DETERMINANTS OF FEMALE EDUCATION IN RURAL AREAS OF PAKISTAN: A HOUSEHOLD ANALYSIS

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CERTIFICATE

This is to certify that this thesis entitled: **"Determinants of Female Education in Rural Areas of Pakistan: A Household Analysis"** submitted by Mr. Zeeshan Rasheed is accepted in its present form by the Department of Economics & Econometrics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree of **Master of Philosophy in Economics**.

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Abstract

The right to acquire education is one of the fundamental human rights. The education plays crucial role for the development of women. Low literacy rate among rural women is a challenge for each developing country. The promotion of women education is a dominant strategy for development therefore, the influences of women schooling are chiefly central for policy-makers. The socio-economic factors play significant role in determining the female education and these factors are the driving forces of a country's economic development. The objective of this study is to investigate the socio-economic factors that affect girls' school enrollment as well as their level of education at household level in Pakistan. The sample for this study consists of 2142 girls of 5-18 years obtained from Pakistan Rural Household Panel Survey 2014 conducted by International Food Policy Research institute. In order to determine the girls' school enrollment status and level of education, logit model for binary outcome and Generalized Poisson model for count outcome are employed respectively. The estimates of the logistic regression illustrate that the household economic status measured by household expenditures, household assets, and household savings have positive and significant role in determining the girls' school enrollment while poverty affects girls' enrollment status negatively and significantly. The estimates also show that parents prefer boys' education over the girls' education and teacher gender matters for them hence both negatively affect the girls' school enrollment. The number of children aged 0-4 years, number of male and female siblings aged 5-15 years influence the girls school enrollment negatively whereas male and female sibling aged 15 years above influence the girls school enrollment positively. The father education, girls' age and beneficiary households of social safety net are found significant factors that affect the girls' school enrollment status positively. On the other hand, estimates of Generalized Poisson Model demonstrate that household income, household assets, father education, household head employment, travel sources for school, poverty, farm work status and domestic work have positive and significant effects on the girls' level of education. The household savings, household debt, travel time required to reach at school, household expenditures, type of school, repetition of last class and family size influence girls level of education negatively. Finally, the study recommends that Government should take into account the measures to improve household's economic status and parents biased behavior towards girl's education. It is also recommended that Government needs to improve and ensure the performance of public schools, social safety net programs and employment opportunities.

Keywords: Socio-economic, school enrollment, logit model, generalized Poisson, siblings

JEL Codes: I21, I24, I25, I22, P36

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LIST OF ABBREVIATIONS

UNESCO	United Nations Educational, Scientific and Cultural Organization
M.Phil.	Master of Philosophy
Ph.D.	Doctor of Philosophy
PESRP	Punjab Education Sector Reforms Program
US	United States
PSLM	Pakistan Social and Living Standards
KPK	Khyber Pakhtunkhwa
HEC	Higher Education Commission
PRHPS	Pakistan Rural Household Panel Survey
IFPRI	International Food Policy Research Institute
IDS	Institute of Development Studies
PCA	Principal Component Analysis
B.A.	Bachler of Arts
B.Sc.	Bachler of Science
AIC	Akaike Information Criteria
BIC	Bayesian Information Criteria
IRR	Incident Rate Ratio

Chapter 1

Introduction

1.1 Background of the study

Education is a prime requirement in this modern age of globalization. It does not only provide insights but it has significant role in building characters, grooming personality, giving skills and inculcating moral values. The first step for each human activity requires education in this phase of technological revolution. The welfare of the individuals and living standards is concerned with the vital role of education. The Education is an important factor that brings changes in human behavior. These changes insist a human to recognize his or her important role in social, economic and political life. To bring these changes, the equal opportunities of acquiring education to male and female are necessary. The education is an important tool to tackle the issues of income distribution and poverty along with facets of demographic, political and social developments. The human capital is relatively important in developing countries as compared to developed countries because education is core need for political, social and economic transformation of institutions. The role of the education in economic development is well recognized except the criticism of Chicago view which concludes, the productive role of education is negligible (Arrow & Spence, 1973). Some studies on Africa in 1970's concluded that the gender role was ignored in the development process and ignorance of gender role may have the adverse effects. This conclusion results in emergence of women in development approach which states women exclusion as problem of development. The roots of subordination of the women were seen in their ignored role in the market place and their control over resources. The solution of this subordination was to legislatively include the role of women 'in' development by overcoming the gender discrimination and by encouraging the women by providing the opportunities in employment and education. The Women in Development approach emphasizes on bringing women into development process to improve efficiency. However, this approach had some flaws like social injustice, exploitation and subordination. This approach also has an objective of fulfilling the needs of gender like the better access to water, so that women could save their time for domestic chores and could utilized their time for education and employment. At that time, the questions were not raised about the responsibility of collecting water by only women and improved access to water as essence for women. Contrary to Women in Development approach, Gender and development approach emerged in 1980s aimed to focus on the women and the effects of macroeconomic policies on their

lives. The Gender and Development approach identified that relations and roles of gender are the key factors to improve the lives of women, with a term 'gender' suggests that there is need to focus on both men and women. Recently, the desire to recognize how gender traverses with some characteristics like sexuality, ethnicity and age has been renowned. The approach of Gender and Development identifies that it will be insufficient to include girls and women into prevailing development processes but it is also required to ask the question about why women remained excluded, supporting that the emphasis ought to be on demonstrating the imbalances of supremacy on the basis of this exclusion. The Gender and Development approach also defines the concept of 'development' and its gentle nature, indicating that there is need to transform narrow understanding of development as economic growth into social development. The projects by Gender and Development approach are holistic and try to eliminate the discriminated forms of institutions against women's interest, for example acquiring land rights, and living violence free lifestyle (Molyneux, 1985; Moser, 1989). The international agencies and developing countries diverted their focus towards human investment in 1980s. The education and ensuring equal opportunities for women were two of the eight millennium development goals in 2000s. The Gender and development approach seeks the relationship between the economic and social roles of men and women to gain the better environment for both gender (Aikman & Unterhalter, 2005). Therefore, treating gender role as an important aspect of economic development has become subject matter of each developing country (Bradshaw, 2013). The country with higher gender discrimination does not experience rapid economic growth, economically efficient outcomes and poverty reduction whereas the country with gender equality grows faster (World bank, 2001a). The development of a country largely depends on the education of residents without any hindrance. The Human development index representing the development of an economy consists of education, health and Per capita income. It means education is the fair determinant of economic development.

Education is an important element and instrument for the development of human resources because it allows the economy to enjoy prosperity by applying new skills, creative ideas, knowledge and gender equality (Sharma & Kanta, 2006). Education provides basis, not only for information, knowledge and awareness, but also a complete strategy for change and development. Education is a crucial input in development of human resources and is important for the economic growth. This fact has shaped awareness on the requirement to emphasis upon elementary

education program and literacy, not merely as a matter of social justice but more to foster social well-being, social stability and economic growth (Goel, 2004). The Education is the source of gaining skills and knowledge that allows people to perform better in productivity and make better living standard. This increment in the productivity of goods and services boosts the economic growth of the country because of the multiplier effect (Saxton, 2000). The economic development is determined by the education and it is widely accepted and recognized across the world. The education not only contributes positively in the economic growth in terms of monetary benefits but it also has some real effects such as productivity of labor and farm's efficiency. Education is an important factor to resolve the macroeconomic issues such as poverty, income distribution. The human capital is relatively important in developing countries than developed countries. Education has chief importance in organization of human resources because it has been utilized to attain the sustainable social and economic growth. For the attainment of social and economic growth, numerous education strategies have been implemented for this development by each government across the world (Nousheen & Awan, 2018). In developing countries, Herz & Sperling (2004) provided extensive evidences about the four categories of returns to women education by following different circumstances across countries. The first category of returns shows the relationship between women empowerment and women education, a strong evidence supports that education improves women's bargaining power in the family and society (Barro, 1999; Sen, 2000). The second category of returns is that women education encourages themselves for a smaller, better-educated and healthier families (World bank, 2001; Hill & King, 1993). The third category of returns shows that women education prepares women for the best defense against HIV or AIDS, because well-being of family, empowerment, earning capacity of women and discouragement of risky health behavior increase due to HIV based education programs and other education programs (UNESCO, 2002). The fourth category is related to the positive effects of women education on the growth of individual and nation's income as whole. A female with an extra year of schooling can receive twenty percent extra income as an adult and if women were given one more year of schooling, they can enhance almost twenty-five percent to the GDP of an economy (Chaaban & Cunningham, 2011). As an outcome of the different education policies and strategies, the enrollment rates of women at primary level of education have been improved from 52 percent in 1970 to 88 percent in 2000 in developing countries. The growth in female enrollment at country level also has been remarkable from 1970 to 2000 by adopting different education

policies in different countries such as, female enrollment at secondary level of education increased from 6 percent to 73 percent in Algeria; 26 percent to 100 percent enrollment in Brazil; 32 percent to 94 percent in South Korea. For example, the stipends for female attendance given under the PROGRESA program in Mexico gave rise to the completion of female primary education by 15 percent; a program of scholarship awarded to the girls in Bangladesh resulted in double enrollment of women; and 90 percent of women have been enrolled as a result of program introduced to build and provide the new education institutions to fulfil educational needs of women (Herz & Sperling, 2004). Here, it is mandatory to mention that there are few economic growth models that elaborate the long run determinants of economic growth like Solow's growth model and endogenous growth model. As for as Solow's model is concerned, it treats long run determinants of growth labor and capital exogenous (Solow, 1957). According to endogenous growth model, output growth depends on the labor and capital of the economy. The labor hired in the research and development or human capital determines the changes in capital stock of the economy. The capital increases due to human capital and it boosts output growth (Romer, 1986; Lucas, 1988). So, education or human capital is an important determinant of economy growth, that's is why this study focuses on the importance of education acquired by the population in the economy. The primary role of women participation in different sectors of an economy reflects in productivity of labor force and in allocative efficiency. If the rural women have equal access to human capital and productive inputs like men then 6 to 20 percent agriculture output can be increased in an agriculture economy (World bank, 2001a). The educated women can have influential and impressive role in the development of a family and society. Hence, female education has been always the core goal for the government and society because it is an effective instrument of progress for female's status. On the other hand, allocative efficiency increases the income of households which results in less child mortality or in extension of life expectancy, it is also estimated that if mother in a family has income in her hands then marginal impact is 20-time larger than the income in hands of father (WBGDG, 2003).

1.2 Research Problem

In developing countries, education is always considered as an important determinant poverty reduction and sustainable development. Therefore, the structural transformation and growth of an economy is only possible by providing the equal opportunities of education to men and women. A woman utilizes the education as an instrument to reduce fertility rate and population growth. She engages herself in healthier activities so that she could bring her children up in healthier way.

Women education plays vital role to reduce both child and maternal mortality, which surges expectancy of life (World Bank, 2001; Herz & Sperling, 2004). The countries with less investment on female education always experienced lower growth rate. The investment on female education in few countries remained low which ultimately reduces the female enrollment such as secondary enrollment of women in Pakistan, sub-Saharan African countries and Cambodia remains below 20 percent. The major obstacles behind these lower enrollments are gender gap, poor governance, over dependence on revenue generated by oil, corruption, macroeconomic instability and weak infrastructure specifically transport and power infrastructure (World bank, 2001a). Pakistan is a developing country with lower human capital. The social and economic barriers for women in Pakistan do not ensure the equal rights of education particularly in rural areas of Pakistan. The situation of female enrollment and literacy rate in rural areas of Pakistan is alarming. There is need to investigate all possible reasons behind the lower enrollment and literacy rate in the rural areas so that desired outcomes of social and economic development could be achieved. Therefore, this study tries to explore all possible determinants of female enrollment and their level of education in rural areas of Pakistan. The rural female gross enrollment ratio from primary to tertiary education is significantly lower than rural male (PSLM, 2014-15). Keeping in view the true importance of female education in any country, the study will try to answer following research question:

1.3 Research Questions
- Why is the female enrollment significantly lower in rural areas of Pakistan?

To answer the research question, the study tries to incorporate all socio-economic and cultural factors playing important role in rural female enrollment in education institutions. Among these factors, most of the factors have been discussed in earlier studies which play important role in determining the female enrollment in rural areas of Pakistan (Farid et al., 2014; Sandhu et al., 2005; Yaqoob, 2012).

1.4 Research Gap
The existing literature explored the different factors affecting women education. The studies identified that Poverty, early marriages, gender inequality, security issues, family income, mother education, family size, religious misconception, lack of institutions and social status are also important factors that determine the female enrollment at different level of education. Along with

identification of dominant factors affecting female enrollment or education significantly, each study recommended different solutions to increase female enrollment at different level of education (Dhanraj & Mahambare, 2019; Mehmood et al., 2018; Irum, 2015; Salik, 2014; Farid et al., 2014; Yaqoob, 2012). But the facts and figures illustrate that there is still lower female enrollment in rural areas of Pakistan and rural women are lagging in education. So, there is need to identify true determinants of female education in rural areas of Pakistan. The identification of true determinants will help to develop effective education policy in the education sector. This study utilizes a general model with all possible explanatory variables to reduce the probability of spurious regression (Charemza & Dreadman, 1997). This study tries to incorporate a set of qualitative as well as quantitative determinants that are not discussed in existing studies and play important role in determining the female enrollment status and level of education. The set of determinants not discussed in earlier studies consists of types of school, failure in last examination, transport sources, time spent on different task at home, farm work, household debt or credit, social safety net, household savings, parent perception about teacher gender and preference of boy education over girl education, household consumption expenditures and head count poverty. The earlier studies conducted in Pakistan only discussed the female enrollment status by using logit regression model. This study utilizes the logit and count data models to determine the female enrollment status as well as their attainment or level of education in in rural areas of Pakistan.

1.5 Objectives of the study
To answer the research question of this study, the objectives of the study are following:

- To identify the factors that maximizes the girl's probability of being enrolled in school
- To investigate the factors that determine the attainment or level of education for enrolled girls

1.6 Significance of the Study
The 18th amendment in Pakistan Constitution resulted in more autonomy to each province. The Article 25A has been presented about free education. According to this article, each province will provide free education to children having five to sixteen years of age. Another implication of the amendment was that the planning, policy, syllabus and education standard will be the responsibility of each province. Each Government of the country across the world is determined to achieve the sustainable development goals especially fourth goal. This goal is aimed to make

sure the equitable and inclusive quality of education, and promotion of long-time learning opportunities for the people through enhancement in education sector. Previously, Pakistan has been failed to achieve the Millennium Development Goals regarding education because desired or required changes were not made to upgrade the country's education system. Nowadays, Fourth Goal of SDG's needs our attentions to improve all mandatory determinants. As focal ministry, Ministry of Planning, Development and Reform at national level has taken oath from Government to achieve fourth goal of SDG's. To pursue targets related to education, federal and provincial governments are trying to overcome obstacles by improving their capacities, increasing resources for education and better sectoral governance. The Government of Pakistan has formulated a National Education Policy Framework to tackle multiple obstacles in education sector. This Framework has set following four priority areas to combat challenges: ensuring increase in the enrollment of children out the school and increase in their school completion, achieving equality in education standard, improving education quality and enhancing access to and relevance of skill trainings. Each province is working on these priority areas of the National Education Policy framework through different departments. The Punjab commission on the status of women and Women Development department are the authorities accountable for women empowerment, ensuring protection for female rights, women contribution in economic development and ensuring the gender equality for women in the rural areas of the Punjab. The ministry of Punjab education is also accountable for the ensuring the education facilities to the public of Punjab. The Sindh education and literacy department are looking after the education affairs in the province. The department of elementary and secondary education handles the education affairs in the Khyber Pakhtunkhwa, ensures the availability of education to each citizen. The analysis of this study will help out each authority of respective province to investigate the reasons for lower female enrollment in rural areas and will recommend possible solution of the investigated problem.

1.7 Organization of the study
To pursue the objectives of the study, this study is organized in six chapters. The second chapter of this study briefly explains the role of female education in case of Pakistan. It also explains the literacy rate, gender enrollments and demographic characteristics of each province in Pakistan. The third chapter of the literature review provides theoretical and empirical literature about the role of female education in an economy along with factors behinds lower female enrollments. Fourth chapter discusses the data and methodology of the study. This chapter includes the source

of data, econometric models, econometric methodologies, variables and their description and goodness of fit measures. The fifth chapter of results and discussion elaborates the descriptive analysis of variables, estimates of binary model and estimates of count data model. The sixth chapter of conclusion and recommendation provides the findings, recommendation, conclusion and limitations of the study.

Chapter 2

Female education in Case of Pakistan

This chapter of the study briefly discusses the historical and current scenario of female education in case of Pakistan. The chapter is comprised of three sections: section 2.1 elaborates the literacy rate and percentage of gender enrollment at different education level in Pakistan, section 2.2 depicts the literacy rate and percentage of gender enrollment at different education level in each province of Pakistan while section 2.3 shows the demographic characteristics of each province with subsections.

2.1 Gender school enrollment in Pakistan

The literacy rate of Pakistan was only 10%, when Pakistan came into existence. By then, Pakistan acquired only 10000 elementary schools in inheritance. The number of the education institutions increased to 2,65,538 (1,14,302 women and 1,51,236 for men) in 2019 as the outcomes of implementing different policies and reforms measures.[1] The major task of the government was to enhance the education system in the elementary schools up to the economic, social and ideological needs of the economy. An action plan contained on many reforms was developed during 1998-2010 to encourage higher education and literacy rate. The objective of these reforms was to provide the facilities to those children who left schools due to unfavorable environment. In 2006, Pakistan has been ranked at 134th in Human development index and quoted as an example among those countries where female education is less (OCSD, 2007). The number of boys going to school is greater than the number of girls going to school with increasing age in Pakistan (Khan, 2008). The female higher education is the most effective education among primary, secondary or higher secondary education because it is the level of education at which people pursue their pre-determined objectives. The higher education is defined as "all types of studies, training or training for research at the post-secondary level, provided by universities or other educational establishments that are approved as institutions of higher education by the competent state authorities" (UNECSO, 1998).

In Pakistan, the bachelor, master, M.Phil., Ph.D. or Post doctorate are considered as higher education that starts very after the higher secondary education or twelve years of schooling. The

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[1] Pakistan economic survey 2019

higher education is the mean for people to pursue their goals of life that people aim to achieve from their childhood (Yasmeen, 2005). The female education is a smart and most effective investment for the development and economic growth of any country in the world, but it remained ignored. The formulated policies are required to empower women in education for decision making, employment and career development (Salik & Zhiyong, 2014). Particularly, the higher education assists the women to get expertise in a specific domain where they feel comfortable and can positively contribute in economic development (Shaukat & Siddiquah, 2013). Zaman (2010) tried to investigate the causal relationship between economic growth and women enrollment rates. It was concluded that there is unidirectional causal relationship between women enrollment and Gross Domestic Product in Pakistan. Pakistan is ranked as sixth most populous country in the world with 207.77 million population. Out of total population, 63.61 percent population belongs to rural areas and female contribution in rural population is 49.08 percent (Pakistan economic survey, 2018-19). The reason behind rapid increase in population is that the women proportion in rural areas is higher. The major portion of the population in Pakistan is young so younger females can be treated as resource which needs to be embedded with human capital to play a significant role in the economy of Pakistan (Mustafa et al., 2016).

Figure 1.1
Literacy Rate in Rural Areas of Pakistan
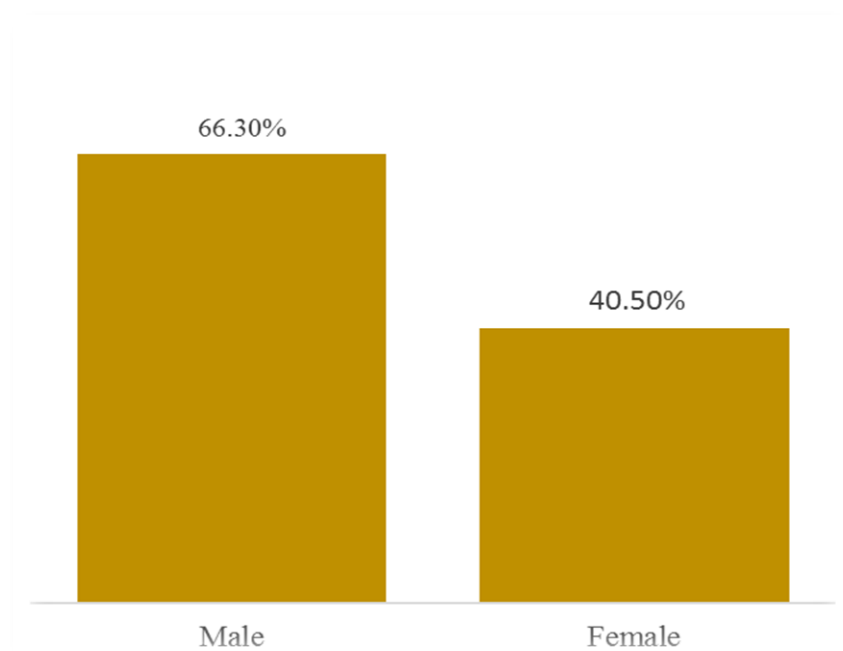
In Pakistan, a person is said to be literate if he or she can write or read his or her name. Despite this, the literacy rate of Pakistan is still lower, and Pakistan has appeared on third number in the world ranking list of highest adult illiterate. The literacy rate in the rural areas of Pakistan is shown in the figure 1.1, depicting that there is clearly gender inequality in the literacy rate. The literacy rate for rural areas is obviously lower than the urban areas but interestingly the female literacy rate is less than male in both areas urban and rural (Ashraf et al., 2015). The total estimated female enrollment in Pakistan at colleges and universities is 47 percent of total enrollment which shows there is gap between male and female enrollment (Pakistan economic survey, 2018-19). The total enrollment has persistently increased over the last few decades but still the female enrollment in higher education from rural areas has been stagnated or marginally increased. The reasons for female lagging are ineffective promotion system of female research due domestic responsibilities, male dominance on top managerial positions and socio-cultural barriers (Batool et al., 2013). Pakistan is facing gender gap over the time, but the efforts of Pakistan higher education commission almost has resolved this problem of gender gap (Kaleem & Rathore, 2017). Ashraf et al. (2015) explained that gender discrimination is dominant hurdle in acquiring education, earnings and employment. This hurdle is narrowing down over the time at international level but still there is need to resolve that problem in traditional societies like rural areas. The major factor of lagging behind with respect to social and economic development for Pakistan is the lower percentage of female education (Ahmad, 1984).

Figure 1.2

Percentage of Gender Enrollment in Pakistan
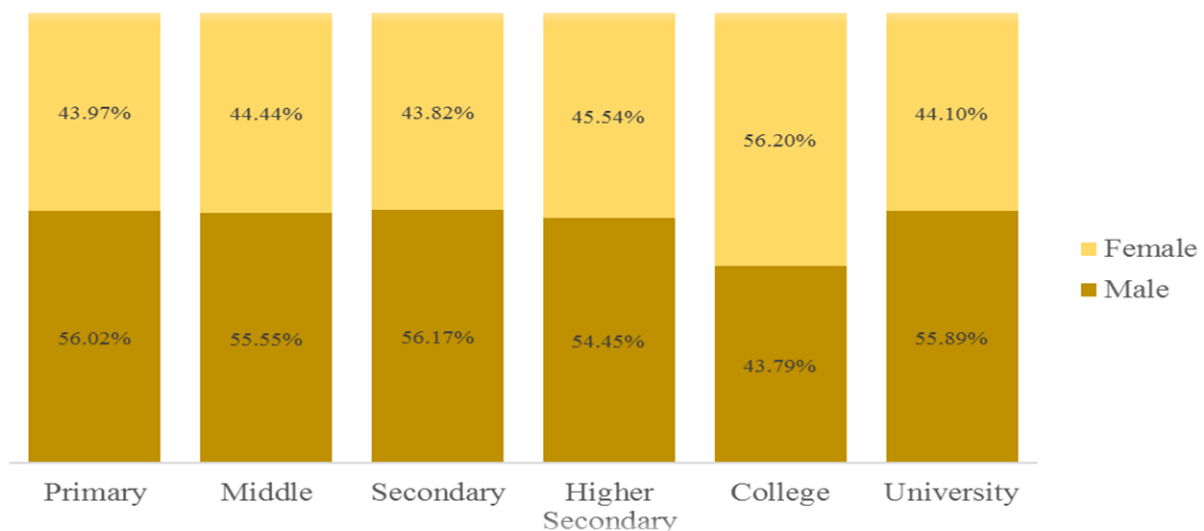
The above figure 1.2 shows the enrollment in primary, secondary, higher secondary and higher education in Pakistan. The graphs clearly depict the enrollment of male in all types of institutions is more than female enrollment. The rural areas of Pakistan are the most neglected areas in higher education and schooling. The females belong to households adopting farming as profession from these rural areas are ignored and less preferred over males (Farid et al., 2014). The female education has impact on the education of family whereas male education is only concerned with himself. The traditional behavior of society toward female education and lack of infrastructure results in discouragement of rural female enrollment (Asghar, 1992). In Pakistan, there are many constraints that affect the rural female enrollment in at different level of education. These constraints are generally classified in social, economic and regional constraints. Patriarchal values have dominant effect on social structure in Pakistan. Ideologically, the home tasks are assigned to a woman because she born to serve her family within the walls of home as wife and mother whereas men borne to earn and allocate resources as breadwinner outside the home. So, chores and care of children is the productive role for a woman while breadwinning is productive role for a man that's why education of a boy is always preferred over a girl due to his breadwinning role and a girl is ignored because she has nothing to do with education to serve family as mother and wife (Farid et al., 2014). There are many other socioeconomic, cultural and regional factors that are playing important role in depressing the rural female enrollment.

2.2 Gender school enrollment in Provinces

The gap between male and female enrollment at different level of education in all provinces is the question of matter. The Punjab the most populous province accounting for 56% of total population of Pakistan. As 49 percent of Punjab population consists of women, still many girls of northern Punjab have no access to schooling due to gender biasness and poverty. On the other hand, Sindh, Khyber Pakhtunkhwa and Balochistan are at second, third and fourth number respectively on the basis of population. The disparities in rural areas of all provinces are greater than urban like high poverty, lack of education institution and poor quality of education. In rural areas, these deficiencies result in schooling as a bad alternative for parents so that they could prefer schooling over the chores done by rural girl at homes (PESRP, 2012). The figure 1.3 shows the literacy rate of all provinces and graphs depicts the lower literacy rate of female as compared to male in all provinces.

Figure 1.3

Literacy Rate in Rural Areas of Provinces
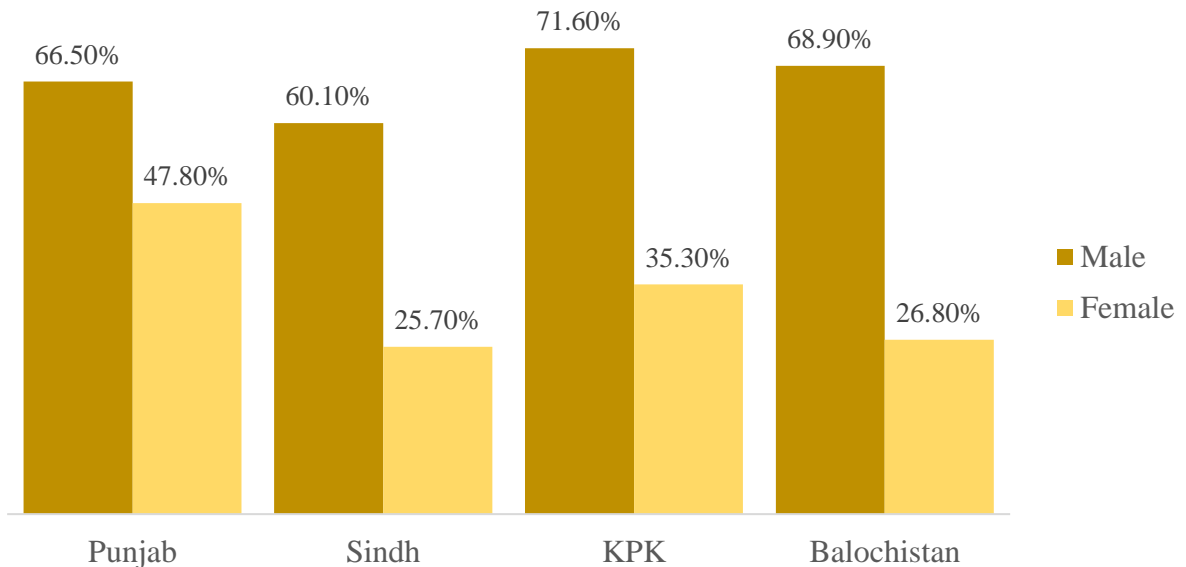
Figure 1.4

Percentage of Gender Enrollment in Punjab
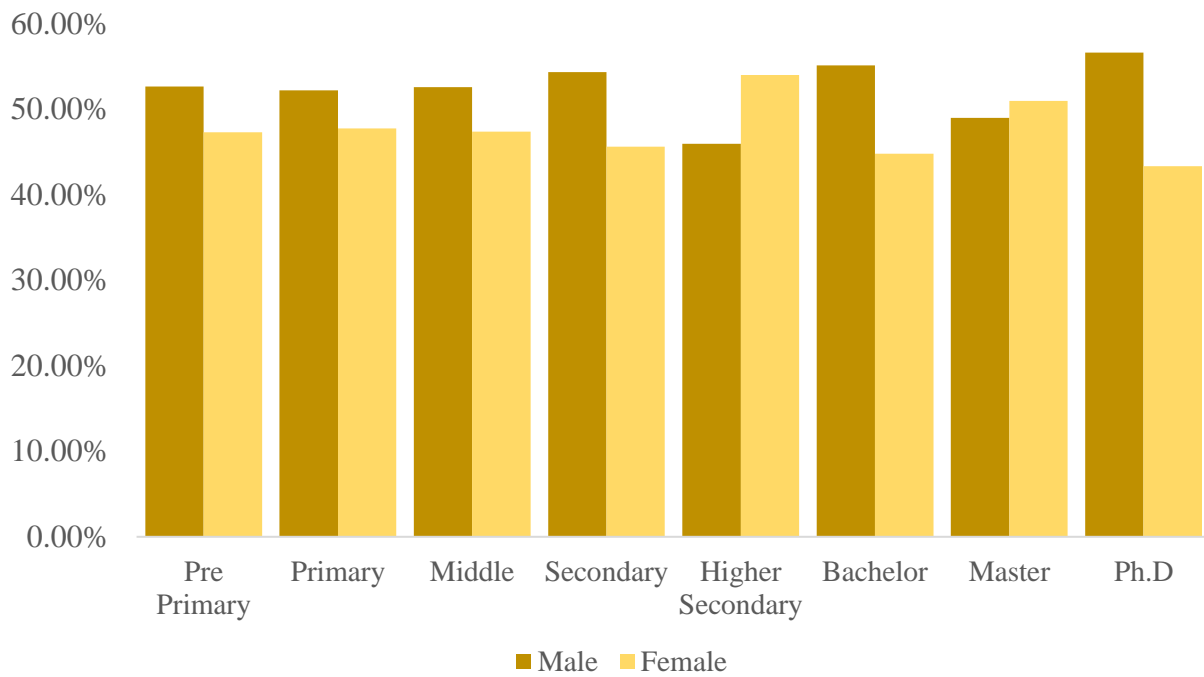
Figure 1.5

Percentage of Gender Enrollment in Sindh
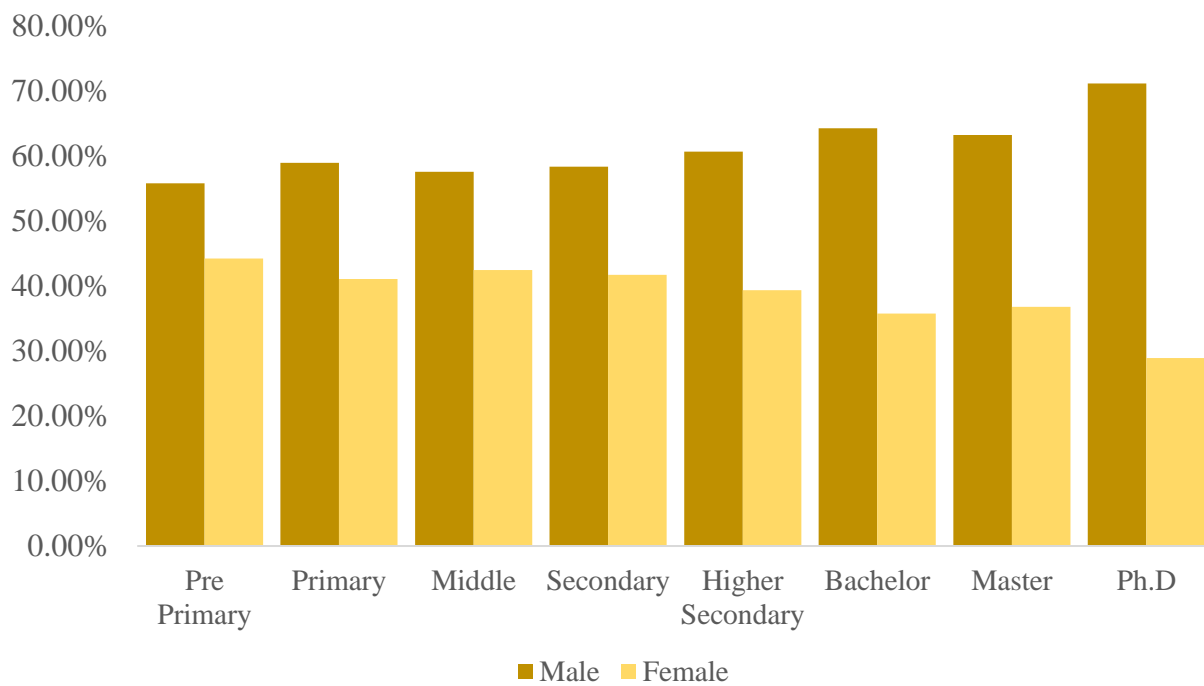
Figure 1.6

Percentage of Gender Enrollment in KPK
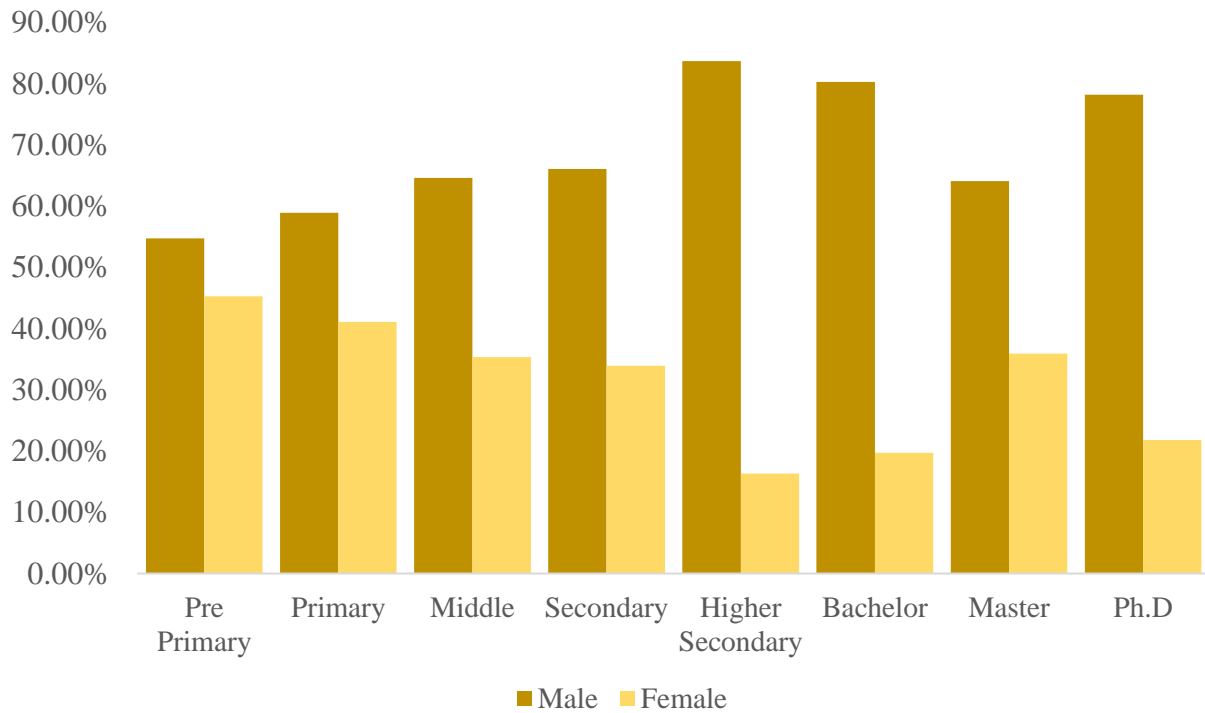
Figure 1.7

Percentage of Gender Enrollment in Balochistan
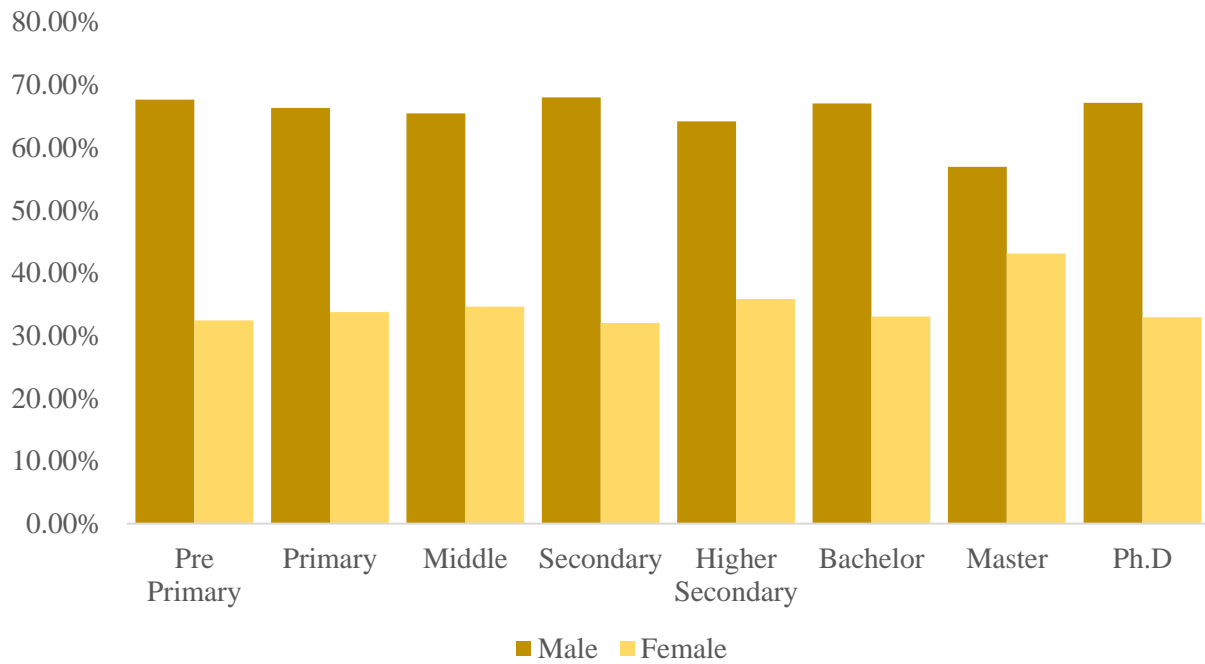
At province level, there is big difference between literacy rate of rural women and men. The figures 1.4 to figure 1.7 represent the four provinces of Pakistan, depicting that female enrollment at different level of education is less than the boy's enrollment in rural areas of all provinces. It is recorded that Punjab gender disparity index had shown the positive sign for Punjab and woman labor force participation rate of Punjab (28%) had overweighed national labor force participation rate of women that is 22 percent. Despite this fact, 5 percent violence against female also has increased in social and economic matters of life from 2016 to 2017. So, the challenges to a woman's decision making and employment participation remained unsolved (Gender Disparity Persists in Punjab, 2018). The female enrollment in different higher education programs also remained lower than male enrollment. The contribution of rural female enrollment in higher education in total rural enrollment is 46.9 percent (Pakistan economic survey, 2018-19). The statistics in above charts provide evidence that there is gap between rural male and female enrollment in any stage of education. The reasons for this gap in all provinces are pro-male biasness, boy preference over girl due to large family size, illiteracy of parents and cultural values (Yusuf, 2013). Farid et al. (2014) explored some socio-economic constraints faced by a rural female in the enrollment at different level of education. These factors are security issue, female ability to do productive work, female early marriages, role of a woman as mother only, patriarchy system, preference to religious education, gender discrimination, location of residence, financial problem and traditional society. There are also other factors that have been explored as socio-economic constraints in rural female enrollment at higher education level like father's income, family size and occupation of family (Sandhu et al., 2005). In addition to these factors, socio-economic status of the students is also an important factor which is most debated and researched determinant affecting the academic achievement of the students. The most dominant argument for socio-economic status is that it influences the quality of a student's academic performance. Many professionals claim that the students fall in low socio-economic status perform less academic performance and reason for worse performance is lack of resources to satisfy basic needs (Adams, 1996). Secondly, the financial problems faced by a student result in the diversion of his attention from the study to job seeking and he fails to perform in study as well as in job market. The students with low socio-economic status become psychologically deficient and they loss self-esteem (US Department of Education, 2003). Yaqoob (2012) has made some new insights on the socio-economic constraints faced by rural female in higher education enrollment. The author came with

already discussed determinants as well as new named as lack of institutes, lack of female teachers, sexual harassment and lack of free curriculum. Some other studies have also contributed to identify some other constraints i.e. role of feudalism, lack of travel freedom and coeducation faced by rural female in higher education enrollment (Mehmood et al., 2018; Ashraf et al., 2015).[2]

2.3 Provinces of Pakistan at Glance
2.3.1   Sindh at Glance

The word Sindh has been derived from a term Sindhu meaning a river and this river is referred to Indus river. Sindh province was established on 1st July 1970. Sindh comes at second and third number in all provinces with respect to population and area respectively. It has population of 47,886,051 and areas of 140,914-kilometer square. The density of population is 340 kilo meter square. It is situated in the southeast region of the Pakistan and historical place for people. Sindh shares borders with north Punjab and west Baluchistan. It also shares borders with south Arabian sea and states of India such as east Gujrat and Rajasthan. The landscape of east Sindh is consisted of the Thar desert nearest to India border and Kirthar mountains in the west Sindh. Geographically, the coordinates of the Sindh are 26° 21′ 0″ North and 68° 51′ 0″ East. The major languages spoken in Sindh are Urdu and Sindhi. Sindh stands second largest while contributing in the economy. In 2010, per capita income of Sindh was almost $1,400 which was 50% higher than the per capita income of the rest nation and 35% higher than the average at national level. Traditionally, contribution of Sindh to gross domestic product of Pakistan remained between 30 to 32%. Out of this contribution, service sector ranges from 21 to 27%. Sindh performs well in the industrial sector as industrial sector ranges 36 to 46% of total contribution in gross domestic product. Karachi is the capital of Sindh and is the largest city of Pakistan. It is the place of financial hub and many headquarters of multinational banks are located there. Sindh acquires a large proportion of industrial production and possesses two seaports of Pakistan named as Karachi port and Bin Qasim port. The Sindh falls in low category of economic development as its value of Human development index is lower. Sindh is also based on agriculture profession and supplies food items, vegetables and fruits to rest of the provinces of Pakistan. The divisions, districts, tehsils and union councils in Sindh are 7, 29, 119 and 1108 respectively (PSLM, 2014-15). The demographic characteristics of Sindh province are shown below in Table 1.1.

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[2] This portion is briefly explained in the chapter of Literature review.

Table 1.1

Demographic Characteristics of the Sindh

	Urban	Rural
Households in Millions	4.4	4.19
Male Population in Millions	13.01	11.92
Female Population in Millions	11.9	11.06
Total Population in Millions	24.91	22.98
Transgender	2226	301
Sex Ratio	109.31	107.8
Household Size	5.7	5.5

2.3.2 Punjab at Glance

The literally meaning of Punjab is the land of five waters or rivers. It came into existence on 1st July 1970. The most populous province in the Pakistan is Punjab with the population of 110,012,442. The area of Punjab is 2,05,344-kilometer square. The density of population is 536 kilo meter square. The Punjab is also biggest province of Pakistan with respect contribution in Gross Domestic Product of Pakistan. Punjab shares the border with other provinces of Khyber Pakhtunkhwa, Balochistan, Azad Kashmir, Islamabad and Sindh. It is also bordered by Indian occupied Kashmir and Rajasthan an Indian's Punjab state. Geographically, the coordinates of Punjab are 31° 0′ 0″ North and 72° 0′ 0″ East. In industrial sector, it also contributes almost 24% of the province GDP. Punjab has almost 76% contribution in total food production in Pakistan. Rice and Cotton are major among these food items. In 2010, Punjab contributed 59% of country's gross domestic product. This province dominates in the agriculture and service sectors. Contribution of Punjab in Service sector ranges from 52% to 64.5 whereas 56% to 61% in agriculture sector. Approximately, 40% people of the population live in urban areas in Punjab which is relatively higher than other provinces. The value of Human development index for Punjab is higher than the rest of the provinces, thus Punjab falls in medium category. Lahore is the capital of Punjab and second most populous city in Pakistan. Lahore is an economic, cultural, cosmopolitan and historical center of Pakistan. The major languages spoken in the Punjab are Urdu, Punjabi, Saraiki and Pothohari. The much of fashion and cinema industries belong to Lahore. Almost two third of the total food exports are produced in Punjab. So, Major portion of labor force in Punjab is associated with the agriculture profession. The divisions, districts, tehsils

and union councils in Punjab are 9, 36, 146 and 7602 respectively (PSLM, 2014-15). The demographic characteristics of Punjab province are shown below in Table 1.2.

Table 1.2

Demographic Characteristics of the Punjab

	Urban	**Rural**
Households in Millions	6.39	10.71
Male Population in Millions	20.76	35.20
Female Population in Millions	19.62	34.43
Total Population in Millions	40.39	69.63
Transgender	4585	2124
Sex Ratio	105.81	102.25
Household Size	6.3	6.5

2.3.3 Khyber Pakhtunkhwa at Glance

The meaning of Khyber is a famous mountain pass between Pakistan and Afghanistan whereas meaning of Pakhtunkhwa is the lands of Pashtuns. Some scholars defined Pakhtunkhwa as culture and society of Pashtuns. Khyber Pakhtunkhwa is situated in the north west sides of the Pakistan. Geographically, the coordinates for Khyber Pakhtunkhwa are 34° 0′ 0″ North and 71° 19′ 12″ East. It shares the border with the Afghanistan. It came into existence on 1st July 1970. Previously, its name was North West Frontier Province but later on, it was given new name of Khyber Pakhtunkhwa due to eighteenth amendment to the constitution of Pakistan in 2010. The capital of Khyber Pakhtunkhwa is Peshawar. The third largest state of Pakistan is Khyber Pakhtunkhwa with respect to economy size and population but it is forth smallest province of Pakistan with respect to area. It has area of 1,01,741km square and population of 3,55,25,047. The density of population is 410 kilo meter square. Within the boundaries of Pakistan, Islamabad, Azad Kashmir, Balochistan, Gilgit-Baltistan and Punjab share the border with Khyber Pakhtunkhwa. The major language spoken in this province is Pashto. The province of Khyber Pakhtunkhwa is third largest contributor in the economy of Pakistan. It contributes almost 10.5% in the gross domestic product of Pakistan. Out of this contribution in gross domestic product, forestry ranges from 35% to 81%. Secondly, mining output is also major industry in Khyber Pakhtunkhwa because almost 20% of the Pakistan's mining is contributed by Khyber Pakhtunkhwa. Agriculture sector also played important role in Khyber Pakhtunkhwa. The major crops maize, tobacco, wheat, rice and fruits are the major products having contribution in agriculture sector. The divisions, districts, tehsils and

union councils in Khyber Pakhtunkhwa are 9, 35, 82 and 986 respectively (PSLM, 2014-15). The Khyber Pakhtunkhwa has lower economic development as it lies in medium category by following the value of human development index. The demographic characteristics of Khyber Pakhtunkhwa province are shown below in Table 1.3.

Table 1.3

Demographic Characteristics of the Khyber Pakhtunkhwa

	Urban	Rural
Households in Millions	0.74	3.10
Male Population in Millions	2.97	12.50
Female Population in Millions	2.76	12.30
Total Population in Millions	5.73	24.79
Transgender	690	223
Sex Ratio	107.83	101.6
Household Size	6.3	6.53

2.3.4 Balochistan at Glance

The meaning of word "Balochistan" is the land of Baloch. The Balochistan is the largest province of Pakistan with respect to area and it is situated in the south west regions of Pakistan. It was established on 1st July 1970. The area and population of Balochistan province are 347190-kilometer square and 1,23,44,408 respectively. The density of population is 36 kilo meter square. It is the least populous province among all provinces of Pakistan. Geographically, the coordinates for Balochistan are 27° 42′ 0″ North and 65° 42′ 0″ East. The capital of this province is Quetta which is largest city of Balochistan. The North-East borders of Balochistan are shared with Khyber Pakhtunkhwa and Punjab, South- East and East borders with Sindh, South borders with Arabian Sea, West border with Iran and North borders are shared with Afghanistan. The major languages spoken in Balochistan are Balochi, Brahui, Pashto, Urdu and Hazaragi. Balochistan is underdeveloped province as compared to all other provinces. The economic development of Balochistan is considered very low as this province lies in low category due to low value of human development index. In spite of this fact, it is well rich by natural resources like natural gas. It is estimated that the natural gas in Balochistan is enough more to fulfill Pakistan's needs for long time period. An important port named as Gawadar port is situated in Balochistan province. In 2016, a report on Dawn concluded that multidimensional poverty had increased up to 71% in Balochistan. The contribution of Balochistan province in gross domestic product of Pakistan

ranges between 3.7 to 4.9%. There is much potential of tourism in Balochistan but province ignored its role. This province could not play important role due to tribal wars and security reasons. Tourism has sharply reduced in Balochistan after the terror attack of 9/11. The divisions, districts, tehsils and union councils in Balochistan are 7, 33, 141 and 86 respectively (PSLM, 2014-15). The demographic characteristics of Balochistan province are shown below in Table 1.4.

Table 1.4

Demographic Characteristics of the Balochistan

	Urban	Rural
Households in Millions	0.47	1.30
Male Population in Millions	1.79	4.69
Female Population in Millions	1.61	4.25
Total Population in Millions	3.40	8.94
Transgender	69	40
Sex Ratio	111.59	110.27
Household Size	7.2	6.93

Chapter 3

Literature Review

3.1   Introduction

The role of education in Economic growth has been proved positive and significant in monetary terms as well as in physical terms such the productivity of labor and efficiency of farm. Investing on women education is essential to transform the economic growth into desired outcomes of development such as opportunities for women, child health and fertility rate is concerned with the literacy rate of women in the country (Summerfield, 1994). The Women education and economic growth have contribution in reduction of fertility rate and in improvement of child health but these outcomes are not consistent with the expansion of opportunities for women in the labor market. The promotion of women education is a dominant strategy for development therefore, the influences of women schooling are chiefly central for policy-makers (Schultz, 2002). The female education helps women to understand the norms of society, need of self-reliance and disheartens the discriminations based on belief, gender, social class and religion. Female education also helps to empower the women to become leader of a society and it also allows them to be an example for young girls. It is stated that female faced conventional access challenges of apparent stereotypes and absence of positive role model in different disciplines of their career of graduate. In Pakistan, opportunities are available for urban male in higher education but there is completely biased behavior against the rural female enrollment in higher education. The gender inequality, poverty of household, less school facilities and education institutes, and lack of family support are the major roots of lower female enrollment in rural areas of Pakistan. The social and economic factors are the driving forces of lower female enrollment. Since, the objectives of this study are to explore all possible factors determining female enrollment and level of education therefore all the socio-economic factors discussed in earlier studies are of much importance. So, this chapter will briefly present the theoretical and empirical literature on the importance and determinants of female education discussed in sections 2.2 and 2.3. The theoretical and empirical literature reviews help to follow a systematic procedure to conduct a research study. It also helps to identify research gap and explains how briefly research questions are answered in earlier studies.

3.2 Theoretical Literature Review

The lower female enrollment has adverse effects at national level as well as at household level. There are many economic theories that highlight the significance of education in a country. The human capital theory or neoclassical endogenous growth theory are concerned with macroeconomic objectives while Marxian theory, modernization theory and feminists' theories of education are concerned with the society or individual objectives. The theory of human capital hypothesized that education increases the output and worker efficiency by growing the level of intellectual skills of labor force. The theory originated from famous development theory of macroeconomics. In 1950s, production function was consisted on four factors of production i.e. Labor, capital, land and entrepreneur (Mincer, 1962b; Becker, 1993). In 1960s, economists were struggling to analyze the economic growth of the United States based on these four factors of production but they faced lot of difficulties to explain it (Schultz, 1961). By then, an essential condition and assumption for economic growth was growth in capital as factor of production. Few empirical studies challenged this assumption first time in history of economics (Becker, 1964; Schultz, 1961 & Mincer, 1974). These empirical studies developed the hypothesis that people who acquire education increase the stock of human capital. The human capital is a dominant factor of production having significant impact on economic growth because it is a stock of productive skills of human with distinctive abilities. Expenditures incurred on the education, health and job training are the examples of investments on the human capital. These expenditures surge the production capacity in future by sacrificing the current pattern of consumption. However, human capital stock only increases over time if the depreciation remains lower than the gross investment. The education is considered as most productive kind of investment, it is even worthwhile investment than investment on physical capital. In order to produce goods and services, the human capital theory depicts that the learning capacity of a person can have comparable value with other complementary resources (Lucas 1990). Human capital theory illustrates that people who invest on training and education perform well in productive activities than those people who have less training and education. So, higher level of training and education rewards people with higher rate of return. Becker (1993) suggested that more schooling years raise returns and productivity chiefly by delivering skills, knowledge and a mean of investigating problems.

The Solow growth model explained that the increasing trend of total factor productivity is the key determinant of economic growth. The determinants of long run growth are exogenous like

technology or human capital is fixed (Solow, 1957). The Endogenous growth model incorporated the technology as endogenous factor determining the economic growth in the long run. The technology progress is endogenous in the model showing that there are few determinants that determine the technological progress. The endogenous growth model considers the production function showing output depends on the technology, labor and capital. The labor engaged in research and development or human capital will result in new capital goods and technology. Hence, change in capital will positively depend on the labor engaged in more research and development or human capital. The endogenous growth theory depicts that investment on innovation, human capital and knowledge is an important determinant of economic growth. The knowledge-based economy results in spillover effects and positive externality which ultimately leads to economic development (Romer, 1986; Lucas, 1988). Economic theory explains that goods or services purchase by people are for either for consumption or investment. Generally, when a consumer consumes goods or takes services, he gets utility but people get education, they gain additive utility as they participate in different events at the university, make friends at college, join a social sorority or fraternity and learn to become independent. The education is viewed as an investment and consumptive service that lasts for long time with significant effects on economic growth. The education gives the non-market benefits as well as market benefits even after the retirement age. A person who has education earns more income that affects his and society living standard (Hansen & Weisbrod, 1969).

The classical theory elaborates that if markets are left alone, the outcome will be maximized output by market forces. The idea of free market is also associated with acquiring education. The objective of classical theories regarding education is that students can make their free choices of the places where they will study and institutions can also decide freely what and how will they teach to the students. This is only possible when the markets for higher education will work freely or outcomes are determined on the basis of demand and supply for higher education. Ultimately, price of acquiring education will be set by the market forces. For example, if enrollments in higher education declines, then the institutes would have to reduce the price of their products to work smoothly. The fall in price stimulates higher enrollments and equilibrium of enrollment will be attained again. It was discussed in Say's law of market which stated that supply always creates its own demand. In simple words, if institutions of higher education will create opportunities for the students, this will lead to rise in the demand for different degree programs. However, demand also

has been considered as an effective determinant of supply. Therefore, supply and demand are the foundations of a market and they have a dynamic behavior which inclines toward market equilibrium. It can be concluded that as long as opportunities will be provided by the universities, enrollments in different degree programs will be increased. In many countries, the higher education is trying to establish the structures which can monitor the access, fairness in admission, control over price and quality of the programs offered by higher education. Moreover, it is argued that free market has nothing to do with the theory of higher education because free market does not exist. There are also insufficient evidences that price alone can create stability in the market of higher education. For example, an attempt was made to democratize the prices of higher education in United Kingdom but it led to greater volatility in the markets. In fact, many universities charge fixed prices around 9000 pounds per annum. The effect of these fixed prices resulted in depressing the enrollment rather to increase the enrollment at different universities. Moreover, a prospective student in United Kingdom delayed his burden of education expenditures by postponing enrollment in the future. Therefore, price or fee do not play important role as the only and most important determinant of participation decisions in higher education. Maringe et al. (2009) concluded that a prospective student was not discouraged by the new high prices or fees declared in the United Kingdom but he was forced to survive on sandwiches for next few years to avail the opportunity of participation in higher education. Anyhow, pricing seems to have a negative association with choices to purchase in higher education. The education programs having lower prices are mostly associated with poor quality and people preferred them less than the programs having high price (Foskett & Hemsley-Brown, 2001).

Karl Marx discussed that each social process of production is also considered as the reproduction process. He developed hypothesis that it is the higher education which causes more inequality in society because lower income family cannot invest money on human capital while upper class families can invest on human capital. The higher education is closely associated with social class of the society. The middle- or upper-class families mostly prefer higher education because of their social norms, social values, cultures and practices whereas lower class or working-class families ignore all of these social aspects (Giroux, 1983; Bowles et al., 2001; Apple, 1978; Willis, 1983). The fundamental reason behind these observations is that education has no effect on the society but it is education including higher education that reproduces the inequality in a society. In this theory, it is claimed that a market in higher education creates and reproduces inequality in context

of socio-economic indicators i.e. wages, social status and authority. For example, there is intellectual division between the global north and global south environments of higher education. It is largely driven by the one-way flow of talent from the global south region to the north region. Moreover, it also has been experienced that numerous efforts have been made to create partnerships between the south institutions and north institutions but intellectual division widened as an outcome, in spite of narrowing. It is evidently that talent flows were unidirectional caused higher brain drain in universities of global south (Mohamedbai, 2013; Ishengoma, 2011).

The modernization theory explains that education is a source to transform the belief, individual values and behavior. Interaction with modern Institutions such as factories, schools, colleges and mass media inculcate attitudes and modern values. These kinds of attitudes comprise promotion of new ideas, freedom from old traditions, planning about future desires, and extraordinary wisdom of social and personal effectiveness. The modernization theorists claim that these attitudinal and normative changes vary throughout different stages of life, lastingly shifting the relationship of an individual into social structure. The modernity level of an individual depends on the number of folks who have interaction with society's institutions. The rapidity of economic development and modernization accelerates when a critical proportion of the population varies. Since, beliefs and individual values are always influenced by the education of the population, therefore education provides necessary building blocks to achieve sustained economic development and to make labor force more productive.

In 1970s, Feminists developed the education models for development when few feminists criticized the development models. These feminists argued that women faced obstacles and remained disadvantaged while explaining education models for development and human capital. So, there is need to address the problems and obstacles faced by women (Coats, 1994). Initiatives and measures are required to correct these issues. However, enquiries are growing over the time, three types of education theories for development by feminists have been emerged to clarify the positions of women in a society: Marxist feminism, the liberal feminism and radical feminism. The liberal feminists contribute by supporting the notion 'equality' which illustrates that a compensary and a good instrument for development is education. This instrument will be effective only if society promotes gender equality to achieve development. Therefore, women access to the education is basic perspective to the liberal feminists. They claim that by ensuring

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equal opportunities of education to both sexes' men and women, an environment would take place in a society to encourage and develop the potential of women. Liberal feminism is agreed that ignoring the role of women in development is the main reason of gender inequality and dissemination of knowledge can be a best solution of this ignorance. Moreover, the education theory of liberal feminism for development intends to focus on the provision of opportunities to the women but it does not much challenge the practices of gender discrimination in education. Radical feminists emerged and put their efforts to convert the ideas of earlier liberal women into action. Radical feminism analyzes the relationship between gender inequality in education, patriarchy forces and male dominated power. They conclude that this is the combination of hierarchy and sexuality which promotes the notions "subordinate female" and "dominant male". Hence, only educators are not accountable for this inequality and they alone cannot recommend solutions to tackle this issue. Women have to play their role by re-educating society into nonsexist practices and behaviors. Therefore, Radical feminists have provided women a mean to initiate, discover and recommend changes through the development of new tactics and inquiry of a woman's experience. Radical feminists challenge the view that education of women comprises only recreational and domestic subjects, suggesting that a woman is only interested in where she lives and what she looks like (Coasts, 1994). They also have belief that education is an important tool for development because it helps to focus on the issues of gender in light of training and education. Nowadays, radical feminism has confronted a generalization related to the role of human in technological progress. They argue that an educated woman as a worker is more efficient and productive than equally educated man. This claim has significant recommendations for the growth models and theories because the general equation of growth model accounts for the gender differences. However, the screening and signaling models have utilized this dimension of gender in the calculus of economic growth and education. In screening model of Information Economics, employers specify sex as an index and treat education as a screening devise when they select candidates for a job.

In general, the role of education in expanding human capital is significant for individuals as well as for society. There have been numerous investigations that have endeavored to quantify the association between economic growth and education. Human capital is likewise thought to carry with it a wide scope of advantages to society, for example lower crime rate, increase in productivity, health care and strong economic status. The investment on Higher education is like

investment on stocks and bonds that can give a fix yield after specific time period on maturity but higher education yields that increase over time with no maturity. Investing on bonds and stocks may result in market benefits but a student going to college gets many other benefits beyond market. For example, if a college student gets engage in social, political and extracurricular activities, then he may have good social relations, health and less likelihoods of crime rate over the lifetime. There are additional non-tangible benefits (social interaction, character building, role of a citizen in society etc.) of getting higher education along with tangible benefits (stationary, food, transport etc.) subject to some financial constraints. The higher education is a product or service that a consumer acquires to get utility. The consumer has two goods, years of higher education and other goods (consumer goods like clothes, foods etc.). He maximizes his utility by opting the optimal bundle of both goods. The community indifference curve can be used to represent the society gaining utility from the optimal bundle of years of higher education and other goods (Toutkoushian & Paulsen, 2016).

3.3 Empirical Literature Review

Many studies have made efforts to identify the socio-economic factors that influence the female enrollment and their level of education. The socio-economic factors are too many so that it is a difficult task to include all factors in a single empirical study. Therefore, few studies analyzed the macroeconomic variables causing lower school enrollment in a country while few studies analyzed microeconomic and social factors at household level. Different socio-economic factors and macroeconomic variables have been identified by different studies that significantly affect women enrollment.

There is lower participation of rural women in different types of employment in the India. The factor behind that is culture causing discouragement of female participation. The cultural aspect of joint family system insists female to opt agriculture employment but hinders the rural women to adopt non-farm employment. The joint family system decreases the working hours of rural women in non-farm employment. The social status of the women is not well defined due to lower education in the north India. The probability of rural women living in joint family system to work in non-farm sector is lower than the women living in nuclear family system. This gap has been lowered over the time but for those rural women who have tertiary education. The tertiary education of rural women overcomes the gender disparities prevailing in non-farm sector

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employment. The women have more drop out ratio than male in initial stage of education at 14 years' age. In the joint family system, the unemployment rate of rural women with a young child is higher than the rural women living in nuclear family system (Dhanraj and Mahambare, 2019). The female enrollment in higher education in Pakistan is lower due to the cultural and socio-economic problems. The travel freedom, sexual harassment, feudalism, religious misconception, lack of higher education institutes and gender discrimination are the dominant perceived factors affecting female education. The most of the female have usually freedom to travel which means there is no much constraint of travel freedom. Sexual harassment is the mostly observed factor having negative influence on the female higher education. The parent permission for girls to acquire education has negligible outcome in lower female enrollment. The impact of feudalism is also an important factor behind lower female enrollment in higher education. Most of the people misinterpret the concept of religion regarding female education. So, religion misconception constraint adversely affects the female education. The security, lack of institutions and traditional customs are also important factors in determining the female education. The co-education causes a big challenge for female enrollment because parents oppose the co-education and do not allow girls to be enroll. The financial resources allow parents to bear the expenditures of female higher education but unfortunately, female higher education is restricted due to lower family income (Mehmood et al., 2018). Women's empowerment is complex and multifaceted, and its definition varies from community to community. Usually, female status refers to feelings of self-development among women, the ability to select from available choices as well as opportunities and the ability to manage your life outside and inside the house. The status of women is concerned with educational opportunities, labor improvement, birth control, decision-making rights, access to resources and decision-making on the reproductive process. Feminist economists indicate a masculine structure that increases gender inequality. To overcome these circumstances, women must challenge existing power relationships and exclude male dominant culture from society. The organizational development enhances the economic role of women. The communities need to raise awareness and to improve organizations to ensure equal opportunities and rights for both men and women. Recently, a large proportion of women occupy high posts in their workplaces, in trade unions, politics and the academic world. But gender inequality still prevails in most parts of the world. The discrimination between men and women affects economic development and partly true for human capital, but this view cannot explain the entire gender pay gap. The lives of women in

Pakistan are governed by ancestral society. Such societies do not give women equal rights. It is widely evidenced that women face gender inequality in income, education, employment, healthcare and control over assets. Pakistan is one of those countries which has largest gender gap and discrimination between man and women in all aspects of life. According to World Economic Forum, women of 58 countries were able to achieve gender equality in five different sectors such as health and educational achievements, wealth, economic opportunities, economic and political participation, while Pakistan was at 56th out of these countries. In Pakistan, the growth rate of labor force participation for women was 15.9% in 2004 and increased to 18.9 percent for next two years (Ashraf & Ali, 2018). Access to higher education is probably going to turn out to be increasingly significant for developing nations but in spite of its pertinence this matter is understudied. In access to higher education, significant disparities exist between men and women emerging from background of parent, location and household wealth. These Disparities are significant regarding distributional worries as well as on the grounds that they may have suggestions for the economic and social prospects of the nations. With regards to a huge writing on the formation human capital, inequalities in accessing higher education appear early and are apparent in relationship between later Enrollment and early methods of learning in higher education. However, children and parent aspirations for acquiring education hardly affect female education but household wealth significantly determines female education as liquidity improves (Sanchez & Singh, 2018). Universities of Pakistan do not stand or secure position in the world ranking because their quality of education does not match international standard. The female education in rural areas of Pakistan is in very alarming situation. In developed countries, advanced infrastructure is provided to colleges and universities but in developing countries, even maintenance of schools is not possible. Government does not allocate desired and required budget for education in Pakistan. The government is focusing on the issues related to institutions and enrollment of the students since last decade whereas earlier state was unsatisfactory. Current state of country shows that government has taken few measures to improve education institutions for men and women at school and university levels. But these measures are not enough to get desired outcomes in the society. The findings in Pakistan show that female enrollment ratio, literacy rate and female participation of labor force have significant positive effects while fertility rate has negative and significant effect on economic growth in Pakistan. Hence, female literacy rate and

female participation of labor force are necessary elements to achieve economic growth (Nosheen & Awan, 2018).

In most part of the world, women have been facing obstacles regarding higher education and it is still evidenced in some part of world. The exclusion of gender discrimination in education system has been a major objective of many international development institutions. According to literature that eliminating of gender disparity and educating female will provide a domain of improved outcomes including high economic growth particularly for under developed countries. But women don't have greater opportunity to receive higher education, specifically in field of technical and professional subjects. This tendency seems to be changing now. There had been greater gender discrimination in education in Pakistan for long time period. Pakistan higher education commission played an important role to enhance the contribution of women in higher education. Women education has increased from 36.8% to 46.2% during the period of 2002-2008. According to recent statistical figure of gender disparity, total female enrollment is 49% which is 0.642 million while male enrolment is 51% which is 0.677 million. Statistical figure shows small difference between male and female enrolment. It means level of higher education between male and female is taking equal opportunities. Historical facts examined that struggle of human development is made to favor man over women in Pakistan but now situation is getting changed in female's courtesy and contribution of women is appreciated in every field of study (Kaleem & Rathore, 2017). in underdeveloped countries, Women have economic and social empowerment, lower investment in capital and limited approach to labor market. The pattern is tremendously interested in middle east and north Africa, where social criteria along with exorbitant unemployment among young generation diminishes women investment in human capital and imposes their dependence on men. One reason is that many interventions have failed to achieve their intended goals in women, a strong emphasis is placed on supporting physical resources without looking at the person capital. In addition, criteria for the role of women in society may limit their perception of what is possible in the workplace, thereby limiting their incentives to invest in human resource. Hence the key question is whether women's relaxing workforce can help them to achieve better economic and social results. To answer this question, the impacts of large-scale empowerment of women are assessed in conservative conditions in rural upper Egypt. We can participate A desired program is offered which provides an incorporate approach to women's economic and social empowerment to increase youth employment for rural women in Upper

Egypt. The program offers business internships and trainings in addition to real support for starting a business. It is found that the offered program increased the chances of women being engaged in income-generating activities, as well as increased the proportion of women who intend to create their own Company. However, social empowerment remained unchanged during the offered program. It is concluded that economic situation may improve the status of women in conservative societies by relaxing human resources restrictions. However, this does not directly lead to improved social outcomes (Elsayed & Roushdy, 2017). The rural women are far away from acquiring the higher education due to social and economic barriers in India. It is found that there are many challenges that women face to make their careers good. Some of them are economic problems, home related problems, institutional problems and societal issues. Sex biasness prevails everywhere in the India whether women are at educational institutes or at other places of the society. Biased behavior of people plays role as barriers especially in rural areas when female steps forward for higher education. Further, issues regarding social, economic and institution need deep insights to be resolved. The early marriages, teacher gender, lack of education facilities and parent's education are the important factors behind the ignorance of women education. The economically week families insist the family women to become the source of income on the cost of higher education. The parent considers the higher education as more expensive education for which big finance is needed so their economic background does not allow them to enroll their female in higher education. The importance of higher education can be realized by giving counselling and guidance to illiterate parents (Selvan, 2017).

Most of the population in Pakistan consists of young male and female proportion. In spite of this fact, alarming factor in the country is that literacy rate of this young population is very low and it has significant role in economic growth. Furthermore, this young population is also segregated into urban and rural population. There is significant gap between the literacy rate of rural and urban areas whereas literacy rate of rural women has been worsened. In Pakistan, people do not prefer women education and hence, they are failed to build a strong society. Sick mentality and bad norms in society are the major factors behind the lower literacy rate of women. The status of a girl in rural areas has been very degraded due to gender biasness. People do not respect women and treat them as their household workers. There are certain serious challenges in Pakistan behind the lower literacy rate of women in rural areas such as early marriages, domestic violence, acidic attacks and murders for family honor. Islam provides equal rights and opportunities to both men and women

for education but it is the misinterpretation of religion that also affects education of a rural female (Mustafa et al., 2016). Gender discrimination has important role in determining the female education in Pakistan. The gender discrimination is deeply rooted in different regions of Pakistan. The society in which gender discrimination prevails is segregated into completely two different classes. These classes have different roles in the society. The patriarchal role of male discourages the female class to be bounded till the walls of a house. The co-education and gender discrimination are factors affect the decision of household head regarding female enrollment in higher education. Religious misconception plays vital role in female education as most of the people misconceive the guidance of religion and refuse the girls to take admission in higher education institutes. In 21st century, there is significant role of media in each aspect of the life, so role of media also plays role in taking decision about female enrollment in higher education by household head. Illiterate parents have bad perception about the role of media like Facebook, WhatsApp etc. so, bad impression results in lower female education (Naeem & Dahar, 2016). Lower female enrollment in education and participation in labor market in Afghanistan have been resulted in higher fertility rate. Taliban ruled Afghanistan territory from 1995 to 2001 and during this tenure, they banned the female education. The Taliban profession were not in favor of women enrollment in education. The relationship between Taliban occupation and female education is negative on theoretical basis. The ban on the female education was a religious misconception that adversely affected. It was also observed that female teachers were not allowed to teach the girls who have age more than 8 years. The ban on first to ninth grades was affected by the exposure of Taliban occupation who wrongly interpreted concept of education in Islam. The security issue also affected the female education enrollment because violence was normally expected. As Taliban group was an ethnic group so culture mattered a lot in this group which ultimately affects education of female. The Taliban occupation resulted in the poor health of female like hearing problem due to weapons etc. so, female health may have positive impact on the female education. The labor market in the era of Taliban occupation was also affected because females were refused to work as well as to get education so labor productivity or labor market had adverse impacts. The effect of Taliban was captured in form of early marriages and higher fertility rate because women were not allowed to work and get education so, they were forced to get marry in early ages (Noury & Speciale, 2016).

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Female are almost 50 percent of total population in Pakistan which means they can equally contribute in the economy if equal opportunities are given in employment and in enrollment at higher education level. The female enrollment in higher education is increasing over the time but still there is the gap between male enrollment and female enrollment. Women are less preferred than men in any type of task. A female is considered as unproductive as compared to male, so it affects female enrollment negatively. The females have limited opportunities in employment provided in different sectors of the economy. There is no independent role of female in higher education so patriarchal system makes them dependent on male decision about the enrollment. The female with higher education enjoys all her rights within constitutions of the country. It is also evidenced that a female feels herself unsafe while getting higher education that's why they are reluctant to get higher education. The view about the female higher education that after enrollment she will go away from religion is not observed in the study (Irum, 2015). In Pakistan, Women bear losses as a result of gender discrimination having roots in the socio-cultural environment. The status of women especially in rural areas has been badly influenced by the social, cultural and economic factors. Patriarchal system has promoted the subornation of women across regions, classes and rural-urban division. Hostile attitudes have been adopted towards a female and male dominated society has taken place in Pakistan. Sons are preferred over daughters because male has productive role in daily life matters. Society encourages a male to acquire a good quality of education than a female because he is considered as the only competitor. Early marriages do not allow women to get higher education because parents have to arrange dowry on the cost of their education expenditures. That's why investment on male education is preferable in rural areas of Pakistan. Another challenge for women is the unavailability of education institutions nearby which requires permission of parents for traveling. Travelling of women may lead to violence against personal security. The higher education of women has been deteriorated due to issue of personal security during travel because the cases of physical harassments are expected even if facility of public transport is ensured (Shaukat & Pell, 2015). After analyzing different findings of the studies, it can be concluded that learning and education play vital role to make an economy prosper. Nations with poor literacy rate suffer worse economic conditions consequently, they have to face high rate of poverty. Individuals belong to rural regions are denied of fundamental facilities of education including quantity and quality Education therefore, in this manner illiteracy rate hikes in rural areas. The gender disparities and dropout rates are the major issues faced by Asian nations.

In Pakistan, dropout rate is high in rural areas. Literacy rate is growing at moderate rate in Pakistan dissimilar to other Asian nations. Threatening conditions exist for the education of rural women which is possibly a main reason for alarming conditions of literacy rate. Rural women are confronting different issues i.e. poverty and gender disparity to acquire education. Another traditional constraint in rural areas is the unsatisfactory facilities for women because people are not willing to send their women to acquire education in the co-education-based institutions. They prefer and choose girls college or schools for their women. Policy makers should also consider another issue of inadequate female faculty in colleges and schools in rural areas. People have lack of awareness about gains allied with women education that's why people do not prefer female education in rural areas. Rapid increase in population also has become hurdle for female education because larger number of schools and colleges are required to provide education. (Ashraf et al., 2015).

In Pakistan, approximately 10 million children at primary level were not enrolled in 2011. Punjab has highest children enrollment in primary education. As expected, a miserable condition is found in rural areas of Sindh and Balochistan where, approximately half percentage of children are out of school. The private schools do not exist meaningfully in rural areas of Balochistan and Sindh. Almost 15 percent children from rural areas were studying at private schools (PSLM, 2011). The highest 23 percent enrollment at private schools has been experienced in Punjab while 14 percent enrollment in Khyber Pakhtunkhwa (KPK). The education statistics shows the gender disparity with respect to enrolment is higher in rural areas of Balochistan where 70 percent girls are out of schools against 45 percent boys. Curiously, the size of Gender Difference regarding enrolment is practically indistinguishable in both Khyber Pakhtunkhwa and Sindh territories. The most minimal distinction, unsurprisingly, is seen in rural areas of Punjab. The buildings of schools, boundary walls, drinking water, toilets and electricity are the amenities which are fundamental to increase children enrollment. The most noteworthy Percentage that recorded Cultural limitations with respect to Girls' Schooling have a place with Balochistan, trailed by Khyber Pakhtunkhwa region. The Supply Side requirements which incorporate school distance, lack of teachers and schools Quality regarding Physical amenities are accounted for by around 20 percent in an analysis. The Child Willingness to Study is likewise remembered for supply side hurdles as it mirrors the disappointment of the Education system in pulling in Children, maybe because of insufficiencies in quality. Few factors like household wealth, ownership of house and livestock have significant

marginal role in the enrollment. The enrolment decision is found negatively influenced by school distance and time required to access public transport. The regional differences with respect to rural development and population could not be ignored while analyzing rural enrolment because these plays significant role in determining level of education in rural areas. Similarly, there is lower school enrollment in the provinces having higher poverty incidence (Jamal, 2014). The role of gender discrimination is worthy to discuss at higher education level in rural areas of Pakistan. Most of the higher education institutions are co-education based which is hurdle for the rural girls from traditional societies. Due to lack of finance, most of the parents withdraw their daughter from early education. The govt. is not giving much attention to rural higher education because only 2 percent gross domestic product has been allocated for rural female higher education that is not enough to tackle the issues in rural areas. The progress of economy cannot be possible without considering female participation. The key to progress is gender equality and not a single country in the world made progress by ignoring gender equality. The investment on the boys is considered as good investment with high returns that discriminates girls from boys which results in less enrollment of rural girls. The lack of road network and higher education institutions results in long distance travelling for much time, so the family does not allow girls to travel alone in rural areas. Gender discrimination is everywhere in Pakistan especially in rural areas. The early marriage is the responsibility of parent that they try to fulfill as soon as possible. The poverty, domestic work, early marriages and no awareness to parent about higher education lead to lower female enrollment in higher education (Salik, 2014). The women in Pakistan do not get the same position and status relative to men who have social, economic and political status in all areas of the matter. It is just because of unequal socio-economic development and growth. The situation is worse in rural areas due to social and cultural factors. One of the most important factors is to strictly prohibit the female to acquire education on the grounds of religion. The social and economic problems are the hurdles for a rural female in the enrollment of higher education. The social and culture of Pakistan society is conservative and patriarchal. There is larger inequality between men and women in controlling the resources, employment, decision making, health facilities, education and in job opportunities in Pakistan. The families with lower income level and higher male to female ratio affect the rural female enrollment but encourage the male enrollment. As for as security of girls is concerned, the parents of rural female do not feel safe while sending their daughters into higher education institutions due to harassment cases. A female does not enroll in higher education because they are

unproductive as compared to male. The patriarchal system is the biggest issue that most of the rural female faced in higher education enrollment (Farid et al., 2014). There is a vital role of woman's decision making at household level in acquiring higher education and job opportunities. The caste, number of siblings, health, types of institutions where women study, encouragement of parents and parental income have been proved as important determinants of a woman's higher education. Furthermore, employment decisions of women are influenced by education of mother, female aspiration, marital status and parental income. In spite of the fact that Women are entrusted with a twice burden of domestic obligations and job duties, their choices to engage in job and higher education may arise in a progressively Equitable and positive way in the changing universe of Modernization and equivalent sharing of family duties as opposed to the old outdated idea of restricting ladies inside the Walls of house. So as to get a more profound image of female decision-making regarding education and job, it is mandatory to think about exclusionary and biased factors in the job market as well as in higher education. (Joseph, 2014). Human capital does not only contribute in the development of human resources through researchers, teachers, scholars and instructors but it is an instrument to bring technology revolution in engineering, business and commerce, industry, agriculture and transports. The quality of women education is very poor in Pakistan due to many reasons. The literature reveals that the current education system of Pakistan does not sound good and there is need to know the issues about the higher education so that possible solution could be developed to make education system desirable. The economic development of an economy depends largely on the higher education's nature and standard. The institutions of higher education are the responsible to achieve few goals i.e. production of highly skilled, competent and knowledgeable people. Higher education commission has taken few initiatives to pursue such goals but there are some external and internal factors which have been proven as constraints for the higher education of female (Khan et al., 2014).

A way to success is to invest money on the education and health of the women as it is one goal of the Millennium Development Goals. The reasons behind that are a healthy and educated girl can perform more productive role, finds better employment and earns higher rate of return over the investment on her education and health. An educated girl invests more in the education of her children, and she is likely to have smaller family. Therefore, investing in education would have positive outcomes of inter-generation in short and long run. The education of a female will result in productivity gain and lower growth rate of population. However, women always faced a

constraint of gender inequality in acquiring education and government did not much focus on the provision of equal opportunities. Women could not participate and secure their career in the race of science and technology because they are not allowed to be enrolled even in primary education. As a result of gender discrimination, few laws against women do not allow them to participate in labor market. Women don't have access to justice to declare themselves as owner of property. Religion is a key determinant of female education in many cultures and it do not ensure the rights for employment and mobility to other cities. Male has dominant role in many cultures which leads to the promotion of patriarchal system. Whenever a female goes out for a job, people expect that the male of her family could not fulfill basic needs. This kind of factors adversely affects male decision about women participation and he imposes restrictions and do not allow a female to go out. Even if women are permitted to go out, they have to suffer from sexual, verbal and physical harassment in the society. It is found that at least one time in whole life, one third women in the world are affected by the violent behaviors in their families. The violence against girls and women in public or private places by known or unknown people remained a major constraint for development process. An estimation shows that only one percent women have owned the property rights which limits the engagements of women in massive production of cash crops. Women are mostly engaged in part time jobs than full time job and their earnings are also lower than male. Women do lot of domestic work at home for which they are not paid but their opportunity cost of domestic work is much higher. Women are considered responsible for looking after children and collecting firewood or water. The higher fertility rate of women negatively affects their abilities to work efficiently. Although, Health facilities are offered to women but there are not enough to recover their abilities (Bradshaw et al., 2013). While schooling results for women have improved over the period 2001–2011, progress has been lopsided inside Pakistan. Rustic young ladies linger a long way behind urban young ladies and progress over the territories stays inconsistent. The change to elementary school—somehow or much basic for improving employability, conceptive wellbeing, and different results—shows much progressively dissimilar advancement by territory and pay class. Inquiries concerning the inclination for private versus public schools and the real selection of schools accessible to women in most territories of the country should be replied in serious manner so that we could see higher female enrollments in secondary schools. Access is probably going to be the principle determinant behind the enrollment in secondary schools. Earlier results show the complete dependence of 10 to 14 years' girls on government schools. This

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recommends private schools are impossible for women in rural regions. Another mediating factor is income level of household: even richer households seem to support state funded schools for women. The data proposes that a female from poor and enormous family contends with her male siblings for inadequate assets. Critically, secondary school is just a choice on finishing primary school and the decisions are more prominent at the primary school level. It is also studied that the Provincial outcomes illustrate the extension of private schooling in Khyber Pakhtunkhwa (KPK) and Punjab while less private schooling in Baluchistan and Sindh (Sathar et al., 2013). A woman is disregarded in every circle of life. The world of male and female is distinctive in term of Employment, Education and Health. The analysis shows that girls face biased behaviors in attaining professional degrees to secure higher ranks. It is also concluded that gender gap restricts female enrollment and other managerial posts. The studies demonstrated few hurdles which are responsible for discrimination against a woman, for example, social, hierarchical and personal constraints. Many affirmative actions are required in society to lessen these constraints promoting gender gap. Higher Education Commission (HEC) formulates policies concerning promotion and selection in the educational employment. To make fair policies for selections and recruitments, Higher Education Commission has considered some measures. All universities follow same policies regarding selection and recruitment. Promotion system is followed by the record of publications whereas women are less likely to have promotion due to their household responsibilities and limited research exposure. These obstacles are interconnected and have association among factors for example social and cultural obstacles are inducing individual and structural obstacles. Representation of women at different level is hindered due to all of these obstacles such as social, cultural, individual and structural. An important reason behind this biasness against a woman is the society itself because society consists of organizations and individuals. People behave in a society followed by their socialization. Hence, these are social and cultural factors that underrepresent the status of women in each aspect of life (Batool, Sajid, & Shaheen, 2013).

In globalization and knowledge-based economies, women higher education has played important role. Particularly, quality of education has become more critical for development of a nation. In Pakistan, women education remained relatively less important and less preferred for the people. Developing countries cannot be benefited from globalization until they have better and increasing trend of female education. Higher education was considered as luxurious product in Pakistan at

the time of higher illiteracy. However, human capital has been proved as essential determinant to sustain development and alleviate poverty in this modern age of life. (Bilal & Imran, 2012). The gender gap is quite clear in the rural areas resulting in lower human capital. The education of boys is preferred over the education of girls. The wealth level of the household and mother education are important factors determining the female enrollment in education institutions. Family size is also an important determinant of the female enrollment in education. The cultural characteristics played significant role toward female education as compared to male education (Yusuf, 2013). The demand for education and rate of return on the education is the question of matter in Pakistan. The enrollment of male candidates emerges higher than girl at secondary level and the effects of factors determining school demand were different at each level of education by gender. Mother education affects female enrollment positively at primary and secondary level of education. The investment on female education may result in women empowerment leading toward gender equity (Qureshi, 2012). It is observed that socio-cultural problems are created by the people of Pakistan themselves and there is no tendency to resolve them after many years of freedom and independence. The dominance of discrimination, fore father practices and regulations have weakened our institutions. These kinds of factors have deep roots and severe influence on brains and psychology of people. The victim of these social factors is not a minority class of the country but the women who have almost equal contribution in the total population. These social and cultural constraints adversely affect the rural female enrollment in higher secondary education. The constraints are categorized into demand constraints and supply constraints. The demand constraints are those that members of the society face due to social and cultural structure whereas supply constraints are from government side. Some important supply constraints in Pakistan are lake of institutions, school distance from home, restricted curriculum and lack of transportation facilities. On the other hand, demand constraints are family income, permission for study in other city, role of religion, early marriages and gender discrimination. The school distance and restricted curriculum which are supply side constraints have significant negative impact on the rural female enrollment in higher secondary school while family income, education expenditures, boy preference over girl, early marriages and parent's education from demand constraints have negative effect on female enrollment. The wrong perception about female education and wrong interpretation of religion about female education also have influence on the enrollment (Yaqoob, 2012).

U-shaped theories explicitly or implicitly depend on the association between women education and economic growth. Education is a precondition for the positive slope of the U-shaped curve where a female gains entry into professional jobs that give returns. Along these lines, the association between participation in labor market and education is key to whether advancement adds to economic freedom for girls. Traditionally, women and men do not have equal access to schools. Economic growth is expected to increase as access to schools is ensured for each girl, with complicated implications for families, girls and markets. The issues are even more complex for girls because their time is divided between work and childcare throughout their whole lives. Moreover, cultural limitations restrict a woman's access to job market, which result in more complicated expectations about changing the behavior of job market during growth periods. Traditionally, women education as a policy has been formulated that increases household yield. The relevance of endowed human capital and job market access for girls may guide to explain the causal relationship between economic growth and girls' contribution in job market. Few factors such as culture, structure of labor market and economics of family may determine the endowment impacts. In developing countries, the way women respond to increase in education level and wealth, is a key factor in formulation of public policy. Particularly, it is needed to recognize the external benefits of women education for a family for example, reduction in fertility rate, improvement in children health and hike in productive labor force. The reduction in economic participation of women depresses the growth economic growth and female education is the only source which can improve women participation in an economy. These findings propose that nations with diversified initial levels of girls schooling and women participation in labor force will have diverse tracks to the development (Linkov, 2008).

Female enrollment in rural areas at higher education is lower due to economic and social constraints in Pakistan. The major constraints are categorized in social and economic constraints. The social and economic factors have direct or indirect impact on the rural female enrollment in higher education. The unavailability of education facilities is considered as most important factor affecting rural female enrollment. The family income, family size and family occupation are important determinants of rural female enrollment in education. The majority of the household favor the secondary education as good level for female. The family of female perceives that the higher education of female results in irreligious behavior of female, hate towards domestic work. There is high correlation among family income, occupation and female enrollment in higher

education. The education of household head has significant contribution in female enrollment of this household (Sandhu et al., 2005).

In most world communities, particularly in under developed countries women are specified to household and men are specified to politics and public dealings. These dissimilarities between men and women are because of biological distinction. Women are born to give birth and house chores. Women give birth to children and keep themselves busy to feed up newly born babies/ children. They are deemed to be as domestic helper while men are physically strong and leave their children for extended periods. Therefore, men are more likely to be engaged in venture such as hunting and fighting and other socio-economic activity. There is greater gender discrimination in most developing countries. A girl-child has lower status and preferences, fewer rights and benefits than a boy-child. Women at very young age are going through the inequality and facing difficulties. Women in Pakistan have been experiencing disadvantages since ages, their basic rights are being deprived. According to these social man-made norms, girls receive less food, less access to education, poor health care than a male child, and as a result, girls are more likely to die from childhood diseases. It has been reported that those girls who acquired training from vocational institutes have few chances to become teacher in vocational centers due to inefficiency of employment opportunities and lack of finances. According to Amnesty international, the girls' school's enrolment rate is very low, and according to the estimation of women organization groups, out of 28% of girls' school's enrolment at primary level, hardly 11% girls go to high school. The Drop rate is very high and girls are kept home to do house chores or to take care of younger siblings/children, when requested by family or if the financial situation is very viable. The 24% females are literate as compared to males who are at 49%. In order to take estimation of women organization group, only 12 to 15 percent girls can read and write (Hirway & Mahadevia, 1996).

Keeping in view the empirical studies, it can be concluded that there are different socio-economic factors in different regions across the world that negatively influence the female enrollment in schools. In case of Pakistan, the findings of different studies illustrate that gender disparity, poverty, parent illiteracy, joint family system, lack of education institutes and facilities, poor health, family size, household income and assets, religion misconception and less travel freedom to women are the dominant constraints for female enrollment in Pakistan.

Chapter 4

Data and Methodology

Suitable methodology and reliable data set are compulsory to conduct an empirical study. In this chapter, the study will briefly discuss data and methodology to pursue objectives of the study. This chapter comprises of four sections; 4.1 section discusses data source and its sampling technique, 4.2 section deals with data collection and survey tool, 4.3 section explains Econometric Methodologies and description of variables. The last section of econometric methodologies and description of variables is further divided into sub-sections; 4.3.1 sub-section discourses the logit model and its distributions, 4.3.2 briefly discusses the negative binomial model, Poisson regression model and Generalized Poisson model as well as their distributions, 4.3.3 sub-section discusses the technique for parameter estimation, 4.3.4 sub-section explains the tests for model specification and 4.3.5 sub-section is related to the measures of goodness of fit.

4.1 Data Source and its Sampling Technique

To achieve research objectives, this study targets three provinces of Pakistan named as Sindh, Punjab and Khyber Pakhtunkhwa. The number of divisions, districts, tehsils and union councils in Sindh are 7, 29, 119 and 1108 respectively. In Punjab, the number of divisions, districts, tehsils and union councils are 9, 36, 146 and 7602 respectively whereas in Khyber Pakhtunkhwa, the number of divisions, districts, tehsils and union councils are 9, 35, 82 and 986 respectively (PSLM, 2014-15). This study utilized the secondary data from Pakistan Rural Household Panel Survey (PRHPS) conducted and provided by International Food Policy Research Institute (IFPRI) and Innovative Development Solution (IDS) in 2014. In Pakistan, the aim of this survey was to offer a basis for quantitative analysis to recognize and address priorities for economic development and policy. Pakistan Rural Household Panel Survey 2014 contains data of 2018 rural households. Out of these households during the survey, 1257 households represent Punjab, 538 households represent Sindh and 223 households represent Khyber Pakhtunkhwa. This survey has collected various information and covered many topics such as education, social safety net, money transfer in or out, economic shocks, health and nutrition, migration, loan and credit, employment nature, assets and saving, time use, consumption, decision making of women and income sources. Four instruments of this survey were formulated by IFPRI to gather all this information. These instruments consist of four questionnaires: one is male questionnaire and second is female

questionnaire which were separately designed to get household and individual's level information. Third and fourth were price questionnaire and community questionnaire respectively. The Pakistan Rural Household Panel Survey 2014 did not contain any information about the province of Balochistan due to war and security reasons there during the survey. The Pakistan Rural Household Panel survey utilized the two-stage sampling technique as used by other famous surveys such as PSLM. The districts were chosen from each province. As for districts are concerned, 12 districts from Punjab, 5 districts from Sindh and 2 districts from Khyber Pakhtunkhwa were selected. The districts chosen from each province is shown in figures 1.8 to figure 1.10.

Figure 1.8
Selected Districts from Sindh

Figure 1.9
Selected Districts from Khyber Pakhtunkhwa

Figure 1.10
Selected Districts from Punjab

In Pakistan Rural Panel Household Survey 2014, the total of 19 districts were chosen from three provinces. out these districts, 30 tehsils from Punjab, 3 tehsils from Khyber Pakhtunkhwa and 14 tehsils from Sindh were selected. Out of these tehsils, 48 union councils from Punjab, 7 union councils from Khyber Pakhtunkhwa and 19 union councils from of Sindh were selected. Furthermore, four mouzas were selected from each district and total of 76 mouzas were chosen from all provinces. Out of these 76 mouzas, 19 mouzas are from Sindh, 48 mouzas from Punjab, and 8 mouzas from Khyber Pakhtunkhwa. On first stage sampling, one enumeration block from each mouza was chosen on the basis of probability proportional to size method. The complete listing of households was conducted at selected enumeration block. On the second stage sampling, 28 households have been selected from the conducted households listing by utilizing systematic sampling. First household from conducted households listing was randomly selected. The survey calculated the weights assigned to household sampling by multiplying the reciprocal of the probability of selected households in the sample. The figure 1.11 illustrates that how sample of households is taken in Pakistan Rural Household Panel Survey from each of the eighteen districts of three provinces.

Figure 1.11
Illustration of Survey Sampling
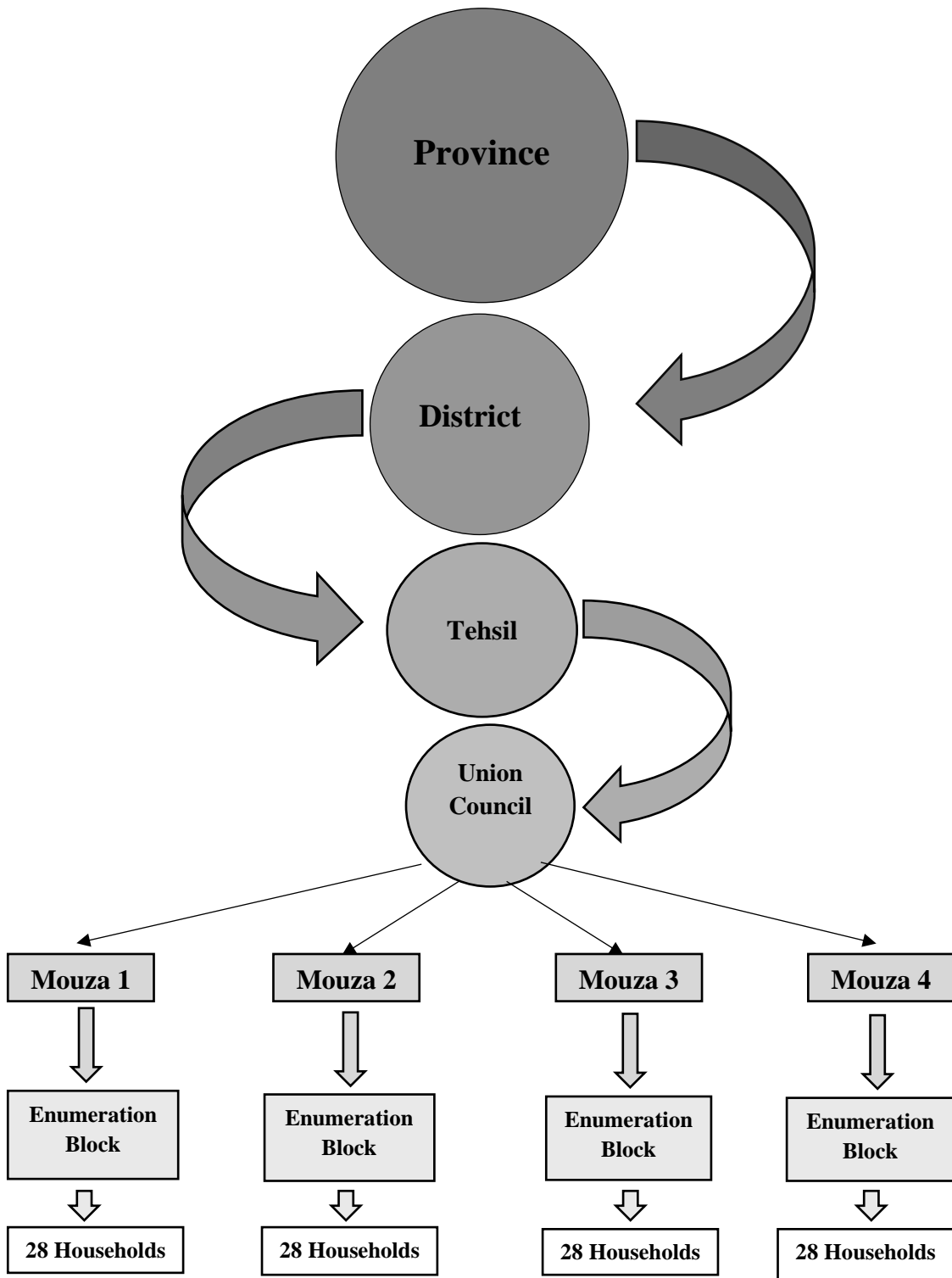
4.2 Data collection and Survey tool

In order to pursue objectives of the study, the data is obtained from the website of International Food Policy Research Institute. The dataset provided by IFPRI also contains questionnaires used during survey. The four questionnaires were used in the Pakistan Rural Household Panel Survey 2014. The questionnaires are named as male questionnaire, female questionnaire, community questionnaire and price questionnaire. As for as this study is concerned, the data for female enrollment or attainment of education associated with female questionnaire is extracted from PRHPS 2014. Pakistan Rural Household Survey utilized the female and male questionnaire to obtain the information about the women and men of a household as well as about their household's characteristics. Since, the female questionnaire of this survey contains education information or data for the women aged 5-18 living in a household therefore, the analysis of this study is also restricted to women aged 5-18. The International Food Policy Research Institute designed this female questionnaire to collect individual as well as household level information about women. This questionnaire contained one cover page, family roster and eight sections. The cover page of the questionnaire contained information about the household identity, household head, respondent's profile, language of household, geographic location, ethnicity and religion of household. Family roster contained the information about the family members of household i.e. number of members, gender, marital status and age. Next five sections of the questionnaire were consisted of the information about the education of women in a household, household income generated from livestock farming, expenditure and consumption of household, assets of household, participation in social safety net, weight and height of female and children, and food security respectively. First section was related to the schooling of female in which questions about basic reading, writing, addition, subtraction and level of intelligence were asked. Moreover, information about enrollment status, reasons for leaving school, type of school, medium of instruction, source of traveling to school, time required to reach at school, school distance, reasons for enrollment, education expenditures, financial assistance for education and level of education was also asked in first section. Second section of the questionnaire was about the information about non-farm and farm employment, and income of women. The information about the time use of women on domestic works or paid work was also collected through second section. Third section of the questionnaire contained the questions regarding consumption, expenditures and savings of the households. Fourth section obtained information about the sanitation of the household. The

information about the programs for social safety net, siblings, women in decision making as well as health and nutrition were asked in fifth, sixth, seventh and eighth sections respectively. The required data or information from specific sections of the female and male questionnaires was extracted from the Pakistan Household Panel Survey 2014.

4.3 Econometric Methodology and Variable Description

An econometric model shows the statistical relationship between dependent and independent variables backed by specific economic theory. In this sections, two econometric models along with methodologies and variables description are discussed in two sub-sections 4.3.1 and 4.3.2 respectively. Furthermore, the estimation of parameter, dispersion tests and goodness of fit measures are discussed in rest of sub-sections.

4.3.1 Logit model and its variables description

First model carries binary dependent variable for the enrollment of female assigning value of 1 if a female is "enrolled" and assigning value of 0 if female "never enrolled" or has been "dropped from school" (Hannum, 2005). On the other side, study carries dummy variables as well as continuous variables as explanatory variables. The sample size for estimation of the first model is 2137 female aged 5-18.

The logit model for the girls' school enrollment status is shown as:

$$z_i = \varphi_0 + \sum_{i=1}^{35} \varphi_i m_i + \varepsilon_i \quad z_i = (0,1) \qquad (1)$$

The explanatory variables are denoted by m_i and dependent variable is denoted by z_i. The study utilizes the cross-section data that's why variables have subscript i. The parameters of the model are denoted by φ_i and ε_i represents the error term of the model. The first econometric models used in this study deals with binary dependent variables assigning value of one if female is enrolled and zero if female is not enrolled. Since, the target variable is categorial and regressors are categorial as well as continuous variable, so limited or binary choice regression model will be estimated. The reason behind using the binary choice model is to identify the association between probability of being enrolled and characteristics of a female. A general form of binary choice model is shown in equation (2):

$$\rho_i = P(z_i = 1) = f(\varphi_0 + \varphi_1 m_{1i} + \varphi_2 m_{2i} + \varphi_3 m_{3i} + \ldots \ldots \varphi_k m_{ki}) \qquad (2)$$

$i = 1,2,3, \ldots, n$

$f = cummulative\ density\ function$

$\varphi_k = Parameters\ associated\ with\ kth\ explanatory\ variable$

$m_{ki} = kth\ explanatory\ variables\ for\ ith\ female$

$\rho_i = probability\ of\ being\ enrolled\ for\ ith\ female$

$z_i = Binary\ dependent\ variable\ for\ ith\ female$

There are two commonly used binary choice models, binomial logistic and binomial probit models. The mathematical expressions for logistic model and probit model are shown in equation (3) and equation (4) respectively:

$$\rho_i = \vartheta(m_i'\varphi) = \frac{1}{1+e^{-(m_i'\varphi)}} \qquad (3)$$

$$\rho_i = \forall(m_i'\varphi) = \int_{-\infty}^{m_i'\varphi} \frac{e^{(-\frac{t^2}{2})}}{2\pi} dt \qquad (4)$$

$$m_i'\varphi = \varphi_0 + \varphi_1 m_{1i} + \varphi_2 m_{2i} + \varphi_3 m_{3i} + \ldots \ldots \varphi_k m_{ki}$$

The logistic cumulative distribution function is represented by $\vartheta(m_i'\varphi)$ in equation (3) whereas the standard normal cumulative distribution function is represented by $\forall(m_i'\varphi)$ in equation (4). The models have quantitative as well as categorical explanatory variables. For a continuous explanatory variable say m_j, it should hold following:

$$\frac{\partial P(z_i = 1|m_i)}{\partial m_j} = \varphi_1. f(m_i'\varphi) \qquad (5)$$

In above equation (5), marginal impact has been calculated by taking first derivative and $f(m_i'\varphi)$ represents density function corresponding to cumulative distribution functions $\vartheta(m_i'\varphi)$ and $\forall(m_i'\varphi)$. The cumulative distribution function is a monotonic function stating that it increases in its entire range. So, the second term in equation (5) always remains positive due to chain rule of derivative. Consequently, whenever partial derivative is taken with respect to particular

explanatory variable, equality between the signs of partial derivative and the parameter of the model appears. Furthermore, it is proved in equation (6) in case of logit model.

$$\frac{\partial P(z_i = 1|m_i)}{\partial m_j} = \varphi_j \left(\vartheta(m_i'\varphi).(1 - \vartheta(m_i'\varphi)) \right) = \varphi_j.\rho_i.(1 - \rho_i) \qquad (6)$$

The logistic cumulative distribution function is represented by $\vartheta(m_i'\varphi)$ in equation (6). As for as marginal impact of an interaction term is concerned, it is a matter of complexity. It is allowed to multiply two explanatory variables named as interaction term in applied econometrics. For instance, m_1 and m_2 are two variables in equation (7) and an additional variable named as interaction term has been created by multiplying both explanatory variables with each other in equation (7).

$$\rho_i = P(z_i = 1) = f(\varphi_0 + \varphi_1 m_{1i} + \varphi_2 m_{2i}) \qquad (7)$$

$$\rho_i = P(z_i = 1) = f(\varphi_0 + \varphi_1 m_{1i} + \varphi_2 m_{2i} + \varphi_3 m_{1i} m_{2i}) \qquad (8)$$

In order to find the marginal impact of m_1 and m_2 in equation (8), partial derivatives with respect to m_1 and m_2 are taken. Marginal impacts of m_1 and m_2 are shown below in equation (9) and (10) respectively.

$$\frac{\partial P(z_i = 1|m_i)}{\partial m_1} = (\varphi_1 + \varphi_3 m_{2i}).f(m_i'\varphi) \qquad (9)$$

$$\frac{\partial P(z_i = 1|m_i)}{\partial m_2} = (\varphi_2 + \varphi_3 m_{1i}).f(m_i'\varphi) \qquad (10)$$

The standard normal and logistic distribution both are similar except the tails both have. Both models provide similar findings but if sample contains very small proportion of one choice out the binary choices, results from logit and probit will not be similar (Baum, 2006). The logit model is preferred over probit because odds ratios in logit model help to interpret the marginal effects. An odd ratio is defined as the ratio of two probabilities such as probability of favorable outcome (being enrolled in school) to the probability of unfavorable outcome (not being enrolled in school). The odd ratios for logit model are shown below in equation (11).

$$Odd = \frac{\rho_i}{(1-\rho_i)} = \frac{\left(1 \middle/ 1+e^{-(m_i'\varphi)}\right)}{\left(e^{-(m_i'\varphi)} \middle/ 1+e^{-(m_i'\varphi)}\right)} = e^{(m_i'\varphi)} \qquad (11)$$

The odd ratio's interpretation is provided by the exponential function. By holding other factors constant, odd ratio is expected to change by $e^{(\varphi_j)}$ if m_j changes by one unit as it is shown in equation (12).

$$OR_j = \frac{Odds\ for\ (m_j+1)}{Odds\ for\ m_j} = \frac{e^{(\varphi_0+\varphi_1 m_{1i}+\varphi_2 m_{2i}+\cdots\varphi_j(m_{ji}+1)\ \ldots+\varphi_k m_{ki})}}{e^{(\varphi_0+\varphi_1 m_{1i}+\varphi_2 m_{2i}+\cdots\varphi_j m_{3j}+\ \ldots\varphi_k m_{ki})}} = e^{(\varphi_j)} \qquad (12)$$

To show the odd ratio for the interaction term, equation (8) is again considered. The odd ratios for interaction term of m_1 and m_2 are shown below in equation (13) and (14).

$$OR_1 = \frac{Odds\ for\ (m_1+1)}{Odds\ for\ m_1} = e^{(\varphi_1+\varphi_3 m_{2i})} \qquad (13)$$

$$OR_2 = \frac{Odds\ for\ (m_2+1)}{Odds\ for\ m_2} = e^{(\varphi_2+\varphi_3 m_{1i})} \qquad (14)$$

Therefore, if interaction term is there then the odd ratio for a chosen regressor will be determined at pre-defined level of an interacting regressor. Particularly, if both regressors are binary in an interaction term, the interpretation of parameters for one regressor and interactive term will be straightforward (Hilbe, 2009). The parameters in a binary logistic regression model are estimated by the method of Maximum Likelihood. The method of Maximum likelihood used to estimate the logistic regression gives best results. The ML maximizes the probability of ordering data into suitable category by giving unique values of the coefficients in the model. The maximum likelihood method has been introduced in many statistical packages to estimate model's parameters. The facilities of testing of parameter hypothesis and reporting the goodness of fit of the model are also provided in these statistical packages. For binary choice or count data models, the count R-square and pseudo R-square are the common measures of goodness of fit. These measures are completely different from traditional R-square in time series analysis. The measures of goodness of fit such as count R-square and pseudo R-square for binary choice or count data models are not much important for a model. These are the expected signs of parameters and statistically significance which are of primary importance (Gujarati, 2011). The logistic

regression has few assumptions like nonlinear relationship, other than normal distribution and mutually exclusiveness and exhaustiveness of categories (Cramer, 2002).

The explanatory variables of logit model are classified on the basis of household and family characteristics, female characteristics and parental or household head's characteristics. The demographic and household characteristics comprise of religion of household, provincial region of the household, family size, household savings, household income, household credit, head count poverty, the household assets, number of male siblings, number of female siblings and household status of social safety net. Some of these household characteristics have been discussed in earlier studies (Jeffery, 2007; Deng et al., 2014; Maitra, 2010; Buchmann & Hannum, 2001; Carneiro & Heckman, 2002; Becker & Lewis, 1973; Zhang et al., 2007; Kurosaki et al., 2006).

Many studies concluded that consumption expenditures of a household are the good measure of materialistic welfare than the income of a household. The consumption of a household can capture the permanent income that's why consumption depicts true welfare of the household. It also considers the welfare gain through the illegal sources of income. The income of a household may mislead regarding welfare because total earnings by the members of a household can fluctuate over the time but consumption remains smoother (Sajid & Khan, 2016). In developing countries, income is not considered as good measure of household's welfare because a lot of goods and services are produced and consumed by a household itself (Meyer & Sullivan, 2003). Furthermore, people do not report the accurate income of the household due to tax imposition but they report consumption relatively better. Another reason of using consumption as the proxy for household's welfare is demonstrating the true standard of living of a household because it incorporates the current income as well as other financing sources such as household credit, gifts or financial assistance and household savings (Meyer et al., 2003). In the same way, households do not spend their all income and save some money which does not increase welfare of the household. Therefore, this study utilizes the per adult monthly expenditures to calculate the head count poverty which is the proxy for the economic status or welfare of the household.[3] The head count poverty is calculated by following the cost of basic needs CBN approach. The CBN approach takes into account the monthly per adult food expenditures required to take 2350 calories per day and

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[3] Arif et al. (1999) considered income-based poverty line to investigate the relationship between poverty and primary school enrollment

monthly per adult expenditures to satisfy basic needs (health, education, shelter and clothes etc.) in a household (Farooq & Younais, 2018). The analysis of this study is based on the dataset of Pakistan Rural Household Panel Survey conducted in 2014 so, it will be useful to consider the poverty line set by Government of Pakistan for the same year of 2014. In Pakistan, the estimated poverty line based on HIES dataset was Rs. 3030 per adult monthly expenditures in 2013-14 and this study has used it to calculate the incidence of head count poverty[4] (Amjad et al., 2018). If per adult monthly expenditures are greater than Rs 3030, female belongs to non-poor household and if per adult monthly expenditures are less than the Rs 3030, female belongs to poor household.

By following previous studies, asset index has been constructed and utilized as the proxy for a household's economic status (Sajid & Khan, 2016). The different assets owned by a household used to construct the asset index. The Pakistan Rural Household Panel Survey contains the information on the more than 70 assets of a household i.e. watch ownership, water pump, energy saver, spade, beds, sofa set, armoire, guns, suitcases, T.V set, bicycle, motorcycle, mobile, refrigerator, car, fan, iron etc. The value of each asset was measured in rupees and this value has been considered for each asset to construct the asset index. The Principal component analysis (PCA) is one of the appropriate and good method to construct an index (Filmer & Pritchett, 2001). This study employed the Principal component analysis to develop asset index by assigning the weights to each asset.

The female characteristics consists of female age, female age square, farm work participation and domestic work participation. The parental and household head characteristics includes gender of the household head, age of the household head, employment status of household head, mother education, father education and parent's perception about female education. The parent's perception contains two explanatory variables named as the perception about teacher's gender of female at secondary school, and perception about the preference of boy education over a girl. The types and description of the response and explanatory variables for the first model is shown in table 1.5.

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[4] Malik et al. (2014) used Rs. 1742 as poverty line for the year 2010-11.

Table 1.5

Description of Variables for Logit Model

Dependent Variable		
Variable Name	**Type**	**Description of the variable**
Female Enrollment	Categorical	0=If Female is not enrolled or left the school 1=If Female is currently enrolled
Explanatory Variables		
Female Characteristics		
Age of Female	Continuous	The age of the female is measured in years
Age square of Female	Continuous	The square of female age is taken to capture the non-linearity in the model.
Farm work	Categorical	The female worked at own agriculture farm or livestock in a year (1=Yes 0=No)
HH_Relation1 (Ref: Other relative)	Categorical	The female's relationship with the household head is measured by generating dummy variable (1=Child/Adopted child 0=Other relative)
HH_Relation2 (Ref: Other relative)	Categorical	The female's relationship with the household head is measured by generating dummy variable (1=Sister/Sister in law 0=Other relative)
HH_Relation3 (Ref: Other relative)	Categorical	The female's relationship with the household head is measured by generating dummy variable (1=Grandchild 0=Other relative)
HH_Relation4 (Ref: Other relative)	Categorical	The female's relationship with the household head is measured by generating dummy variable (1= Niece 0=Other relative)
Domestic work	Continuous	The time spent by female on the different tasks at home is measured in average hours per day in a year i.e. these tasks include cleaning, cooking, water collection, wood collection, washing clothes and family care etc.
Demographic and Household Characteristics		
Province1 (Ref: KPK)	Categorical	The province female belongs to (1=Punjab 0=else)
Province2 (Ref: KPK)	Categorical	The religion of female (1=Sindh 0=else)
Religion (Ref: Non-Muslim)	Categorical	The religion of female (1=Muslim 0=Non-Muslim)
Ethnicity1 (Ref: Shina/Hazarwal/Saraiki)	Categorical	The dummy variable is generated for the ethnicity of female (1=Punjabi 0=else)
Ethnicity2 (Ref: Shina/Hazarwal/Saraiki)	Categorical	The dummy variable is generated for the ethnicity of female (1=Pakhtoon 0=else)
Ethnicity3 (Ref: Shina/Hazarwal/Saraiki)	Categorical	The dummy variable is generated for the ethnicity of female (1=Balochi 0=else)
Ethnicity4 (Ref: Shina/Hazarwal/Saraiki)	Categorical	The dummy variable is generated for the ethnicity of female (1=Sindhi 0=else)
Social Safety Net	Categorical	Any member of the female's household who is getting any kind of financial assistance such as BISP, education scholarships, Zakat etc. The dummy variable represents the status of the household whether getting any financial assistance or not. (1=Yes 0=No)
Household Saving	Continuous	The household savings is yearly measured and logarithm is taken to interpret it conveniently.
Head count poverty	Categorical	The poverty illustrates whether female belongs to poor household or non-poor household. If the monthly per adult expenditures are greater than the threshold monthly expenditures set by the poverty line (Rs. 3030) based on cost of basic needs approach, then female belongs to non-poor household and if the case is converse of it, female belongs to poor household (1=Poor 0=Non-Poor).

Asset index	Continuous	An index is constructed for the assets of the households with the help of Principal Component analysis.
Per adult household expenditures	Continuous	Yearly per adult household expenditures are obtained by dividing the total household expenditures except education expenditures on number of adult members in a household. The logarithm is taken to make the interpretation convenient.
Children (0-4-year age)	Continuous	The number of children aged 0-4 year residing in household of the female.
Male siblings (5-15 year)	Continuous	The number of male members aged 5-15 year residing in the household of female.
Male siblings (16 or above year)	Continuous	The number of male members aged 16 or above year residing in the household of female.
Female siblings (5-15 year)	Continuous	The number of female members aged 5-15 year residing in the household of female.
Female siblings (16 or above year)	Continuous	The number of female members aged 16 or above year residing in the household of female.

Parental and Household Head characteristics

Household head employment status	Categorical	The employment status of the household head is measured by binary variable. (1=Employed 0=Unemployed)
Age of Household head	Continuous	The age of the household head is measured in years.
Gender of Household Head	Categorical	The gender of the household head is (1=Male 0=Female)
Mother education1 (Ref: Never enrolled)	Categorical	The female's mother who has primary or less than primary education is measured by introducing dummy variable. The female's mother having education equivalent to katchi-Pacci, class 1, class 2, class 3, class 4 and class 5 is considered in the category of the primary education (1=Primary education 0=else)
Mother education2 (Ref: Never enrolled)	Categorical	The female's mother who has secondary or above but more than primary education is measured by introducing dummy variable. The female's mother having education equivalent to class 6, class 7, class 8, class 9, class 10 and madrassa is considered in the category of the secondary education (1=Secondary education 0=else)
Father education1 (Ref: Never enrolled)	Categorical	The female's father who has primary or less than primary education is measured by introducing dummy variable. The female's father having education equivalent to katchi-Pacci, class 1, class 2, class 3, class 4 and class 5 is considered in the category of the primary education (1=Primary education 0=else)
Father education2 (Ref: Never enrolled)	Categorical	The female's father who has secondary or above but more than primary education is measured by introducing dummy variable. The female's father having education equivalent to class 6, class 7, class 8, class 9, class 10 or madrassa is considered in the category of the secondary education (1=Secondary education or above 0=else)
Teacher gender1	Categorical	The perception of household head about the female's teacher gender at primary level of education (1=Matters 0=Does not matter)
Teacher gender2	Categorical	The perception of household head about the female's teacher gender at secondary or higher level of education (1=Matters 0=Does not matter)
Gender inequality	Categorical	The parents of the female prefer boy education over the education of girls. Their perception about gender inequality is captured by the binary variable (1= Yes 0=No)5

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[5] Ref stands for the reference or benchmark category of the categorical variables

4.3.2 Count data model and its variables description

The second model of the study carries the count dependent variable represents level or attainment of education of those girls who are treated as enrolled in first model of the study. The sample size of enrolled female aged 5-18 is 941. The education level of an individual is a good indicator of the education attainment in any analysis (Beblo & Lauer, 2004). In Pakistan, an individual completes two, five, eight, ten, twelve and fourteen years of schooling in order to have pre-primary, primary, middle, secondary, higher secondary and bachelor or graduation respectively. Researchers utilize the familiar approach of categorizing ratio scale variables into different sets. In few case studies, researchers follow a common practice of treating continuous variable as ordinal variable because of setting a threshold for a variable. The categorization of the variables is essential for setting a threshold level (Sentas et al., 2005). In this study, count dependent variable for second model also has been categorized into six categories or counts of preprimary, primary, middle, secondary, higher secondary education and graduation as recommended by few authors (Blake, 1985: Beblo & Lauer, 2004). The count dependent variable is assigned value of 1 if a girl has pre-primary education, assigned value of 2 if she has primary education, assigned value of 3 if she has middle education, assigned value of 4 if secondary education, assigned value 5 if higher secondary education and assigned value of 6 if she is enrolled in graduation or bachelor. The girls having education equivalent to Katchi/Pacci will fall in category of pre-primary education, the girls having education equivalent to class 1, class 2, class 3, class 4 and class 5 will fall in the category of primary education, the girl having class 6, class 7 and class 8 will fall in the category of middle education. The girls having education equivalent to class 9 and class 10 will fall in the category of secondary education, the girls having class 11 and class 12 will fall in the category of higher secondary and finally, girls with 13 years or 14 years' education will be considered in the last category of graduation or bachelor. The official age for starting primary education in Pakistan is 5 year, so maximum attainable education for female aged 5-18 is graduation or B.A/B.Sc. education.

The second model of the study to be estimated is as following:

$$z_i = \varphi_0 + \sum_{i=1}^{35} \varphi_i m_i + \varepsilon_i \quad z_i = (1,2,3,4,5,6) \qquad (15)$$

The explanatory variables are denoted by m_i and dependent variable is denoted by z_i. The subscript i represents a female or one cross-section. The parameters of the model are denoted by φ_i and ε_i represents the residual of the model. The count data model shown in equation (15) also carries dummy variables as well as continuous variables as explanatory variables.

The standard distribution of Poisson is required to understand the different count data models. The objective to develop such distribution was to specify model having discrete choices. There are two restrictive assumptions of the Poisson distribution. First assumption of the distribution is the equality between mean and variance of the count regressand but in reality, mean remains lower than the variance. However, Poisson models do not perform well even in case of count outcomes because of overdispersion or under dispersion of the count choices. The second assumption of the Poisson models is that two events occurs independently. Another assumption of the Poisson model is the proportional relationship between the interval length and chances of occurrence of an event. The density function for Poisson distribution is shown below in equation (16).

$$\rho(Z = z_i) = \frac{e^{\gamma_i}\gamma_i^{z_i}}{z_i!}, z_i \in \{0\} \cup \mathbb{R}^+ \quad (16)$$

i=1, 2..., n

The expected value or conditional mean and variance of Z are equal in Poisson distribution and are represented by one parameter γ_i. The mean and variance of Z are the function of set of regressors and their respective parameters. The mathematical expression for this function can be shown below in equation (17).

$$E(Z|m_i) = \gamma_i = e^{(m_i'\varphi)} \quad (17)$$

Overdispersion takes place when conditional mean gets lower than the heteroskedastic conditional variance. The maximum likelihood approach estimates the Poisson regression model by utilizing either iterative reweighted least square or Newton-Ralphson formula. The equation of likelihood function for Poisson model is shown in equation (18).

$$l(\varphi) = \sum_{i=1}^{n}(z_i m_i'\varphi - e^{m_i'\varphi} - \ln (z_i!)) \quad (18)$$

The function in equation (18) depicts the global concavity and confirms the convergence. The Poisson model shows robustness in case of overdispersion if the specification of conditional mean is correct. The estimator of pseudo-likelihood is needed to overcome the overdispersion (Cameron & Trivedi, 1998). The Poisson regression is a good technique for count data but when variance will be greater than the mean of the distribution, then data is called over dispersed and vice versa. The violation of this assumption leads to the spurious results of the model. Therefore, larger variance deflates standard error and inflates value of standardized normal. Poisson models do not have capability to overcome these issues. To overcome that problem, Negative Binomial or Generalized Poisson regression can be employed to get the values of parameters by including the dispersion parameter (Famoye, 1993; Lawless,1987; Elhai et al., 2008).

To resolve the issue of overdispersion, modifications have taken place in the Poisson model and this modified version is called negative binomial model for count data. The negative binomial distribution specifies that there is exponential relationship between the mean of count data and the regressors. The mathematical expression for this relationship is shown in equation (19).

$$E(z_i|m_i) = \mu_i = \mu_i(m_i) = e^{(m_i'\varphi)} \quad (19)$$

This form of distribution comprises of a parameter θ for dispersion and functional form of conditional variance. The conditional variance is non linearly associated with mean because the variance function contains square of mean as shown in equation (20).

$$Var(z_i|m_i) = \mu_i + \theta\mu_i^2 \quad (20)$$

The negative binomial model and its log-likelihood function is illustrated in equation (21) and (22) respectively.

$$\rho(\mu_i, \theta, z_i) = \frac{\gamma(z_i+\theta^{-1})}{z_i!\gamma(\theta^{-1})} \cdot \left(\frac{\theta\mu_i}{1+\theta\mu_i}\right)^{z_i} \cdot \left(\frac{1}{1+\theta\mu_i}\right)^{\theta^{-1}}, z_i = 1, 2, ... \quad (21)$$

$$l(\theta, \varphi) = \sum_{i=1}^{n}\left[\left(log\frac{\gamma(z_i+\theta^{-1})}{\gamma(z_i+1)\gamma(\theta^{-1})}\right) - (z_i - \theta^{-1})\log(1+\theta\mu_i) + z_i log\theta\mu_i\right] \quad (22)$$

In above equation (21), $\gamma(.)$ represents the gamma function and parameter of dispersion θ is unknown here. If parameter of dispersion θ approaches to zero, the equation (21) will yield the Poisson regression model. The positive value of dispersion parameter θ depicts the over dispersion

of dataset. The generalized poisson model is best alternative when there is under-dispersion or over-dispersion (Famoye, 1993). This model is known as a good competitor model for the negative binomial model. The generalized Poisson model is stated below in equation (23).

$$\rho(\mu_i, \theta, z_i) = \left(\frac{(1+\theta z_i)^{z_i-1}}{z_i!}\right) \cdot \left(\frac{\mu_i}{1+\theta\mu_i}\right)^{z_i} \cdot e^{\left(\frac{-\mu_i(1+\theta z_i)}{1+\theta\mu_i}\right)}, z_i = 1, 2, ... \quad (23)$$

The mean and variance for the generalized Poisson model are illustrated by $E(z_i|m_i) = \mu_i$ and $Var(z_i|m_i) = \mu_i(1+\theta\mu_i)^2$ respectively. In this model, when parameter of dispersion θ approaches to zero, generalized Poisson model becomes Poisson model. When the value of dispersion parameter θ is positive (negative), count data is over-dispersed (under-dispersed) (Heilbron, 1994; Gupta, 1996; Famoye & Singh, 2006).

Many explanatory variables appeared in the logit model are also the part of count data model. Some additional explanatory variables associated with female and schooling characteristics have been included in the second model that affect the attainment or level of education of female. These additional explanatory variables are described in the table of variables and their description. The types and description of the response and explanatory variables for count data model are shown in table 1.6.

Table 1.6

Description of the Variables for the Count data Model

Dependent Variable		
Variable Name	**Type**	**Description of the variable**
Female Enrollment	Count	1=Pre-primary education
		2=Primary education
		3=Middle education
		4=Secondary education
		5=Higher secondary education
		6=Bachelor or graduation
Explanatory Variables		
Female Characteristics		
Farm work	Categorical	The female worked in own agriculture farm or livestock (1=Yes 0=No)
HH_Relation1 (Ref: Grandchild)	Categorical	The female's relationship with the household head is measured by generating dummy variable (1=Child/Adopted child 0=Else
HH_Relation2 (Ref: Grandchild)	Categorical	The female's relationship with the household head is measured by generating dummy variable (1=Sister /Sister in law 0=Else)

HH_Relation3 (Ref: Grandchild)	Categorical	The female's relationship with the household head is measured by generating dummy variable (1= Niece 0=Else)
HH_Relation4 (Ref: Grandchild)	Categorical	The female's relationship with the household head is measured by generating dummy variable (1=Other relationship 0=Else)
Domestic work	Continuous	The time spent by female on the different tasks at home is measured in average hours per day in a year i.e. these tasks include cleaning, cooking, water collection, wood collection, washing clothes and family care etc.
School Joining Age	Continuous	The age when a female joined school first time is measured in years.

Demographic and Household Characteristics

Province1 (Ref: KPK)	Categorical	The province female belongs to (1=Punjab 0=else)
Province2 (Ref: KPK)	Categorical	The religion of female (1=Sindh 0=else)
Ethnicity1 (Ref: Punjabi)	Categorical	The dummy variable is generated for the ethnicity of female (1=Pakhtoon 0=else)
Ethnicity2 (Ref: Punjabi)	Categorical	The dummy variable is generated for the ethnicity of female (1=Baloch 0=else)
Ethnicity3 (Ref: Punjabi)	Categorical	The dummy variable is generated for the ethnicity of female (1=Sindhi 0=else)
Ethnicity4 (Ref: Punjabi)	Categorical	The dummy variable is generated for the ethnicity of female (1= Shina/Hazarwal/Saraiki 0=else)
Family Size	Continuous	The number of family members living in a household
Social Safety Net	Categorical	Any member of the female's household who is getting any kind of financial assistance such as BISP, education scholarships, Zakat etc. The dummy variable represents the status of the household whether getting any financial assistance or not. (1=Yes 0=No)
Household Saving	Continuous	The household savings is yearly measured and logarithm is taken to interpret it conveniently.
Household Debt or Loan	Continuous	The household credit or loan is yearly measured and logarithm is taken to interpret it conveniently.
Head count poverty	Categorical	The poverty illustrates whether female belongs to poor household or non-poor household. If the monthly per adult expenditures are greater than the threshold monthly expenditures set by the poverty line (Rs. 3030) based on cost of basic needs approach, then female belongs to non-poor household and if the case is converse of it, female belongs to poor household (1=Poor 0=Non-Poor).
Per adult household expenditures	Continuous	Yearly per adult household expenditures are obtained by dividing the total household expenditures except education expenditures on number of adult members in a household. The logarithm is taken to make the interpretation convenient.
Household Income	Continuous	The yearly household income measured in rupees includes income from all sources (agriculture, business, employment and livestock etc.). Logarithm is taken to interpret conveniently.
Asset index	Continuous	An index is constructed for the assets of the households with the help of Principal Component analysis.

Parental and Household Head Characteristics

Age of Household head	Continuous	The age of the household head is measured in years.
Household head employment status	Categorical	The employment status of the household head is measured by binary variable. (1=Employed 0=Unemployed)
Mother education1 (Ref: Never Enrolled)	Categorical	The female's mother who has primary or less than primary education is measured by introducing dummy variable. The

Mother education2 (Ref: Never Enrolled)	Categorical	female's mother having education equivalent to katchi-Pacci, class 1, class 2, class 3, class 4 and class 5 is considered in the category of the primary education (1=Primary education 0=else) The female's mother who has secondary or above but more than primary education is measured by introducing dummy variable. The female's mother having education equivalent to class 6, class 7, class 8, class 9, class 10, above secondary or madrassa is considered in the category of the secondary education (1=Secondary education or above 0=else)
Father education1 (Ref: Never Enrolled)	Categorical	The female's father who has primary or less than primary education is measured by introducing dummy variable. The female's father having education equivalent to katchi-Pacci, class 1, class 2, class 3, class 4 and class 5 is considered in the category of the primary education (1=Primary education 0=else)
Father education2 (Ref: Never Enrolled)	Categorical	The female's father who has secondary or above but more than primary education is measured by introducing dummy variable. The female's father having education equivalent to class 6, class 7, class 8, class 9, class 10, above secondary or madrassa is considered in the category of the secondary education (1=Secondary education or above 0=else)

Schooling Characteristics

School Type (Ref: Private/Madrassa)	Categorical	The type of school in which female is enrolled (1=Government 0=else)
Repetition of Last class	Categorical	The female who repeated last class due to failure or low grades (1=Yes 0=No)
Travel source1 (Ref: walking/residence in school)	Categorical	The female used bike/chin chi as source of travel while going to school is measure by binary values (1=Yes 0=No)
Travel source2 (Ref: walking/residence in school)	Categorical	The female used bus/Suzuki/Datsun as source of travel while going to school is measure by binary values (1=Yes 0=No)
Time1 (Ref: 45 minutes above)	Categorical	The time spent on traveling while going to school is measured in range of minutes (1=0-15minutes 0=else)
Time2 (Ref: 45 minutes above)	Categorical	The time spent on traveling while going to school is measured in range of minutes (1=16-30minutes 0=else)
Time3 (Ref: 45 minutes above)	Categorical	The time spent on traveling while going to school is measured in range of minutes (1=31-45minutes 0=else)

4.3.3 Parameter Estimation

The parameters in all count data models i.e. logit, probit, Poisson and negative models are estimated by algorithm of Maximum Likelihood. The algorithm of Maximum likelihood used to estimate the count data models gives best results. The ML maximizes the probability of ordering data into suitable category by giving unique values of the coefficients in the model. The algorithm guesses the value of a parameter by which likelihood function maximizes. The algorithm successively approximates and finds unique values of the parameters. The Newton-Raphson algorithm is firstly used by R.A. Fisher for the maximum likelihood. The algorithm works in the vicinity of first guess to approximate the likelihood function by utilizing the polynomial function.

The shape of the polynomial function is concave and parabola. The curvature and slope of the polynomial function is similar at first guesses as does the likelihood function because its purpose is to identify the maxima of this polynomial function. The same polynomial function makes second guess at the location of first maxima as a result of first guess to maximize the likelihood. The third guess is also made at the location of second maxima as a result of second guess. This process of maximizing the likelihood function is called iterative method because same steps are repeated by the algorithm. The convergence to the estimates of maximum likelihood takes place as approximations go on successively. The maximum likelihood method has been introduced in many statistical packages to estimate model's parameters.

4.3.4 Tests for Model Specification

Over-dispersion test: The negative binomial model yields Poisson model when the dispersion parameter θ approaches to zero. Therefore, there is need to test the hypothesis of dispersion parameter θ in negative binomial model. The hypothesis testing of dispersion parameter θ will guide to choose one model from both poisson and negative binomial models. The null hypothesis for over-dispersion test is $H_0: \theta = 0$ which means value of dispersion parameter θ is zero and the alternative hypothesis for over-dispersion test is $H_1: \theta < 0$ which describes that value of dispersion parameter is positive. The dispersion parameter θ is tested by likelihood ratio test in the specification of negative binomial model against the specification of Poisson model. There will be presence of overdispersion in count data specified by negative binomial model if the null hypothesis of overdispersion test is rejected. The rejection of null hypothesis shows that dispersion parameter θ has positive value. Therefore, the negative binomial regression model will be estimated. If the null hypothesis of the test is not rejected then poisson model will be estimated. The rejecting alternative hypothesis shows that the dispersion parameter θ has zero value (Cameron & Trivedi, 1998). The likelihood ratio test for θ is shown below in equation (24).

$$likelihood\ ratio\ test_\theta = -2\big[\log(\hat{\mu}) - \log(\hat{\mu}, \hat{\theta})\big] \qquad (24)$$

In equation (24), $\log(\hat{\mu})$ represents the maximized log likelihood from Poisson model and $\log(\hat{\mu}, \hat{\theta})$ represents the maximized log likelihood from the negative binomial model. The asymptotic theory explains that the alternative hypothesis of likelihood ratio test for dispersion parameter θ follows one-half chi-square distribution and one-half probability mass distribution. Hence, the degree of freedom for chi-square distribution is one and zero for rest. The asymptotic

Wald statistics is also another option for testing of hypothesis which is the ratio of the value of dispersion parameter θ to standard error of θ.

Akaike and Bayesian information criterions: The criteria for the selection of a non-nested model is also based on the fitted functions of log-likelihood. It is also expected that when number of parameters increase, the log-likelihood also increases. This criterion imposes penalty on a model as number of parameters increase. The penalty is also associated with the sample size. The most commonly used information criterion is Akaike Information criterion. This criterion helps to choose a model that has minimum negative likelihood. The Akaike information criterion is expressed in equation (25).

$$Akaike\ Information\ Criterion = -2ln(l) + 2(k) \qquad (25)$$

In equation (25), l represents estimated likelihood function and k represents number of parameters in the model. A model will be preferred having minimum value of Akaike information criterion (Akaike, 1973). Some modifications have taken placed in Akaike Information Criterion and the modified version has been named as Bayesian Information Criterion. The Bayesian Information Criterion is expressed in equation (26).

$$Bayesian\ Information\ Criterion = -2ln(l) + (\ln(n)).(k) \qquad (26)$$

In equation (25), l represents estimated likelihood function while k and n represent number of parameters and observations in the model respectively. The model having lowest value of Bayesian information criterion will be chosen for analysis (Cameron & Trivedi, 1998).

4.3.5 Measures for Goodness of Fit

The performance of the model is evaluated by goodness of fit. The goodness of fit has few measures such as Pearson statistics and deviance statistics. In these both measures, weights are assigned to the sum of the residuals of the model. Furthermore, these measures are used to develop measures of pseudo R-squared. A measure of pseudo R-squared formulated with the help of deviance statistics is preferred over other measures. The last measure of goodness of fit is chi-square test which compares the mean predicted probabilities of a count model with the relative frequencies. This test helps to control the estimation errors in parameters of the regression.

Pearson Statistics: The goodness of fit has a measure called Pearson statistics for a count data model with mean μ_i and variance $Var(z_i|m_i)$. The Pearson statistic is given in equation (27).

$$Pearson\ statistics = \sum_{i=1}^{n} \frac{(z_i - \widehat{\mu_i})^2}{\widehat{Var(z_i|m_i)}_i} \quad (27)$$

In equation (27), the estimated mean and estimated variance are represented by μ_i and $\widehat{Var(z_i|m_i)}_i$ respectively. If the specification of variance and mean of count data is correct then $E\left[\sum_{i=1}^{n} \frac{(z_i - \mu_i)^2}{Var(z_i|m_i)_i}\right] = n$ because of $E\left[\frac{(z_i - \mu_i)^2}{Var(z_i|m_i)_i}\right] = 1$. The value of Pearson statistics is compared with the degree of freedom, showing the correction in degree of freedom associated with the estimation of mean $\widehat{\mu_i}$. In case of Poisson model, there is equality between mean and variance of the count data. The Pearson statistic in case of Poisson model is shown in equation (28).

$$Pearson\ statistics = \sum_{i=1}^{n} \frac{(z_i - \widehat{\mu_i})^2}{\widehat{\mu_i}} \quad (28)$$

Therefore, it is valid to employ Poisson model if the value of Pearson statistic is equal to one. If the value of Pearson statistic is greater (less) than one, it shows negative binomial or generalized Poisson model should be employed. It should be noted and presumed that the conditional mean μ_i is correctly specified for this interpretation (Cameron and Trivedi, 1998). Few studies suggested that Pearson statistic has asymptotic distribution of chi-square but this is only justified for grouped data with larger sample size for each mean μ_i. A distribution is given for ungrouped data which requires to consider the dependency of mean μ_i and regression parameter φ. The distribution of Pearson statistic can be attained by $P'\widehat{V}_p^{-1}P \sim \varkappa^2$, where the variance $\widehat{V}_p^{-1}$ contains a cumbersome formula (Mccullagh, 1986).

Deviance Statistic: The goodness of fit shows how good a model explains its regressand. To assess this goodness of fit, the analysis of difference between predicted and actual values of regressand is required. Different test statistics measure the fit or difference between actual and predicted value of regressand. Among the useful test statistics, deviance statistic is one of them. It is defined in equation (29).

$$Deviance\ statistic(z:\hat{\mu}) = -2[l(z:\hat{\mu}) + l(z:z)] \quad (29)$$

This statistic guides whether inclusion of new explanatory variables has significant impact on fit or not. So, there should be a deviance statistic for each estimated model with or without new explanatory variables. The difference of deviance statistic from a basic estimated model to the extended models has approximately distribution of chi-square. This distribution has degree of freedom equals to the number of parameters associated with additional variables in the extended model. The minimum value of deviance statistic for an estimated model shows that predicted value and actual value of regressand are nearer to each other (Agresti, 2007).

Test for overall goodness of fit: The likelihood ratio test measures the overall goodness of fit of an estimated model. This test is associated with the difference in chi-square of a model because it subtracts the deviance of final model (having all possible regressors) from the deviance of null or intercept model. The degree of freedom for this test is calculated by deducting one from the number of regressors in the final model. The model having only intercept in this test is called the null model. The chi-square difference tells the better fit of final model against the null model. The statistic for likelihood ratio test is expressed in equation (29).

$$LRT = -2(l_{null} - l_f) \qquad (29)$$

In equation (29), The log-likelihood of final model and log-likelihood of null or intercept model are represented by l_f and l_{null} respectively. The null hypothesis of this test comprises of the zero value of all parameters appeared in the model. The statistic for likelihood ratio test has chi-square distribution.

Chapter 5

Results and Discussion

In this chapter, the study will briefly elaborate the empirical results obtained from the empirical methodologies employed to pursue objectives of the study. This chapter comprises of five sections; 5.1 section deals with exploratory data analysis of variables, 5.2 section discusses the results of the estimation of the logit model of the study, 5.3 section deals with the estimation results of count data model.

5.1 Descriptive Analysis

Research studies comprise of systematic set of observations and descriptions of the properties of events or objects to discover the association among variables. The generalization is the prime objective which is helpful to describe a phenomenon and to forecast future outcomes. Few principles should be defined to conduct a research study so that resemblance could be achieved between observation of a phenomenon and its description by facts and figures. Measurement is a universally accepted and precise process of describing phenomena, by assigning quantitative or numeric values to the characteristics of an event or object. For a quality research, care and planning are required for research design to collect data but it the post-analysis which ensures the quality of this research (Best, 1981). Practically, samples of dataset are drawn from large populations in various formats that's why a straightforward and meaningful description of dataset cannot be expected. The analysis of the characteristics of collected data plays a vital role to pursue the research objectives of a study. The meaning of this analysis is to categorize, classify and summarize data to answer the questions of research study. Classification and categorization of data help to tabulate and arrange the big dataset into interpretable and comprehensible forms (Youngman, 1979). Descriptive analysis also helps to confine generalization to an observed and particular group of individuals. The inferences are made for this particular group and none of other groups would be considered in the analysis. Descriptive analysis is a simple analysis in research but it delivers worthy and valuable information concerning the particular group under consideration (Best & Kahn, 2003). Firstly, the descriptive analysis helps to answer research questions by estimating, summarizing and arranging data into graphs and tables. Secondly, it helps to understand the behavior of variables having uncertainty and variability in the data. Thirdly, it indicates the unexpected observation and pattern in the dataset which is crucial for a formal analysis. Most importantly, the descriptive analysis guides about the distribution of dataset i.e.

normal distribution etc. The application of empirical methodologies and estimation techniques to draw inferences are subject to the descriptive analysis of dataset. Therefore, this section briefly explains the descriptive statistics and visualization of variables included in this study. The response variables for the first and second model of this study are binary and count variables respectively. The logit and count data models have many common explanatory variables. Since, mean and standard deviations for the categorical variables are not of much importance, the study demonstrates bivariate frequency distribution for the categorical variables by using bar graphs. On the other hand, the descriptive statistics such as mean, standard deviation, minimum and maximum values for all continuous variables are shown with the help of summary table (Shaukat, javed, & Imran, 2020). In this study, the explanatory variables of logit model are also the part of count data model as discussed in previous chapter. Therefore, the figure 1.12 to figure 1.22 illustrate the exploratory data analysis of both logit and count data model. The binary dependent variable of logit model has two categories enrolled and non-enrolled girls. Since, the count dependent variable of count data model represents enrolled girls which is the category of binary dependent variable, therefore the figure 1.12 to figure 1.21 also illustrate the exploratory data analysis for the count data model. There are few additional explanatory variables in count data model, for which figure 1.22 to 1.24 are shown right below the figure 1.21.

Figure 1.12

*School Enrollment Status of Girls Aged 5-18*
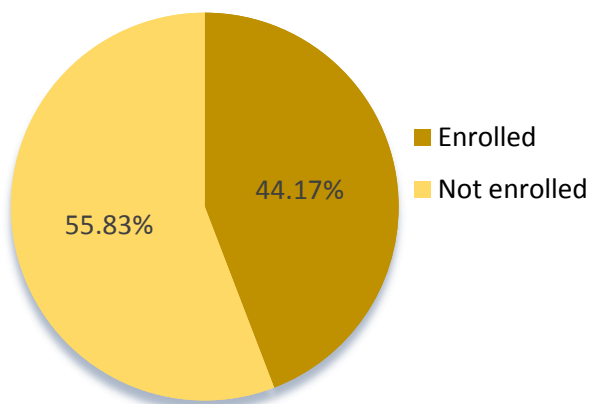
Region wise Percentage of 5-18 years girls in sample
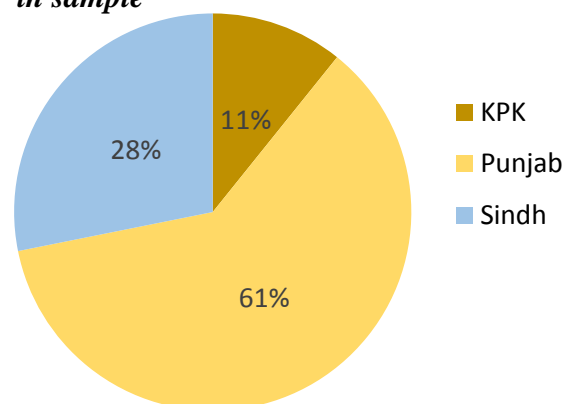
The sample size for the estimation of first econometric model consists of 2133 girls having age 5-18 years. This sample is drawn from three provinces of Pakistan named as Punjab, Sindh and KPK. Out of total sample, 61 percent girls belong to Punjab, 28 percent girls belong to Sindh and 11

percent girls belong to KPK as shown on the right side of the Figure 1.12. As discussed in previous chapter, the sampling technique was based on probability proportion to size, that's why Punjab, Sindh and KPK respectively have declining proportions of sample. The left side of the figure 1.12 illustrates the enrollment status of the girls, showing that 55.83 percent girls of total sample are enrolled in the schools whereas 44.17 percent girls are not enrolled in the school.
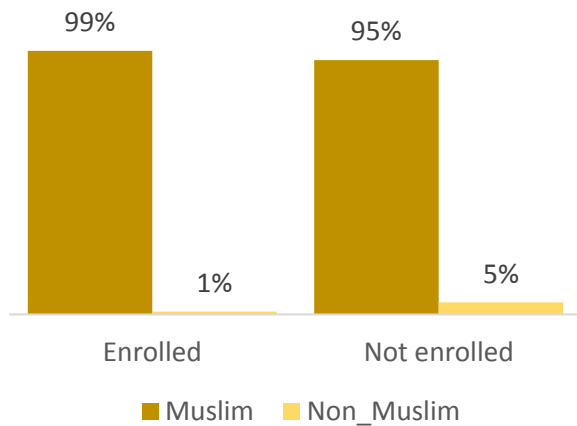
Figure 1.13
*School Enrollment Status across Regions*
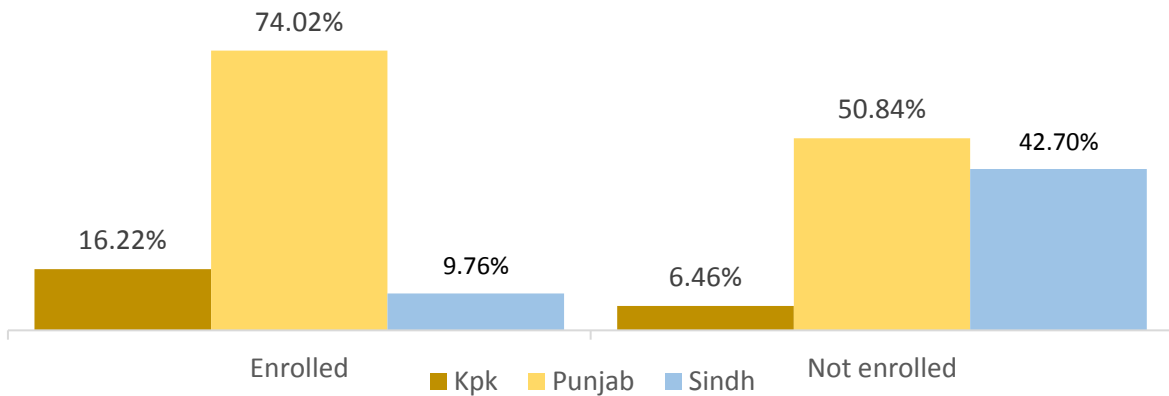
The figure 1.13 illustrates the girl's enrollment status across three provinces. Out of total enrolled girls, 74 percent girls are from Punjab province, 16 percent girls represent KPK province and rest 9 percent enrolled girls belong to the Sindh province. On the other hand, 50 percent of non-enrolled girls represent Punjab province, 42 percent from Sindh and 6 percent non-enrolled girls belong to KPK. It can be observed here that the higher proportion of enrolled girls belong to Punjab province whereas higher proportion of non-enrolled girls also belong to the Punjab province. The Sindh Province has lowest proportion of enrolled girls and second highest proportion of non-enrolled across regions. The KPK province has lowest proportion of non-enrolled girls while second highest proportion of enrolled girls.

Figure 1.14

*Girls Religion and School Enrollment Status*

Gender of Household Head and School enrollment Status of Girls
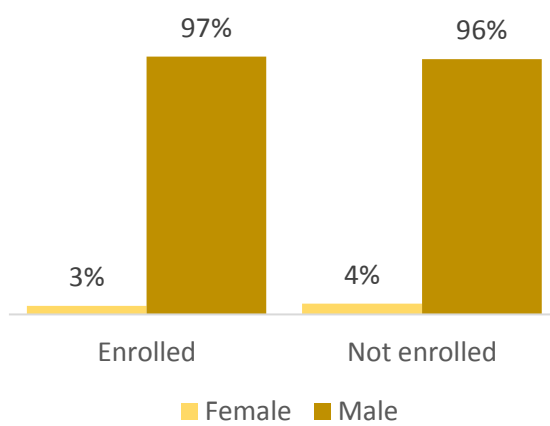
The figure 1.14 illustrates the religion and gender of household head of all girls included in sample. The left side bar graph in figure 1.14 depicts that 99 percent of enrolled girls are Muslim and rest of enrolled girls are non-Muslim whereas 95 percent of non-enrolled girls are Muslim and rest non-enrolled girls are non-Muslim. The right-side bar graph depicts in figure 1.14 depicts that 97 percent of the enrolled girls have male household head and rest enrolled girls have female household head whereas 96 percent of non-enrolled girls have male household head and rest non-enrolled girls have female household head.
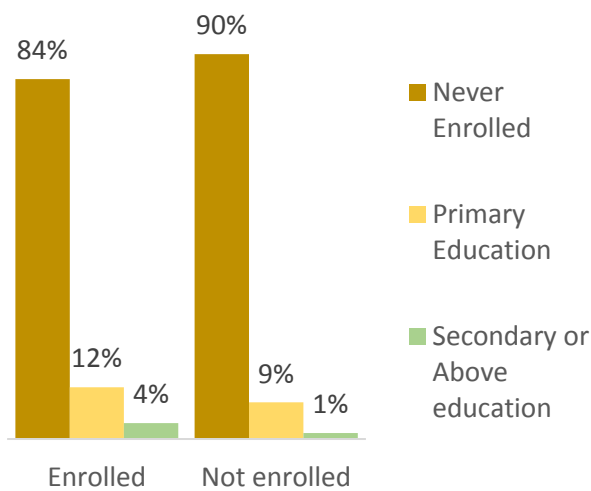
Figure 1.15

*Girls Ethnicity and School Enrollment Status*

70
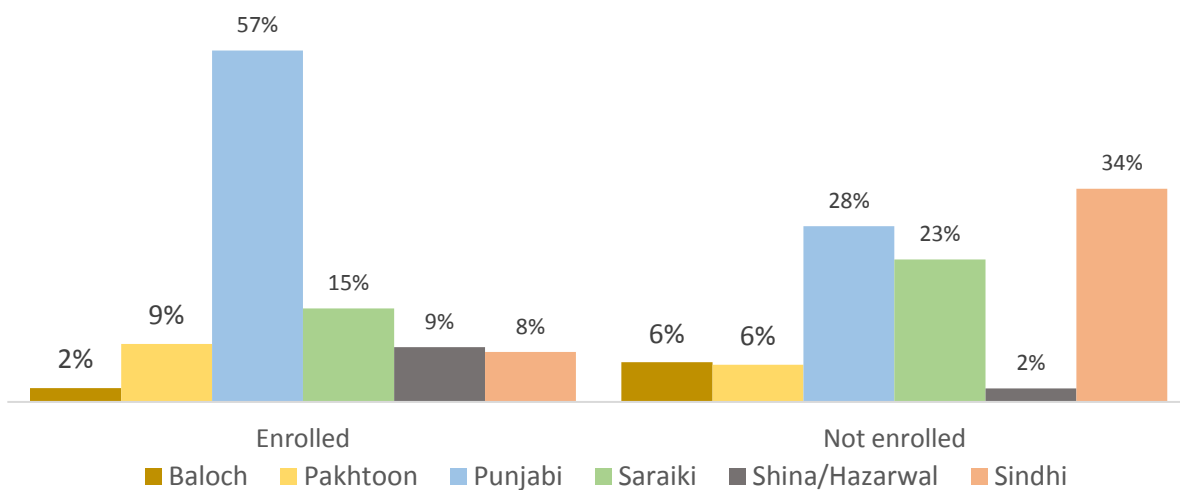
The figure 1.15 illustrates the ethnicity of the girls who are enrolled or not. The bar graph shows that 57 percent of the enrolled girls have Punjabi ethnicity, 15 percent enrolled girls have Saraiki, 9 percent have Pakhtoon or Shina and 8 percent enrolled girls belong to Sindhi ethnicity. The lowest percentage of enrolled girls is 2 percent which represents the Baloch ethnicity. On the other hand, highest percentage of non-enrolled girls belong to Sindhi ethnicity. The percentages of non-enrolled girls belong to Punjabi, Saraiki, Baloch and Pakhtoon ethnicities are 28, 23, 6 and 6 percent respectively. The lowest percentage of non-enrolled girls is from the Shina or Hazarwal ethnicity.

Figure 1.16

Girls Enrollment Status and their Father's education level

*Girls Enrollment Status and their mother's education level*
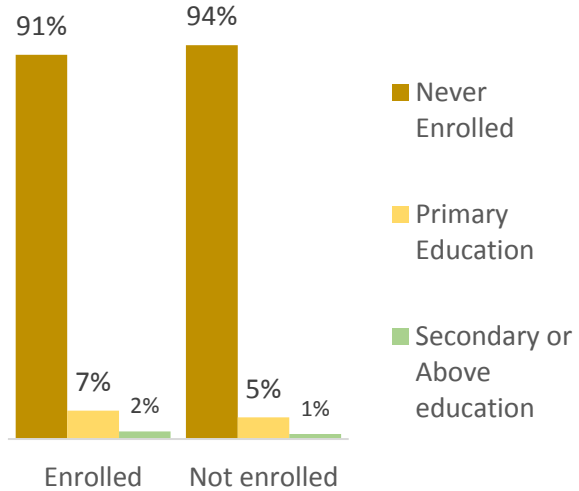
The figure 1.16 demonstrates the father and mother education of the enrolled and non-enrolled girls. The left side bar graph depicts the percentages of enrolled and non-enrolled girls having father's education equivalent to never enrolled, primary, secondary or above education. There are 84 percent enrolled girls with no father's education, 12 percent enrolled girls with father's primary education and 4 percent enrolled girls having father's education equivalent to secondary or above education. There are also 90 percent non-enrolled girls with no father education, 9 percent with primary education of father and 1 percent non-enrolled girls with secondary or above education of father. The right-side bar graph shows the percentages of enrolled and non-enrolled girls having mother's education equivalent to never enrolled, primary and secondary or above education. There are 91 percent enrolled girls with no mother's education, 7 percent with primary education of mother and 2 percent with secondary or above education of mother. On the other hand, there are
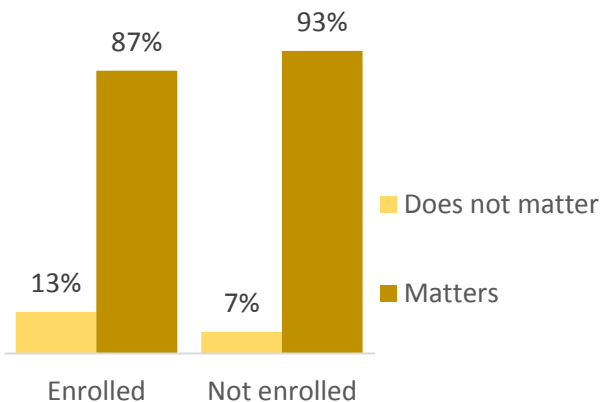
94 percent non-enrolled girls with no mother's education, 5 percent with mother's primary education and 1 percent with secondary or above education of mother.

Figure 1.17
School Enrollment Status and Parent's perception about Teacher Gender at primary level
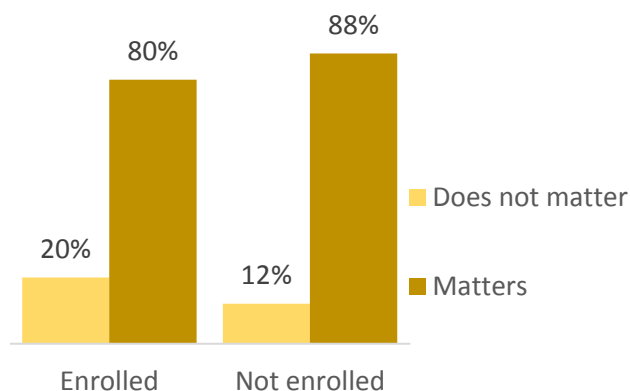
School Enrollment Status and Parent's perception about Teacher Gender a secondary level

The figure 1.17 explains the percentages of enrolled and non-enrolled girls with parents for whom teacher gender matters or does not matter at primary and secondary level of education. The left side bar graph depicts the perception of parents at primary level of education. There are 80 percent parents of enrolled girls who perceive that teacher gender matters at primary level of education and 20 percent parents who perceive that teacher gender does not matter. On the other side, there are 88 percent parents of non-enrolled girls who perceive that teacher gender matters at primary level of education and rest of percentage perceive contrary to it. The right-side bar graph shows that there are 87 percent parents of enrolled girls who perceive that teacher gender matters at secondary level of education whereas, rest of 13 percent perceive that teacher gender does not matter. On the other hand, there are 93 percent parents of non-enrolled girls who perceive that teacher gender matters at secondary level of education while rest of percentage think contrary to it.

Figure 1.18
Household Head's Employment Status
and Female Enrollment Status

Girls Farm Work Participation and
Female School Enrollment Status
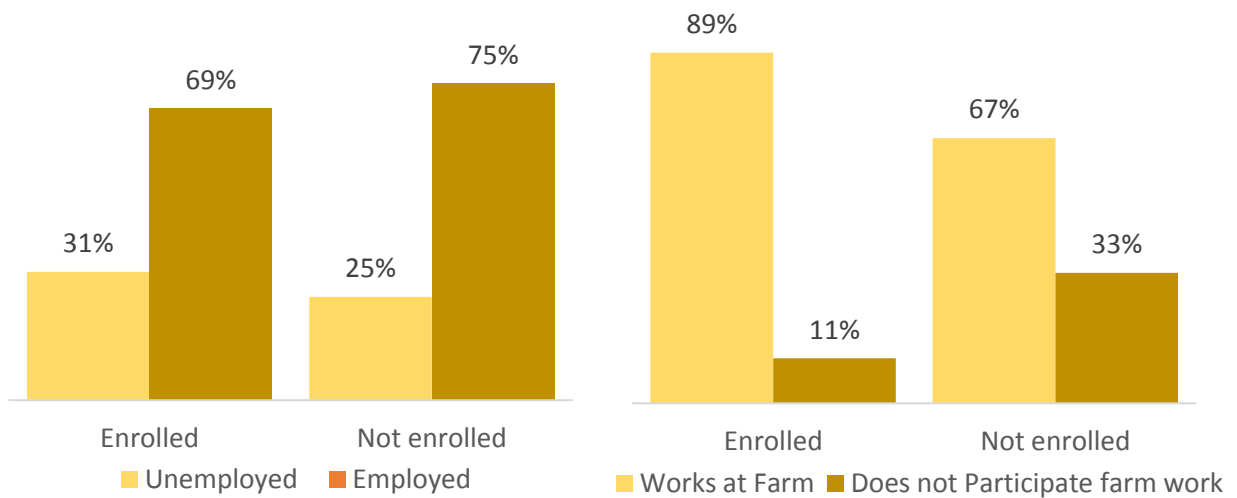
The figure 1.18 demonstrates the farm work status of enrolled and non-enrolled girls as well as their household head's employment status. The left side bar graph shows the employment status of a household head whether he or she is employed or unemployed. It can be seen in left bar graph that 69 percent of enrolled girls have employed household heads while rest percentage declares the unemployed status of household heads. As for as non-enrolled girls are concerned, 75 percent of non-enrolled girls have employed household heads and remaining have unemployed household heads. The right bar graph represents the girl's status of farm work whether a girl works at own farm or not. It is shown in right bar graph that 89 percent of enrolled girls work at their farm whereas rest percentage of enrolled girls do not work at farm. The non-enrolled girls who work at farm have less proportion of 67 percent as compared to enrolled girls while 33 percent of non-enrolled girls do not work at their farms.

Figure 1.19

Head Count Poverty Status and Female Enrollment Status

Social Safety Net and School Enrollment Status
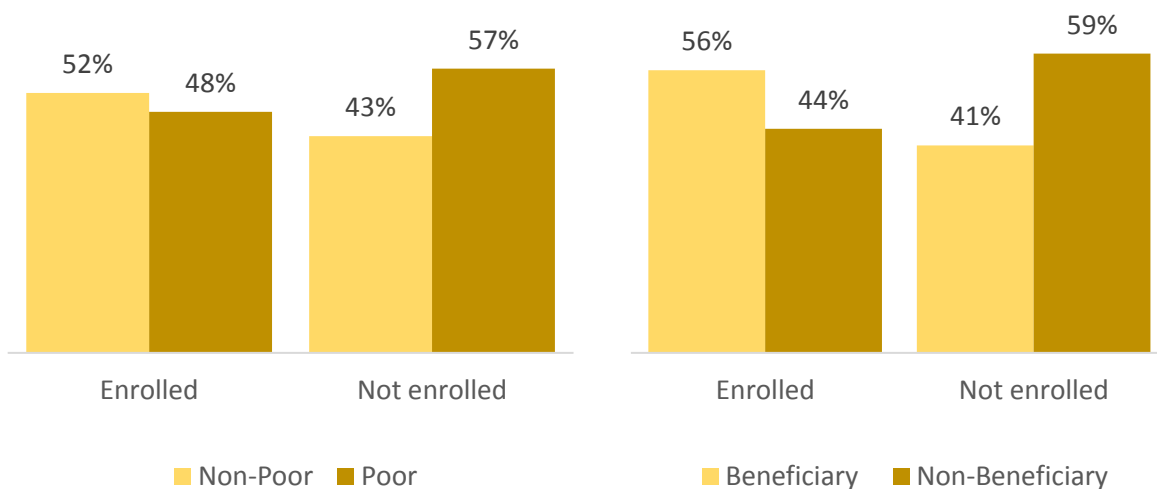
The figure 1.19 depicts the status of poverty and social safety net of a household to which enrolled or non-enrolled girls belong. The left bar graph shows the head count poverty of households to which enrolled or non-enrolled girls belong. It is shown that 52 percent enrolled girls belong to non-poor household while 48 percent enrolled girls belong to poor households. On the other hand, 57 percent non-enrolled girls belong to poor households whereas 43 percent non-enrolled girls belong to non-poor family. The right bar graph explains the status of girl's household either household is beneficiary of social safety net or not. The facts and figures show that 56 percent enrolled girls belong to the households which are beneficiaries and rest of percentage are non-beneficiaries of social safety net. While talking about non-enrolled girls, 59 percent non-enrolled

girls belong to non-beneficiaries while 41 percent non-enrolled girls belong to beneficiaries of the social safety net.

Figure 1.20

Girls Relationship with Household Head and School Enrollment Status
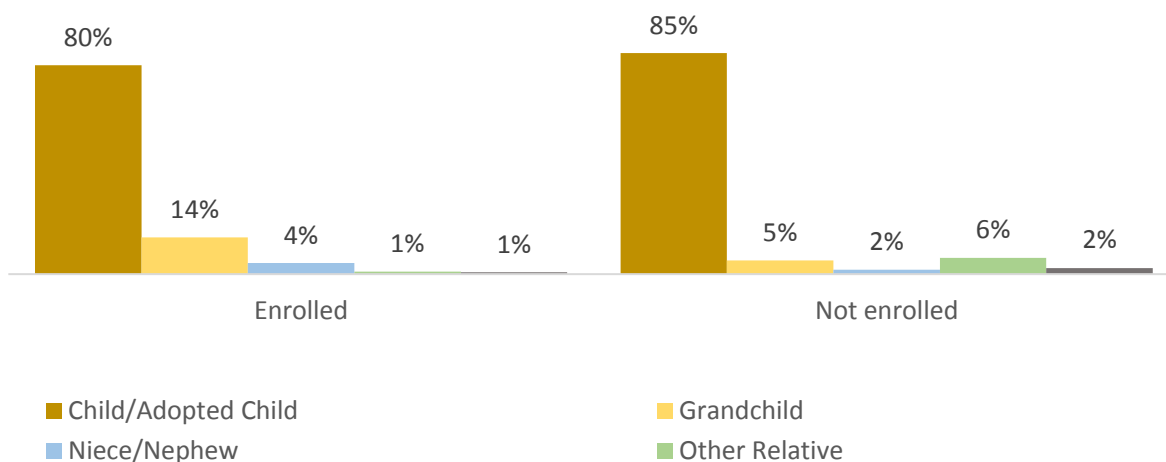
The figure 1.20 illustrates the percentages of enrolled and non-enrolled girls having different relationships with the household head. Out of total enrolled girls, 80 percent girls are the child or adopted child of household head, 14 percent are grandchild, 4 percent are niece and 1 percent enrolled girls are sisters or other relatives. Similarly, 85 percent non-enrolled girls are the child or adopted child of household head, 6 percent are other relatives, 5 percent are grandchild and 2 percent non-enrolled girls are niece or sisters of household head.

Figure 1.21

Parents preference to boy education and Female School Enrollment Status
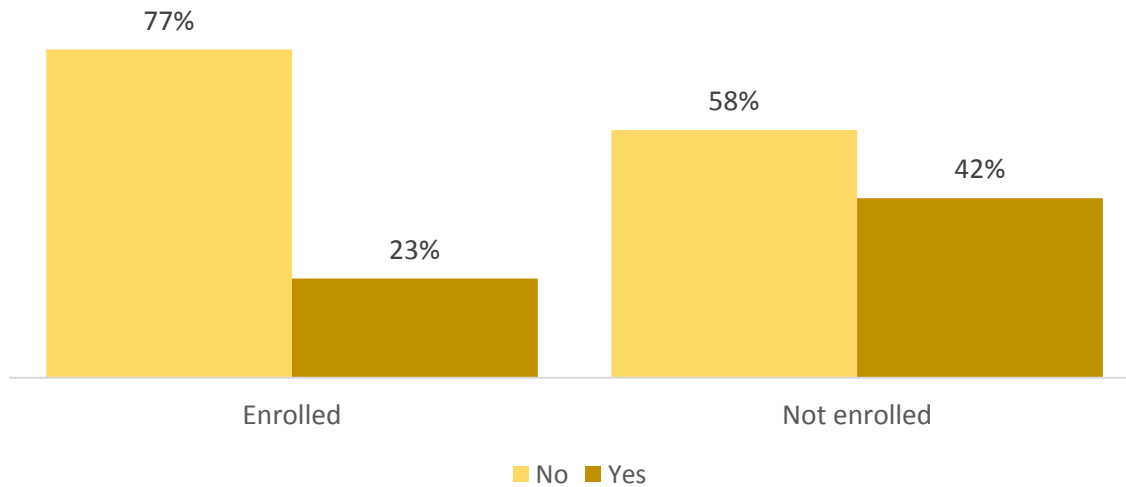
The figure 1.21 elaborates the preference of boy education by the parents over the girl education. The above bar graph shows that 77 percent parents of enrolled girls do not prefer boy education over the girl education rather both are equally preferred while 23 percent parents of the enrolled girls prefer boy education over the girl education. In the same way, 58 percent parents of the non-enrolled girls do not prefer boy education over the girl education whereas 42 percent parents of the non-enrolled girls prefer boy education over the education of girls.

The bar graph of figure 1.22 demonstrates the frequency percentage of count dependent variable for Poisson model. The highest proportion of the girls is enrolled in primary education. There are 29.01 percent girls who are enrolled in Katchi/Pacci or pre-primary, 15.2 percent girls are enrolled in Middle education, 9.67 percent girls have secondary education, 1.38 percent girls are enrolled in higher secondary and 0.74 percent girls are enrolled in graduation or bachelor level of education. The frequency distribution of girls enrolled in different level of education matches with the Poisson distribution as the percentage of girls enrolled in upper level of education rapidly declines.

Figure 1.22

The Level of Education for Enrolled Girls
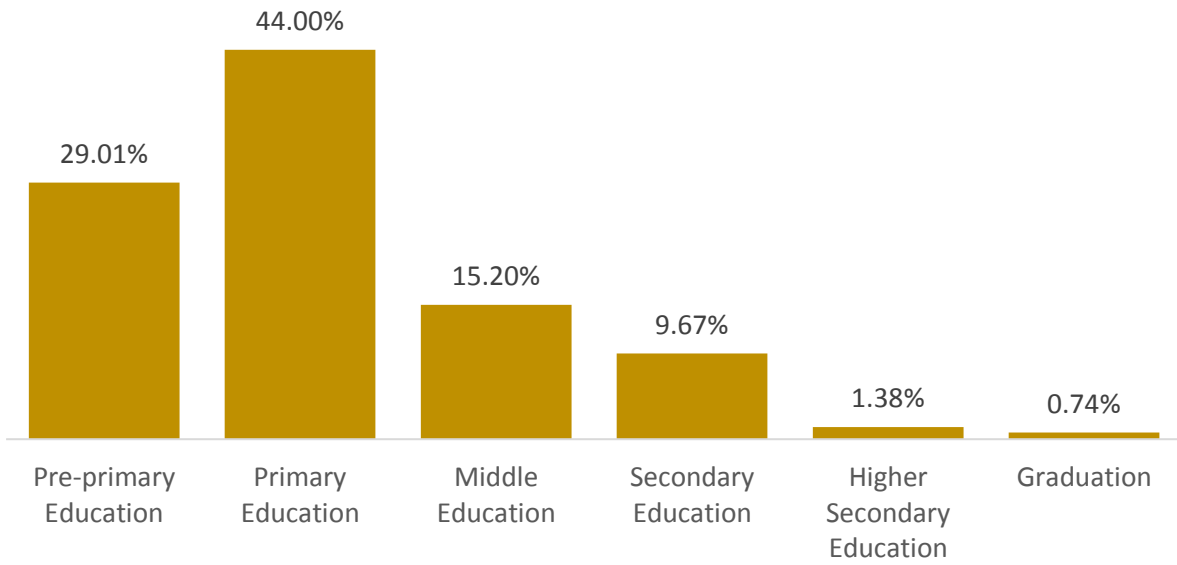
Figure 1.23

School Distance in Minutes from Home for Enrolled Girls
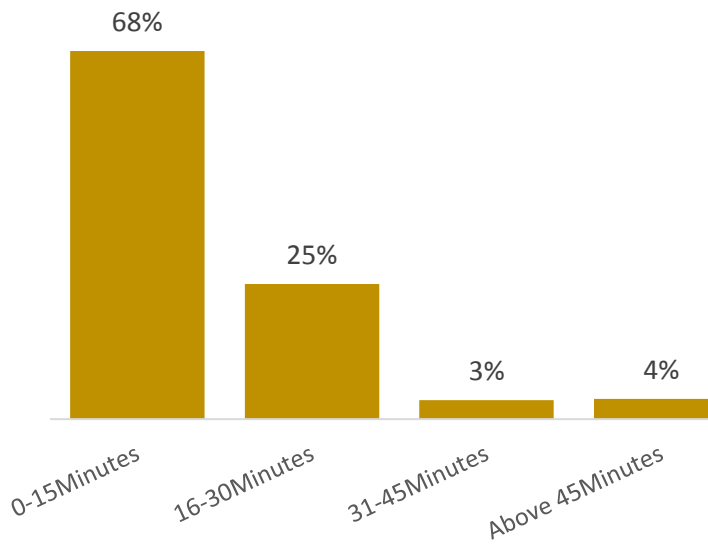
Types of School for Enrolled Girls
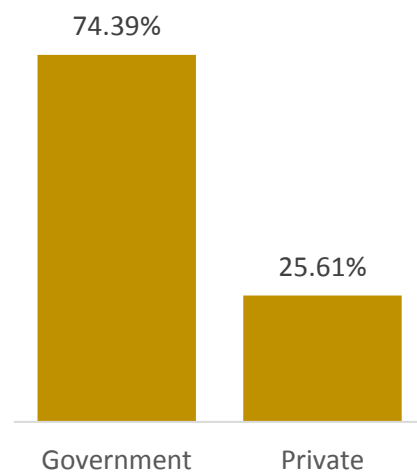
The time spent on traveling to reach at school also affects the enrollment status as well as the education attainment of girls. The dataset utilized in this analysis only contains the information of traveling time measured in minutes for only enrolled girls that's why this is the part of count data model but could not appeared as explanatory variable in the logit model. The left bar graph in figure 1.23 shows that major proportion of 68 percent enrolled girls travel daily travel below fifteen minutes to reach at school. There are 25 percent girls who spend fifteen minutes to half hour on school traveling while 7 percent enrolled girls daily travel more than half hour. The right bar graph in figure 1.23 illustrates the types of school in which girls are enrolled. There are 75 girls who are enrolled at government schools whereas rest of the girls are enrolled at private schools or NGO based schools.

Figure 1.24

Sources of Travel for Enrolled Girls   *Last Class Repetition status for Enrolled Girls*
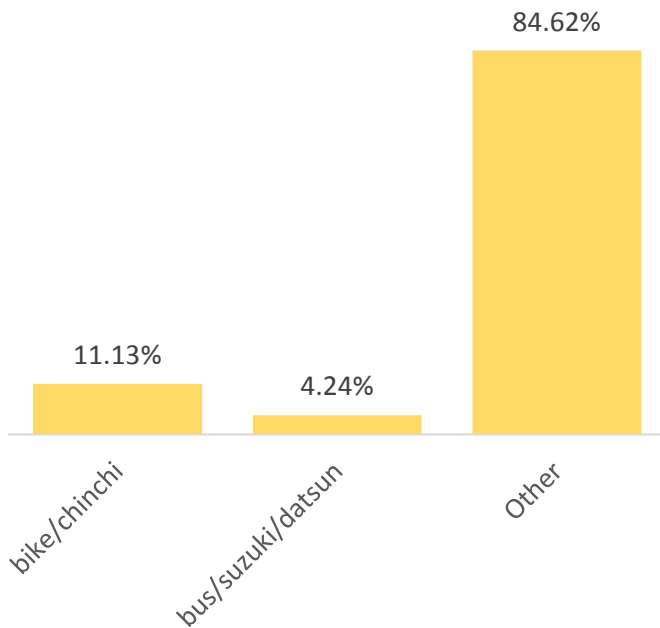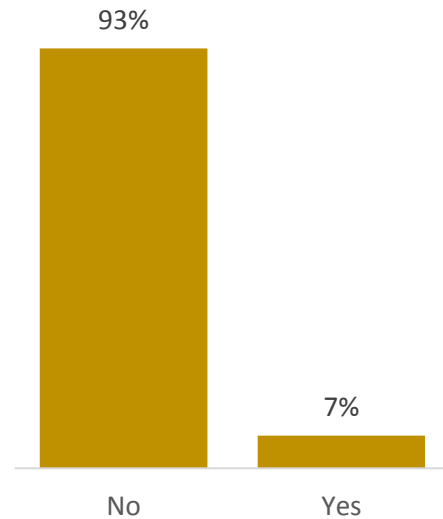
Finally, the right bar graph of figure 1.24 explains the sources of travel to schools for enrolled girls. There is large proportion of enrolled girls who do not use any kind of transport rather go to school on feet or they reside in the school premises. Out of total enrolled girls, 84.6 percent girls

go to school on feet or live in the premises of school, 11.1 percent girls utilize bike or chin chi, 4.2 percent girls travel through bus or Suzuki or Datsun. The right-side bar graph represents those enrolled girls who repeated their last class due to failure or mark improvement. There are only 7 percent enrolled girls who repeated their class while rest of the enrolled girls did not repeat their class.

Table 1.7

Summary Statistics for Continuous Explanatory Variables

Variables	Female School Enrollment Status							
	Not enrolled (N=1192)				Enrolled (N=941)			
	Mean	S. D	Min	Max	Mean	S. D	Min	Max
Age of Girl	12.32	4.27	5	18	10.03	3.38	5	18
Household Head Age	47.98	11.24	20	89	48.14	12.09	20	89
Domestic work	2.71	2.97	0	19.98	0.8	1.43	0	11.98
Household Saving	8395	82124	0	2300000	18754	99388	0	1020000
Household Assets	-0.57	2.05	-2.65	19.31	0.72	2.73	-2.51	19.31
Household per Adult Expenditures	68344	61086	8727	985975	84985	96851	6644	985975
Female sibling (15 year above)	1.89	1.36	0	9	2.06	1.23	0	9
Female sibling (5-15-year-old)	2.06	1.32	0	8	2.03	1.37	0	8
Male sibling (15 year above)	1.34	1.25	0	7	1.17	1.05	0	6
Male sibling (5-15-year-old)	1.8	1.3	0	8	1.87	1.51	0	11
Children (0-4-year-old)	0.82	1.11	0	7	0.87	1.13	0	7
Family size	8.9	4.04	3	37	9.07	4.34	3	37
Household Income	218630	311524	55000	4532400	329231	525500	60000	4532400
Household debt	40486	87143	0	1120000	51999	120207	0	1130000
School joining Age	NA	NA	NA	NA	5.22	1.17	3	12

NA stands for not applicable

The table 1.7 provides the summary statistics for the continuous explanatory variables of both logit and count data models. The mean age of the non-enrolled girl is greater than the mean age of enrolled girl by two years whereas the minimum and maximum ages of the non-enrolled and enrolled girl are similar. The mean age of household head for non-enrolled is 47.98 years and for enrolled girls is 48.14 years showing do not differ much. The minimum and maximum age of the household head for both enrolled and non-enrolled girls is 20 and 89 years respectively. On average, the non-enrolled girls work 2.71 hours per day at home as compared to enrolled girls who do 0.8 hours per day. The minimum work done at home by an enrolled or non-enrolled is zero while maximum hours per day spent on domestic work by non-enrolled and enrolled girls are 19.98

and 11.98 respectively. The mean household savings of non-enrolled girls is significantly lower than the mean household savings of enrolled girls whereas the maximum household savings of an enrolled girl also significantly greater than the maximum household savings of a non-enrolled girl. The mean value of household asset index for non-enrolled girls is significantly lower than the mean value of household asset index for enrolled girls. The minimum value of household asset index for an enrolled girl is also greater than the minimum value of household asset of a non-enrolled girl. The mean value of per adult household expenditures for non-enrolled girls is lower than the mean value of per adult household expenditures for enrolled girls. The minimum per adult household expenditures for a non-enrolled girl is greater than the minimum per adult household expenditures for an enrolled girl. The average number of children aged 0-4 year in the household of enrolled girls is 0.87 and for non-enrolled girls is 0.8. The maximum and minimum number of children aged 0-4 year in the household of an enrolled girl are seven and zero respectively whereas a non-enrolled girl also has the same value of maximum and minimum number of children aged 0-4 year. The mean number of female siblings above 15-year-old for enrolled girls is greater than the mean female siblings above 15 years old for non-enrolled girls. The maximum and minimum values of female siblings 15 year above for an enrolled and a non-enrolled girl are similar. The mean number of female siblings 5-15 years old for enrolled girls is slightly lower than the mean number of female siblings 5-15-year-old for non-enrolled girls. The average number of male siblings 15 year above for enrolled girls is less than the average number of male siblings 15 year above for non-enrolled girls. The maximum number of male siblings 15 year above for an enrolled girl is 6 and for a non-enrolled girl is 7. Lastly, the mean number of male children 5-15-year-old for enrolled girls is greater than the mean number of male children 5-15-year-old for non-enrolled girls. The maximum number of male children 5-15-year-old for an enrolled girl is 11 and for a non-enrolled girl is 8. The school joining age, household income, household debt and family size are the additional continuous explanatory variables of the count data model. The average school joining age of enrolled girls is 5.22 years. The mean family size of non-enrolled girls is less than the mean family size of enrolled girls. The standard deviation of family size for both enrolled and non-enrolled girls is less than the mean family size. The minimum school joining age of an enrolled girl is 5 years and maximum school joining age of an enrolled girl is 12 years. Finally, the average values of household debt and household income for the enrolled girls are greater than the values of household debt household income for the non-enrolled girls.

5.2 Estimates of Logit Model

Before estimation of the logistic regression model, it is better to check the correlation among the continuous explanatory variables of the model to avoid multicollinearity. The multicollinearity is defined as the high but imperfect correlation among the explanatory variables (Gujrati, 2003). If correlation between two explanatory variables is more than 0.8 or 0.9 then, these variables would cause multicollinearity. It is also evidenced that the consequences of multicollinearity are shown in unreliable estimations and inferences. In the presence of multicollinearity, standard error of estimator tends to increase and sign as well as magnitude of a parameter wrongly appear (Belsley et al., 1980).

Table 1.8

Correlation Matrix for the Continuous Explanatory Variables of Logit Model

Variables	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11
(1) Girl age	1										
(2) Household head age	0.219	1									
(3) Domestic work	0.539	0.069	1								
(4) Asset index	0.058	0.148	-0.12	1							
(5) Female siblings 5_15	-0.3	-0.07	-0.15	0.07	1						
(6) Female siblings 16 above	0.283	0.191	-0.02	0.43	0.05	1					
(7) Male siblings 5_15	-0.03	-0.05	0.035	0.05	0.05	0.113	1				
(8) Male siblings 16 above	0.126	0.112	0.013	0.38	0.13	0.572	0.07	1			
(9) Children 0_4	-0.23	-0.03	-0.12	0.25	0.28	0.277	0.14	0.25	1		
(10) Per adult household expenditures	-0.1	-0.04	-0.07	0.21	0.09	-0.1	0.05	-0.15	-0	1	
(11) Household Saving	0.018	0.03	-0.01	0.3	0.07	0.056	0.06	0.09	0.049	0.09	1

The correlation matrix for the logit model is shown in table 1.8. It can be observed that female siblings above 15-year age has relatively strongest and positive correlation of 57 percent with male siblings above 15-year age at home. Furthermore, domestic work at home also has stronger and positive correlation of 54 percent with the girl's age. The correlation of household head age with other explanatory variables remained lower than 21 percent. The household asset and female sibling above 15-year age have positive correlation of 42 percent. The weakest and positive correlation of 1 percent has been observed between male siblings above 15-year age and domestic work at home. The female siblings aged 5 to 15 year has comparatively strongest and negative correlation of 30 percent with girl's age. The weakest and negative correlation of 0.1 percent is found between per adult household expenditures and 0 to 4 years' children residing in the household.

Table 1.9

Estimates of Logit regression for school enrollment status of girls 5-18 age

Explanatory variables	Coef.	Robust St. Er.	t-value	p-value	Odd Ratio	Sig
Female Characteristics						
Age of female	0.86	0.105	8.16	0	2.36	***
Age square of female	-0.046	0.005	-9.54	0	0.96	***
Farm work (Ref: non-participant)	-0.503	0.171	-2.94	0.003	0.61	***
HH_Relation1 (Ref: Other relative)	0.892	0.308	2.9	0.004	2.44	***
HH_Relation2 (Ref: Other relative)	1.025	0.56	1.83	0.067	2.79	*
HH_Relation3 (Ref: Other relative)	1.095	0.364	3	0.003	2.99	***
HH_Relation4 (Ref: Other relative)	2.081	0.54	3.85	0	8.01	***
Domestic work	-0.255	0.042	-6.02	0	0.78	***
Demographic and Household Characteristics						
Punjab (Ref: KPK)	-1.414	0.286	-4.95	0	0.24	***
Sindh (Ref: KPK)	-3.557	0.562	-6.33	0	0.03	***
Religion (Ref: Non-Muslim)	0.721	0.338	2.13	0.033	2.06	**
Ethnicity1 (Ref: Shina/Hazarwal/Saraiki)	0.944	0.154	6.14	0	2.57	***
Ethnicity2 (Ref: Shina/Hazarwal/Saraiki)	-0.6	0.318	-1.89	0.059	0.55	*
Ethnicity3 (Ref: Shina/Hazarwal/Saraiki)	1.003	0.558	1.8	0.073	2.73	*
Ethnicity4 (Ref: Shina/Hazarwal/Saraiki)	0.918	0.489	1.88	0.061	2.5	*
Social safety net (Ref: Non-beneficiary)	0.561	0.122	4.59	0	1.75	***
Ln HH savings	0.095	0.04	2.4	0.017	1.1	**
Head count poverty (Ref: Non-Poor)	-0.389	0.144	-2.69	0.007	0.68	***
Asset index	0.116	0.042	2.75	0.006	1.12	***
Ln per adult expenditures	0.389	0.236	1.65	0.099	1.48	*
Children_0_4age	-0.165	0.06	-2.76	0.006	0.85	***
Msibling_5_15age	-0.234	0.056	-4.21	0	0.79	***
Msibling_16age_above	0.102	0.061	1.68	0.093	1.11	*
Fsibling_5_15age	-0.205	0.052	-3.91	0	0.82	***
Fsibling_16age_above	0.021	0.067	0.31	0.757	1.02	
Parental and Household Head characteristics						
HH employment status (Ref: Unemployed)	0.037	0.203	0.18	0.855	1.04	
HH age	0.011	0.006	1.92	0.055	1.01	*
HH gender (Ref: Female)	-0.665	0.31	-2.14	0.032	0.51	**
Mother primary Edu (Ref: Never enrolled)	0.145	0.28	0.52	0.604	1.16	
Mother secondary Edu (Ref: Never enrolled)	0.287	0.551	0.52	0.603	1.33	
Father primary Edu (Ref: Never enrolled)	0.713	0.227	3.14	0.002	2.04	***
Father secondary Edu (Ref: Never enrolled)	0.629	0.377	1.67	0.095	1.88	*
Teacher gen primary (Ref: Doesn't matter)	-0.06	0.226	-0.27	0.789	0.94	

Teacher gen secondary (Ref: Doesn't matter)		-0.671	0.285	-2.35	0.019	0.51	**
Boy preference over girl (Ref: No)		-0.492	0.133	-3.7	0	0.61	***
Reference Categories							
Constant		-3.867	1.468	-2.63	0.008	0.02	***
Mean dependent var	0.442	SD dependent var					0.497
Pseudo r-squared	0.359	Number of obs					2133
Chi-square	537.695	Prob > chi2					0
Akaike crit. (AIC)	1950.497	Bayesian crit. (BIC)					2154.481

*** p<.01, ** p<.05, * p<.1

The table 1.9 illustrates the estimates of logit regression for determining the girls school enrollment status.

Female Characteristics: The results show that a girl's age significantly affects the girls school enrollment status. By holding other variables constant, if age increases by one year, a girl is 2.36 times more likely to be enrolled. Arif et al. (1999) concluded that the age of the girl significantly and positively affects the enrollment status. The girls who work at their agricultural farms are 39.5 percent less likely to get enrolled at school than the girls who do not work at farms. The domestic work done by girls at home has significant effect on the girls' school enrollment status. The girls work involved in domestic work are 22.5 percent less likely to be enrolled as domestic work done by a girl increases by one hour per day. In rural areas of Pakistan, a study results also show that girls are engaged in own farm and domestic work rather at the cost of leaving school temporarily or permanently (Rafiq and Mohy-ud-din, 2018; Iddrisu, 2014). The co-efficient of girl's age squared is negative and significant showing that initially as age increases, the likelihood of girls' enrollment increases, it reaches at maximum and them begins to fall as discussed in earlier studies (Khan and Ali, 2003). The four dummy variables for the girl's relationship with household head show that own child or adopted child of household head is 2.44 times, sister or sister in law is 2.78 times, grandchild is 2.99 times and niece is 8.01 times more likely to be enrolled in comparison to the any other relative of household head.

Demographic and Household Characteristics: The location of a girl with respect to provinces significantly affects the school enrollment status of girls. If a girl belongs to Punjab, she is 75.7 percent less likely to be enrolled as compared to a girl who belongs to Khyber Pakhtunkhwa. If a

girl belongs to Sindh, she is 97.1 percent less likely to be enrolled in comparison to Khyber Pakhtunkhwa. The girls from Sindh have minimum probability of being enrolled as compared to rest of provinces. The co-efficient of girl's religion also has significant impact on the girl's school enrollment status. A Muslim girl is 2.05 time more likely to be enrolled as compared to Christian or Hindu girl. The dummy variables for ethnicities illustrate that the Punjabi girls are 2.57 times, Pakhtoon girls are 0.54 times, Balochi girls are 2.72 times and Sindhi girls are 2.5 times more likely to be enrolled as compared to common benchmark category of Shina or Saraiki or Hazarwal girls. The girls belong to beneficiary households of social safety net are 1.75 time more likely to be enrolled than the girls belong to non-beneficiary households. The household savings have positive and significant impact on the girls' school enrollment status. If there is one percent change in the household savings, the household's girls are 9 percent more likely be enrolled. Deng et al. (2014) discussed the positive impact of liquid assets such as household savings and treasury bills etc. on the girls' enrollment status. The assets of the household also play significant role in determining the school enrollment status of the girls. Holding other variables constant, the girls are 12.3 percent more likely to get enrolled if there is one-unit change in asset index. Deng et al. (2012) explained that household assets and per capita expenditures represent the household resources which increases the probability of female enrollment. The per adult total expenditures of household and head count poverty based on expenditures both are the indicators of household economic status. The head count poverty of household illustrates that a girl belongs to poor household is 32.2 percent less likely to get enrolled as compared to a girl belongs to non-poor household whereas the girls are 47.6 percent more likely to get enrolled if there is one percent increase in per adult household expenditures. The earlier studies demonstrated the similar findings of head count poverty and household income or expenditures in relation to girls' school enrollment status (Sajid & Khan, 2016; Chaudhury, 2006; Arif et al., 1999). Arif et al. (1999) utilized household income than household expenditures as determinant of female enrollment because data for household expenditures was not available but the study favored to use variable of household expenditures as it provides reliable results. The girls are 15.2 percent less likely to get enrolled if number of children aged 0-4 increase by one. More the children 0-4 year, girls have to look after them at home that is why girls are less likely to be enrolled (Iddrisu, 2014; Khan & Ali, 2003). A girl is 18.5 percent less likely to be enrolled in school if number of female siblings aged 5-15 years increase by one whereas she is 20.9 percent less likely to get enrolled if number of male siblings

aged 5-15 years increases by one. The girls are 10.8 percent more likely to get enrolled if her male siblings aged above 15-years increase by one. The 5-15 years' age group of male and female children has larger contribution in household expenditures either they are enrolled in school or not. If they are enrolled, more financial resources are required for basic needs and education. On the other hand, if they are not enrolled still, they require financial resources for basic needs. The male siblings above 15-year age are considered as adult population and they are the part of labor force. Therefore, their earnings increase the financial resources or economic status of a household and these financial resources reduce a girl's financial constraints and allow her to get enrolled (Khan & Ali, 2003). The number of female siblings above 15-year age in a household have no influence on the girl's school enrollment status. The reason for no influence might be the marriages of the girls after age of 15 years because they would not be longer the part of the family as discussed in earlier studies (Parveen, 2008; Yaqoob, 2014).

Parental and Household head characteristics: A girl is 1.01 times more likely to be enrolled when household head's age increases by one year. A household head with older age may have older siblings or family members who can support household financially. The gender of household head has significant co-efficient stating that if household head is male, a female is 48.6 percent less likely to be enrolled than a girl having female household head. The possible reason behind this is sending girls to school in rural areas is considered as threat for the honor of family. Ali & Khan (2003) stated that girls are less likely to be enrolled in schools if gender of household head is male in Pakistan. The dummy variable capturing parent perception about teacher gender at primary level of education showing whether teacher gender matter or not is found insignificant. It is widely believed that a girl in primary education has age less than 9 years and she is considered as child hence; parents have no threat to family honor if gender of teacher is male and they do not expect sexual harassment at primary level of education. On the other hand, the parent's perception about the teacher's gender at secondary level of education has statistically significant impact showing that the girls are 48.9 percent less likely to be enrolled whose parents take into account the matter of teacher's gender. The girls age in secondary school is considered as adult age that's why teacher gender matters for parent in secondary education. The parents who prefer boy's education or discriminate between boys and girls, their girls are 38.8 percent less likely to be enrolled in school. Yaqoob (2012) also concluded similar results that preference of boy education over girl education is a constraint for the female enrollment. The employment status of household

head and mother's education have no significant influence on the girl's school enrollment status. Few studies found that there is no relationship between household head's employment status and girls' enrollment (Iddrisu, 2014; Khan & Ali, 2003). discussed that there is no relationship between a girl's enrollment and her mother education but for a boy's enrollment. The literature also supports the argument that mother education has no relationship with girls' school enrollment (Thomas et al., 1991; Handa, 1996; Deng et al., 2014). A girl whose father has primary education is 2.04 times more likely to get enrolled and a girl whose father has secondary education is 1.87 times more likely to be enrolled as compared to the girls with no father's education. Sajid & Khan (2016) also had similar findings of the study regarding father's education and girls school enrollment.

Goodness of fit: The overall performance of the estimated model can be checked by Likelihood Ratio test distributed as chi-square. The value of Likelihood Ratio test is significant and high as probability value is zero showing that all explanatory variables are jointly significant and non-excludable. There is a traditional goodness of fit measure such as R-square which is meaningless for binary outcome variable (Gujarati, 2004). The meaningful measures of goodness of fit for binary outcome variable are Pseudo and McFadden R-square. The value of Pseudo R-square for above estimated model is 35.9 percent showing that estimated model is good fitted. However, these measures are not much important, the things matter here are the significance and expected signs of the parameters.

5.3 Estimates of Count Data Model

Prior to the estimation of count data model, it is mandatory to check the linear association among the continuous explanatory variables to avoid the multicollinearity. For this, correlation matrix is developed to check the linear association among the explanatory variables. The correlation matrix for explanatory variables of count data model is shown in table 1.10.

Table 1.10

Correlation Matrix for the continuous explanatory variables of Count data model

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Domestic work	1.000								
(2) School Joining age	0.129	1.000							
(3) Asset Index	-0.052	-0.172	1.000						
(4) Household Head Age	0.048	-0.002	0.155	1.000					
(5) Family Size	-0.071	0.022	0.465	0.180	1.000				
(6) Household Income	-0.058	-0.052	0.607	0.145	0.328	1.000			
(7) Household Debt	-0.035	-0.008	0.250	0.134	0.157	0.417	1.000		
(8) Household Saving	-0.014	0.053	0.377	0.044	0.178	0.417	0.262	1.000	
(9) Per Adult Household Expenditures	-0.019	-0.070	0.218	0.013	-0.071	0.531	0.234	0.116	1.000

The table 1.10 shows the correlation among the continuous explanatory variables appeared in count data model. Domestic work done by girls has moderate and negative association with all explanatory variables except household head age. The strongest correlation is found among the asset index of household, household income, household debt, household saving and per adult household expenditures. There is weaker correlation between school joining age of girls and rest of explanatory variables. The household asset index and household income both are highly correlated but this correlation is tolerable and does not affect the consistency and reliability of the estimations. The least correlation can be observed between the household head age and school joining age of the girls.

Table 1.11

Summary Statistics for Count Dependent Variable

Variable	Mean	Variance	Min	Max
Level of Education	2.1264	1.0573	1	6

The table 1.11 illustrates the summary statistics for the count dependent variable. There are different count data models with different features based on their own assumptions. Generally, Poisson model is a familiar count data model with the assumption of equality between mean and variance of the sample known as equidispersion. If mean and variance of the sample are not equal, other count data models such as negative binomial and generalized Poisson models can be employed to tackle the issues of over-dispersion or under-dispersion of count dependent variable. If the variance of count dependent variable is greater(smaller) than mean, it is the case of over-dispersion (under-dispersion). The negative binomial model is suitable count data model if dataset

is over-dispersed and it becomes Poisson model when the value of its dispersion parameter is zero. The negative binomial model does not consider the under-dispersion in the dataset so, it is meaningless to employ if dataset is under-dispersed (Cameron & Trivedi, 2005).[6] The table 1.11 shows that the variance of the count dependent variable is less than the mean showing the count dependent variable is under-dispersed. The generalized Poisson model is preferred count data model over the negative binomial and Poisson models when count dependent variable is under-dispersed or over-dispersed (Winkelmann & Zimmermann,1994). In case of under-dispersion, the Poisson and negative binomial count models overestimate the standard errors and mislead the findings (Harris et al., 2012). In order to check the nature of dispersion, Poisson and negative binomial models are estimated to get the goodness of fit statistics such as deviance and Pearson Chi-square as shown in table 1.12 In case of over-dispersion, the ratio of deviance to degree of freedom and ratio of Pearson Chi-square to degree of freedom remain greater than one while in case of under-dispersion, value of both ratios remains below one. The value of both ratios equal to one illustrates the equidispersion of count dependent variable hence, Poisson model should be employed (Mccullagh & Nelder, 1989). Another possible way to check the equidispersion or over-dispersion is the value of estimated dispersion parameter in negative binomial model. Since, negative binomial model only accounts for equidispersion or over-dispersion, its dispersion parameter has zero lower bound. In negative binomial model, the value of dispersion parameter equal to zero shows equidispersion and value greater than one shows the over-dispersion (Cameron & Trivedi, 2009).

Table 1.12

Tests for Model selection

	Poisson Model	Negative Binomial Model
Deviance/degree of freedom	0.299	0.3
Pearson Chi-Square/degree of freedom	0.301	0.301
Akaike Information Criteria	2764.99	2766.99
Bayesian Information Criteria	2934.64	2941.48
Dispersion parameter (Alpha)	NA	0

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[6] The count data models based on different assumption are briefly discussed in chapter 4 of data and methodology.

The goodness of fit measures such as ratios of deviance and Pearson Chi-square to degree of freedom for Poisson and negative binomial model are shown in table 1.12. The values of both ratios are less than one and almost similar for both Poisson and negative binomial models showing that the count dependent variable of this study is under-dispersed. The likelihood-ratio test indicates that the value of dispersion parameter in negative binomial model is zero showing that there is equidispersion and Poisson model can be estimated. It should be noted that the dispersion parameter in negative binomial model does not account for under-dispersion and there is the possibility of under-dispersion as illustrated by goodness of fit statistics. The Akaike information criteria and Bayesian information criteria for Poisson and negative binomial model are almost similar because both models assume Poisson distribution based on equidispersion.

Table 1.13

Estimates of Generalized Poisson Model for the Girls level of Education

Explanatory variables	IRR	Robust St. Er.	z	p-value	Sig
Female Characteristics					
Farm work (Ref: Non-participant)	1.115	0.042	2.86	0.004	***
HH Relation1 (Ref: Grandchild)	1.128	0.049	2.78	0.005	***
HH Relation2 (Ref: Grandchild)	1.219	0.137	1.76	0.078	*
HH_Relation3 (Ref: Grandchild)	1.192	0.083	2.52	0.012	**
HH Relation4 (Ref: Grandchild)	1.096	0.092	1.1	0.273	
Domestic work	1.096	0.01	10.1	0	***
School Joining Age	0.947	0.01	-5	0	***
Demographic and Household Characteristics					
Province1 (Ref: KPK)	0.868	0.041	-3.02	0.003	***
Province2 (Ref: KPK)	1.072	0.145	0.51	0.608	
Ethnicity1 (Ref: Punjabi)	0.782	0.046	-4.23	0	***
Ethnicity2 (Ref: Punjabi)	0.727	0.092	-2.53	0.011	**
Ethnicity3 (Ref: Punjabi)	0.851	0.113	-1.21	0.225	
Ethnicity4 (Ref: Punjabi)	0.928	0.03	-2.3	0.021	**
Family Size	0.981	0.004	-5.3	0	***
Social Safety Net (Ref: Non-beneficiary)	1.029	0.028	1.06	0.291	
Household Saving	0.984	0.007	-2.24	0.025	**
Household Debt or Loan	0.988	0.005	-2.25	0.024	**
Head count poverty (Ref: Non-Poor)	1.071	0.031	2.38	0.017	**
Per adult household expenditures	0.864	0.039	-3.26	0.001	***
Household Income	1.032	0.013	2.48	0.013	**
Asset index	1.024	0.006	3.88	0	***

Parental and Household Head Characteristics					
Age of Household head	1.009	0.001	7.19	0	***
Household head employment status (Ref: Unemployed)	1.077	0.04	1.97	0.048	**
Mother education1 (Ref: Never Enrolled)	1.006	0.047	0.13	0.897	
Mother education2 (Ref: Never Enrolled)	0.999	0.092	-0.01	0.993	
Father education1 (Ref: Never Enrolled)	1.016	0.04	0.4	0.686	
Father education2 (Ref: Never Enrolled)	1.208	0.089	2.57	0.01	***
Schooling Characteristics					
Govt. school (Ref: Private/Madrassa)	0.942	0.03	-1.84	0.065	*
Repetition of Last class (Ref: No)	0.788	0.038	-5	0	***
Bike/Chin chi (Ref: walking/residence in school)	1.263	0.05	5.91	0	***
Bus/Datsun (Ref: walking/residence in school)	1.294	0.071	4.71	0	***
Travel 0-15minutes (Ref: 45 minutes above)	0.75	0.047	-4.64	0	***
Travel 16-30minutes (Ref: 45 minutes above)	0.837	0.053	-2.78	0.005	***
Travel 31-45minutes (Ref: 45 minutes above)	0.784	0.065	-2.96	0.003	***
Reference Categories					
Constant	4.184	1.044	5.74	0	***
Delta	-0.67	0.028			***
Chi-square for L-R test of Delta=0	461.29	Prob>L-R chi2			0
Pseudo r-squared	0.175	Number of obs			941
Chi-square	1109.56	Prob > chi2			0
Akaike crit. (AIC)	2305.708	Bayesian crit. (BIC)			2154.481

*** p<.01, ** p<.05, * p<.1

The table 1.13 depicts the estimates of generalized Poisson model for the level of education of enrolled girl aged 5-18.

Female Characteristics: The estimates show that an enrolled female who works at own farm significantly increases expected value of count by 11.5 percent than a female who does not work at farm. The girls working at farm may help their households to generate financial resources which are mandatory for the education. Therefore, greater financial resources allow girls to have greater education level. The dummy variable of HH Relation1 showing that if a girl is the child of the household head, the expected value of count is more likely to increase by 12.8 percent than a girl who is grandchild of household head. The HH Relation2 has significant incident rate ratio showing that if a girl is sister of household head, expected value of count is more likely to increase by 21.9 percent than the benchmark category of a girl who is household head's grandchild. The dummy

variable HH Relation3 showing whether the girl is niece of household head or not, is found statistically insignificant. The variable HH Relation4 has significant incident rate ratio showing that if a girl is cousin or other relative of household head, the expected value of count of the model is more likely to increase by 9.6 percent than a girl who is grandchild of household head. Holding other variables constant, mean value of count variable increases by 9.6 percent if a girl's domestic work increases by one hour per day. The parents of the children in rural areas remain busy in agriculture tasks while the girls at home bear the burden of household chores. As they get older, the burden of household chores increases along with education level. The incident rate ratio of school joining age illustrates that mean value of count variables decreases by 5.3 percent as school joining age of a girl increases by one year.

Demographic and Household Characteristics: The location of girls with respect to provinces has significant effect on the count dependent variable. The expected value of count decreases by 13.2 percent if the location of girls changes from the reference category of KPK to Punjab represented by Province1 whereas the Sindh represented by Province2 has no significant impact. The dummy variables for the ethnicity of a girl have significant impact except Ethnicity3 categorized for Sindhi ethnicity. The mean value of count decreases by 21.8 percent if Punjabi girls are replaced with Pakhtoon girls represented by Ethnicity1. The expected value of count for education level decreases by 27.3 percent if Balochi girls named as Ethnicity2 take place instead of Punjabi girls. Lastly, the mean count for shina, Saraiki or hazarwal girls named as Ethnicity4 decreases by 7.2 percent in comparison to the Punjabi girls. The family size affects a girl's level of education significantly in the model. The expected count decreases by 1.9 percent if family size increases by one family member. The greater family size requires greater financial resources to acquire education. Lack of financial resources does not allow each member to acquire higher education level. The social safety net has no significant role in determining a girl's level of education. The household saving and household debt or loan have adverse effects on the expected count. The mean value of count decreases by 1.6 percent when household saving increases by one percent while expected count decreases by 1.2 percent if household debt increases by 1 percent. The expected count for the girls who belong to poor household is more likely to increase by 7.1 percent than the girls who belong to non-poor household. It is possible that children from poor households perform well in education attainment because children are well aware about the financial limitations and they struggle much to reward their parents. The parent-child relationship

is the source of motivation for children to outperform in education attainment (Cheang & Goh, 2019). The household expenditures have negative and significant impact on the expected count. When household expenditures increase by one percent, the expected count decreases by 13.6 percent. The household income and household asset index affect expected count positively and significantly. The mean value of count increases by 3.2 percent when household income increases by one percent whereas mean count increases by 2.4 percent when household asset index increases by one unit.

Parental and Household Head Characteristics: The age of household head is positively related the expected count of a girl's level of education. The expected count for a girl increases by 0.9 percent if the age of household head increases by one year. The employment status of household head also has positive and significant effect on the expected count. If household head of a girl is employed, the expected count is more likely to increase by 7.7 percent than a girl with unemployed household head. The dummy variables showing mother education equivalent to primary and secondary education are found insignificant in determining the expected count of the model whereas only father education equivalent to secondary or above is found significant. The expected count for a girl is more likely to increase by 20.8 percent if her father has secondary or above education in comparison to a girl whose father has no education.

Schooling Characteristics: The type of school is a significant factor determining the girl's level of education. The girls who study at government school, their expected count is likely to decrease by 5.8 percent than the girls who study at private school or madrassa. The repetition of last class has significant and negative impact on the expected count. The expected count for the girls who repeated their last class is 21.2 percent less than the expected count for the girls who did not repeat their last class. The dummy variables for the travel sources used by girls to approach school are found significant. The girls who utilized bike or chin chi as travel source to reach at school have 26.3 percent greater expected count than the girls who use to walk or who have residence in the school. The girls who utilized bus or Datsun have 29.4 percent greater count than the girls who use to walk or who have residence in the school. Lastly, the dummy variables for the travel time required to reach at school are also found significant. The girls who travel 0 to 15 minutes for school have 25 percent less expected count than the girls who travel more than 45 minutes. The girls who travel 16 to 30 minutes for school have 16.3 percent less count than the girls who travel

more than 45 minutes. The girls who travel 31 to 45 minutes for school have 21.6 percent less expected count than the girls who travel more than 45 minutes.

Goodness of fit: The parameter of dispersion named as alpha has negative and significant value showing that the count variable has under-dispersion. The likelihood ratio test for the alpha has zero probability value showing that null hypothesis has been rejected. The null hypothesis of the likelihood ratio test distributed as chi-square shows that alpha is equal to zero while alternative hypothesis shows that alpha has positive or negative value. The likelihood test for overall model fit distributed as chi-square also has zero probability value showing that the regressors are jointly non-excludable and have significant effect on the count dependent variable. The value of pseudo R-square shows that model is good fitted against the model with only intercept.

It can be concluded that social safety net programs, household head gender and boy preference over girl's education have significant impact on female enrollment status only while distance to school, sources of school traveling, types of school are additional factors that play important role in determining the girls' level of education only. Finally, head count poverty, household income, household expenditures, family size, household and farm work, household head employment status, father education, household saving, age of household head and household assets are the important factors affecting both girls' enrollment status and their education level.

Chapter 6

Conclusion and Recommendations

6.1 Findings of the Study

The findings of the logistic regression illustrate that the household economic status measured by household expenditures, household assets, and household savings have positive and significant role in determining the girls' school enrollment while poverty affects girls' enrollment status negatively and significantly. It is also concluded that parents prefer boys' education over the girls' education and teacher gender matters for them hence both negatively affect the girls school enrollment. The number of children aged 0-4 years, number of male and female siblings aged 5-15 years influence the girls school enrollment negatively whereas male and female sibling aged 15 years above influence the girls school enrollment positively. The father education, girls age and beneficiary households of social safety net also have positive and significant impact on the girls' school enrollment status. As for as the findings of Generalized Poisson model are concerned, household income, household assets, father education, household head employment, travel sources for school, poverty, farm work status and domestic work have positive and significant effects on the count variable named as girls' level of education. The household savings, household debt, travel time required to reach at school, household expenditures, type of school, repetition of last class and family size have negative and significant impact on the girls' level of education.

6.2 Policy Recommendations

Keeping in view the findings, there are significant factors from the point of policy view. The poverty is one of the significant factors that determines the girls school enrollment. The government should consider the measures to alleviate poverty to increase the girls' enrollment in rural areas. The age of the girl has positive and significant influence. In rural areas, girls' enrollment is often delayed. Therefore, government should provide pre-schooling facilities so that girls could be enrolled in very early age. The government should give incentives to the rural households to encourage savings as household saving is a significant factor that positively affect the girls' enrollment status. The government should increase social safety net programs for rural households so that girls' enrollment could be better. Government should make organizations in rural areas which can aware and deliver the importance of girl's education to their parents so that parents equally prefer boys and girl's education. The government should construct male and female schools separately in the rural areas so that matter of teacher gender could be resolved for

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parents. The less numbers of siblings aged below 16 years result in more girl's enrollment in rural areas so Government should make sure the services of Pakistan population welfare department to get desired outcomes of population in rural areas. The government should provide the employment opportunities to the heads of households in rural areas as they positively affect the girls level of education. The authorities also need to improve the functioning of government schools in comparison to private schools because private schools have significant and positive impact on the girls' level of education. Finally, the government should construct schools and colleges near to the residence of girls so that for each next stage of education, the girls should not travel too much. All the recommendation and suggestions discussed above could have significant role in the formulation of education policies for Sindh and Khyber Pakhtunkhwa governments because the estimations show comparatively greater marginal effects of the factors for them.

6.3 Conclusion

The education is the basic right and need of human being. The sustainable social and economic development is only possible by providing and acquiring education. An important determinant of this social and economic development is the education of girls. The objectives of this study are to explore the determinants of girls' school enrollment as well as their level of education at household level in Pakistan. In this study, the dataset of 2142 girls aged 5-18 years has been obtained from Pakistan Rural Household Panel Survey 2014 conducted by International Food Policy Research institute. In this study, two econometric models have been estimated named as Logit model for binary outcome and Generalized Poisson model for count outcome. The logistic regression model is employed to identify the determinants of girls' school enrollment status while Generalized Poisson regression model has been utilized to diagnose the determinants of girls' level of education. The estimates of the logistic regression demonstrate that the household economic status measured by household expenditures, household assets, and household savings have positive and significant effects on the girls' school enrollment while head count poverty has negative and significant effect on girls' enrollment status. The results also show that parents prefer boys' education over the girls' education and teacher gender matters for them therefore, both negatively affect the girls school enrollment. The number of children aged 0-4 years, number of male and female siblings aged 5-15 years influence the girls school enrollment negatively whereas male and female sibling aged 15 years above influence the girls school enrollment positively. The father education, girls age and beneficiary households of social safety net also have positive and

significant impact on the girls' school enrollment status. As for as the findings of Generalized Poisson model are concerned, household income, household assets, father education, household head employment, travel sources for school, poverty, farm work status and domestic work have positive and significant effects on the count variable named as girls' level of education. The household savings, household debt, travel time required to reach at school, household expenditures, type of school, repetition of last class and family size have negative and significant impact on the girls' level of education.

6.4 Limitations of the Study

There are certain limitations of this study. The analysis of this study is not based on latest household datasets because latest dataset did not have the information to pursue the objectives of this study. Therefore, a better analysis can be undertaken by utilizing the latest dataset in the future. Besides this, data could not be collected from Balochistan province due to security reason in 2014 but analysis can be extended in future by including Balochistan, Islamabad capital territory and Gilgit-Baltistan. Another limitation of this study is that the utilized dataset of the survey only contains information about specific age group of girls 5-18 years' so, authors may come up with extended version of analysis beyond this age group in the future. The maximum attainable level of education in this study is graduation due to specific age group of the girls, hence authors may also extend analysis to higher level of education such as master, M.Phil., Ph.D. in future studies. Furthermore, the objectives of this study are to determine the school enrollment status and level of education of rural girls while a better analysis can be made to determine the school enrollment status and level of education in context of comparative analysis of boys and girls along with urban and rural locality.

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