CREB Working Paper No. 04-21 (Unedited copy)

Determining the Extent of Gender Discrimination in Education Sector: A case of Pakistan

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Approval Date: September 2021

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Preface

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Determining the Extent of Gender Discrimination in Education Sector: A case of Pakistan

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Abstract

Gender bias in developing countries may restrict educational opportunities for girls in comparison to boys. This paper attempts to measure the gender disparity in education amongst children from 5 years to 18 years of age across Pakistan. Using the data from PSLM 2010-2011 and applying Oaxaca decomposition with probit estimation we measure the gender gap. The results interestingly show that although a strong bias exists against females in overall enrollment rates, but as we explore further, we see that males drop out of private schools more as compared to females and the accumulated level of schooling of the male adults is also lower than that of females. We find that much of these differences are not due to the endowment effects. Large negative deviation for males may be attributed to the unobservable pressure and society's norms regarding the role of males that affect them in an adverse manner.

Keywords: Education, gender discrimination, Pakistan.

JEL classifications: I15, I24, O10.

1. Introduction

While gender discrimination remains a widely discussed issue, especially, in the developing countries, the main focus of this paper is to measure whether gender discrimination exists in schooling decisions that refrain girls from fair access to education, or is it that, lack of resources in form of proper educational systems and effective allocation of public expenditures have stagnated the enrollments in these schools, fir the first time specifically for the case of Pakistan. Using the data from PSLM 2010-2011 and Oaxaca decomposition technique we measure whether, females with similar characteristics of that of boys are discriminated when it comes to the decision of education. We check for discrimination in three major education decisions; overall enrollments of children, the enrollments in private schools and at the accumulated level of schooling. Our results show that there is substantial discrimination against females in the overall enrollments at an aggregate level but strikingly positive female bias exists in private schools at all levels of education (primary, middle and higher) and also for the accumulated level of schooling for adults.

Education is an important medium for enhancing socio-economic growth and human capital development of a country. More importantly, education further instigates employment opportunities, appropriate skill learning and chances of better standards of living. The Human Development Index (HDI) takes into account education as one of its main component to gauge the development progress of countries. In the year 2011, Pakistan had a Human Development Index value of 0.504 and therefore, was ranked 145 out of 187 countries (United Nations Development Program, 2011). Compared to its neighboring countries, Pakistan has one of the lowest literacy rate (Economic Survey of Pakistan, 2011). Education sector is one of the under producing sectors in Pakistan. The education expenditure as a proportion of GDP was reported to be as low as equivalent to 2.7% for year 2009 (CIA - The world fact book). Similarly, according to the United Nations Development Program Report (2011), the male literacy is reported to be higher than that of females 69.5% and 45.2% respectively. Likewise, a few statistics also show disparity in enrollments across provinces as well as across rural and urban areas.

In case of Pakistan with an approximate population growth rate of 2.1% per year, it has been anticipated that influx of around 3.4 million children are added to the population cohort, of whom only half are fortunate enough to benefit from education while the rest contribute to the ever increasing dropout rate in Pakistan with females registering a figure of 66% out of school children. As far as specific gender gap index in terms of education attainment is concerned it was categorized as 123 out of 130 countries in 2008. Furthermore, a cross-country study on the impact of missing the millennium development goals (MDG) target on gender equality by (Abu-Ghaida, Klasen, 2004) estimated that countries like Pakistan, which have not achieved the target of equal education by 2005, are at risk of losing an average of 0.4% in annual economic growth between 2005 and 2015, if they fail to catch up. In developing countries where the resources are constrained a general perception is that females experience marginalized access to education as parents expect lower future economic returns from their education compared to education of male members present in the household. Therefore, we use data to measure if girls in Pakistan suffer from discrimination or not.

The paper is organized as follows: Section 1 is introduction. Section 2 comprises of the literature review. Section 3 discusses the data and summary statistics while section 4 provides the theoretical framework and the methodology. Specification issues are identified in Section 5. Discussion of the results is in section 6 and section 7 is the conclusion.

2. A Review of Literature

The literature on schooling looks at its relevance from different aspects. We broadly categorize literature into three main streams. The first branch of literature analyzes the socio-economic determinants of education. Another branch of literature, more specifically provides the evidence of gender bias in enrollment rates and gender differentials across levels of education completed. Lastly, literature covers the gender bias in levels of understanding and preference for public vs. private schools. This research paper tries to cater to the last two categories of the literature and analyze if the bias amongst children exists in Pakistan in schooling decisions at household level.

Evidence of gender bias regarding enrollment of children in schools:

This paper proposes to analyze the effect of gender differences on intra-household access to education in terms of type of institution, maximum level of education attained and level of understanding in children. Several economists have tried to trace the effects of gender bias in such household decisions.

Merlo and Echevarria (1999), determines gender differences in education through a two-sex (male and female) overlapping generations model. The study further incorporates a bargaining model where households take collective decisions regarding consumption, expenditure decisions related to education of children based on their gender and number of children as oppose to the model of unitary household decision making model proposed by Becker (1965, 1991). The results based on the model show that gender differences in education occur due to the main differences in both the genders that are further transmitted into the household and the labor market. The model signifies that as number of children increase in a given household women experience increasing time cost of producing children. This increase initiates gender gap in educational status as fertility rates of women rise.

Kingdon (2005,) tested two possible reasons for failure to detect existing gender biases in intra-household allocation of resources. Firstly, gender bias can exist in expenditure when household expenditure is allocated positively for sons and remains zero for daughters. Secondly, even if positive expenditure is allocated both to sons and daughters, a lower amount is assigned to females as opposed to males. Using hurdle model they estimate that in rural India gender bias exists, which entails that household expenditure for schooling is not in favor of girls. A possible reason for this result could be ‘son preference’ dilemma, due to which education expenditure allocations for eligible females in a household are likely to fall as more children are produced in hope of a son being born.

Another plausible technique has been used in the literature in recent years to gauge existing gender gaps in school enrollment rates. This technique is known as Blinder-Oaxaca decomposition, which measures variation in school enrollment rates and returns to education. Pal (2004), in the paper titled “How much of the gender difference in child school enrollment can be explained? Evidence from rural India” takes into account the opportunity cost of schooling in

India, by signifying existing gender gaps in children's school enrollment and participation in market jobs. The results of the paper indicate that important indicators of school enrollment across both genders mainly include parental preferences, household expenditure, and opportunity cost of participating in household related work as measured by ratio of siblings. Moreover, results based on econometric models illustrate that approximately 30% of disparity in school enrollment is due to differences in characteristics of male and female children whereas 70% of difference is unexplained due to discriminatory reasons.

Evidence of gender bias in levels of education attained:

Asadullah and Chauhdry (2008), in their recent paper on "Reverse gender gap in schooling in Bangladesh: Insights from urban and rural households, examine how variation in enrollment rates of males and females occur for secondary level schooling. The study utilizes Household Expenditure Survey (HIES) of Bangladesh for years 1995, 2000 and 2005. The main aim of the research was to justify that gender difference does exist in schooling outcomes and within household resource allocations, partly because of the female secondary stipend program initiated in the year 1994 in Bangladesh. Since, more than one regression was run, variables like grade completion, currently in school, child labor and education expenditure were used as dependent variables. On the other hand, variables like parental education, age, sex of the children and household head, household's per capita expenditure and the landholdings were incorporated as explanatory variables. Since the study was based only on the secondary schooling outcomes, the sample was restricted to children between ages of 11-17 years. The authors used a household fixed-effects approach to estimate the gender gaps in schooling firstly with both genders and then separately for both males and females. The results indicate that pooled gender based regressions did not show any evidence of gender differences for any of the four dependent variables. However, regressions based separately on males and females illustrated that girl in contrast to boys in urban non-metropolitan areas registered higher rate of school enrollment and completion. Therefore, the study concludes that gender-bias exists in Bangladesh, which favors girls more than boys for both rural and urban areas.

A recent study by Lancaster, Maitra and Ray (2008), conducted a similar research on some selected Indian states in which they analyzed gender biases within the allocation of household expenditure. The study follows Basu (2006), and determines the bargaining position of both adult male and female earners through their respective household expenditure effects. The empirical analysis is carried out by employing a three-stage least square technique (3SLS) based on Uttar Pradesh and Bihar's "Survey of Living Conditions" for years 1997 to 1998 along with National Sample Survey as the second data source which covers more states of India for years 1993-1994. The dependent variable is the budget share of individual goods; tobacco, food, alcohol, energy/fuel, and education. The results demonstrate that wide gender preferences are found for boys, specifically for middle and higher levels of education. There are possible interpretations given in the paper for the existent gender bias in Indian states; parents prefer spending more on education of boys as higher economic returns are associated with male education in a developing country like India. Thus, it is more likely that parents invest more in male education and as a result boys are able to complete their education at least till secondary or even higher levels. Secondly, social constraints of not sending girls to far off schools may also explain the pro-male bias that exists as far as allocation of household expenditure towards education is concerned.

Moreover, a study by Rammohan and Dancer (2008), observed impact of household characteristics like birth-order, sibling composition and gender bias in Egypt on attainment of education. According to the authors, in most of the developing countries when number of school-age children increase in a household, parents have to make decisions regarding efficient allocation of limited resources amongst all members of the household. The dataset used for the study is Egypt Integrated Household Survey (1997), and the sample is restricted to children in the age bracket of seven to seventeen years. Using a multivariate logistic regression model they estimate wide gender and region disparity as far as schooling outcomes in Egypt are concerned. Interestingly, as far as birth order of females is concerned in rural areas girls born late are more likely to attain more levels of education than those born early. Also, first born males do not show any benefit in terms of years of schooling, especially in rural areas where they mostly work to help parents financially rather than studying. In contrast if the first child is a female, then there are better chances that she will complete the schooling years as per her age. Apart from these factors, other variables like parents' education, urban residence, and household expenditure all lead to an increase in children's schooling years.

Likewise, the paper by Baluch and Shahid (2009), titled as "Measuring gender disparity at primary school level in Pakistan", examines gender inequality in enrollment rates at primary school level for Pakistan. The dataset used for the study is Pakistan Social and Living Standard Measurement Survey (PSLM) for years 2004-2005 covering 76,520 households. The results of the research shows that for primary level education in Pakistan the gender gap is around 11.3%, whereas explained variation due to difference in characteristics between male and female students was -2.84% and the unexplained variation was 98.4% resulting from discrimination and treatment of boys and girls in the households. The variations in the gender gap generated signify that males are prioritized over females in education. Following the same domain, another paper by Rahji (2006) also focuses on enrollment rates of primary schools in rural areas of Southwestern Nigeria. The author utilizes the same combination of Probit and Oaxaca decomposition technique to calculate the gender differentials. By using the same set of dependent variable and explanatory variables, the results of the paper also show gender preference of boys against girls. The gender gap 12.58 whereas the explained gap is 20% and the unexplained gap is around 74.96% of the total gap.

Therefore, most of the literature signifies that based on household and individual indicators a strong pro-male bias exists in education attainment with females lagging behind in terms of enrollment and level of education achieved.

Evidence of gender bias in level of understanding and between types of institutions (public vs. private):

Aslam (2009) examines the impact of existing gender bias on two components of education; school choice and grade completion. The basic reason behind carrying out this study is that a large number of children in Pakistan, especially girls in contrast to boys are not enrolled into schools and as a result the face strong pro-male bias in intra-household allocation of resources. The data is collected from a specific school based survey carried out by the author in Lahore, Pakistan in year 2002 till 2003. The author firstly, tests likelihood of boys to attend private schools through a linear probability model (LPM) against independent variables that include all children and household related characteristics. The results for this particular model show that huge pro-male biases exist in Punjab whereas Sindh exhibits a pro-female bias. The study undertaken by Aslam (2009) further distinguishes schooling outcomes by testifying achievement levels of children across public and private schools. For this purpose, education production function is used to create a model that uses achievement scores of children on standardized tests (Raven's Standard progressive Matrices test) as the dependent variable against educational variables as explanatory variables.

The results show that on average, students from private schools score higher on tests of literacy and numeracy than students enrolled in public institutions. A possible reason for this difference could be that children studying in private schools have better learning environment both at home and at school, along with educated parents and a better social status. From a gender perspective, results show that in both types of schools' male students scored higher in the math section whereas female students performed better in the reading section. As a result, in private schools there was more pro-male bias coming from high performance in mathematics scores and pro-female bias in reading remained insignificant, however, in government schools there was pro-male bias in math scores and pro-female bias in reading scores as well.

Furthermore, Alderman and Orazem (2001)[1] used their research on low-income people living in urban areas of Lahore to show that children even in poor households are enrolled into private schools. A possible reason cited for this pattern is that parents even in low income households are insightful about quality of school their children are enrolled into, which is obviously higher in private schools. Similarly Kim, Alderman and Orazem (1999)[2] examined impact of subsidies in private school enrollment in Quetta, Pakistan. The subsidies were channeled towards ten randomly selected areas which did not have any single-sex public school for girls. The results for the study showed that enrollment rates specifically of girls increased for private schools and continued to rise even after the subsidies were decreased.

Andrabi, Das and Khwaja (2002)[3] also advocate their findings regarding Pakistan's pattern of gender specific enrollment into schools, which signifies that private institutions accommodate admission of girls at the same rate as they do for boys. Specifically, it is reported that almost for all age groups of primary and secondary levels of education, female enrollment is higher in private schools as compared to boys' enrollment. However, the same pattern does not exist for females in age group of 20-24 years, which is appropriate for tertiary education.

Long and Cogner (2011) in their paper on "Gender sorting across public high schools and its possible effects" discuss that female students are more likely to perform better than boys in grade, course and college enrollments, achievement tests and degree completion. On the contrary male students are more likely to achieve better grades in math-based tests as also put forward by Fryer and Levitt (2010). The methodology of the paper is based on a dependent variable that has one of four outcomes namely high school math and reading score, high school completion and

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[1 & 5] Lloyd,C. , Mete, C. , Sathar, Z. (2005). 'The effect of gender differences in primary school access, type, quality on the decision to enroll in rural Pakistan', *University of Chicago*.

[3] Aslam, M. (2009). 'The relative effectiveness of government and private schools in Pakistan: are girls worse off?', *Education Economics*, Vol. 17 (3), pp. 329-354

four year college admission of students in Florida. On the other hand, independent variables include age, race, demographic (X_i) and achievement based student characteristics along with high-school indicators (H_i). These variables are used to carry out logit regression for dummy dependent variables and ordinary least squares for continuous dependent variables. The results show that there is significant sorting of boys and girls in public schools. The main reason behind the gender gap may be attributed to preferences of parents which may impact students' enrollment into high schools. Also, there is a high probability that if separate private schools for boys and girls are present nearby, then students may start enrolling into private schools rather than public schools. As far as college enrollment is concerned, gender gaps in high schools can also impact college admissions for both genders as girls are more likely to enter college as they have stronger peer effects than boys.

Nevertheless, in most of the developing countries like Pakistan a general perception is that after primary and in very few cases after secondary level of education, girls are not enrolled for further education due to social norms attached to them as they either reach the age of puberty or are married off. A common belief is that in most of the developing countries even if girls are enrolled into schools in comparison to boys they are only able to gain only first few years of schooling, thus further strengthening existence of gender bias in education. We use this analysis to identify whether the data supports this argument in Pakistan or not after correcting largely for the measurement errors.

3. Data and Summary Statistics

The data used in this paper is taken from the Pakistan Social and Living Standards Measurement Survey (PSLM) 2010-2011. The survey is carried out at district levels and includes data on 76,546 households from all over Pakistan, with main focus on social indicators. In context of Millennium Development Goals (MDGs), social indicators like education, health, household possessions and household expenditures are included in the survey. Furthermore, all the required indicators are disaggregated on basis of provinces, districts, gender and region.

For the purpose of this paper, the relevant sample comprises of households that have children enrolled into schools between the ages five to eighteen years since the scope of the study incorporates three levels of education: primary, secondary and higher. Given this criterion, our sample comprises of 53,414 households. However, the analysis carried out on an individual level is based on data availability of 193,051 individuals who fall in the required sample age group. Further division of the sample shows that out of the total sample 115,964 individuals are enrolled and 13,612 are not enrolled into schools whereas the remaining are not included due to data unavailability.

The questions related to access to children's education, type of institutions children are enrolled into, parents' education and employment history and overall status of every household together with the standard set of explanatory variables have been used from the survey.

To begin with, the sample data signifies that around 85.5% children are enrolled whereas as remaining 17.05% are not enrolled into schools. However, since this paper focuses on gender differentials of children in schools, the gender indicator of the sample demonstrates that, amongst children enrolled into schools 59.8% are male children, whereas only 39.96% are females (Appendix B-Table 1). Since, gender differentials in choice of public vs. private schools is also another core focus of this paper, apart from enrollment rates, the descriptive statistics imply that amongst the sample, 72% of the children are enrolled into public schools and 25.7% go to private institutions (Appendix B-Table 2). The remaining 0.9% of the children are enrolled into other types of schools (like masjid, religious and other types) available, but they have not been added into this paper. Furthermore, division of the statistics shows that 61.1% male children are enrolled into public schools whereas only 38.8% females are enrolled into public schools. As far as private schools are concerned, 57% male children are enrolled into private schools and on the contrary only 43% female children attend private schools.

In addition to this, household based statistics shows that from a sample of 53,414 households the average household size is of eight members. From a regional perspective, rural households due to more family members have an average of eight members in comparison to urban households where the average family size is seven members (Appendix B - Table 3). The mean age of household heads for both genders signifies a lower age for males (24.3 years) as compared to that of female heads (30.2 years) (Appendix B - Table 4).

Data based on the sample also demonstrates that the average years of schooling for children between ages five to eighteen years is around 4.7 years of schooling which mainly constitutes of the primary education. Gender classification shows that for male children average years of schooling is 4.8 years whereas, female students from the sample showed approximately 4.7 years of education. Likewise, region categorization also signifies that urban areas show an average of 5.4 years of education and rural areas in the study sample register only an average of 4.4 years of schooling (Appendix B - Table 5).

As far as enrollment rates across different levels of education are concerned, there appears to be a sharp decline in enrollment from primary education to secondary education. The enrollment rates can be classified as gross and net enrollment rates. Gross enrollment rate (GER) is defined as number of individuals who are actually enrolled in schools divided by the number of children who are of the corresponding school enrollment age. Whereas, net enrollment rate (NER), incorporates number of enrolled children aged for particular level of education divided by number of children in the age group for that level of education. In the sample used, the net and gross enrollment rate in primary education is 56% and 71.7% respectively; however, the enrollment rate in secondary school falls to 44.7% as far as GER is concerned and NER is around 34.3%. Lastly, the enrollment rates in higher education for Pakistan are lower when compared with primary and secondary levels, standing at GER of only 41.5% and NER of 29.6% (Appendix B - Table 6 and Table 7).

Also, since the analysis is based on Pakistan it is imperative to look at enrollment differences across all four provinces. In the sample, Punjab shares the highest level of enrolled children with a figure of 42.6%, whereas Sindh has 23.6% enrolled children followed by KPK which has 20.1% enrolled children and Baluchistan shows only 13.6% enrolled children (Appendix B - Table 8). Further disaggregating data on provinces, signifies that almost 36.6% children in Punjab are enrolled into government schools. As far as private institutions are concerned, Punjab with almost 58.5%, mainly accounts for more than half of the enrollments (Appendix B - Table 9). On the other hand, Sindh exhibits enrollment trends standing at 24.7% for public schools whereas in the case of private schools Sindh has an enrollment rate of 19.02% (Appendix B - Table 10). Likewise, KPK more or less follows enrollment trends in Sindh with 20.5% children enrolled in government schools. Interestingly, private schools enrollment rate in KPK is 18.13% whereas in the sample, Baluchistan has the lowest proportion of children 17.7%

going to government based schools. Additionally, in Baluchistan, due to low literacy rates and less preference for education only 2.69% of the children are enrolled into private schools (Appendix B - Table 11 and 12).

The statistics show that rural areas have higher enrollment rates of 61.1% as compared to urban areas, which contributes only 38.9% to school enrollments of children between ages five to eighteen years (Appendix B - Table 13). A possible explanation for this result is that, since, the domain of the paper is to focus on enrollment rates of the entire family living in every household included in the sample, this comprises of households that have joint family systems as well. As a result, since in rural areas there are more families living together in a household and there are more children going to school in contrast to urban areas where only immediate family members are more likely to live together. Likewise, more than half of the children 69.2% in rural areas go to public schools in comparison to only 30.6% children from urban areas enrolled into private schools (Appendix B - Table 14). However, the situation is different for urban areas as private schooling is existent and preferred more in urban than in rural areas. Therefore, in the sample, urban areas attribute around 63% enrollment into private schools as compared to government schools which only contributes 38.6% to the proportion of public school going children (Appendix B - Table 15).

As far as regional analysis is concerned, gender decomposition of data shows that in urban areas 54.2% male children between ages five years to eighteen years are enrolled into schools whereas 45.8% girls are enrolled into schools (Appendix B - Table 16). As far as rural areas are concerned, 63.6% males are enrolled into schools; on the other hand, only 36.4% female children attend schools in rural areas (Appendix B - Table 17).

The overall trend demonstrates that the enrollment patterns show high gender differentials with boys enrolling in schools more than girls for both school types. As far as three levels of education are concerned, there has been a fall in enrollment rates across primary, secondary and higher level of education.

4. Methodology

We use the Probit-Oaxaca decomposition model as proposed by Rahji (2006), and Handa (1996), to measure gender differences in primary level enrollment rates in South Western Nigeria and to gauge gender gaps in primary school enrollments of rural areas respectively. The model combined with Oaxaca technique decomposes gender gap and estimate explained and unexplained coefficients for the two groups (males and females) of children. The technique estimates separate enrollment equations for a particular reference group and another group that will be compared with the reference group. The coefficient will be decomposed into explained and unexplained variation. The explained variation will signify differences in enrollments or years of education achieved between groups due to factors like education, age and social status. Whereas, the unexplained part of the decomposition will indicate for the reference group, the differences that occur as a result of being part of that group alone and not due to any other variable that was controlled in the regression.

The simplified equation of the appropriate Probit model is written as:

$$Pr(E = 1/X_i) = \Phi\ (X_i B_i) \tag{1}$$

Where, E_i takes a value of one if the child is enrolled in school for each respective level of schooling i.e., primary, middle, secondary and higher secondary for each gender category. On the other hand, X_i refers to childrens' characteristics and household factors like education of parents and occupation status of household members, household size, wealth index, ages of all enrolled children and region (rural/urban). The B_i in the equation represents coefficients of every variable $_i$ and Φ is the sign for the cumulative density function with standard normal distribution.

The Probit models are run for both gender specifications separately. The estimated coefficients from the first two models and ordinary least squares model as the third model above is further decomposed to assess whether gender gaps exist between males and females enrollment levels on aggregate level, enrollments in private schools and accumulated years of schooling.

The predicted probability of enrollment rates, enrollment into public/private schools and level of accumulated level of schooling for boys in each model respectively is:

$$P(Xb, \hat{\beta} b) = \frac{1}{Nb} \sum_{i=1}^{Nb} \varphi(Xb, \hat{\beta} b) \tag{2}$$

Where m = every enrolled male child in the sample

Also, the predicted probability of enrollment rates, enrollment into public/private schools and level of accumulated level of schooling for girls in each model respectively is:

$$P(Xg, \hat{\beta} g) = \frac{1}{Ng} \sum_{i=1}^{Ng} \varphi(Xg, \hat{\beta} g) \tag{3}$$

Where g = every enrolled female child in the sample

Following the decomposition, the gender gap for every dependent variable (whether enrolled or not, private/public school enrollments and years of accumulated level of schooling) is estimated by measuring the gender wise difference in predicted probabilities calculated above. The equation for calculating gender differential is:

$$\text{Gender Gap (GAP)} = P(Xb, \hat{\beta} b) - P(Xg, \hat{\beta} g) \tag{4}$$

$$\text{Explained Variation} = P(Xg, \hat{\beta} b) - P(Xb, \hat{\beta} b) \tag{5}$$

$$\text{Unexplained Variation} = P(Xb, \hat{\beta} g) - P(Xb, \hat{\beta} b) \tag{6}$$

$$\text{Residual Gap} = \text{Gender Gap} - \text{Explained Variation} - \text{Unexplained Variation} \tag{7}$$

Based on the equations above, the entire process of decomposition is carried out with male students as the reference group, with further disaggregation in form of differences due to observed factors also termed as explained variation as shown in equation (7). The unexplained variation (equation 8) is defined as the difference that occurs if probability of male enrollments and years of education achieved are a result of coefficients used for female children. Lastly, the residual gap (equation 9) is calculated by reversing the reference group (being boys in this case).

All the components of Oaxaca decomposition remains same for the OLS model as well, however instead of predicted probabilities the third model generates expected value of years of education attained by individuals and their resulting gender differentials as shown below:

$$Gender\ Gap\ (GAP) = E(Xb, \hat{\beta}b) - E(Xg, \hat{\beta}g) \quad (10)$$

$$Explained\ Variation = E(Xg, \hat{\beta}b) - E(Xb, \hat{\beta}b) \quad (11)$$

$$Unexplained\ Variation = E(Xb, \hat{\beta}g) - E(Xb, \hat{\beta}b) \quad (12)$$

All the estimations are based on the above specifications regarding measurement of gender differentials across overall enrollments, enrollments into public/private institutions for three levels of education primary, middle/secondary, higher secondary and accumulated years of schooling.

4.1 Estimating the Gender Disparity in School Enrollments

The probabilities of males and females to get enrolled in school based upon their respective observable characteristics controlled in the regression is estimated as follows:

$$Z_{male} = \beta_0 + \beta_1\ Father's\ education + \beta_2\ Mother's\ education + \beta_3 Working\ Male/All\ Working\ members + \beta_4\ Working\ Female/All\ Working\ members + \beta_5\ Household\ size + \beta_6\ Wealth\ Index + \beta_7\ Age\ of\ child\ (5\text{-}18years) + \beta_8\ Own\ home + \beta_9\ Dummy\ of\ Distance\ to\ nearest\ water\ facility + \beta_{10} Total\ number\ of\ children + \beta_{11} Region\ Dummy + \beta_{12} First\text{-}born + + \beta_{13}\ Incomepercapita + \beta_{14} DistrictDummies + \epsilon \quad (13)$$

$$Z_{female} = \beta_0 + \beta_1\ Father's\ education + \beta_2\ Mother's\ education + \beta_3\ Working\ Male/All\ Working\ members + \beta_4\ Working\ Female/All\ Working\ members + \beta_5\ Household\ size + \beta_6\ Wealth\ Index + \beta_7\ Age\ of\ child\ (5\text{-}18years) + \beta_8\ Own\ home + \beta_9\ Dummy\ of\ Distance\ to\ nearest\ water\ facility + \beta_{10} Total\ number\ of\ children + \beta_{11} Region\ Dummy + \beta_{12} First\text{-}born + \beta_{13}\ Income\ per\ capita + \beta_{14} DistrictDummies + \epsilon \quad (14)$$

The equations (13) and (14) are used to measure the probabilities of children enrolled in school based upon their gender separately. For the children falling in the age group of 5 years to 18 years where, Z_{male} and Z_{female} are the binary dependent variables in equations 2 and 3 respectively which takes a value of 1 if a child is enrolled and 0 otherwise for primary, secondary and higher level of education.

The independent variables contain both continuous and dummy variables. The variables include children's age cohort, parents' educational attainment, household employment status), the gender of the child, the region the family resides in, that is either urban or rural, district dummy variables and wealth index. We control for parent's characteristics that play vital role in schooling decision of a child. Parents' education, occupation and age are controlled. The variable for household size is included that may capture increased expenditures at household level which might affect the schooling choices. Additionally, in countries like Pakistan where concept of joint family is very common, increase in household size means more members contributing resources to share of public services like electricity and gas, thus, leaving behind greater proportion of resources to be allocated towards education (Aslam, 2003). Moreover, the variable measuring impact of a first born in a household will determine whether birth order has a significant impact on schooling outcomes of children.

4.2 Estimating the Gender Disparity in School Enrollments at Public and Private Schools (Primary, middle and Secondary Level)

The probabilities of males and females to get enrolled in private schools based upon their respective observable characteristics controlled in the regression is estimated as follows:

$$Y_{male} = \beta_0 + \beta_1 \textit{ Father's education} + \beta_2 \textit{ Mother's education} + \beta_3 \textit{Working Male/All Working members} + \beta_4 \textit{ Working Female/All Working members} + \beta_5 \textit{ Household size} + \beta_6 \textit{ Wealth Index} + \beta_7 \textit{ Own home} + \beta_8 \textit{ Dummy of Distance to nearest water facility} + \beta_9 \textit{ Region Dummy} + \beta_{10} \textit{Total number of children} + \beta_{11} \textit{First-born} + \beta_{12} \textit{District Dummies} + \beta_{13} \textit{ Distance to nearest primary/middle secondary/higher secondary school} + \beta_{14} \textit{ Income per capita} + \epsilon \quad (15)$$

$$Y_{female} = \beta_0 + \beta_1 \textit{ Father's education} + \beta_2 \textit{ Mother's education} + \beta_3 \textit{ Working Male/All Working members} + \beta_4 \textit{ Working Female/All Working members} + \beta_5 \textit{ Household size} + \beta_6 \textit{ Wealth Index} + \beta_7 \textit{ Own home} + \beta_8 \textit{ Dummy of Distance to nearest water facility} + \beta_9 \textit{ Region Dummy} + \beta_{10} \textit{Total number of children} + \beta_{11} \textit{First-born} + \beta_{12} \textit{District Dummies} + \beta_{13} \textit{ Distance to nearest primary/middle secondary/higher school} + \beta_{14} \textit{ Income per capita} + \epsilon \quad (16)$$

The second model is based on whether the child is enrolled in private or public school. where, Y_{male} and Y_{female} are the two binary dependent variables for each gender specification based regression. Both the dependent variables will equal 1 if a child is enrolled in a private school and 0 if he/she is in a public school. This estimation is repeated separately for three levels of education: primary, middle secondary and higher secondary. We control for same variables in the regression as above.

4.3 Estimating the Gender Disparity in the Overall Accumulated Level of Schooling

The accumulated level of schooling for each respective gender based upon their observable characteristics controlled in the regression is estimated as follows:

$$U_{male} = \beta_0 + \beta_1 \textit{ Father's education} + \beta_2 \textit{ Mother's education} + \beta_3 \textit{ Working Male/All Working members} + \beta_4 \textit{ Working Female/All Working members} + \beta_5 \textit{ Household size} + \beta_6 \textit{ Wealth Index} + \beta_7$$

Own home+ β_8 *Income per capita* +β_9 *Region Dummy*+ β_{10}*Total number of children*+ β_{11}*First-born*+β_{12}*District Dummies*+ β_{13} *Age*+ *Income per capita* +ϵ (17)

U_{female} = β_0 + β_1 *Father's education*+ β_2 *Mother's education*+ β_3 *Working Male/All Working members*+ β_4 *Working Female/All Working members* + β_5 *Household size*+ β_6 *Wealth Index*+ β_7 *Own home*+ β_8 *Income per capita* +β_9 *Region Dummy*+ β_{10}*Total number of children*+ β_{11}*First-born*+β_{12}*District Dummies*+ β_{13} *Age*+ *Income per capita* +ϵ (18)

The third model estimates the gender differentials amongst children across accumulated level of schooling where, U_{male} and U_{female} will be continuous dependent variables for the age group 17 -30 years.

5. Specification Issues

First, since the analysis is carried out at an individual level, there would be a number of unobserved variables in the analysis. Basically factors like individual ability and motivation levels of children going to school and income shocks of all the households may not be measured as they are unobservable, resulting in omitted variable bias. Due to this, a biased and inconsistent estimate of enrollment rates and education levels will be achieved, thus making identification of a true causal impact difficult. As data being used for the research is from (PSLM), separate IQ or ability-based tests cannot be carried out for analysis domain of the study. In order to cater to this possible specification issue, variables like parents' education in form of highest level of education achieved. To measure the impact of parents' education on children's education variables indicating highest level of education achieved by parents will be generated. Therefore, these variables would act as proxies of every child's ability to enroll into schools.

Secondly, comparison of households enrolling their children into schools to households' not enrolling children obviously points towards difference in income and expenditure levels between the two groups. Due to this variation, the households enrolling their children into schools do not act as a random sample. To rectify this problem, the variable income can be added into the regression equation along with a wealth index. The index will be based on household possessions and other characteristics (Monazza, 2003; Baluch and Shahid, 2009). This way a long-term view of every household's social and economic condition can be assessed, since the wealth measure will incorporate historical along with recent information.

Thirdly, since the data being used in the research is a cross-sectional data, chances of hetroskedasticity may exist due to changes in the variance of error terms with magnitude of independent variables. To correct this particular problem, heteroskedastic robust standard errors are estimated.

6. Results

The sub first section reports the Oaxaca-probit gender gap in enrollment status of children between ages five to eighteen years. In the second sub section we discuss the results for the gender gap estimation of enrollments into public vs. private schools across three levels of schooling: primary, secondary and higher. Lastly, the third sub section reports the results for the gender gap in levels of education achieved by children from the study sample. All the regression estimations have been carried out by the Oaxaca- Blinder technique (1973) combined with Probit and OLS regressions are provided separately for both girls and boys.

6.1 Measuring the Overall Gender Gap in Enrollments, Pakistan

The results for measuring gender differentials in enrollment rates is reported in table 1, where the dependent variable equals 1 if the child is enrolled and 0 if the child is not enrolled(5-18 years).

Table 1: Overall Gender Gap in enrollment rates, Pakistan

DEPENDENT VARIABLE	ENROLLMENT STATUS
MAIN	
GIRLS	0.835*** (0.00154)
BOYS	0.865*** (0.00118)
GENDER GAP	-0.0295*** (0.00194)
ENDOWMENTS (EXPLAINED DIFFERENCE)	0.0201*** (0.00102)
COEFFICIENTS (UNEXPLAINED DIFFERENCE)	-0.0706*** (0.00198)
INTERACTION	0.0211*** (0.00111)

Author's own calculations
Standard errors are clustered at household level. ***p<0.01, **p<0.05, *p<0.1

The results from Oaxaca decomposition of gender differences suggests that a gender gap of -0.0295 exists. From the overall gender gap, the significant positive explained gap due to differences in enrollment rates of boys if they had girls' characteristics is 0.0201. The endowment effect shows that if the boys had similar observable characteristics (as controlled in the regression) of that of girls, the probability of them being enrolled in school would have increased by 2%. On the other hand, the negative yet significant unexplained gap due to differences in estimated coefficients is -0.0706. The unexplained components of this gap corresponds to the discrimination as suggested in literature due to unobservable factors like child abilities and motivation levels, parental preferences, social and cultural barriers and bias against active participation of women in education. Lastly, the gap due to significant interaction effect that accounts for possibility that variation in endowments and coefficients exist simultaneously is 0.0211.

The probit results reporting the impact of other important variables on enrollments controlled in the regressions are reported in Appendix C1. Parents' academic achievements show significant positive increases in enrollment rates of both male and female children in the sample. However, the results show that educated mothers are likely to increase enrollment of female children by 4.86% as compared to only 1.81% increase in enrollment rates of boys. Also, fathers' education significantly impacts boys' enrollment rates by 3.73% in contrast to a low increase of only 2.32% in girls' enrollment rates.

Moreover, the variables measuring working proportions of male and females greater than 18 years against all members in a household show significant, yet a negative relationship with enrollment rates of both girls and boys in the study sample. A possible reason for this result could be that school going children between ages five to eighteen years instead of being enrolled into schools are put to work by their parents due to financial constraints. However, interestingly the female working proportion shows a positive relationship with overall school enrollments of boys. This specifies that as more number of women in a given household start to work probability of boys attaining education increases. Also, the results indicate that household size has a positive and significant effect on the allocation of the budget to education expenditure. This is so as there are more children in the school age bracket; families will spend more on education. Furthermore, a household's wealth (measured by the wealth index) has a positive and significant correlation with the enrollment levels of both boys and girls. The results indicate that parents are more likely to enroll their children into schools as their wealth status increases but the increase is higher for boys at 15.5% as compared to girls sharing only 11.8% probability of enrollments.

Interestingly, as far as the region variable is concerned the urban areas demonstrate a negative relationship with enrollment rates of boys as compared to rural areas being the base case. A possible reason for this relationship can be mainly attributed to the fact that the study sample incorporates enrollment rates of all the children living in a household between ages five to eighteen years. The reason behind this is the existence of 'joint family' system in Pakistan, especially in rural areas where usually more than one family is living together in a household. As a result, due to larger household sizes in rural areas, the variable shows a negative relationship of urban areas. The region variable is found to be significant for enrollment rates of girls as well. Unlike in the case of boys, the region variable signifies a positive relationship with enrollment rates of girls. This means that in urban areas due to better socio-economic conditions, girls are more likely to enroll into schools as compared to rural areas.

Additionally, the variable measuring impact of a first-born child demonstrates a negative relationship for both male and female first born children in households. Interestingly, if the first born-child in a household is a male his enrollment into school is likely to fall by 7.52% as oppose to insignificant results if the first born is a female. This means that in comparison to a first-born male, male children born later are more likely to attain education. Therefore, as also suggested by Rammohan and Dancer (2008) being male may not be the only preferable condition for children's enrollment into schools. Also, the difference in magnitude between first-born male and female enrollment rates signify that elder male children may not attain suitable levels of schooling as they may be working to support the family instead of studying.

The variable measuring impact of other children in a household indicates a significant negative impact on the enrollment rates of both girls and boys. According to Merlo and Echevarria (1999), a potential reason for this negative relationship may be that increase in number of children can increase time spent by parents' on children's upbringing thus, limiting allocation of resources and increasing financial burden on parents. Also, more children mean that limited resources are to be divided between more people even in a join family.

6.2 Measuring the Overall Gender Gap in primary level schools, Pakistan

The results for measuring gender differentials in primary level of education across two types of schools is reported in table 2, where the dependent variable equals 1 if the school is private and 0 if the child is enrolled in public school.

Table 2: Overall Gender Gap in primary level schools

DEPENDENT VARIABLE	1= ENROLLED IN PRIVATE 0= ENROLLED IN PUBLIC
MAIN	
GIRLS	0.304*** (0.00274)
BOYS	0.287*** (0.00225)
GENDER GAP	0.0172*** (0.00355)
ENDOWMENTS (EXPLAINED DIFFERENCE)	0.0488*** (0.00235)
COEFFICIENTS (UNEXPLAINED DIFFERENCE)	-0.0272*** (0.00267)
INTERACTION	-0.00436*** (0.000825)

Author's own calculations
Standard errors are clustered at household level. ***p<0.01, **p<0.05, *p<0.1

The results show that a gender gap of 0.0172 exists for the education at primary level. This positive gender differential indicates a pro-female gap that can be further substantiated by the higher enrollment probability of girls (group1: 0.304) as compared to a lower figure for boys (group 2: 0.287). From the overall gender gap, the significant positive endowment gap due to explainable differences in enrollment rates of boys if they had girls' characteristics is 0.0488. On the other hand, the negative significant unexplained gap due to differences in estimated coefficients is -0.0272. The unexplained components of this gap as suggested in literature include factors like child abilities and motivation levels, parental preferences, social and cultural barriers and bias against active participation of women in education. Also, the unexplained gap shows the discrimination effect that measures change in primary level enrollments occurring if probability of boys' enrollments is established by girls' coefficients. The negative unexplained variation shows that although the overall gender gap is in favor of girls' enrollments into private schools the difference in coefficients shows that boys based on their gender differential treatment should be going to private schools instead of girls as girls should be going even more which they are actually not. Lastly, the gap due to significant interaction effect of both endowment and coefficient gaps is –0.00436.

Appendix C2 reports how other controlled factors may affect the decision of the tye of the school the child is enrolled at. The variables measuring parents' educational status depict significant positive impact on enrollment rates of children into primary level based private schools in contrast to public institutions. However, along with significant impact of fathers' education on children's enrollment into primary schools the results also report that mother's education increases boys' enrollment into private schools more by 2.20% as compared to even a higher figure of 2.36% for girls. On the other hand, educated fathers positively impact boys' enrollment into private schools by 2.02% as oppose to 2.09% for girls. Therefore, mothers' and fathers' education in both cases does not favor enrollment of children into primary level public schools, rather there is a preference for private schools. Another plausible reason for this result can be that since educated parents are more aware of school quality in terms of student-teacher ratio, infrastructure and education quality that tends to be higher in private institutions, they prefer sending their children to private schools instead of enrolling them into public schools.

As far as variables measuring occupational status of working members in households are concerned, they indicate insignificant results for primary school enrollments of both male and female children in the sample. The household size variable, in contrast to earlier results shows a positive relationship at primary level enrollments into private schools as oppose to public schools. As mentioned in certain studies a negative relationship may mean that as household size increases, the economic burden on the household rises and therefore education expenditure becomes less of a priority and so, fewer children are enrolled into schools. However, the magnitude of the coefficients shows that as household members increase enrollment of girls into private schools increases by 7.23% in contrast to a rise of only 5.92% for boys. Therefore, with increase in household size parents may prefer sending their children to private rather than public schools. Another interesting result in the model is of the variable wealth index. As wealth increases, the private school enrollments for primary level increase by 20.1% for girls and 20.8% for boys. The result indicates that as wealth status of households improve; more boys are likely to enroll into private institutions as compared to girls whose enrollments into private schools also increase but by a smaller degree. Thus, household size and wealth index variables show a pro-female and pro-male preference in primary level enrollments respectively as oppose to public institutions being the base category.

Interestingly, the income per capita variable remains insignificant for primary level of education of both girls and boys. The age cohort variable for primary level education indicates a negative result, showing that as age increases more children are likely to enroll into public primary schools.

The negative coefficient of the region dummy which equals one if a particular household is in urban area and zero if in rural area signifies that urban areas have an inverse relationship with primary education enrollments into private schools. This implies that, in urban areas more enrollments occur in public institutions as oppose to private institutions. As far as gender classification is concerned, girls' enrollment into urban private schools remains insignificant whereas in urban regions boys' enrollment into private schools is likely to fall by 9.77% as compared to public schools. This indicates that due to a larger data-sampling unit of rural areas, these areas show higher enrollment rates as compared to urban areas.

The social status of a household measured by the dummy variable that equals to one if the households own the house and zero if rented demonstrates a positive relationship with primary education enrollments. This relationship means that if a house is self-owned by the members of the house, they are more likely to enroll their children into better private schools in comparison to public schools. Basically, owing a particular house rather than paying rent for it indicates better social standing of the household members which enables them to incur more education expenditure on private schools in comparison to public schools. Interestingly, the results show a pro-male favor in enrollment rates as girls' enrollment into private schools in contrast to public schools increases by 18.5% as compared to 23.4% for boys if households are owned.

The distance to the nearest primary school variable is insignificant in impacting primary school enrollment of both boys and girls into private schools. The variable measuring supply side of public schools available indicates that as fraction of individuals enrolled in public schools at PSU level increases by 1% then the probability of a single child being enrolled in private school falls by 1.9% for girls and 1.7% for boys. On the other hand, the private school proportion indicates that as fraction of children being enrolled into primary level private schools increases by 1% then the probability of a single child being enrolled in private school increases by 2.79% for girls and 3.19% for boys. Therefore, the supply side variables indicate that presence of both public and private schools favor enrollments of boys as compared to that of girls. Moreover, Long and Cogner (2011) in their paper on gender sorting in schools in Florida also indicate that if more private schools are available nearby then more students will enroll into private as compared public schools.

The first born variable impacts significantly the enrollment of both girls and boys. The outcome is positive meaning that presence of a first born in the household means that he/she is more likely to be enrolled into primary schools as compared to other school going children. This result is in contrast to findings of Rammohan and Dancer (2008) who observed that both late born male and female children are likely to complete additional years of schooling as compared to children born earlier.

On the contrary, the variable measuring presence of other children in a household shows a negative relationship with enrollment rates into private schools. As suggested by Parish and Willis' (1993), presence of siblings or other children in a household can be beneficial regardless of their gender, as the elder children may work to help financially or move out of the house as a result, reducing resource constraints. However, further disaggregation of the results shows that with more number of children in a household, enrollment rates of girls in primary based private schools falls by 11% as oppose to only 8.24% fall for boys. So if more children in a household are of a particular school going age, there is more likelihood that parents prefer sending sons instead of daughters to public as oppose to private schools due to financial constraints.

6.3 Measuring the Overall Gender Gap in secondary/middle level schools, Pakistan

Table 3 disaggregates the decision of child being enrolled in public or private school based upon the gender of the child at secondary level. This division incorporates the decision to be enrolled at secondary level of children between 11-14 years into public vs. private institutions.

Table 3: Overall Gender Gap in secondary/middle level schools

DEPENDENT VARIABLE	1= ENROLLED IN PRIVATE 0= ENROLLED IN PUBLIC
MAIN	
GIRLS	0.266*** (0.00385)
BOYS	0.229*** (0.00284)
GENDER GAP	0.0363*** (0.00479)
ENDOWMENTS (EXPLAINED DIFFERENCE)	0.0738*** (0.00310)
COEFFICIENTS (UNEXPLAINED DIFFERENCE)	-0.0258*** (0.00394)
INTERACTION	-0.0117*** (0.00221)

Author's own calculations
Standard errors are clustered at household level. ***p<0.01, **p<0.05, *p<0.1

The gender discrimination measured through the Oaxaca decomposition reported in Table 3, for the secondary level education shows a positive gender gap of 0.0363. This gender differential can be further substantiated by the higher average probability of girls' enrollment (group1: 0.266) as compared to a lower rate for boys (group 2: 0.229). From the overall gender gap, the significant positive explained gap due to differences in enrollment rates of boys if they had girls' characteristics is 0.0738. On the other hand, the negative yet significant unexplained gap due to differences in estimated coefficients is -0.0258. The unexplained gap again indicates that although overall gender gap demonstrates pro-female enrollments however, based on the difference due to estimated coefficients boys are more likely to enroll into secondary/middle level private schools so girls should be enrolling even at a higher number than their current rates, however they are not. Lastly, the gap due to significant interaction effect is -0.0117.

The Probit results as noted in Appendix C3 shows that parents' education as previously noted, significantly and positively impacts private school enrollment rates at secondary level education. However, gender decomposition shows that mothers' education increases boys' enrollment into private schools by 1.73% as compared to only 1.2% for girls. This means that unlike for primary level schooling as far as secondary level of education is concerned educated mothers prefer sending boys to private institutions more as compared to public schools. Also, fathers' education significantly affects the boys' enrollment at secondary level. Overall, both parents' education in secondary level enrollments illustrate that there is pro-male favor in private school enrollments. The working proportion of female members in a household is significant for girls' enrollment and insignificant for boys' enrollment into private schools as oppose to public schools. On the other hand, working proportion of male members is only significant for boys' enrollments into secondary level schools. As proportion of male working members above eighteen years of age increases, enrollment of boys into secondary level private schools is likely to fall by 6.96%. As a result, with increase in number of male working members in a household there is more likelihood that boys in secondary school going age bracket will be enrolled into public schools as compared to private schools. The age cohort variable for primary level education indicates a negative result, showing that as age increases more children are likely to enroll into public primary schools as compared to private schools. The region variable is significant for secondary level enrollment rates of both boys and girls. The variable indicates that enrollments of girls and boys into private schools are likely to decrease in urban areas in comparison to public schools. Moreover, the residential status variable demonstrates a positive and significant impact only on girls' enrollment into private schools. As a result, if a household has a better social status as defined by self-owing the residence then there is more likelihood that parents even prefer sending their daughters to secondary level private schools.

The distance to the nearest school for secondary level education shows significance only in case of girls' enrollment rates. Interestingly, enrollment of girls into secondary level public instead of private schools will increase if the nearest school within 0-14 minutes' distance as compared to the base case distance of an hour or more. Therefore, the distance variable indicates that more girls will enroll into nearby public schools available in contrast to private school. The variable measuring proportion children enrolled into secondary/middle public schools indicates that as fraction of individuals enrolled in public schools at PSU (which are the primary sampling units that include sample villages and households) level increases by 1% then the probability of a single child being enrolled in private school falls by 2.58% for girls and 1.72% for boys. On the other hand, as fraction of children enrolled into secondary level private schools increases the probability of a single child being enrolled in private school increases by 2.08% for girls and 2.43% for boys. Thus, presence of public schools shows that chances of girls being enrolled into secondary level private schools fall by a greater degree as compared to boys. However, the private schools favor enrollments of boys more as compared to that of girls.

Lastly, as mentioned in the primary level education results variables like household size first-born child, per-capita income and wealth index positively impact secondary level enrollments of both boys and girls. In addition, presence of other children in a household negatively impacts enrollment of both boys and girls into secondary level based private schools.

6.4 Measuring the Overall Gender Gap in higher secondary Level, Pakistan

Table 4 shows the results for the third division regarding type of school model incorporates the higher secondary level of education and enrollment of children between ages 15-18 years into public vs. private institutions.

Table 4: Overall Gender Gap in higher secondary education schools

DEPENDENT VARIABLE	DUMMY =1 IF ENROLLED IN PRIVATE SCHOOL & =0 IF ENROLLED IN PUBLIC SCHOOL
MAIN	
GIRLS	0.263***
	(0.00517)
BOYS	0.207***
	(0.00356)
GENDER GAP	0.0559***
	(0.00628)
ENDOWMENTS (EXPLAINED DIFFERENCE)	0.0775***
	(0.00382)
COEFFICIENTS (UNEXPLAINED DIFFERENCE)	-0.00337
	(0.00612)
INTERACTION	-0.0183***
	(0.00426)

Author's own calculations
Standard errors are clustered at household level. ***p<0.01, **p<0.05, *p<0.1

The Oaxaca decomposition shows that higher education indicates a pro-female positive gender gap of 0.0559. This gender differential can be further seen in average probability of higher education enrollment for girls (group1: 0.263) as compared to a lower rate for boys (group 2: 0.207). From the overall gender gap, the significant positive gap explained through differences in boys' enrollment rates if they had girls' characteristics are 0.0775. On the other hand, the unexplained gap due to differences in estimated coefficients is insignificant. This insignificance implies that most of the gender gap in this model is due to the endowment effect and discrimination against gender does not affect the decision of secondary schooling. Lastly, the gap due to significant interaction effect is only -0.0183.

For higher secondary level of education, as far as parents' education is concerned unlike in case of primary and secondary level education mothers' and fathers' education status only significantly impact boys' enrollment into higher education based private schools. Nevertheless, if fathers are more educated they are more likely to enroll boys into private schools for higher secondary education and increase enrollments of boys by 1.3% as compared to only 0.98% increase if mothers are more educated. As also established by Aslam (2009), within a household boys are more likely to be sent to private schools in comparison to girls. Therefore, choice of school type can act as an essential medium of biased treatment of enrollment of girls into school.

As predicted earlier the wealth index and income per capita also demonstrates a significant positive relationship with the enrollment rates in higher-level public schools for both girls and boys. The region dummy variables show that for higher secondary education in urban areas, enrollment rates of girls and boys in public schools are more likely to increase as oppose to private school enrollments due to larger sample size of rural areas. In addition, variables measuring effect of residential status and first-born child on higher secondary school enrollment rates show results similar to previous levels of education.

In addition, variables measuring impact of school distance signify that girls and even are more likely to be enrolled into nearby public schools instead of private schools even if the distance is of less than hour. For higher secondary level schools, the variable measuring proportion children enrolled into secondary/middle public schools indicates that probability of a single child being enrolled in private school falls more for girls and less for boys. On the other hand, as fraction of children enrolled into secondary level private schools increase enrollments of boys more in comparison to girls. The total number of children in households remains insignificant for higher education enrollment rates of girls and effects boys' enrollment into private schools negatively.

6.5 Measuring the Overall Gender Gap in higher secondary Level, Pakistan

In the third model, the continuous dependent variable will capture accumulated years of education achieved by individuals between ages 18 to 30 years. Table 5 shows variation in years of education achieved by male and female falling in the age bracket eighteen to thirty years.

Table 5: Overall Gender Gap in Accumulated years of education achieved by children, Pakistan

DEPENDENT VARIABLE	YEARS OF EDUCATION
MAIN	
GIRLS	9.264*** (0.0238)
BOYS	9.172*** (0.0180)
GENDER GAP	0.0919*** (0.0299)
ENDOWMENTS (EXPLAINED DIFFERENCE)	0.667*** (0.0189)
COEFFICIENTS (UNEXPLAINED DIFFERENCE)	-1.044*** (0.0334)
INTERACTION	0.469*** (0.0258)

Author's own calculations

Standard errors are clustered at household level. ***p<0.01, **p<0.05, *p<0.1

The results from Oaxaca decomposition shows a positive gender gap of 0.150. The gender difference can also be seen in the average years of education achieved by girls (group1: 9.264) as compared to an interestingly lower figure for boys (group 2: 9.172). From the overall gender gap, the significant positive explained gap due to differences in enrollment rates of boys if they had girls' characteristics is 0.667. On the other hand, the negative yet significant unexplained gap due to differences in estimated coefficients is -1.044. Lastly, the gap due to significant interaction effect is 0.469 that indicates that differences in endowments and coefficients can to some extent exist simultaneously between both gender groups. Interestingly, the individual components of the total gender gap indicate that both explained and unexplained along with interaction portion of the gap contribute significantly to the gender gap. Although, the overall gender gap shows that female individuals are more likely to attain additional years of education, however the unexplained component of the total gap indicates that if the girls' coefficient is applied to the boys' characteristics, the boys attain lesser years of education.

The results of the standard controls in the regression as shown in appendix C5 shows that educational status of mother and father proves to be significant in impacting years of education of both female and male individuals. This result indicates that educated fathers are more likely to concentrate on schooling of boys and help them attain higher levels of education whereas more educated mother favor girls' additional years of schooling.

The variables measuring female and male working proportions all demonstrate a negative relationship with additional education of individuals except mother's education in case of female individuals. Therefore, more educated mothers are likely to concentrate on schooling of female individuals as compared to educated fathers. The wealth index and per capita income variables are significant in increasing years of education of both boys and girls attaining education. However, the wealth status significantly increases girls' levels of education more as oppose to a smaller increase in boys' education years. The main reason behind this result may be that as wealth status of a household increases, parents may enroll more female children into schools in comparison to boys who may already be going to school in normal financial conditions as well. As a result, with more chances of being enrolled into school's girls may attain additional years of education by a greater degree. On the other hand, per-capita income significantly impacts boys' education more as compared to education of girls.

As far as first-born variable is concerned, it remains significant for both girls and boys. As established before by Lindert (1977), children born earlier have fewer children with them in a household so they are expected to attain more education and perform better in school. The results indicate that if a first-born is a boy, he is more likely to attain additional education when compared to a first-born male child. The variable for total number of children indicates that with increase in number of children, both male and female children are less likely to complete additional years of schooling. Interestingly, the fall in years of education is higher for female individuals as compared to males. As put forward by Pal (2004), children born earlier may have to support the family in financial terms rather than going to schools thus making it easier for children born later to attain education.

Furthermore, variables like region significantly impact both boys' and girls' years of education. Interestingly, for girl's urban areas demonstrate higher years of education whereas boys show higher educational years in rural areas. A possible explanation for this result can be that in urban areas due to more awareness female education is given more recognition as compared to rural areas that show pro-male education in countries like Pakistan. Also variables like household size and residential status positively impact years of education achieved by both boys and girls, however the magnitude of change is in favor of boys as opposed to girls' attainment of additional education. Interestingly, the age variable demonstrates that as female age increases they are less likely to attain education, whereas the variable is insignificant for boys.

7. Conclusion

The objective of this study was to identify whether gender discrimination exists at different levels of education in Pakistan. After controlling for the observable child level characteristics, parent's characteristics and geographic characteristics to minimize the estimation errors we use the Oaxaca-probit technique to decompose the gender gap estimations into explained and unexplained portions. Where the unexplained proportion of the estimate is attributed to the component of discrimination against each type of gender. Our results interestingly report overall dynamics of gender discrimination in education sector for the case of Pakistan. Although we see discrimination against girls in early ages but later we find that the discrimination against girls fades away. Although overall the results show that on average the enrollments are higher for boys but the probability of being enrolled in private schools is higher for girls at primary, middle and secondary level. Also, the accumulated level of schooling is higher for girls as compared to the boys.

The results of the study are similar to the results proposed by Baluch and Shahid (2009) that show that gender discrimination in favor of boys exists in overall enrollments of children between ages 5 years- 18 years. Findings by Lancaster, Maitra and Ray (2008) in their paper on India further emphasizes on the households preference of enrolling boys into schools and argue that better future economic returns are associated with higher enrollments for boys whereas, girls are mostly not enrolled into schools especially if schools are far off and due social and security barriers. On the contrary the results for the school choice (private vs. public) disaggregated at the three levels of education indicate that pro-female preferences for enrollments into private school exist that remains consistent for at all the three levels of education i.e., primary, secondary and tertiary. These findings are similar to those of Asadullah and Chauhdry (2008) where they suggest that in Bangladesh gender-bias exists, which favors girls more than boys for both rural and urban areas.

Finally, the significance of the results on the accumulated level of schooling further signifies that there is a significant overall gender gap in performance levels of both male and female students implying that females outperform males and therefore end up with significantly higher accumulated level of schooling as compared to boys but at disaggregate level the results show that the boys ends up accumulating lesser years of schooling if the girl's coefficient is applied on the boys characteristics, implying that the unobservable characteristics on boys like pressure to earn at a specific age could possibly be a hindering factor for boys in later ages.

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Appendix A

Net Primary Enrollment Rates in Pakistan over time (measured in percentage)							
Year	2003	2004	2005	2006	2007	2008	2009
Total	57.5	62.8	64.7	62	66.2	66.1	66.4
Male	66.4	72.5	73.3	69.5	72.6	72.2	72.1
Female	48	52.6	55.7	54.2	59.4	59.7	60.2

Source: UN Statistics Division

Net Secondary Enrollment Rates in Pakistan over time (measured in percentage)								
Year	2003	2004	2005	2006	2007	2008	2009	2010
Total	27.39238	30.44374	29.14656	30.40492	32.76995	33.11421	33.22703	33.84638
Male	30.83715	34.4476	32.98293	34.3806	37.41367	37.83629	37.3206	38.4433
Female	23.79633	26.2649	25.14313	26.25675	27.92906	28.19479	28.96389	29.05916

Source: UN Statistics Division

Net Higher Enrollment Rates in Pakistan over time (measured in percentage)								
Year	2003	2004	2005	2006	2007	2008	2009	2010
Total	23.06554	26.16792	22.5969	22.21749	23.96238	25.04855	25.51809	26.28389
Male	24.36971	28.39236	24.74188	24.8061	27.21207	28.75896	28.41122	30.13248
Female	21.70489	23.84789	20.36013	19.51811	20.57648	21.18476	22.50629	22.27744

Source: UN Statistics Division

Appendix B Descriptive Statistics

Table B1: Percentage of children between ages 5-18 years attending school

Gender	Percentage of children between ages 5-18 years attending school (%)
Male	59.8
Female	39.9

Table B2: Percentage of children between ages 5-8 years attending public vs. private school

Type of School	Percentage of children between ages 5-8 years attending public vs. private school (%)	Percentage of children between ages 5-8 years attending public vs. private school Male (%)	Percentage of children between ages 5-8 years attending public vs. private school Female (%)
Public	72%	61.1%	57%
Private	25.7%	38.8%	43%

Table B3 Average household size

Region	Average household size (number of members)
Entire Sample Average	8
Rural	8
Urban	7

Table B4: Mean age of household head

Type of School	Mean age of household head (years)
Male	24.7
Female	31.3

Table B5: Average years of schooling for children aged 5 to 18 years

Type	Average years of schooling for children aged 5 to 18 years (years)
Entire Sample	4.7
Male	4.8
Female	4.7
Rural	4.4
Urban	5.2

Table B6: Gross Enrollment Rates

Level of Education	Enrollment Rate (%)
Primary	71.7
Secondary	44.7
Higher	41.5

Table B7: Net Enrollment Rates

Level of Education	Enrollment Rate (%)
Primary	56
Secondary	34.3
Higher	29.6

Table B8: Percentage of Children Attending School in Provinces

Province	Percentage of Children Attending School across provinces (%)
Punjab	42.6
Sindh	23.6
KPK	20.1
Baluchistan	13.6

Table B9: Percentage of Children Attending Type of School in Punjab

Type of School	Percentage of Children Attending Public vs. Private School in Punjab (%)
Public	36.6
Private	58.5

Table B10: Percentage of Children Attending School in Sindh

Type of School	Percentage of Children Attending Public vs. Private School in Sindh (%)
Public	24.7
Private	19.02

Table B11: Percentage of Children Attending Type of School in KPK

Type of School	Percentage of Children Attending Public vs. Private School in KPK (%)
Public	20.5
Private	18.13

Table B12: Percentage of Children Attending Type of School in Baluchistan

Type of School	Percentage of Children Attending Public vs. Private School in Baluchistan (%)
Public	17.7
Private	2.69

Table B13: Region wise Percentage of Children Attending School

Type of School	Percentage of Children Attending school (%)
Urban	45
Rural	55

Table B14: Percentage of Children Attending School in Rural Areas

Type of School	Percentage of Children Attending Public vs. Private School in Rural areas (%)
Public	69.2
Private	30.6

Table B15): Region wise Percentage of Children Attending School in Urban Areas

Type of School	Percentage of Children Attending Public vs. Private School in Urban Areas (%)
Public	38.6
Private	63

Table B16: Gender-wise enrollment rates for urban areas

Gender	Enrollment Rates (Urban)
Male	54.2
Female	45.8

Table B17: Gender-wise enrollment rates for rural areas

Gender	Enrollment Rates (Rural)
Male	63.6
Female	36.4

Appendix C

Table C1*: Probit Results for Overall Gender Gap in enrollment rates, Pakistan*

Dependent variable Dummy= 1 if enrolled in school	**Girls**	**Boys**
Mother's education	0.0486***	0.0181***
	(0.00285)	(0.00287)
Fathers education	0.0232***	0.0373***
	(0.00197)	(0.00182)
Female working Proportion	-0.0668***	0.0379**
	(0.0176)	(0.0160)
Male working proportion	-0.130***	-0.249***
	(0.0104)	(0.00876)
Household size	0.0443***	0.0926***
	(0.00761)	(0.00715)
Wealth Index	0.118***	0.155***
	(0.00637)	(0.00562)
Region dummy	0.183***	-0.213***
	(0.0228)	(0.0210)
Residential status	0.0545**	0.0969***
	(0.0229)	(0.0203)
Nearest Water Facility Distance	-0.0139	0.115***
	(0.0422)	(0.0304)
Age	-0.305***	-0.293***
	(0.00322)	(0.00291)
Income per capita	0.0000218***	0.00000605
	(0.00000493)	(0.00000394)
First Born	-0.0408	-0.0752***
	(0.0219)	(0.0182)
Total Number of children	-0.0604***	-0.100***
	(0.00964)	(0.00881)
_cons	5.151***	4.976***
	(0.137)	(0.128)
N	52778	76798
District Fixed effects	Yes	yes

Standard errors in parentheses

"* p<0.10 ** p<0.05 *** p<0.001"

Table C2: *Probit Results for Overall Gender Gap in primary level schools, Pakistan*

Dependent Variable Dummy= 1 if Enrolled in Private school	Girls	Boys
Mother's Education	0.0236***	0.0220***
	(0.00306)	(0.00284)
Father's Education	0.0209***	0.0202***
	(0.00264)	(0.00230)
Female working proportion	0.0315	-0.0357
	(0.0267)	(0.0229)
Male working proportion	-0.0138	-0.0226
	(0.0157)	(0.0136)
Household Size	0.0723***	0.0592***
	(0.00879)	(0.00778)
Wealth Index	0.201***	0.208***
	(0.00890)	(0.00753)
Region dummy	-0.0492	-0.0977***
	(0.0298)	(0.0266)
Residential Status	0.185***	0.234***
	(0.0301)	(0.0268)
Nearest Water Facility distance	0.0340	0.0336
	(0.0702)	(0.0537)
Age	-0.0833***	-0.0740***
	(0.00696)	(0.00603)
Income per capita	0.0000119**	-0.00000463
	(0.00000595)	(0.00000346)
Primary school distance dummy 1	0.202	-0.0976
	(0.427)	(0.215)
Primary school distance dummy 2	0.326	-0.0115
	(0.429)	(0.216)
Primary school distance dummy3	0.280	-0.0222
	(0.438)	(0.225)
Primary school distance dummy 4	0.266	-0.0364
	(0.471)	(0.268)
Proportion of children going to Public school	-0.0190***	-0.0176***
	(0.000915)	(0.000765)
Proportion of children going to private school	0.0279***	0.0315***
	(0.000961)	(0.000860)
First born	0.171***	0.217***
	(0.0350)	(0.0309)
Total number of children	-0.111***	-0.0824***
	(0.0117)	(0.0103)
_cons	-0.685	-0.167
	(0.453)	(0.254)
N=55592	23416	32176

Standard errors in parentheses
="* p<0.01 ** p<0.05 *** p<0.001"

Table C3: Probit Results for *overall Gender Gap in secondary/middle level schools*

Dependent Variable Dummy=1 if Enrolled in Private school	Girls	Boys
Mother's Education	0.0120***	0.0173***
	(0.00413)	(0.00370)
Father's education	0.0187***	0.0222***
	(0.00372)	(0.00299)
Female working proportion	0.0642*	0.00180
	(0.0372)	(0.0305)
Male working proportion	-0.0321	-0.0696***
	(0.0218)	(0.0174)
Household size	0.0545***	0.0770***
	(0.0137)	(0.0112)
Wealth Index	0.168***	0.190***
	(0.0132)	(0.0101)
Region dummy	-0.325***	-0.160***
	(0.0438)	(0.0360)
Residential Status	0.138***	0.0661
	(0.0417)	(0.0348)
Nearest Water facility distance	0.0364	0.110
	(0.0980)	(0.0771)
Age	-0.0798***	-0.0817***
	(0.0148)	(0.0123)
Income per capita	0.0000105	0.000000426
	(0.00000741)	(0.00000303)
Secondary school distance dummy 1	-0.325*	-0.0319
	(0.141)	(0.0984)
Secondary school distance dummy 2	-0.226	0.00141
	(0.142)	(0.0994)
Secondary school distance dummy 3	-0.260*	0.0652
	(0.154)	(0.104)
Secondary school distance dummy 4	-0.495**	-0.0461
	(0.199)	(0.135)
Proportion of children going to Public school	-0.0258***	-0.0172***
	(0.00139)	(0.00104)
Proportion of children going to Public school	0.0208***	0.0243***
	(0.00131)	(0.00108)
First Born	0.143***	0.110**
	(0.0423)	(0.0348)
Total number of children	-0.0954***	-0.104***
	(0.0185)	(0.0149)
_cons	0.0730	-0.135
	(0.326)	(0.245)
N= 29317	11259	18058

Standard errors in parentheses
="* p<0.01 ** p<0.05 *** p<0.001"

Table C4: Probit Results for *Overall Gender Gap in higher secondary education schools*

Dependent Variable Dummy=1 if Enrolled in Private school	Girls	Boys
Mother's education	0.00856*	0.00988**
	(0.00453)	(0.00426)
Father's Education	0.00696	0.0130***
	(0.00442)	(0.00360)
Female Working Proportion	0.0590	-0.0141
	(0.0477)	(0.0379)
Male Working Proportion	0.0204	-0.0562**
	(0.0237)	(0.0200)
Household Size	0.00214	0.0417**
	(0.0165)	(0.0133)
Wealth Index	0.0970***	0.169***
	(0.0163)	(0.0123)
Region dummy	-0.480***	-0.268***
	(0.0534)	(0.0447)
Residential Status	0.100**	0.0984**
	(0.0482)	(0.0414)
Nearest water facility distance	0.167	0.0420
	(0.127)	(0.0921)
Age	-0.0915***	-0.0993***
	(0.0171)	(0.0142)
Income per capita	0.00000487	0.000000813
	(0.00000572)	(0.00000502)
Higher school distance dummy 1	-0.473***	-0.190*
	(0.164)	(0.108)
Higher school distance dummy 2	-0.375**	-0.0790
	(0.165)	(0.108)
Higher school distance dummy 3	-0.345**	-0.0974
	(0.172)	(0.113)
Higher school distance dummy 4	-0.491**	-0.236*
	(0.235)	(0.139)
Proportion of children going to Public school	-0.0218***	-0.0179***
	(0.00170)	(0.00129)
Proportion of children going to Private school	0.0126***	0.0154***
	(0.00154)	(0.00125)
First Born	0.121***	0.169***
	(0.0448)	(0.0370)
Total number of children	0.00264	-0.0353*
	(0.0219)	(0.0174)
Constant	1.198**	0.906**
	(0.398)	(0.313)
N=18435	6857	11578

Standard errors in parentheses
="* p<0.01 ** p<0.05 *** p<0.001"

Table C 5:*OLS results for Overall Gender Gap in years of education achieved by children*

Dependent Variable Accumulated years of schooling	Girls	Boys
Mother’s Education	0.104***	0.0435***
	(0.00488)	(0.00447)
Father’s Education	0.102***	0.188***
	(0.00465)	(0.00348)
Female working proportion	0.339***	-0.0655**
	(0.0411)	(0.0336)
Male working proportion	-0.272***	-0.390***
	(0.0211)	(0.0138)
Age	-0.0899***	-0.00305
	(0.00659)	(0.00487)
Household Size	0.200***	0.207***
	(0.0136)	(0.0109)
Wealth Index	0.604***	0.491***
	(0.0149)	(0.0106)
Region dummy	0.500***	-0.365***
	(0.0519)	(0.0410)
Income per capita	0.0000218***	0.0000243***
	(0.00000391)	(0.00000269)
First Born	0.127***	0.154***
	(0.0422)	(0.0326)
Total number of children	-0.280***	-0.226***
	(0.0173)	(0.0136)
Distance to nearest water facility	-0.362***	-0.00974
_cons	8.892***	6.959***
	(0.231)	(0.190)
All results with district effects		
N= 59574	23178	36396
Standard errors in parentheses		
="* p<0.01	** p<0.05	*** p<0.001"

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