \text{Rural } i + \beta_3 \text{Income} + \beta_4 \text{Mother Education} + \beta_5 (\text{Female X Rural}) + \beta_6 \text{Religion } i + \epsilon_i$$

Or

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \epsilon_i$$

X. MODEL PARAMETER ESTIMATION

The model estimation of the above variables is as follows:

$$Y = 4.0296 - 1.0599 X_1 - 0.593 X_2 - 0.014 X_3 + 0.804 X_4 - 0.602 X_5 - 0.178 X_6 + \mu$$

$$R^2 = 0.711, \text{ Adjusted R squared} = 0.71, F = 522.615, N = 1200$$

Economics Significance Test

1. Gender (Female), $\beta_1 = -1.060$ ($p < 0.001$)

This shows that girls complete about 1.06 fewer years than boys representing substantial gender gap

2. Location (Rural) $\beta_2 = -0.593$ ($p < 0.001$)

Rural children complete roughly 0.59 fewer years than the students of urban areas

3. Income $\beta_3 = -0.014$ ($p \approx 0.82$)

Income is not significant as it shows a negative relation with years of schooling with is not in line with the economic reality. The variable should be adjusted or deleted for better results.

4. Mothers Education, $\beta_4 = +0.804$ ($p < 0.001$)

One year increase in mother's education raises the child's schooling by 0.8 years on an average. This is the largest positive effect in the model affecting years of schooling of the child and thus leads to strong intergenerational transmission. Thus, maternal education is the most influential positive factor, nearly doubling the likelihood of enrolment and years of schooling.

5. Female X Rural (Double disadvantage) $\beta_5 = -0.620$ ($p = 0.007$)

This is a double disadvantage for the rural female as gender gap is larger in rural areas.

Table 1: Econometric Test Results

Regression Results (Least Squares)
 Dependent Variable: Years of Schooling
 Method: Least Squares
 Sample: 1,200 observations

Coefficients Table

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	4.0296	0.1540	26.158	0.0000
Female	-1.0599	0.1064	-9.963	0.0000
Rural	-0.5933	0.1222	-4.854	0.0000
Income K/10	-0.0140	0.0626	-0.224	0.8223
Mother Edu.	0.8042	0.0207	38.905	0.0000
Female × Rural	-0.6204	0.2292	-2.707	0.0070
Religion	-0.1777	0.1340	-1.325	0.1855

Table 2: Model Statistics

Statistic	Value
R-squared	0.711
Adjusted R-squared	0.710
Standard Error of regression	2.22
Sum squared residual	5837.5
Log likelihood	-3021.9
F-statistic	522.61
Prob (F-statistic)	0.0000
Durbin-Watson stat	= 2.0

Table 3: Information Criteria

Criterion	Value
Akaike AIC	5.041
Schwarz SC	5.083
Hannan-Quinn HQ	5.056

Statistical Inference Test/Goodness of Fit Diagnostics

1. Sample Determination Coefficient

R^2 indicates the fitting degree of regression line to the observation value. The closer it is to 1 better indicator is your econometric model and explains a larger portion of the variation in the dependent variable due to the independent variables. The results indicate $R^2 = 0.711$, shows that model explains 71% of the variation in Years of Schooling while the remaining is included in the random error term.

2. Adjusted Sample Coefficient

It aims to evaluate the goodness of fit for multiple regression models by adjusting for the number of predictor variables. The results show Adjusted $R^2 = 0.710$ indicating the model has a strong ability to predict the dependent variable and the included variables account for a substantial portion of the total variance in the dependent variable.

3. Breusch-Pagan (BP) Test

This is a statistical test for checking heteroscedasticity in a multiple regression model. OLS assumes constant variance of errors i.e. homoscedasticity. The test results show Lagrange Multiplier (LM)= 7.99, $p = 1.239$. Since p -value is more than 0.05, there is not strong statistical evidence of heteroscedasticity in the residuals of the model.

4. RESET TEST

The Ramsey RESET test (Regression Specification Error Test) is used to detect misspecification, identifies important omitted variables. The results show $F=30.92$, $p < 0.001$ indicating omitted variables or functional form misspecification in the model. To address this issue, additional robustness checks such as inclusion of quadratic terms (MotherEdu², Income²) were added to the regression model. Now the RESET TEST result shows $F= 0.09$, $p=0.761$ which can be interpreted as no sign of misspecification. Thus, by the addition of nonlinear terms fixed the RESET problem.

Table 4: Remedy by adding nonlinear terms to the Regression model

Regression Results with Quadratic Terms (Least Squares)
 Dependent Variable: Years of Schooling

Method: Least Squares with Robust SEs

Sample: 1,200 observations

Coefficients Table

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.24	0.3206	10.092	0.0000
Female	-1.07	0.1906	-5.603	0.0000
Rural	-0.63	0.1634	-3.853	0.0001
Income K/10	+0.3902	0.1859	2.099	0.0358
(Income K/10) ²	-0.076	0.0327	-2.314	0.0207
Mother Edu.	+1.0513	0.0486	21.620	0.0000
(Mother Edu.) ²	-0.022	0.0038	-5.826	0.0000
Female × Rural	-0.5747	0.2248	-2.557	0.0106
Religion	-0.1962	0.1325	-1.481	0.1385

Table 5: Model Statistics

Statistic	Value
R-squared	0.719
Adjusted R-squared	0.717
F-statistic	490.18
Prob (F-statistic)	0.0000
RESET F	0.09
RESET p-value	0.761
Breusch-Pagan LM	21.92
Breusch-Pagan p-value	0.0051

With the inclusion of non-linear terms in the model, we see that income and mother's education not just have a positive diminishing returns relationship with the dependent variable. Poor families experience big schooling gains with slight increase in income while the rich families get smaller benefits. The model supports that each year rise in mother's education positively raises years of schooling but there exist diminishing returns to maternal education implying biggest gains at lower levels while reducing at higher levels.

HYPOTHESIS TESTING RESULTS

Hypothesis	Tests used	Decision	Interpretation
H1: Urban Literacy > Rural Literacy	Two-sample t-test (Welch's test), Regression Coefficient Test (OLS)	Reject Ho; Urban literacy is significantly higher in urban areas than in rural areas	Urban children have a significant advantage over their rural counterparts as the latter have around 0.63 fewer years of schooling; highly significant.
H2: Household Income and mother's education positively affects Years of Schooling	t-tests in the quadratic OLS model	Reject Ho (nonlinear); Female children face significantly lower literacy outcomes compared to male children.	Income has a positive effect initially (+0.39) but eventually has diminishing returns (-0.076). Mother's education, the most powerful indicator is strongly positive (+1.05) but has diminishing returns (-0.022) at higher levels of maternal education.
H3: Female literacy < Male literacy	Two-sample t-test (Welch's test), Regression Coefficient Test (OLS)	Reject Ho; Household income and mother's education positively impacts child's literacy	Girls have 1.07 fewer years of schooling. There significantly exists gender-based differences.
H4: Female × Rural < 0	Regression Coefficient Test (t-statistic)	Reject Ho; The interaction of being female	This confirms that rural girls have double disadvantage with an

		and rural (Female × Rural) negatively influences literacy.	average 0.57 years fewer schooling.
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CONCLUSION

The study of the model using of econometric tools and statistical analysis like OLS multiple regression analysis identified core determinants of years of schooling i.e. maternal education and household income along with gender, cultural barriers. The t-tests revealed that the educational differences between urban and rural as well as males and females are statistically significant. The regression analysis also highlighted that the rural female children from a low-income family are at the double disadvantage situation leading to educational exclusion. The findings demonstrate that structural and interlinked socio-economic forces are the reason for low level of literacy in the Nuh district and suggests an urgent need for targeted government policy to uplift female education, eliminate economic and cultural barriers and improve access, equity and quality of education in the district. Interventions must focus on strengthening female education and reducing dropout rate through scholarships and transport, expand rural school infrastructure to enhance the quality of education, integrate madrasas with mainstream curricula along with the introduction of modern subjects for better job opportunities, and implement community campaigns to change gender norms. As mentioned earlier, mother's education stands out as the strongest determinant of children's education, suggesting increased investments in adult women literacy to avail intergenerational benefits. Thus, the analysis through robust empirical evidence validates educational inequality in the district suggesting prioritising female education along with addressing the issue of socio-cultural barriers for its upliftment and bridging the educational divide.

References

- Banerjee. A.V., Duflo. E. (2011). Poor Economics, Penguin Rando House India, ISBN 9788184002805
- Becker, G. (1962). Investment in Human Capital: A Theoretical Analysis, *Journal of Political Economy*, Vol. 70, No.5, pp 9-49. Retrieved from: <https://www.jstor.org/stable/1829103>
- Becker, G. (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education. Columbia University Press, New York.
- DISE District Report Cards on Mewat (2006-07 to 2015-16)
- District Census Handbook of Mewat (2011)
- District Health and Household Survey (2012-13)
- District Report Card for Aspirational Districts Mewat (Haryana), National Achievement
- Franzis, H. (2002). Human Capital, signaling, and the pattern of returns to education. *Oxford Economic Papers* 54. Pp 298-320.
- Govind. R, Bandyopadhyay M. (2010), Social exclusion and school participation in India: Expanding access with equity, Springer, UNESCO IBE 2010, pp 337-354
- Hong, P, Duy. T, Educational Philosophy in Plato's "The Republic: Implications for educational development in Vietnam's today. *Journal of Law of Sustainable Development*. ISSN-2764-4170. Pages-01-27.
- India National Multidimensional Poverty Index: A Progress Review 2023, NITI Aayog, 2023. https://ophi.org.uk/sites/default/files/2024-03/India_National_MPI_2023.pdf
- Ishtiyaque, M., and Hurera, A. (2014). Role of Madrasa in promoting education and socio-economic development in Mewat district, state of Haryana, India, *Procedia-Social and behavioral Sciences* 120, 84-89.
- Ishtiyaque, M., and Hurera, A. (2014). Traditional Education System: Its Impact on Socio-Economic Development in Mewat District of Haryana, India. *Bulletin of Geography: Socio-economic series*, 76(23), 73-86.
- Kingdon. G, Sipahimalani.V, (2010), Para-Teachers in India: Status and Impact, *Economic and Political Weekly*, Vol. 45, Issue NO. 12, ISSN (Print) - 0012-9976 | ISSN (Online) - 2349-8846
- Leoni, S. (2023). A Historical Review of the Role of Education: From Human Capital to Human Capabilities, *Review of Political Economy*, 37 (1), pp 227-244
- 16.
- Psacharopoulos .G, Partinos. H, Returns to Investment in Education, Policy Research Working Paper 2881, The World Bank. Retrieved from: [chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://documents1.worldbank.org/curated/en/512891468739485757/pdf/multiopage.pdf](https://documents1.worldbank.org/curated/en/512891468739485757/pdf/multiopage.pdf)
- Schultz. W. T (1961). Investment in Human Capital, *The American Economic Review*, Vol.51, No.1. pp 1-17

19. Sen A, Drèze J. India: Economic Development and Social Opportunity. Oxford: Clarendon Press; 1995, Retrieved from: http://www.amazon.com/India-Economic-Development-Social-Opportunity/dp/0198290128/ref=sr_1_2?s=books&ie=UTF8&qid=1310742863&sr=1-2
20. Siddiqui Z, Khan A. (2022), Educational Status of Muslim Women in India: A Comparative Study, International Journal of Creative Research Thoughts, Volume 10, ISSN: 2320-2882
21. Socio-Economic and Caste Census (2011)
22. Spence, M. (1973). Job Market Signaling, *The Quarterly Journal of Economics*, Vol. 87, No. 3. pp 355-374.
23. Survey, 2017-18, NCERT, Ministry of Education, GOI.
24. U-DISE 2016-17, 2020-21