Impact Assessment of School Infrastructure Quality Index on School Enrollment: A Study Quantifying Gender Differentials in Punjab, Pakistan

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Introduction

Pakistan is struggling to alleviate poverty and terrorism from the territorial boundaries. In order to obtain fruitful results the government should invest in human capital. Given the recognized role of education as a medium for economic and social development, improving our understanding of the determinants of schooling is vital. This would enable policymakers to adopt policies to improve the allocation of resources, with the aim of increasing school enrollment and lowering the inequality in attainment. Therefore, this study identifies *school infrastructure quality index (SIQI)* to be an imperative explanatory variable in determining the probability of primary-middle school enrollment.

A good school environment directly improves children's health, school attendance and efficient learning. In that way individuals progress and become capable and productive members of society. Branham (2004) found a positive and significant relation between school enrollment and quality of school facilities.

In a country like Pakistan, where females receive less education compared to males, analyzing the sample separately by gender becomes important (Burney and Irfan, 1991). Factors such as labor market discrimination, cultural norms, restrictions on female mobility cause low enrollment of girls in schools (Alderman, Orazem and Paterno, 2001). Secondly, the enrollment differentials across gender are evident as the Gross Parity Index of Gross Enrollment Rate (GER) primary

schools in Pakistan is 0.85 suggesting that more boys are enrolled at schools relative to girls.[1] These statistics increase the urge for policy proposition in educational sector in Pakistan.

Moreover, government school system guarantees equitable geographical access to schools for people of all income levels. Those children who are neglected by their parents and are deprived of learning investments at home are expected to join government schools. Learning and Education Achievements in Punjab Schools (LEAPS) study of 2008 narrates that although the government is the main provider of education, the infrastructure quality of public schools remains poor compared to private schools.[2] Moreover, unsafe school buildings and lack of all-girls schools are factors that hamper that female enrollment especially in the rural areas. Although, numerous studies have identified the demand and supply side determinants of schooling in Pakistan, very few have addressed the gender disparity in enrollment due to differences in school infrastructure quality in public schools. Therefore, this study aims to bridge the gap by constructing a school infrastructure quality index using all public schools in the districts of Punjab.

The purpose of this study is to find the impact of SIQI on probability of primary and middle school enrollment of children aged between 5-14 years in 36 districts of Punjab over the period of 2007/08 and 2010/11. Further, this study examines is there any significant gender differentials in school enrollment with SIQI.

Methodology

Multiple Indicator Cluster Survey (MICS) 2007/08 and 2010/11 is employed to delve the impacts of primary-middle school enrollment.[3]

[1] *Pakistan Education Statistics (2013-2014)*

[2] Andrabi, T., Das, J., Khwaja, A. I., Vishwanath, T., & Zajonc, T. (2007). Learning and Educational Achievements in Punjab Schools (LEAPS): Insights to inform the education policy debate. *World Bank, Washington, DC.*

[3] MICS is a detailed household survey conducted by Bureau of Statistics, Planning and Development Department, Government of Punjab to identify socio-economic indicators for 35 districts, comprising of 145 tehsils, in Punjab.

Further, to examine the marginal probability effects of variables on school enrollment Dprobit econometric estimation technique is adapted. The Dprobit model specification used to study gender differentials is as follows:

$$\begin{aligned}\boldsymbol{P}rob(S_i = 1) = {} & \beta_0 + \beta_1(Wealth\ Score\ index) + \beta_2(Time) \\ & + \beta_3(Wealth\ ScoreIndex * Time) + \beta_4(Family\ Time) \\ & + \beta_5(Household\ Head'sEducation\ Level) \\ & + \beta_6(Mothers\ Education\ Level) + \beta_7(Age) + \beta_8(Age^2) \\ & + \beta_9(SIQI) + \sum_{k=1}^{35} \rho_k District_k + \varepsilon_{it}\end{aligned}$$

Note: the model was estimated separately for male and female
where *i* is the individual child, *j* is gender (m = males,f = females), Prob (S_i) = the probability of child i being currently enrolled in primary-middle school.

Furthermore, *SIQI* variable is generated using EMIS data for the period of two years (2007/08 and 2010/11). For this purposes Principal Component Analysis was used.

Results and Discussion

Table 1 (Appendix) exhibits the estimates for determinants of school enrollment, including the policy variable-SIQI.

The wealth score index is statistically significant at 1%, which indicates that socio-economic status has an impact on school enrollment. The study highlights an important notion that in developing countries low income does not restrict parents from sending their children to school. Instead economic returns to schooling are very low which makes the opportunity cost of enrollment is higher. Over the years the probability of enrollment of an average child in Punjab has increased across gender. Male enrollment has augmented by 3.88% whereas female enrollment increased by 6.95%, ceteris paribus. Moreover, parental education has a considerable impact on child's enrollment but mother's education puts forth a much stronger effect of increasing school enrollment. Model 1 highlights that if a mother is more educated the

probability of girl's enrollment would augment by greater percentage than boy's enrollment. It can be affirmed from the research that as mother's education level increases by one unit the probability of male child's enrollment mounts by 2.05% but for female child her probability of enrollment augments by 3.36%, ceteris paribus.[4] Model 2 corrects for clustered standard errors. The results reported in Table 1, controlling for the district specific fixed effects, depict that the household and individual level variables are all significant at 1%.[5] Nevertheless, an increase in the school infrastructure quality index by one unit increases the probability of school enrollment by 0.402% for male and 2.72% for female in both models. After correcting for clustered standard errors, school quality index becomes insignificant for male while the significance level remains the same for female thereby depicting the importance of school infrastructure quality while sending girls to school.[6]

Numerous models are run to ensure robust checks which above allows us to conclude that even in the presence of policy variables (with and without the district effects) the regression estimates on entire population of Punjab and across gender is analogous. The entire set of explanatory variables maintains their level of significance at 1% thereby regarded as highly considerable in affecting child's enrollment at primary-middle school.

Conclusion

The study explores the probability of primary-middle school enrollment of children aged between 5-14 years of 36 districts in Punjab. To identify the causes behind school enrollment differentials across gender Dprobit regression model was estimated using nine variables after

[4] Variables wealth score index, household head and mother's education were checked for collinearity. Meager degree of collinearity has been found amongst the variables.

[5] On the other hand, *time variable* denotes the time dummy determining the impact of each year on enrollment, with 2011 equals 1 and 2007 otherwise.

[6] Clustered standard errors have been employed to correct for the high degree of multicollinearity that could exist between the districts of Punjab that are likely to be similar across many dimensions such as tastes, preferences of parents, school quality etc.

accounting for the time invariant district effects. The results suggest that policy variable, SIQI, constructed using PCA, has a significant impact on enrollment of both male and female. But the degree of importance regarding school infrastructure quality enhances in the case of female due to parental concerns while sending their daughters to school. Thereby, the study concludes the probability of enrollment for female student increases by 2.72% as a result of one unit improvement in school infrastructure quality. In contrast, for male only 0.402% increment is observed.

Moreover, the study provides with some pragmatic policy analysis by shedding light on the importance of education and the extent to which the Government of Pakistan needs to take important policy measures as far as increasing enrollment at primary school level is concerned. The study scrutinized upon the basis of lower education attainment at the primary level. Therefore, it allows us to conclude that if higher economic education returns are ensured, probability of school enrollment can be augmented. Nevertheless, imperfections in the labor market need to be corrected for. Government needs increase the educational share in the annual budget.

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Appendix

Table 1: Tabular Representation of Dprobit Econometric Models Measuring Gender Differentials in the presence of the Policy Variable and Corrected for Clustered Standard Errors

		Model 1		***Model 2***	
		Males	***Females***	***Males***	***Females***
VARIABLES	Parameters	School Enrollment	School Enrollment	School Enrollment	School Enrollment
Wealth Score Index	β_1	0.110*** (0.00179)	0.178*** (0.00215)	0.110*** (0.00565)	0.178*** (0.00655)
Time	β_2	0.0388*** (0.00228)	0.0695*** (0.00267)	0.0388*** (0.00530)	0.0695*** (0.00529)
Wealth Score*Time	β_3	-0.0317*** (0.00227)	-0.0255*** (0.00278)	-0.0317*** (0.00448)	-0.0255*** (0.00494)
Family size	β_4	-0.00195*** (0.000315)	-0.00410*** (0.000360)	-0.00195*** (0.000499)	-0.00410*** (0.000619)
Household Head's Education	β_5	0.0288*** (0.000760)	0.0309*** (0.000859)	0.0288*** (0.00114)	0.0309*** (0.00114)
Mother's Education Level	β_6	0.0205*** (0.00108)	0.0336*** (0.00127)	0.0205*** (0.00125)	0.0336*** (0.00249)
Age	β_7	0.194*** (0.00278)	0.211*** (0.00326)	0.194*** (0.00553)	0.211*** (0.00639)
Age-Square	β_8	-0.0101*** (0.000142)	-0.0114*** (0.000167)	-0.0101*** (0.000281)	-0.0114*** (0.000322)
School Infrastructure Quality Index	β_9	0.00402** (0.00181)	0.0272*** (0.00205)	0.00402 (0.00272)	0.0272*** (0.00413)
Controlled for District Fixed Effects	$\delta_1 \ldots \delta_{35}$	Yes	Yes	Yes	Yes
Pseudo R^2		0.1793	0.2655	0.1793	0.2655
Observations		146,247	136,264	146,247	136,264

*Note that the values in the parenthesis illustrate the standard errors with asterisk *, **, *** demonstrating significance at 10%, 5% and 1% respectively.*
Source: Survey