Asian Economic and Financial Review
ISSN(e): 2222-6737/ISSN(p): 2305-2147
journal homepage: http://www.aessweb.com/journals/5002

GENDER DISPARITY IN EDUCATION ENROLLMENT IN PAKISTAN

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ABSTRACT

The paper examines the determinants of school enrollment in Pakistan. The likelihood of school enrollment is estimated using separate logistic regression models for three different age groups. The empirical results indicate severe gender disparity in school enrollment across all age groups, particularly among the older age groups. Although the rate of school enrollment is positively associated with household income, the gender disparity actually deteriorates with an increase in household income for the middle-income households. This study failed to find any evidence that gender disparity can be attributed to discrimination in intra-household resource allocation.

Keywords: School enrollment, Gender disparity, Household allocation of resources, Odds ratio, Logistic regression, Non-parametric plot.

JEL Classification: J16; I2.

Contribution/ Originality

This paper's primary contribution is finding that gender disparity in education in Pakistan is actually more acute for the richer households even though overall school enrollment is positively associated with household income. Furthermore, the empirical results show no evidence of gender discrimination in household resource allocation.

1. INTRODUCTION

The disparity between male and female school enrollment in Pakistan has already been well documented. According to the United Nations International Children's Emergency Fund (UNICEF), Pakistan is one of the ten countries in the world with the largest disparity in school enrollment between boys and girls. The goal of this study is to investigate whether poverty is the

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DOI: 10.18488/journal.aefr/2015.5.3/102.3.407.417
ISSN(e): 2222-6737/ISSN(p): 2305-2147

primary cause of such inequality in education between boys and girls. If household income is an important determinant of school enrollment, then one would expect this disparity to dissipate as household income increases. Another explanation could be that systematic discrimination in resource allocation against girls is pervasive in Pakistan and that as such the inequality in education is simply another phenomenon of this widespread disparity in consumption. In the absence of any empirical evidence of gender disparity or negative correlation between household income and school enrollment, one would be inclined to conclude that the lower rate of female participation in education is possibly an outcome of social conservativeness rather than simple economic deprivation. The long-term policy implication of such gender disparity is that girls would grow up less educated than their male siblings. Since mothers' education is assumed to play a vital role in the overall development of children, lack of maternal education would have an adverse effect on future generations.

Blau and Kahn (1997) have shown that investment in female education has a higher rate of return than investment in male education. Khan (1997) provided empirical evidence of this association between female education and higher rate of return for Pakistan. The literature suggests that equality in gender education leads to improvement in the important development indicators (Abu-Ghaida and Klasen, 2004). Akram *et al.* (2011) found that gender disparity in education attainment hinders growth in Pakistan. As such, it is important to conduct a quantitative analysis to identify possible gender disparity in education and also find the source of such disparity.

Lokshin and Sawada (1999) identified the supply side constraints on village girls' primary education and concluded that policy interventions such as hiring more female teachers and providing schools in close proximity to villages would improve the probability of female school enrollment. According to Sabir (2001), although government subsidies directed toward primary education are pro-poor all over Pakistan, females are disadvantaged in terms of access to education. Moreover subsidies directed toward higher education are targeted in such a way that the poorest income group receives lesser than the rich income group. Filmer (2000) found that large gender gaps are a pervasive phenomenon in South Asia and that wealth interacts with gender to exacerbate the existing gap in education outcomes among males. Filmer and King (1999) concluded that the disparity between educational outcomes across gender is not related to economic conditions. Alderman (1996) found that the gap, by which girls lag significantly behind boys in education in many developing countries, may slow economic growth and increase inequality.

The rest of the paper is organized as follows. Section 2 briefly describes the data and variables; section 3 estimates the gender disparity in school enrollment; section 4 uses a nonparametric approach to look at the relationship between household income and disparity in school enrollment between boys and girls; section 5 analyzes possible gender disparity in intra-household allocation of resources, section 6 looks at expenditure on education, and finally section 7 provides concluding remarks.

2. DATA AND VARIABLES

Data was obtained from the Pakistan Panel Survey 1986-1991, collected and compiled by the International Food Policy Research Institute (IFPRI). The dataset comprised 975 households from three provinces - Northwest Frontier Province (NWFP), Punjab, and Sindh. The sample consisted of 3779 young people aged 5 through 22 (i.e., all school and college-going boys and girls) from 866 households. We used a logistic regression to estimate whether a child is enrolled in school, based on individual characteristics, household profile, and geographic location. The binary dependent variable takes the value 1 if the person is enrolled in school and 0 otherwise.

A dummy variable for gender was used, and the estimate was expected to be positive since the probability of going to school would be higher for a boy. For older children, age should negatively affect the schooling choice since they have better opportunity to work. Higher income would enable households better to afford sending their children to school and hence would have a positive sign. Both mother's education (Mothedu) and father's education (Fathedu) should have a positive impact on children's school enrollment. Because an additional member of the household competes for resources, an increase in the number of children should have a negative impact on school enrollment. Two variables—number of boys (Boys) and number of girls (Girls)—were applied to measure whether the impact of an additional boy is different from the impact of an additional girl in the household. Finally, two dummy variable—provinces Punjab and Sindh—serve to capture any impact of geographic location on school enrollment.

In Table 1, the school enrollment rate for the entire sample between ages of 5 and 22 was 29 percent, of which female enrollment was merely 14 percent, compared to 44 percent male enrollment. Whereas the male enrollment rate declined from 53 percent among 5 year to 11 year olds, to 50% among 12 to 17 year olds, the female enrollment rate dropped drastically from 24 percent to only 11 percent across the same age group. It is worthwhile to notice that the male enrollment rate for the 18 to 22 year olds was still substantially higher than even the female enrollment rate in 12 to 17 year old age group. From a sample of 348 girls in the 17 to 22 year old age group, only 10 were enrolled in an educational institution.

Table-1. Summary Statistics of School Enrollment Rate

	Mean	**Standard Deviation**	**N**
All Age Groups			
Male & Female Combined	0.2895	0.4536	3779
Male	0.4380	0.4963	1920
Female	0.1361	0.3430	1859
Age: Five to Eleven			
Male & Female Combined	0.3902	0.4879	1676
Male	0.5349	0.4991	860
Female	0.2377	0.4260	816
Age: Twelve to Seventeen			
Male & Female Combined	0.3118	0.4634	1129
Male	0.4983	0.5004	592
			Continue

Female	0.1061	0.3083	537
Age: Eighteen to Twenty-Two			
Male & Female Combined	0.0836	0.2770	682
Male	0.1677	0.3741	334
Female	0.0029	0.0536	348

3. GENDER DISPARITY IN EDUCATION

Our primary focus was to examine empirical evidence of gender disparity in school enrollment. We employed the following Logit model to estimate the effect of the explanatory variables on the probability that a child will go to school:

$$P(School) = b_0 + b_1\, Gender + b_2\, Age + b_3\, Income + b_4\, Mothedu + b_5\, Fathedu + b_6\, Boys + b_7\, Girls + b_8\, Punjab + b_9\, Sindh + \varepsilon \quad (1)$$

This model was estimated for three groups: 1676 children from age 5 through 11; 1129 boys and girls from age 12 through 17; and 974 young men and young women from the age group 18 through 22.

Consequently, we are interested in the estimated coefficients and the corresponding p-values, as well as marginal effects (partial derivatives) and the odds ratio of independent variables in the logistic model. The marginal effect of the probability of a particular independent variable calculates $\delta P(y=1)/\delta x = \beta p(1-p)$, where x is the independent variable, β is the logit estimate, p is the probability that y equals 1, and $(1-p)$ represents the probability that y is 0. The odds ratio is the exponential of the logit coefficient; for binary explanatory variables, the odds ratio in the logistic regression is $p/(1-p)$, where p is equal to the conditional probability that $y=1$ when the independent variable $x=1$. For instance, the odds ratio associated with gender represents the probability of a boy's school enrollment divided by the probability of a girl's school enrollment. Some children in the sample were in the same households and therefore did not constitute independent observations. Therefore, standard errors of the coefficients were corrected for clustering.

Table 2 reports the estimated coefficients, marginal effects, and odds ratios for three age categories of male and female school enrollment. Table 2 represents a logistic regression, which is estimated because the dependent variable is binary. Appropriate corrections were made for clustering in view of multiple observations from the same household. The marginal effect allows interpretation of the effect of the continuous independent variables (age, household size, household income, and education level of the household head), and the odds ratios explain the effect of binary variables (gender, and dummy variables for the provinces).

Table-2. Logistic Regression Results for School Enrollment

Variables	Logit Coefficient	Marginal Effect	Odds Ratio	p- value
Ages: Five to Eleven				
Gender	1.627*	0.347	5.089	0.000
Age	0.228*	0.051	1.256	0.000
Income	0.412*	0.092	1.510	0.000
Mothedu	0.327	0.073	1.387	0.104
Fathedu	0.179**	0.040	1.196	0.023
Boys	-0.034	-0.008	0.967	0.536
Girls	-0.006	-0.001	0.994	0.871
Punjab	-0.357***	-0.077	0.700	0.092
Sindh	-2.311*	-0.412	0.099	0.000
Constant	-5.499*			0.000
Ages: Twelve to Seventeen				
Gender	2.667*	0.437	14.377	0.000
Age	-0.286*	-0.049	0.751	0.000
Income	0.400*	0.069	1.492	0.001
Mothedu	0.123	0.021	1.131	0.470
Fathedu	0.342*	0.059	1.408	0.000
Boys	-0.126***	-0.021	0.882	0.071
Girls	0.018	0.003	1.018	0.692
Punjab	-1.274*	-0.199	0.280	0.000
Sindh	-2.319*	-0.277	0.098	0.000
Constant	-0.920			0.426
Ages: Eighteen to Twenty Two				
Gender	5.210*	0.089	183.015	0.000
Age	-0.282*	-0.002	0.754	0.001
Income	0.593*	0.004	1.809	0.002
Mothedu	0.552	0.004	1.736	0.138
Fathedu	0.610*	0.004	1.840	0.001
Boys	-0.043	-0.0003	0.958	0.637
Girls	-0.035	-0.0002	0.965	0.644
Punjab	-3.071*	-0.021	0.046	0.000
Sindh	-3.706*	-0.014	0.025	0.000
Constant	-4.469**			0.046

* Significant at 1 percent; ** Significant at 5 percent; *** Significant at 10 percent;

The logistic regression for the younger group, from ages 5 through 11, showed that the probability of school enrollment for a boy is 5.089 times the probability of school enrollment for a girl. The enrollment probability increases by 0.051 with a one-year increment in the child's age. An increase in the household income and the educational level of both parents positively influence the enrollment rate. Although coefficients for the number of boys and girls in the household had a negative sign, neither was statistically significant. In comparison to NWFP, the odds of school enrollment in Punjab was somewhat lower (0.70) and in Sindh, drastically lower (0.10).

The probability of school enrollment for a boy between the ages of 12 through 17 was 14.377 times the probability of school enrollment of a girl in the same cohort. In contrast to their younger counterparts, the probability of school enrollment decreases by 0.049 with a one year increment in

the child's age. Both household income and father's educational level had positive impact on the child's school enrollment. The educational level of the mother was not statistically significant. For this particular age group, the number of boys in the family had a statistically significant negative impact on the school enrollment rate. In comparison to NWFP, the odds of school enrollment in Punjab was lower (0.279) and in Sindh, drastically lower (0.10).

The probability of school enrollment for a male in the age group 18 through 22 (eligible for college education) was an astounding 183.015 times that of a female. Such wide gender-differences in schooling do not only put the girls at a severe disadvantage but also have dire consequences for the girls' future and that of their children (in terms of nutrition, health, and education). For the youth in this age group, the probability of school enrollment decreased with age. Once again, income and father's educational level had a statistically significant impact on school enrollment.

4. ROLE OF HOUSEHOLD INCOME

Although schooling itself in general is a pervasive problem for all children in Pakistan, the primary concern of this analysis was an attempt to identify the sources of such glaring gender disparity in education. If poverty were one of the major factors contributing to discrimination against girls, then one would observe a reduction in the huge gap between educational opportunity for boys and girls among households with higher levels of income.

A nonparametric approach was used to investigate the role of income level of the household on the gender disparity in education. Locally weighted regressions were run to estimate the odds ratio of gender for groups of households that belong to the same income level. Each of these logistic regressions had 100 households. These households were ordered according to their rank in income level where the first regression used the 100 poorest households; the next regressions progressively added the next household in the income hierarchy by dropping the poorest household from the sub-sample. Hence from a total of 866 households in the sample, a total of 767 locally weighted regressions were obtained. The nonparametric analysis enhances the robustness of the empirical analysis and also provides a graphical depiction of the relationship between income and odds ratio of school enrollment across gender.

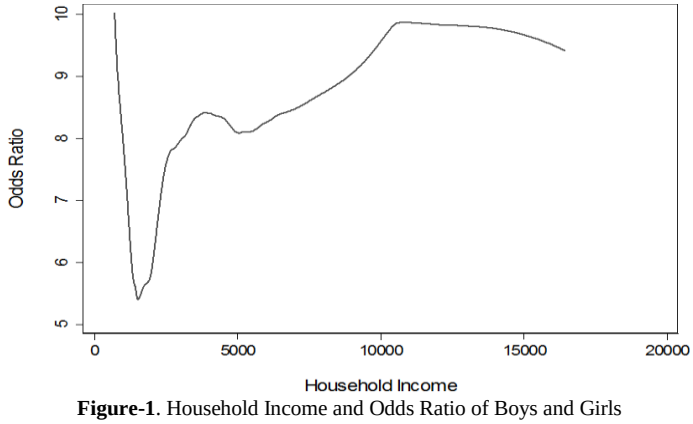

Figure-1. Household Income and Odds Ratio of Boys and Girls

After estimation of each regression, the odds ratio for the variable gender were saved and matched with the average household income for the 100 households in the sample. Next, a nonparametric plot of odds ratio against average household income was constructed to demonstrate the relation between income and gender disparity in education. Although the gender odds ratio plotted in Figure 1 declined as income increased for the poorest 30 percentile of the households, and also for the richest 20 percentile of the households, the odds ratio actually raised with an increase in household income for the 50 percent of the households in the middle. An anecdotal explanation could be that social conservativeness dominates these households so much as to offset and surpass the possible favorable effect of income choice of sending girls to school. In fact, if one considers all the households together, income would seem to have a positive effect on the odds ratio (meaning that the attitude of households tends to become less favorable toward female education as income level improves). Additionally, rich households may perceive daughters' financial future as being less dependent on education. A possible explanation for the odds ratio *per se* as household income increases is that the rate of boys attending school improves with little or no improvement in girls' attendance rates.

5. INTRAHOUSEHOLD ALLOCATION OF RESOURCES

The study's focus was not only limited to gender disparity in household resource allocation but also extended to how it effects disproportionate school enrollment between boys and girls. Discrimination against females in the Indian subcontinent is well documented in Bhagwati (1973), Sen (1984), Behrman (1987), Quayes (2003), etc. The inheritance laws that are skewed in favor of males may be largely responsible for such. Deaton (1989) found no sign of gender difference in Cote d'Ivoire but found small and statistically insignificant bias in favor of boys in Thailand. Using Household Expenditure data, Deaton verified the evidence of boy-girl discrimination in Pakistan.

Rothbarth's method, modified by Deaton *et al.* (1989), allows recovery rules for resource allocation within the household in the absence of data on actual individual consumption. Tobacco and movies were identified as adult goods, and a reduction in their consumption due to an increase in the number of family members was estimated. If the reduction is significantly greater for a male child in comparison to a female child, it would indicate that households disproportionately allocate resources based on the gender of the child. Observation of the allocation of resources to children under the age of 15 provides statistical evidence of differences between female and male children. The children were divided into three groups; under 5 years, from 5 to 10 years inclusive, and from 11 to 15 years inclusive. There was no evidence of disparity in resource allocation for girls and boys in any of the age groups. Table 3 reports the following estimated regression

$$R_i = \beta_0 + \beta_1 g05_i + \beta_2 b05_i + \beta_3 g10_i + \beta_4 b10_i + \beta_5 g15_i + \beta_6 b15_i + \beta_7 g55_i + \beta_8 b55_i + \beta_9 Headedu_i + \beta_{10} gPunjab_i + \beta_{11} Sindh_i + \varepsilon_i \quad (2)$$

where R = Ratio of adult goods to per capita expenditure

g05 = Female below 5 years of age

b05 = Male below 5 years of age

g10 = Female from age 5 through age 11 inclusive

b10 = Male from age 5 through age 11 inclusive

g15 = Female from age 10 through age 15 inclusive

b15 = Male from age 12 through age 17 inclusive

g55 = Female from age 16 through age 55 inclusive

b55 = Male from age 15 through age 55 inclusive

Headedu = Educational level of household head

An increase in number of family members ought to result in a reduction in the consumption of adult goods, which is empirically verified by the negative signs on all the independent variables. Except for the coefficients for girls from 5 through 11 years inclusive, and boys of the same age-range, all the estimates are significant at the 1-percent level (education is significant at the 5-percent level). Punjab and Sindh are dummy variables for the respective provinces.

Table-3. Regression on Ratio of Adult Goods to Per Capita Expenditure

Variables	**Estimated Coefficient**	**Test for equality of coefficients**	
Female *under 5*	-0.00022* (0.002)	$H_0: \beta_1 = \beta_2$	p-value = 1.000
Male *under 5*	-0.00021* (0.001)	$H_1: \beta_1 \neq \beta_2$	Difference is not significant
Female *5 – 10*	-0.00003 (0.786)	$H_0: \beta_3 = \beta_4$	p-value = 0.554
Male *5 – 10*	-0.00012 (0.133)	$H_1: \beta_3 \neq \beta_4$	Difference is not significant
Female *10 – 15*	-0.00046* (0.000)	$H_0: \beta_5 = \beta_6$	p-value = 0.272
Male *10 – 15*	-0.00035* (0.000)	$H_1: \beta_5 \neq \beta_6$	Difference is not significant
Female *15 – 55*	-0.00027* (0.000)	$H_0: \beta_7 = \beta_8$	p-value = 0.410
Male *15 – 55*	-0.00018* (0.002)	$H_1: \beta_7 \neq \beta_8$	Difference is not significant
Education	-0.00012** (0.022)		
Punjab	0.00080* (0.000)		
Sindh	0.00187* (0.000)		
Constant	0.00328* (0.000)		

* Significant at 1 percent; ** Significant at 5 percent;

To avoid an age effect, data were restricted to a comparison of male and female household members across the corresponding age group. The estimates for boys under the age of five and girls under the age of five were both statistically significant, indicating a reduction in the share of adult-goods expenditure due to an increase in the number of children. Although the absolute value of the coefficient for girls below five was slightly greater than the coefficient for boys below five, this

difference was not statistically significant. The same is true for girls from age 11 through 15 as well as for boys in that age group. Surprisingly, the coefficients for girls from age 5 through age 10 inclusive, and boys between of same age, were not statistically significant. Reduction in the adult goods expenditure-share (with higher level of education for the head of the household) conforms to intuition. Among the three provinces, households in Sindh had the highest composition of adult goods in the household budget, with Punjab coming up second and North West Frontier province coming in last.

Table 4 reports the tests for the difference between the consumption of male household members versus female household members. The tests failed to reject the null hypothesis that there is no disparity between boys and girls. The choice of the alternative was simply to accommodate the estimated coefficients in the regression. The difference in allocation of household resources between boys below five and girls in the same age-group was not statistically significant. The difference in consumption for children of both genders above 5 years but under 12 years was not significant even at 20 percent. There was no difference between girls and boys of any group even at the 10-percent level of significance. The fact that girls require some clothing even when their brothers can go about without a shirt offsets the disparity in food consumption for the poorest families. And because the disparity is greater for poor families, this effect of clothing may be why the data did not manifest any statistically significant differences.

6. EXPENDITURE ON EDUCATION

With each household as a unit of observation, the following regression model was estimated using the quantile regression procedure.

$$E = \gamma_0 + \gamma_1 girl + \gamma_2 boy + \varepsilon \qquad (3)$$

where $E =$ Education expenditure as a fraction of total household expenditure
$girl =$ Number of girls attending school
$boy =$ Number of boys attending school

Table-4. Regression on Ratio of Education Expenditure to Household Expenditure

Variables	Estimated Coefficient		
Twenty Five Percentile			
Girl	0.0019** (0.026)	$H_0: \gamma_1 = \gamma_2$	p-value = 0.354
Boy	0.0015** (0.023)	$H_1: \gamma_1 \neq \gamma_2$	Difference is not significant
Fifty Percentile			
Girl	0.0019 (0.137)	$H_0: \gamma_1 = \gamma_2$	p-value = 0.389
Boy	0.0025 (0.177)	$H_1: \gamma_1 \neq \gamma_2$	Difference is not significant
Seventy Five Percentile			
			Continue

Girl	0.0083* (0.008)	$H_0: \gamma_1 = \gamma_2$	p-value = 0.396
Boy	0.0075* (0.008)	$H_1: \gamma_1 \neq \gamma_2$	Difference is not significant
Ninety Percentile			
Girl	0.0016 (0.726)	$H_0: \gamma_1 = \gamma_2$	p-value = 0.049
Boy	0.0114** (0.016)	$H_1: \gamma_1 \neq \gamma_2$	Difference is significant

* Significant at 1 percent; ** Significant at 5 percent;

Estimated coefficients for equation (3) at the 25th, 50th, 75th, and 90th percentiles appear in Table 4. Positive signs for all coefficient estimates show that education expenditure as a share of total household expenditure increases with an additional child going to school, whether a boy or a girl. The coefficient estimates were statistically significant for the 25th, 75th, and 90th percentiles. A cursory look at these coefficient estimates revealed negligible difference between boys and girls except for the households in the 90th percentile. The coefficient estimates for the 50th percentile (or the median quartile) were not significant. It means that these households reallocate existing expenditure on education among the increased number of children going to school rather than allocating a higher amount of resources.

Boys and girls between the ages of 5 and 19 that attend school were defined as school-going children. In Table 4, which showed the results of the test for difference in expenditure for a school-going girl versus a school-going boy, fails to reveal any statistical evidence for the households in the 25th, 50th, and 75th percentiles. However, the difference between the expenditure on boys' education versus the expenditure on girls' education was statistically significant for the top 10 percent of the households.

7. CONCLUSION

The results show that the school enrollment rate improves with household income, but surprisingly the gender disparity in school enrollment becomes more acute for relatively richer households. Analogous to prior expectations, disparity in school enrollment worsens with age of children involved. Despite stark differences in educational enrollment between boys and girls, no statistical disparity occurs in the educational expenditure between boys and girls from the bottom 75 percent of the households that send their children to school. On the other hand, there is significant difference in education expenditure between boys and girls that come from the top 10 percent of these households, boys being favored over girls. No statistical evidence suggests systematic disparity in the intra-household allocation of resources between girls and boys. Although the disparity is undeniable, its relationship to household income appears to be the inverse of the study's hypothesis. Poorer girls are more likely than rich girls to be in school. It appears that rich households may tend to be more prone to assert traditional gender-roles, which offer

potential explanations for future research on whether a rich girl and her parents are less inclined to perceive education as a vehicle to the girl's financial security.

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