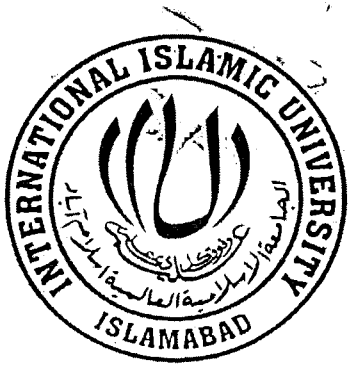
Econometric Analysis of Household Expenditure on Education in Pakistan



By

Mahboob Elahi
Reg. 15-FBAS/MSST/F12

Department of Mathematics & Statistics
Faculty of Basic and Applied Sciences
International Islamic University,
Islamabad
Pakistan
2016

Econometric Analysis of Household Expenditure on Education in Pakistan

By

Mahboob Elahi

Supervised by

Dr. Muhammad Akbar

Department of Mathematics & Statistics
Faculty of Basic and Applied Sciences
International Islamic University,
Islamabad
Pakistan
2016


بسم الله الرحمن الرحيم

Econometric Analysis of Household Expenditure on Education in Pakistan

By

Mahboob Elahi

A Dissertation
Submitted in the Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
IN
STATISTICS

Supervised by

Dr. Muhammad Akbar

Department of Mathematics & Statistics
Faculty of Basic and Applied Sciences
International Islamic University,
Islamabad
Pakistan
2016

Certificate

Econometric Analysis of Household Expenditure on Education in Pakistan

By

Mahboob Ellahi

A DISSERTATION SUBMITTED IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF THE MASTER OF SCIENCE IN STATISTICS

We accept this dissertation as conforming to the required standard.

1. _____
Prof. Dr. Muhammad Aslam
(External Examiner)

2. _____
Dr. Ishfaq Ahmad
(Internal Examiner)

3. _____
Dr. Muhammad Akbar
(Supervisor)

4. _____ 06/12/16
Prof. Dr. M. Arshad Zia
(Chairman)

Department of Mathematics & Statistics
Faculty of Basic and Applied Sciences
International Islamic University, Islamabad
Pakistan
2016

Dedication

To my family,
For the endless support and patience.

To my Teachers,
For the constant source of Knowledge and Inspiration.

To my friends,
The ones that are close and the ones that are far.

Forwarding Sheet by Research Supervisor

The thesis titled **"Econometric Analysis of Household Expenditure on Education in Pakistan"** submitted by **Mahboob Elahi** (Registration # 15-FBAS/MSST/F12) in partial fulfillment of M.S degree in Statistics has been completed under my guidance and supervision. I am satisfied with the quality of his research work and allow him to submit this thesis for further process to graduate with Master of Science degree from Department of Mathematics and Statistics, as per IIU Islamabad rules and regulations.

Dated: _____

Dr. Muhammad Akbar
Assistant Professor
Department of Mathematics & Statistics
Faculty of Basic and Applied Sciences
International Islamic University,
Islamabad.

Acknowledgements

All the praises to Almighty ALLAH the most gracious, the most merciful and the creator of all the creature in the creature. Thanks to ALLAH and his Prophet (P.B.U.H). There are few people who made this journey easier for me with their encouragement and ideas.

I express my gratitude to my supervisor **Dr. Muhammad Akbar** for his regardless and inspirational efforts and moral support throughout my research carrier. His sound advices and lots of good ideas were very helpful to me. I would have been lost without him. May ALLAH bless him with all kinds of happiness and success in his life and may all his wishes come true. Furthermore, I wish to extend my appreciation to Dr. Ishfaq Ahmad and Prof. Dr. Zahid Iqbal.

Finally, I express my sincere appreciation to all the helpful staff of the Statistics Department IIUI. I would like to thanks to everybody who was important to successful realization of this thesis as well as expressing my apology to those that I could not mention.

Mahboob Elahi

DECLARATION

I hereby declare that this thesis, neither as a whole nor a part of it, has been copied out from any source. It is further declared that I have prepared this dissertation entirely on the basis of my personal efforts made under the supervision of my supervisor **Dr. Muhammad Akbar** No portion of the work, presented in this dissertation, has been submitted in the support of any application for any degree or qualification of this or any other learning institute.

Signature: _____

Mahboob Elahi
MS (Statistics)
Reg. No 15-FBAS/MSST/F12
Department of Mathematics and Statistics,
Faculty of Basic and Applied Sciences,
International Islamic University Islamabad, Pakistan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

cdf	Cumulative Distribution function
FES	Family Expenditure Survey
HHEE	Household Expenditure on Education
HIES	House hold Integrated Economic Survey
KPK	Khyber Pakhtunkhwa
OLS	Ordinary Least Square
PBS	Pakistan Bureau of Statistics
pdf	Probability distribution function
PLFS	Pakistan Labor Force Survey
PSLM	Pakistan Social and Living standards Measurement survey
SD	Standard Deviation
y*	Latent variable

ABSTRACT

In both developed and developing countries, education is considered as the most important factor of economic growth and development. It plays a significant role in creating human capital which is considered as the engine of economic growth. Keeping in view of the importance of education, the present study has been conducted to determine the important factors affecting households spending on education in Pakistan. For this purpose, data are taken from Household Integration Economic Survey (HIES) published by Pakistan Bureau of Statistics in 2010-11. This study explores the key issues affecting Household Expenditure on Education (HHEE). Tobit regression and Hurdle model are applied to examine the impact of household characteristic and other key covariates that influence HHEE. The key findings from the Tobit regression and hurdle model analysis in present thesis are as follows: First, household total income has positive impact on the total quantity of educational expenditure. An increase in the earnings of the household is always related to an increase in educational expenditure. Second, families where the household heads have a higher grade of education or female household head enhances the possibilities of educational spending. Third, households with more school going children spend more on education, while families with government type of institute's children spend less on education. These empirical findings demonstrate that households with more resources and better human capital are those who are able to expend more resources on education. So, if the government desires to mobilize household expenditure for education, it is really significant that the government raises its own budget distribution to education significantly. Ultimately, the number of school going children is one of the most important indicators that have significant impact on household expenditures. If any

households in the country have more than one or two school going children, the government should help these households to have an equivalent access to education.

CHAPTER 1

INTRODUCTION

Education and investment in human capital are empirically recognized as vital factor of economic growth in any nation. Education provides individuals with the means to enhance their health, productivity, knowledge, and skills, and also improves the economy's capacity to develop and implement new technology for the determination of economic and social development. These advantages from education, increasing education levels are a significant concern for policy makers in any country. The importance of education cannot be overemphasized in a state like Pakistan.

After introducing Becker (1964) theory of human capital, expenditure on education has been extensively studied in every country including Pakistan. Expenditure on education applies a main influence upon earnings or professional status and is seen almost as a worldwide remedy to economic problems such as poverty and unemployment. Rendering to the theory of human capital, education increases efficiency and income through the gaining of information. Empirical results prove that education may perform as a tool for reallocating income and easing poverties so, education can provide a foundation of both economic development and income equivalence.

Household Expenditure on Education (HHEE) is affected by an extensive variety of factors. Household expenditure in education can be understood in terms of economic factors. Primarily household's expenditure in education, as they predict economic and non-economic advantages from education. The net economic benefits of education are

measured familiarly in terms of internal rates of return to education. Despite several limitations that the method of rate of return analysis carries with it, such estimates are found to be useful in educational planning, including the decision-making for investment both by the households and the public domains (Tilak 1987).

If the income of the family is lower than the expenditure on education. Then families may or may not be keen to borrow money for education, as education return back is risky and moreover, the credit market for education is yet to be produced in many growing countries like Pakistan. Therefore, it is generally felt that the levels of investment of families in education are related to income levels. Normally it is followed that high income families' spend more on education as compared to poor earnings families.

There are many problems to help families with lower spending on education. Nevertheless, in specific, there are efficiency anxieties because of targeting households who do not need any assistance, or not targeting households who do need help.Such efficiency losses from unproductive targeting are especially challenging in developing rural areas facing severe resource constraints. Recent advances in the empirical approaches for analyzing HHEE, (Aslam and Kingdon 2008) analyzed in their research the determinants of household expenditure on education in Pakistan. Suggests the criteria for professionally providing policy which help for educational expenditure. Kingdon(2005) analysis serves as a model for other south Asian countries that are looking for to improve educational results by assisting households with educational expenditure.

In many poor nations, education is considered a priority to decrease poverty, and numerous empirical studies have highlighted its importance. Many researchers from different countries argue that public expenditure distributions for education can progress, economic growth however promoting equity. Size and the efficiency of public expenditure on education are important in improving socioeconomic performance. Advancing the education sector normally involves increasing public spending on education. Particular, education expenditure is considered as providing additional human capital to those who are in the education sector. As these souls come out of the sector, they contribute to the touchstone of human capital of their several families in the form of improved labor skills. The design of education expenditure influences the distribution of this additional standard among different socioeconomic household groups (Jung and Thorbecke 2003).

In this study, we utilized most recent available data that covered all of Pakistan provinces will provide us a good scenario of the effect of social-economic changes on the household educational expenditure. For empirical analysis of the educational expenditure in this study is accompanied utilizing a Tobit regression model. Previous studies in the literature have utilized Ordinary Least Square (OLS) or logistic regression model. However, the data expenditure on educational of numerous poor household is categorized by zero educational expenditure, ignoring this lower censoring in the data will lead to bias results.

1.1 Objectives of the Study

The following are the main objectives of the study

- To determine the factors affecting households education expenditure in Pakistan.
- Comparison of the performance of Tobit model and Hurdle model.
- To give policy recommendations.

1.2 Organization of the Thesis

This dissertation is passed out into five Chapters. Chapter 1 is about the introduction. Chapter 2 comprises domestic and foreign review of literature relevant to this study. Chapter 3 is about the materials and various statistical methods used for the descriptive and inferential analysis purpose. The estimated results attained from Tobit regression and hurdle model and their marginal effect are described in chapter 4. The last chapter contains of conclusions, findings and recommendations for the new researchers.

CHAPTER 2

Review of Literature

2.1 Introduction

A literature review is a comprehensive statement of the studies found in the literature associated with our research field. The review should define, summarize, evaluate and clarify this literature. It should give a theoretical basis for the research and help us the nature of our study. Select a partial number of decent studies that relate to our study and not trying to accumulate a large number of studies that are not thoroughly related to our research field. A literature review goes beyond the search for information and contains the identification and enunciation of relationships among the literature and our sphere of research. The Literature review is also very vital to see what has and has not been studied, to see what has and has not been explored and to classify data sources that other researchers have used.

2.2 Importance of Household's Education Expenditures

Household expenditure on children's education is a significant part of human income asset and can helpful for children better education, and consequently, higher wages in the labor market. In many developing countries, including Pakistan education in general and higher education in particular is mostly in the public sector, though the trend is rapidly changing.

It is empirically proven fact that households with more assets and better human capital are those who are capable to consume more incomes on their children's education. Education is considered as an obliging of economic and social development of the nation. Educated people are usually more appreciated in the society. However, heavy investments in children's education may cause of sinking the quality of life, dissimilarity in children's educational achievements and in order broaden social inequality.

2.3 Review of Studies Related to Pakistan

Many researchers in Pakistan analyzed the factors that influenced the HHEE. Tobit regression and hurdle model are used for the purpose of different kinds of data analysis.

Aslam and Kingdon (2008) investigated the gender wise HHEE in Pakistan. This study used secondary data of Pakistan Integrated Household Survey (PIHS) obtained from Pakistan Bureau of Statistics (PBS) for the period of 2002. For analysis purposes, it applied angle curve technique and calculated descriptive statistics. The empirical study found some significant facts that household expenditure on males was more than females. In Pakistan HHEE were 4.6% of the total household expenditure on the average, urban people spending 6.7% and rural people spend 3.5% HHEE. The gender discrimination with regard to HHEE was strong in Baluchistan, KPK and FATA.

Holmes (1999) empirically analyzed that the families of Pakistan spend a significant quantity of expenditures on education. The key findings of the studies, parent's education is an important determinant of both boys' and girls' education, with mother's education, applying a greater impact on girls' education and father's education

effecting more seriously the education of boys. Household income is also a key factor in influencing children's education and its influence is larger for females. The mainstream of educational resources in Pakistan is reserved for improving access to primary level schools. Distance to primary school does not affect to children's education, while distances to middle and secondary schools are significant factors of final education achievements.

Irfan *et al.* (2013) measured the Labor force market gender discrimination with regard to occupation in Pakistan. In this study utilized secondary data obtained from Pakistan Bureau of Statistics (PBS) about Pakistan Labor Force Survey (PLFS) for the period of 2009-10. First, they calculated Duncan dissimilarity index and then they applied Tobit regression model to find out the effect of education, age, sex and training on Duncan dissimilarity index. The key findings of the study, occupation of the manger were larger discrimination effect as compare with other occupations. This study also found that as the level of education increased the gender discrimination decreased.

Usman *et al.* (2015) examined allocate, economic, technical efficiency of gladiolus cut flower farms in Punjab, Pakistan. This study uses primary data of 100 farmers that was obtained from district Kasur Pakistan in 2011. There is used Data Envelopment Analysis (DEA) technique and Tobit regression model for analysis purpose. It is found that new production tools were necessary for increasing gladiolus production. Results showed that seed source, tenant farmers, age, and family labor had negative and statistically significant effect on the inefficiencies of gladiolus farms.

2.4 Review of Studies Related to Other Countries

It is a well-known fact that total household expenditure, household head's, age, education location, experience, marriage status is highly correlated with HHEE. Many researchers from different countries like Brazil, Cyprus, Turkey, USA, Vietnam, India, etc. had applied Tobit regression model and other statistical methods to determine this relation.

Andreou (2012) estimated HHEE and empirically analyzed factors that affect the level of education in Cyprus. This study uses the secondary data obtained from the Family Expenditure Survey (FES) for different periods of 1996/97, 2002/03 and 2008/09. It used Ordinary Least Square (OLS) regression to find out the factors that affect the HHEE, founded that Income, area of the residence, number of children in the household, and household head's age, gender and education have statistically significant effect on household expenditure on child's education. However the effect of household head's age and education reduced over time.

Baby (2014) analyzed the expenditure on higher education, for both science and arts college students in Erode district India. By utilizing secondary and primary data calculated descriptive outturns for analysis purpose. This study found that male students spend more money on higher education as compared to female students. Rural area students need more money than urban area students for achieving higher education and arts students' expenditure more than science students.

Bircan and Tansel (2006) measured the household expenditure on private tutoring in Turkey. It utilized secondary data obtained from a state institute of statistics of turkey about Household Expenditure Survey (HES) for the period of 1994. To avoid from censoring affect they used Tobit model. There is found that total household expenditure, household head's, age, education and location had positive and significant effect on expenditure on private tutoring. However, the outcomes shows the number of children in the household, had negative effect on expenditure on private tutoring.

Quang (2006) investigated the factors that affect the household expenditure on children's education in Vietnam. This study uses the secondary data attained from Vietnamese Household Living Standards Survey (VHLSS) for the period of 2006. This study utilized the Tobit model to analyze the different models to determine this relationship. The study found that the total income of a household, household's head education, occupation; sex and marital status were positive and significant effect on household expenditure on children's education.

Qian and Symth (2011) analyzed parent's expenditure on children's education in China. This study examined the elements that determine the children's domestic and foreign education expenditure. It used secondary data of 32 cities of china that obtain form China Mainland Marketing Research Company (CMMRC) for the period of 2002. It used a Tobit regression model for analysis purpose. The authors in this study found that total household income positive and significant effect on children, domestic and foreign education expenditures. This study also found that household's mother's education and

father's professional occupations were positive and significant effect on children's education. High income families send their children in foreign countries for education.

Maitra (2003) sought to calculate the factor that influences the demand for education in Bangladesh. This study had applied probit regression model and censored ordered probit regression model to analyze current enrollment, and highest level of education achieved. The author estimated results indicate that there was no evidence of gender discrimination with regard to current enrollment status but female students received higher levels as compared to male students. If the total income of household increased than education attainment also increased. Parental education was a positive and statistically significant impact on both the educational attainment and school enrollment of children.

Dang (2007) estimated the factors that affect the household expenditures on private tutoring for primary level, secondary level and higher level of education in Vietnam. In this study used the secondary data attained from the Vietnamese Living Standards Survey (VLSS) for two different periods of 1997–98 and 1992–93. To avoid from endogeneity and truncated problems the author applied Tobit ordered probit regression model. The author found that there had no gender difference in household expenditures on private tutoring. However, household expenditures on private tutoring decreased as education of primary school teacher increased. This study found that household expenditure on private tutoring significant effect on a child's academic achievement, but the effect was larger for primary level education.

Yueh (2007) investigated the pattern of parent's investment on children's education in urban China. This study uses comprehensive secondary data set received from Urban Household Survey (UHS) for the period of 1995. It applied two stage least squares unitary intra household resource allocation model and found that household expenditure was larger on male students age 13 to 15 and larger on female students aged 16 to 18. This study also found that there was some gender discrimination in the educational enrollment of school aged children.

Aakvik *et al* (2005) examined the impact of family background like family earnings and parent education on educational achievement of children born from 1967 to 1972 in Norway. This study uses secondary data obtained from administrative registers from Statistics Norway and National Censuses of Population and Housing (NCPH).There is used ordinary least square regression model to assess the impact of family background variables on the educational achievements of the children. This study found that permanent family income and parental education had a positive and significant effect on children's achievement when they were 0 to 6 years old.

Nepal (2015) examined the effect of heavy international remittances on child schooling, household expenditures and child labor. This study uses secondary data set obtained from the Nepal Living Standards Survey (NLSS) for the period of 2010. It had applied instrumental variable technique. The study results indicated that child education and child labor were not correlated with international remittances. However, international remittances were positive and significant effect on child's educational expenditures and nonfood expenditures.

Saha (2013) measured the gender discrimination in HHEE on their children in India at the level of the state. This study uses 64th round National Sample Survey (NSS) data set. To analyze gender discrimination she utilized Oaxaca – Blinder decomposition, based on Ordinary Least Squares (OLS) Quantile Regression (QR). This study found gender discrimination in household expenditure on children's education in whole India and across different Indian states. Results also indicated that now gender discrimination had found in urban and rural regions. Results showed that household expenditure across both rural and urban areas of the country prefer to spend more on their male students as compared to female students. Inequality among discriminated female students had found lower in urban regions as compared to rural regions.

Welte *et al* (2007) analyzed different types of gambling and gambling, availability was related to problem of gambling by age and sex in the USA. This study uses primary data gathered through a phone survey of 2631 US individuals. To analyze the relationship between different types of gambling, age and sex, there is utilized Tobit regression model. It found that casinos and lottery gambling create the most society problems. Lotteries, casinos, gambling machines and bingo created the most overall problems in females. Casinos, lotteries and gambling machines created the most overall issues for society over age 29 and for society under 30 it was cards and casinos.

Foster and Kalenkoski (2013) empirically compared Ordinary Least Square regression (OLS) and Tobit regression marginal effect coefficients results for the two diary window lengths. This study uses Austrian time use surveys data set for two different periods 1992 and 1997. It found that time diary data set includes large numbers

of zeroes and Ordinary Least Square regression coefficients in situation were bias and inconsistent. There is also found that Tobit estimates were more sensitive than OLS estimates to the presence of zeroes in the data.

CHI and QIAN (2015) empirical analyzed education expenditure level, ratio of expenditure to household earnings, and dissimilarity in this expenditure. This study utilized Urban Household Surveys conducted by the China National Bureau of Statistics (CNBS) for the period of 2007 and 2011. This study applied ordinary least square regression and found that education expenditure incurred outside the school significantly contributed to improved household education expenditure. Compulsory education programs had positive effected the curbing in school education expenditure. However, it had not prevented the rapidly growing education investment outside school

2.5 Summary

Household expenditure in education are effected by an extensive variety of factors, which, can be assorted into different categories a) Household head's characteristics, specifically, sex, age, education and work status b) Household characteristics, particularly, type, size, total income, total consumption and the turn of the children going to school. c) Household social context, especially, region, area and year. In many previous studies the authors used Ordinary Least Square (OLS) regression, logistic regression and some other techniques. However, they ignored the censoring effect because many families were categorized by no educational expenditure, its causes of biased and inconsistent results. The results, based on Tobit regression and hurdle model can be found more accurate and consistent.

CHAPTER 3

MATERIALS AND METHODS

3.1 Introduction

In this chapter, we describe in detail the materials and methods used in present study. These contain details of model specification, sample size, data, and of variables, statistical methods for data analysis like a Tobit regression, hurdle model and other descriptive statistics of dependent and explanatory variables. Features of the HHEE, each is described in the sections below.

3.2 Model's Specification

In the present study, we estimate the HHEE and main factor that affecting the HHEE in Pakistan. Following Tobit regression and hurdle model are used for the determination. The households with no or zero expenditure on education are censored (Sofia 2012; Quang 2012).

$$y_i^* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \sum_{i=9}^{12} B_i X_i + \sum_{j=13}^{16} B_j X_j + \sum_{k=17}^{23} B_k X_k + e_i$$

$X_1 = \mathbf{Age}$

$X_2 = \boldsymbol{square\ of\ Age}$

$\mathbf{X_3}$ = **Gender**

$\mathbf{X_4}$ = **Region**

$\mathbf{X_5}$ = **Married**

$\mathbf{X_6}$ = **Family Size**

$\mathbf{X_7}$ = ***Total School Going Children***

$\mathbf{X_8}$ = **Square of Total School Going Children**

$X_{i=9}^{12}$ **Province$_i$**

$X_{j=13}^{16}$ **Type of Children Education Institute$_j$**

$X_{k=17}^{23}$ **Edu$_k$**

Where $y_i^*$the latent variable, and all other explanatory variables with explanation are defined in table 3.1. The dependent variable y_i (household's expenditure on education) is defined as $y_i = 0$ if $y_i^* = 0$ and $y_i = y_i^*$If $y_i^* > 0$.

To decrease heteroscedasticity, HHEE transformed into a logarithmic form. But, since there are a large number of households had no or zero expenditure on education, an arbitrary value of one allocated in the position of the no or zero expenditure on education and after taking log of these values it again becomes zero.

3.3 Data and Construction of Variables

In this section we explain the source of data and construction of variables.

3.3.1 Sources of data

In this study, we used secondary data published by Pakistan Bureau of Statistics (PBS) about Household Integrated Economic Survey (HIES) for the period of (2010-11). Pakistan bureau of statistics starts Household Integrated Economic Survey (HIES) in 1963. Since then, Pakistan Bureau of Statistics (PBS) has been conducted HIES but with uneven gaps. In order to see the requirements compulsory by new accounting system, the HIES questionnaire was reviewed in 1990 which was used to conduct four succeeding rounds of Household Integrated Economic Survey (HIES). Pakistan bureau of statistics starts a new survey known as the Pakistân Integrated Household Survey (PIHS) in 1998-99 and they also include information about HIES in this survey, which is recognized as Pakistan Social and Living standards Measurement (PSLM) survey.

PSLM survey sources of different socioeconomic variables like individual's respondent's income, age, education, health, gender, marital status, assets in possession etc. and its pattern of urban and rural households at district provincial and national level, data also provided information individually for males and females. The Household Integrated Economic Survey (HIES) is a sub part of PSLM survey included some extra information about detail of household Expenditure like Expenditure on food items, Expenditure on medical care, expenditure on education, etc.

The sample size of Pakistan Social and Living standards Measurement (PSLM) survey is about 80000 households at national level, while, Household Integrated Economic Survey (HIES) has 15807 household's information. In this study, 8342 households at national level whose annual HHEE and all other independent variable information are given in HIES data set, are utilized for data analysis.

3.3.2 Variables and Specification

Previously literature review showed the factors that affected the HHEE. These studies focused on the earnings of the families and the magnitude and structure of the families. Some studies observed the key indicators like age, sex and educational level of the household head that had an impact on the expenditure for education. The literature review also indicates that the region of households also significantly influenced the HHEE.

On the basis of previous research studies related to our study, we used the variables that are distributed into three main groups:

1) Characteristics of household heads especially (sex, age, marital status and educational level).

2) Factors concerning to the households' characteristics like total size of a family, total annual income of household, type of child education institute and the number of the child going to school.

3) Factors about the social context which may be cause of an effect on entire expenditure. They include two key indicators namely region and province.

The variables used in this study are shown below in table 3.1 with their name and description. The response variable, HHEE comprised different types of expenditure like School/college fees and private tuition fees, books and exercise note books / copies, stationary, etc. Other educational expenses are bags, professional society membership, transportation, hostel expenses and stationery supplies such as pen, pencils, stapling machine, pin etc. We used logarithm transformation on HHEE because it reduced the skewness problem. The logarithmic transformation also used to produce approximately equal spreads.

Table 3.1: Variables and Description

Variable	Classification	Description	Base category
Age		Complete Age of Household Head in years	
Age2		Age square	
Gender		Gender of household head	
	Male	=0 if respondent male	
	Female	=1 if respondent female	
Region		Region of household	
	Urban	=0 if respondent belongs to an urban area	
	Rural	=1 if respondent belongs to a rural area	
Married		Marital status of household head	
	Never Married	=0 if respondent never married	
	Married	=1 if respondent married	
FS		Total family size of households	
TSGC		Total school going children in a family	
TSGC2		Square of school going children in a family	
AIHH		Annual Income of households in hundreds	
Provinces			
	pro1	=1 if respondent belongs to Punjab Otherwise 0	
	pro2	=1 if respondent belongs to Sindh Otherwise 0	

	pro3	=1 if respondent belongs to KPK Otherwise 0	
	pro4	=1 if respondent belongs to Baluchistan Otherwise 0	pro4
Institution Type		Type of Children education institute	
	TCEI1	= 1 if respondent's children are Not going to School	TCEI1
	TCEI2	= 1 if respondent's children are going to government institutes Otherwise 0	
	TCEI3	= 1 if respondent's children are going to private institutes Otherwise 0	
	TCEI4	= 1 if respondent's children are going to both government and private institutes Otherwise 0	
Education			
	edu1	=1 if the household head education below primary Otherwise 0	edu1
	edu2	=1 if the household head education is primary Otherwise 0	
	edu3	=1 if the household head education is lower secondary Otherwise 0	
	edu4	=1 if the household head education is secondary Otherwise 0	
	edu5	=1 if the household head education is upper secondary Otherwise 0	

	edu6	=1 if the household head education is graduation (14 years of education)Otherwise 0	
	edu7	=1 if the household head education is master and above Otherwise 0	
LnHHEX		Natural logarithm of annually Household Expenditure on Education	

3.4 Methodology of Analysis

Tobit model is also called censored regression model. Censoring can be from below or from above, also called left and right censoring. The model is called Tobit because it was first introduced by Tobin (1958), and includes aspects of probit analysis a term coined by Goldberger for Tobin's Probit. The main reasoning behind it if we include the censored observations as dependent variable (y = 0), the censored observations on the left will pull down the end of the line, resulting in underestimates of the intercept and overestimates of the slope. If we exclude the censored observations (that is, truncating sample) and just use the observations for which dependent variable (y>0), it will overestimate the intercept and underestimate the slope. The degree of bias in both will increase as the number of observations that take on the value of zero increases.

The Tobit model uses all of the information, including information on censoring and provides consistent estimates. It is also a nonlinear model and similar to the probit model. It is estimated using maximum likelihood estimation techniques. The likelihood function for the Tobit model, is contains of two terms, the first for non-censored

observations, it is the probability distribution function (pdf) and the second for censored observations it is the cumulative distribution function (cdf). The estimated Tobit model coefficients are the marginal effects of a change in the explanatory variable on metric dependent variable (y*), the unobservable latent variable can be interpreted in the same way as in ordinary Linear Regression (OLS) model. But such an interpretation may not be useful since we are interested in the effect of the independent variable on the observable dependent variable (y) or change in the censored outcome (Long 1997).

In the social sciences it is common to estimate Tobit models like to censor regression. Tobit regression models have been used regularly by researchers in sociology, physiology and other behavioral sciences to estimate variables that take on values in the zero to one range (Bonke *et al* 2008). Tobit regression models also have been applied to examine variables that can get on only positive or zero values, such as time and money expenditures (Kim et al 2010). In economics, Tobit regression models have been applied extensively to estimate individuals' time expenditures, including parents' child care time (Floro and Miles 2003). Many researchers from across the social sciences and natural sciences are now seeing whether it is more appropriate to estimate censored regression (Tobit) models via Maximum Likelihood (ML), linear models using Ordinary Least Squares (OLS) model, to analyze the truncated or censored data set, because linear models ignore the censoring effect, OLS estimators are biased and inconsistent in this empirical analysis (Greene 1997).

3.4.1 Censoring and Truncation

In traditional OLS regression models, the data of all indicators are identified for the whole sample. But in many situations we face the problem in which the sample is limited due to censoring or truncation. The problem of censoring occurs when the data or information of explanatory variables for the whole sample is known, but in response variable we have only limited data or information. We may be known that the response variable is less than a certain point, but we have no idea how much less. Truncation limits the data more severely by excluding observations based on characteristics of the response variable. In a truncated sample all cases where the response variable is less than certain point would be deleted. While truncation changes the sample, censoring does not .If the response variable value is equal to or greater than the value of certain point, than response variable is censored from below or left censored. And if the response variable value is equal to or less than the value of certain point than response variable is censored from above or right-censored.

Censoring from below

$$y = \begin{bmatrix} y^* \text{ if } y^* > LL \\ 0 \quad \text{if } y^* \leq \text{LL} \end{bmatrix}$$

Where LL for lower limit

Censoring from above

$$y = \begin{bmatrix} y^* \text{ if } y^* < UL \\ 0 \quad \text{if } y^* \geq \text{UL} \end{bmatrix}$$

Where UL for upper limit

Truncation from below y = [y^* if $y^* > LL$] Where LL for lower limit

Truncation from above y = [y^* if $y^* < UL$] Where UL for upper limit

3.4.2 Tobit Model

We concentrate on the impact of independent variable, x, on the response variable, y. A Tobit model for the latent variable y^*.

$$y_i^* = \mathbf{X'_i\beta} + \varepsilon_i;\ \varepsilon_i \sim N(0, \sigma^2)$$

If $y_i^* > 0$ than $y_i = y_i^* = \mathbf{x'_i\beta} + \varepsilon_i$

If $y_i^* \leq 0$ than $y_i = 0$

$$P(y = 0 \mid x) = P(y^* \leq 0|x)$$

$$= P\left[\frac{(y^* - \mathbf{X\beta})}{\sigma} \leq \frac{0 - \mathbf{X\beta}}{\sigma}|x\right]$$

$$= P\left[Z \leq \frac{-\mathbf{X\beta}}{\sigma}|x\right]$$

$$= \Phi\left(-\frac{\mathbf{X_i\beta}}{\sigma}\right) = 1 - \Phi\left(\frac{\mathbf{X_i\beta}}{\sigma}\right)$$

and if $(y > 0\ |x)$

$$= P(y^* > 0|x)$$

$$= 1 - \Phi\left(\frac{-\mathbf{X\beta}}{\sigma}\right) = \Phi\left(\frac{\mathbf{X\beta}}{\sigma}\right)$$

The Tobit model is a combination of two models one is probit model and the other is truncated regression model. The probit model used for desecrate decision to see whether

or not y zero or positive and truncated regression for the continuous decision. We use in this study type 1 Tobit model.

$$E(y|y > 0) = \mathbf{X'\beta} + \sigma\lambda(\mathbf{X'\beta})$$

Where λ is called the inverse Mills ratio; it is the ratio between the standard normal p.d.f and standard normal c.d.f.

3.4.3 Tobit Model Estimation

In Tobit model we estimate the coefficient with the maximum likelihood estimation method.

$$y_i = \mathbf{X_i\beta} + \varepsilon_i \quad (1)$$

$$\varepsilon_i = y_i - \mathbf{X_i\beta}$$

We know that $y_i = y_i^*$ if $y_i^* > 0$

Likelihood function of equation (1) is

$$\ell_i = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left[-\frac{1}{2}\frac{(y_i - \mathbf{X_i\beta})^2}{\sigma^2}\right] \quad (2)$$

$$\ell_i = \frac{1}{\sigma}\frac{1}{\sqrt{2\pi}} \exp\left[-\frac{1}{2}\frac{(y_i - \mathbf{X_i\beta})^2}{\sigma^2}\right] \quad (3)$$

We know that

$$\frac{1}{\sqrt{2\pi}}\left[-\frac{1}{2}\frac{(y_i - \mathbf{X_i\beta})^2}{\sigma^2}\right] = \phi\frac{(y_i - \mathbf{X_i\beta})}{\sigma} \quad (4)$$

Putting equation (4) in equation (3) then we get.

$$= \frac{1}{\sigma}\,\phi\,\frac{(y_i - \mathbf{X_i\beta})}{\sigma}$$

And $y_i = 0$ if $y_i^* \leq 0$

The likelihood influence is the probability that if $y_i^* \leq 0$

$$\ell_i = P(y_i^* \leq 0)$$

$$= P(\mathbf{X_i\beta} + \varepsilon_i \leq 0)$$

$$= P(\varepsilon_i \leq -\mathbf{X_i\beta}) = P\left(\frac{\varepsilon_i}{\sigma} \leq \frac{\mathbf{X_i\beta}}{\sigma}\right)$$

$$= \Phi\left(-\frac{\mathbf{X_i\beta}}{\sigma}\right) = 1 - \Phi\left(\frac{\mathbf{X_i\beta}}{\sigma}\right) \qquad (5)$$

Let we have

$$\ell_i = \frac{1}{\sigma}\,\phi\,\frac{(y_i - \mathbf{X_i\beta})}{\sigma} \text{ if } y_i^* > 0$$

$$= 1 - \Phi\left(\frac{\mathbf{X_i\beta}}{\sigma}\right) \text{ if } y_i^* \leq 0 \qquad (6)$$

Now we have one pdf (for the observed portion of the distribution) and one CDF (for the truncated portion of the distribution) a linear portion and a probit portion. Let we take a dummy variable say D_i and dummy variable takes the value 1 if $y_i > 0$ and 0 otherwise. We can write the above likelihood function as.

$$\ell_i = \left[\frac{1}{\sigma}\,\phi\,\frac{(y_i - \mathbf{X_i\beta})}{\sigma}\right]^{D_i}\left[1 - \Phi\left(\frac{\mathbf{X_i\beta}}{\sigma}\right)\right]^{1-D_i} \qquad (7)$$

For the entire sample size the likelihood function, L is

$$L(\beta_i, \sigma) = \prod_{i=1}^{n} L_i = \prod_{i=1}^{n} \left[\frac{1}{\sigma}\phi\frac{(y_i - X_i\beta)}{\sigma}\right]^{D_i}\left[1 - \Phi\left(\frac{X_i\beta}{\sigma}\right)\right]^{1-D_i} \quad (8)$$

We normally worked with the ln (L)

$$\ln L(\beta_i, \sigma) = \sum_{i=1}^{n} D_i \ln \frac{1}{\sqrt{2\pi}}\left[-\frac{1}{2}\frac{(y_i - X_i\beta)^2}{\sigma}\right] + \sum_{i=1}^{n}(1 - D_i)\ln\left[1 - \Phi\left(\frac{X_i\beta}{\sigma}\right)\right] \quad (9)$$

After replacing

$$\frac{1}{\sqrt{2\pi}}\left[-\frac{1}{2}\frac{(y_i - X_i\beta)^2}{\sigma^2}\right] = \phi\frac{(y_i - X_i\beta)}{\sigma} \quad (10)$$

Putting the value of equation (10) in equation (9) then we get.

$$= \frac{N}{2}[(\sigma^2) + \ln(2\pi)]\sum_{i=1}^{n} D_i\left[-\frac{(y_i - X_i\beta)^2}{2\sigma^2} + (1 - D_i)\ln\left[1 - \Phi\left(\frac{X_i\beta}{\sigma}\right)\right]\right]$$

Now taking first derivation with respect to parameter and equating to zero, we get the value of unknown parameter.

3.4.4 Marginal Effects in the Tobit Model

The estimated parameters β_j measure the effect of X_j on y^*. But in censoring or truncated problem, we are concerned in the impact of X_j on actual y. Measures the effect of a X_k change on y β_k overstates the marginal impact of a change in X_k.The marginal effect is the effect on the conditional mean of the response variable of changes in the independent variables. This effect changes according to whether attention lies in the latent variable mean $X'\beta$ or the truncated or censored means.

Differentiating each with respect to x yields

Left censored (at 0)

$$\frac{\partial E(y|x)}{\partial X_k} = \beta_k \Phi\left(\frac{\mathbf{X'\beta}}{\sigma}\right)$$

Latent variable

$$\frac{\partial E(y^*|x)}{\partial X_k} = \beta_k$$

The modest expression for the censored mean is attained after some operation. It can be decomposed into two effects, one for y = 0 and one for y > 0 In some situation truncation and censoring are just an object of data collection, so the truncated and censored means are of no basic interest and we are interested in $\partial E(y^*|x)/\partial X_k = \beta_k$.

3.4.5 Hurdle Model

The validity of the tobit model of household educational expenditure depends on whether its two key assumptions hold: normality and homoskedasticity. If these assumptions do not hold, then the tobit model makes nonsensical predictions.

A better alternative is the hurdle model (sometimes referred to as the two-part model).Unlike the tobit model, the hurdle model does not require the assumptions of homoskedasticity and normality for consistency. The hurdle model of household educational expenditure has two parts (Kingdon, 2005). The first part is a binary outcome equation that models the Pr (*edu. expenditure*>0) using a probit model; *edu. expenditure*=0 implies that educational expenditure on child is zero and that the child is not enrolled in school. In contrast, *edu .expenditure*>1 implies that educational

expenditure on child is greater than zero and that the child is enrolled in school. The second part of the hurdle model involves linear regression to model E(ln*edu. expenditure*| *edu. expenditure*>0), which is regressing educational expenditure conditional on positive educational expenditure. The two parts are assumed to be independent and estimated separately. It is further assumed in this study that the same set of explanatory variables affect both parts. Since the distribution of educational expenditure is non-normal, and the dependent variable for the tobit model and second part of the hurdle model is the natural log of educational expenditure on child.

3.5 Summary

In this chapter we have only discussed the imported set of models that deal with censoring and truncation. In both of these models, the basic problem is the similar. Due to some data collection instrument, data are missing on some of the observations in a systematic way. As a consequence the linear regression model provides biased and inconsistent estimates. We make the derivation of Tobit model and discussed about the partial effect of coefficients. If normality and homoskedasticity not exist in the data, a better alternative model is the hurdle model.

CHAPTER 4

RESULTS AND DISCUSIONS

4.1 Introduction

In present chapter, the estimated results of the empirical analysis of the key factors that affecting HHEE on their children at different categories of institutes like not going to school, government, private and both governments & private will be presented. We also estimate the HHEE at provincial level.

The statistical methods used are Tobit regression and Hurdle model. In this chapter our estimated results show descriptive statistics like mean, Standard deviation, minimum value and maximum values of all explanatory variables and response variable. We also use the bar graphs for the categorical variables province, maximum education of household head and type of children's education institute separately for showing the relationship between response and explanatory variables. Histograms with normal curve are also created for continuous variables complete age of household head in years, total family size of households, the annual income of households and total number of school going children in households with their frequency.

The Tobit regression model coefficients and marginal effect of coefficients also estimated. The Hurdle model contains two parts. In first part we calculate Probability of Positive expenditure and in second part linear regression conditional on positive educational expenditure

We can also test for an overall effect of the province, maximum education of household head and type of children's education institute separately. Because our fitted model provides information about the significant effect on the response variable only for base category, however, for estimating the other categories impact on HHEE we used Wald test. We can also test extra hypotheses about the differences in the coefficients for different levels of the categorical variables province, type of children education institute and maximum education of household head we used Wald test statistics. We used STATA 14 for data analysis purpose.

4.2 Descriptive Analysis

4.2.1 Province Vise Variations in Household Expenditures on Education

In table 4.1 and figure 4.1 shows the distribution of four provinces with annual household expenditures on education. The results indicate that Punjab annually household's expenditures on education are higher than all other provinces with mean annual household expenditures on education are 10451.57 rupees. The results show that Balochistan annual household expenditures on education are lower than all other provinces with mean annual household expenditures on education is 3964.026 rupees. The results also indicate that KPK annual household expenditures on education are 9294.5467 rupees. The results show that Sindh annual household expenditures on education are 5462.5395 rupees.

4.2.2 HHEE in Various Types of Institutes

In table 4.2 and figure 4.2 indicates the distribution of household education expenditures with regard to the type of child education institute. In this study, we make four different categories not going to school, government, private and both governments & private. The average annual household expenditures on education are 709.71344 rupees for not going to school category with Standard deviation 4978.306 rupees and 2,352 households belongs from this category which is lower than all other categories.

The results indicate that average annual household expenditures on education are 5592.1359 rupees for the government institute category with Standard deviation 9474.075 rupees and 3,476 households belong from this category. The results show that average annual household expenditures on education are 17316.199 rupees for private institute category with Standard deviation 18537.05 rupees and 1,573 households belong from this category. The average annual household expenditures on education are 20121.669 rupees for both governments& private category with Standard deviation 20051.31 rupees and 976 households belong from this category which is higher than all other categories.

Table 4.1: HHEE, by Province

Province of Household	Mean (HHEE) (Rs.)	SD (HHEE) (Rs.)	N (HHEE)
Punjab	10429.45	16731.24	3,708
Sindh	5462.53	10839.84	2,339
KPK	9269.27	14786.59	1,294
Balochistan	3964.02	7822.23	1,001
Total	8081.00	14324.95	8,342

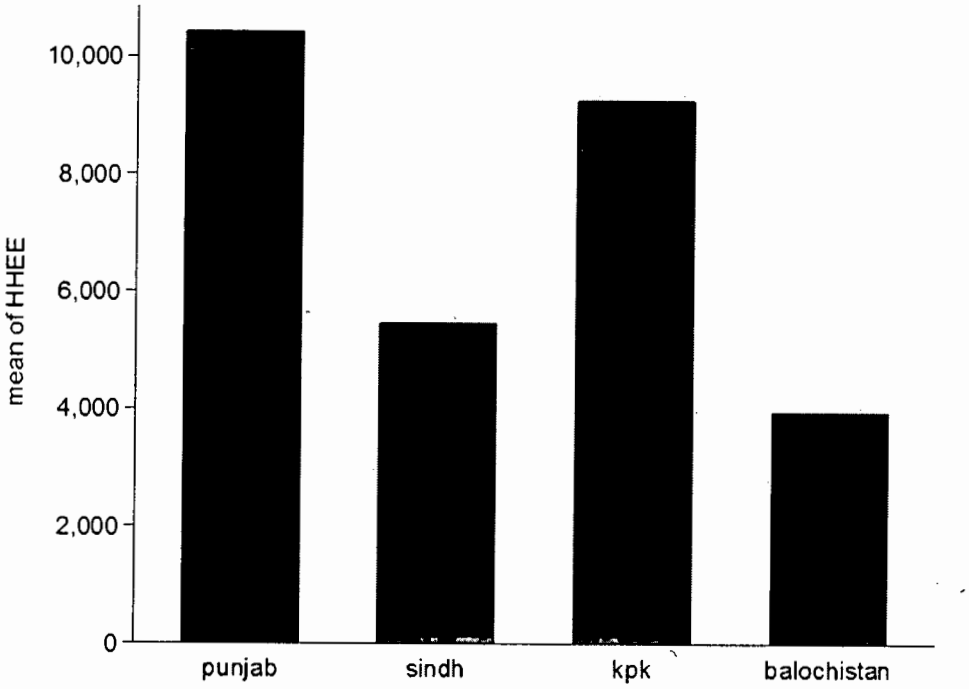
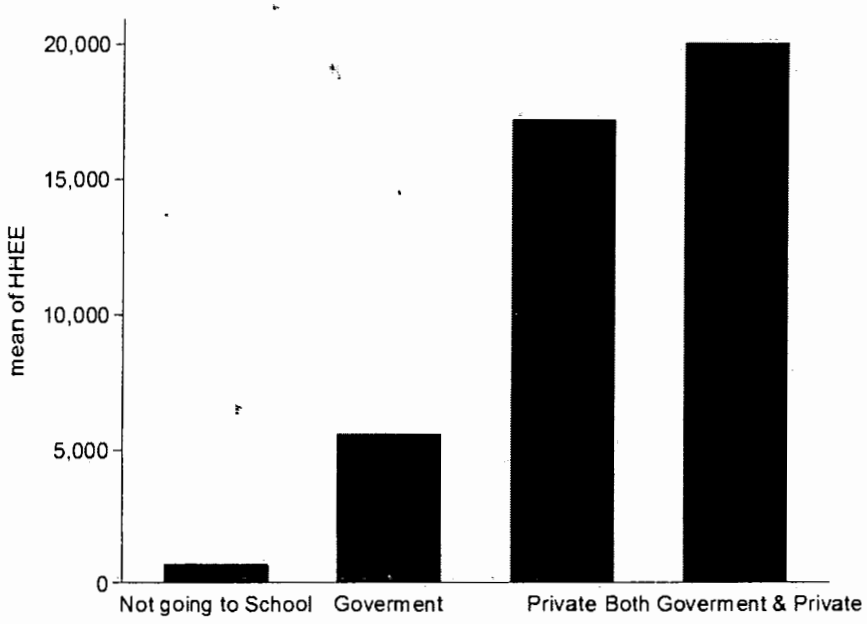


Figure 4.1HHEE, by Province

Table 4.2: HHEE in Various Types of Institutes

Type of Children, Education Institute	Mean (HHEE)	N (HHEE)
Not going to School	692.73138	2,349
Government	5592.1359	3,467
Private	17267.509	1,551
Both Governments & Private	20117.589	975
Total	8081.0018	8,342

Figure 4.2 HHEE in Various Types of Institutes



family size of households shown and the shape of the distribution is positive skewed more than 90% family have 10 or less than 10 sizes of their families. The 6 person, family size, frequency is 1392 which is larger than other family size frequencies as shown in figure 4.4 (A).

Table 4.3: HHEE, by Level of the Household head Education

Household head Education	Mean (HHEE)	N (HHEE)
Below Primary	3744.5669	598
Primary	4381.9194	1,725
Lower Secondary	5882.3425	1,556
Secondary	8537.524	2,269
Upper Secondary	11021.378	916
Graduation (14 years)	13715.128	689
Master and Above	16203.367	589
Total	8081.0018	8,342

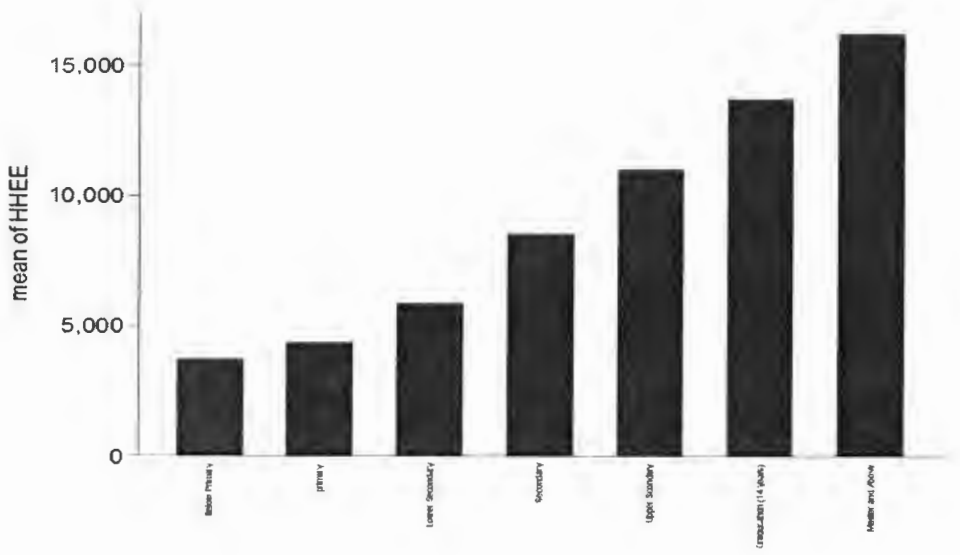


Figure 4.3 HHEE, by Level of the Household head Education

Table 4.4: Age Family Size School Going Children and Annual Income of Household

Variable	Mean	Minimum	Maximum
Age of House Hold Head	44.22968	16	95
Total Family size of House Holds	6.693719	1	31
Total number of school going children in House Hold	1.899544	0	13
Annually Income of House Holds	209015.5	0	2064000

4.2.5 Total Annual Household Income

The total annual household income analysis results indicated in table 4.4 the results indicate that roughly 50% of the entire number of the families received a lower rate of earnings, less than or equal to 162000 rupees per year. The number of the families with higher total earnings was not so great. When considering the average total yearly earnings of the families it is estimated that the households to earn a total yearly income is 209015.5 rupees per year with a Standard deviation 179349.6.In figure 4.4 (B) the distribution of total annual income of households with a normal curve shown and the shape of the distribution is positively skewed.

4.2.6 Age of Household Head in Years

An estimation of the complete age of household head in years in the families shown in table 4.4 the estimated results indicates that the average complete age of household head in years is 44.22968 years with a Standard deviation 12.47613 years. Most household heads were between the ages of 31 and 60 years. It can be measured that the approximately 50% of the total number of the households age is less than or equal to 43. Maximum complete age of household head in years is 95 years and minimum complete age of household head in years is 16 years. In figure 4.5 (A) the distribution of the total complete age of household head in years with a normal curve shown and the shape of the distribution is positively skewed. In our sample data set 28.16% household has no school going children.

4.2.7 Number of School Going Children

The estimated results of school going children are shown in table 4.4 the results indicates that more than 71% of all households had children attending school. The number of households with four or less than four children attending school are approximately 92%. The number of households with two or less than two school going children's is approximately one third of the entire number of the household.

The average number of school going children is 1.899544 with a Standard deviation 1.733255. Maximum number of school going children is 13 and the minimum number of school going children zero. In figure 4.5 (B) the distribution of the number of school going children with a normal curve shown and the shape of the distribution is positively skewed.

4.2.8 HHEE, by Region of the Household

In table 4.5 shows the distribution of region with annual household expenditures on education. The results indicate that 4,134 households belong to urban region and 4,208 households belong to rural regions. The results in table 4.5 show that the urban region's households spend on the average 11315.18 rupees on their children's education with a Standard deviation 17102.371 rupees. On the other hand, households belongs to the rural region spends on the average 4903.6987 rupees on their children's education with a Standard deviation 9956.1967 rupees. Urban region households sped more income on their children's education as compared to rural regions.

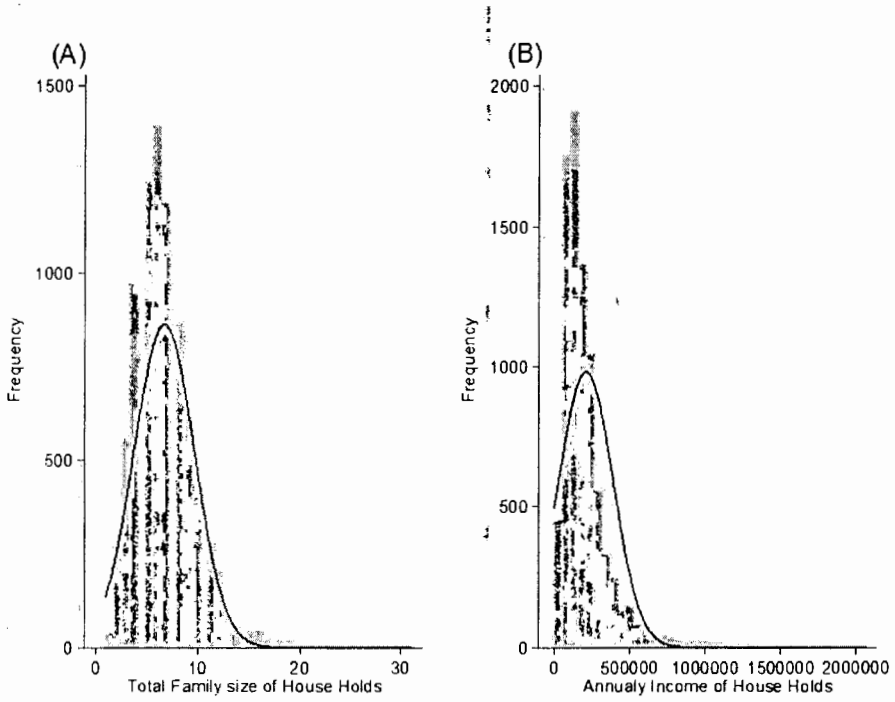


Figure 4.4 (A) Family Size and (B) Annual Income of Households

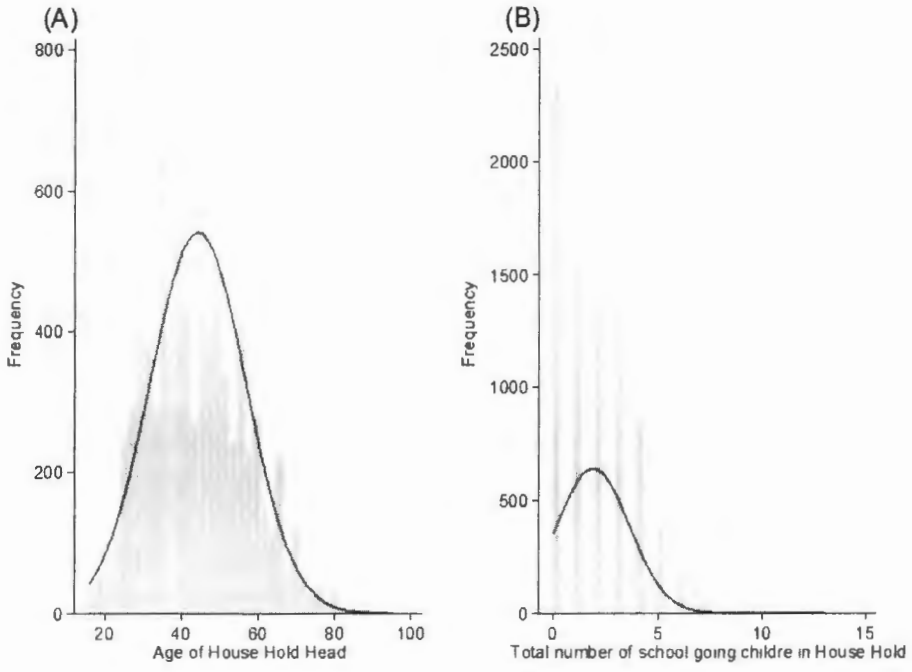


Figure 4.5 (A) Age and (B) Number of School Going Children in Households

Table 4.5: HHEE, by Region of the Household

Region of Household	mean(HHEE)	N(HHEE)
Urban	11315.18	4,134
Rural	4903.6987	4,208
Total	8081.0018	8,342

Table 4.6: HHEE, by Gender of the Household

Gender of Household head	mean(HHEE)	N(HHEE)
Male	8044.5803	8,177
Female	9885.9636	165
Total	8081.0018	8,342

Table 4.7: HHEE, by Marital Status of the Household

Marital Status of Household head	mean(HHEE)	N(HHEE)
Never Married	4088.6008	243
Married	8200.7886	8,099
Total	8081.0018	8,342

4.2.9 HHEE, by Gender of the Household

In table 4.6 shows the distribution of gender with annual household expenditures on education. The results indicate that 8,177 household head belongs to male category and 165 household head belong to female category. The estimated results in table 4.6

indicate that the household head belongs to the male category spends on the average 8044.5803 rupees on their children's education with a Standard deviation 14314.614 rupees. On the other hand household head belong to the female category spends on the average 9885.963 rupees on their children's education with a Standard deviation 14760.794 rupees. Female household head spends more than the male household head.

4.2.10 HHEE, by Marital Status of the Household

In table 4.7 shows the distribution of household's marital status with annual household expenditures on education. The results indicate that married household's head are 8,099 and never married household's head are 243. The results in table 4.7 show that the married household's heads spends on the average 8200.7886 rupees on their children's education with a Standard deviation 14425.935 rupees. On the other hand never married household's heads spends on the average 4088.6008 rupees on their children's education with a Standard deviation 9613.4901 rupees. Married households head on average spend more expenditure on children's education as compared to never married household heads.

4.2.11 Annual House Holds Expenditures on Education

In this section, the analysis results of annual household expenditures on education are presented. In table 4.8 the results of annual household expenditures on education indicate that 8,342 households with the average spend 8081.002 rupees annually on their children's education with a Standard deviation 14324.96. It can be measured that the approximately 50% of the households spend 2800 rupees on their children education. The value of skewness is 3.240084 and mean value also greater than median indicate a

positive symmetry, kurtosis value also is 15.28817 indicates that the distribution of annual household expenditures on education is not symmetric.

Table 4.8: Annually House Holds Expenditures on Education

Variable	Observation	Mean	Standard Deviation	Median
HHEE	8,342	8081.002	14324.96	2800
Variable	**Maximum**	**Minimum**	**Skewness**	**Kurtosis**
HHEE	100000	0	3.240084	15.28817

4.2.12 Annual Households Expenditures on Education for Positive Values

The results of annual household expenditures on education only for positive values (ignoring zeros) indicates that 6,188 households with the average spend 10893.94 rupees annually on their children's education with a Standard deviation 15684.3 rupees. It can be measured that the approximately 50% of the households consume on their children's education 5000 rupees. The value of skewness is 2.831801 and mean value also greater than median indicate a positive symmetry. But these estimates are not a good representative of Population because these do not utilize all information about a data set.

4.3 Econometric analysis

In general, the descriptive analysis of the preceding section indicates some significant structures involving the level of expenditure on education to family characteristics.

The econometric analysis in this section becomes a step beyond and tries to estimate the overall and marginal effects of the determinants of HHEE. The sample contains of households with children at all education levels (pre-primary, primary, secondary and higher education level) for the years 2010-11.

The final log likelihood (-14621.379) of the tobit model is shown in the table 4.9 (A). Log likelihood used in the Likelihood Ratio Chi-square test of whether all independent variable coefficients in the model are significantly better. The Likelihood Ratio (LR) test of the fitted model is (13323.58) with a p-value of 0.000. It indicates that number of explanatory variables in the model is significantly better. The value Pseudo R-square (0.3130) indicates that the overall tobit model is not well fitted.

The total number of observations in the dataset is 8,342 for which all of the explanatory variables and dependent variable information are available. The total numbers of uncensored observations are 6,188 and censored observations are 2,154. Here, we see that none of the observation is right censored because we have only used left side censoring; the total numbers of left censored observations are 2,154 at zero. The model is estimated in three ways, i.e. OLS, tobit model and two- part hurdle model. Then, performance of the three estimated models is compared. In this study the data is censoring below, so obviously OLS regression is not suitable, we just use it for

comparisons. Tobit Model is used for censored data. Here tobit model is estimated and the results of OLS and tobit model are presented in table 4.9.

In the third step, LM test is applied to test suitability of tobit model while constructing the following hypothesis

Ho: - Tobit model is perfect model for given data.

H1:- Tobit model is not is perfect model for given data.

Bootstrap critical values

lm	%10	%5	%1
5521.3	2.72158	3.9624829	6.3877892

Hence 1%, 5%, and 10% values less than lm value it mean Ho reject so tobit model is not perfect model for this data. This problem come when data is not normal or not homoskedastic. The alternative best model is the two-part hurdle model. Estimated results of hurdle model are presented in table 4.10 (B). In the first part of hurdle model, the probit model shows in table 4.10 (A) the value of Likelihood Ratio (LR) test of the fitted model is (6635.67) with a p-value of 0.000. It indicates that number of explanatory variables in the model is significantly better. The value Pseudo R-square (0.6963) indicates that the model is well fitted.

In table 4.9 (B) the coefficients of age and age-square have significant p-values, the sign of age coefficient is positive and the sign of age - square coefficient is negative. These results indicate that age has a diminishing effect on dependent variable. According to tobit marginal coefficients, if one year increases in age of the household head, it will

cause to increases 0.07% education expenditure of the household, holding all other variables constant. The 1st year of age (1^{st} year of age is starting from 16 to 17). It can also important to measure where the turning point (or maximum of the function) is. In our estimated model the maximum age* is [.0697)/ (2*0.00049)] $\approx$ 70.52 years. Both marginal estimated coefficients also provide approximately same results, but the marginal effect of sample has little magnitude as compared to other resorts (Wooldridge 2013).According to hurdle model if age of household head increases one year then the probability that HHEE will be positive increases by 0.0038. Second part of hurdle model shows that one year increase in age causes 0.0524% increases in HHEE given that HHEE are positive. Hurdle model shows that age square is insignificant.

Coefficient's estimate of gender is significant which shows that female household is more likely to do education expenditure as compare to male household. Marginal effects show that education expenditure increases by 0.9844% in case of female household as compare to male household. In hurdle model if household family head is female, the probability to enroll the child in school increases 0.106 as compare to male household. Then the education expenditure will be 0.406% Rs. more as compare to male household head on average.

In tobit model the coefficient region estimate has a significant impact on HHEE. The marginal effect of region shows that the household head belongs from rural areas spends less 0.424 percent on HHEE as compare to urban areas head, holding all other variables constant. In hurdle model if household head belongs to rural areas, the probability of positive educational expenditure decreases by 0.0313. Moreover, education expenditure of a household belonging to rural areas decreases by 0.292% as compare to

the household of urban areas. In tobit model the coefficient estimate of marital status has significant impact on HHEE with a p-value 0.018. The marginal effect of never married household's head shows that they spend less 38.7 percent on HHEE as compare to married household.

The coefficient estimate of total family size in tobit model has significant effect on education expenditure but negative sign shows that increase in family size decrease in HHEE. The marginal effect of the total family size of the household shows that if the family size increase by one unit then household's expenditure on education decrease by 0.018 percent. In hurdle model the household head marital status and family size have insignificant effect on household education expenditure.

The first part of hurdle model shows that married household head having probability 0.00102 more to spend on education as compare to never marry. The second part of hurdle model indicate that married household head educational expenditure decreases by 0.6435% as compare to never married household. In hurdle model if family size of a household increases, then probability of positive educational expenditure increases by 0.0000146. Moreover the unit change in family size education expenditure of a household head increases by 0.0002%.

Number of observations	8,342	**Left censored observations at lnHHEE <= 0**	2,154
LR chi2(21)	13323.58	**Uncensored observations**	6,188
P-value of chi^2	0.0000	**Right censored observations**	0
Pseudo R^2	0.3130	**Log likelihood**	-14621.379

Table: 4.9(A) Tobit Model Coefficients

Variable	**OLS with a Censored Data (Estimates with p-values)**	**Tobit Analysis (estimates with p-values)**	**Tobit Analysis (Marginal effect about mean)**
Age	0.0463 (0.000)	0.0697 (0.000)	0.06778
Age2	-0.0003 (0.001)	-0.0005 (0.000)	-0.00048
Gender	0.7513 (0.000)	1.0126 (0.000)	0.9844
Region	-0.3397 (0.000)	-0.4368 (0.000)	-0.4246
Married	-0.2428 (0.038)	-0.3987 (0.018)	-0.3875
FS	-0.0190 (0.021)	-0.0192 (0.079)	-0.0187
TSGC	0.5604 (0.000)	0.5749 (0.000)	0.5589

TSGC2	-0.0403 (0.000)	-0.0428 (0.000)	-0.0415
AIHH	0.0002 (0.000)	0.0002 (0.000)	0.000184
pro1	0.7591 (0.000)	0.9596 (0.000)	0.9328
pro2	0.3025 (0.000)	0.3826 (0.000)	0.3719
pro3	0.6842 (0.000)	0.8936 (0.000)	0.8687
TCEI2	5.7953 (0.000)	7.6463 (0.000)	7.4331
TCEI3	6.9265 (0.000)	8.6863 (0.000)	8.444
TCEI4	6.7168 (0.000)	8.4639 (0.000)	8.2278
edu2	0.1648 (0.042)	0.2409 (0.031)	0.2342
edu3	0.2630 (0.001)	0.4029 (0.000)	0.3916
edu4	0.3956 (0.000)	0.5779 (0.000)	0.5618
edu5	0.6607 (0.000)	0.9220 (0.000)	0.8963
edu6	0.5565 (0.000)	0.7759 (0.000)	0.7542

edu7	0.7475 (0.000)	1.0298 (0.000)	1.001
Constant	-1.2908	-3.9705	-3.9705

Table 4.9 (B) OLS AND TOBIT MODEL COEFFICIENTS

The tobit model coefficient estimated results shows that the total number of school going children (TSGC) and TSGC-square have significant effect on HHEE. The coefficient sign of TSGC is positive and the coefficient sign of the TSGC-square is negative. These results indicate that TSGC has quadratic effect. The Tobit model marginal effect shows that TSGC has an increasing effect on household education expenditure i.e. the unit change in TSGC is approximately increasing 0.558% HHEE. In hurdle model if total school going children increase then the probability that a household head having educational expenditure increase by 0.057. The unit change in total school going children causes 0.439% change in household education expenditure.

Number of observations	8,342	**Left censored observations at lnHHEE <= 0**	2,154
LR chi2(21)	6635.67	**Uncensored observations**	6,188
P-value of chi^2	0.0000	**Right censored observations**	0
Pseudo R^2	0.6963	**Log likelihood**	-1446.9295

Table: 4.10(A) Probit Model Coefficients

TABLE 4.10(B) HURDLE MODEL (TWO PART MODEL)

Variable	***Hurdle Model***		
	PART 1		***PART 2***
	Estimates of probit model with p-values	***Marginal effects of probit model***	***Linear regression condition on positive education expenditure***
Age	*0.0217431* *(0.071)*	*0.0038168*	*0.0524* *(0.000)*
Age2	*-0.0001523* *(0.224)*	*-0.0000267*	*-0.0004* *(0.000)*
Gender	*0.6054294* *(0.000)*	*0.1062768*	*0.4062* *(0.000)*
Region	*-0.1788637* *(0.001)*	*-0.0313976*	*-0.2926* *(0.000)*
Married	*0.0058377* *(0.964)*	*0.0010247*	*-0.6435* *(0.000)*
FS	*0.0039711* *(0.726)*	*0.0006971*	*-0.0288* *(0.000)*
TSGC	*0.3240882* *(0.000)*	*0.0568903*	*0.4390* *(0.000)*
TSGC2	*-0.0295817* *(0.007)*	*-0.0051928*	*-0.0278* *(0.000)*
AIHH	*0.000083* *(0.000)*	*0.0000146*	*0.0002* *(0.000)*

pro1	*0.5179379*	*.0909186*	*0.5698*
	(0.000)		*(0.000)*
pro2	*0.2929131*	*0.0514178*	*0.1265*
	(0.000)		*(0.007)*
pro3	*0.7298187*	*0.128112*	*0.3329*
	(0.000)		*(0.000)*
TCEI2	*2.551927*	*0.4479641*	*1.4266*
	(0.000)		*(0.000)*
TCEI3	*2.995956*	*0.5259087*	*2.4253*
	(0.000)		*(0.000)*
TCEI4	*2.614842*	*0.4590082*	*2.3080*
	(0.000)		*(0.000)*
edu2	*0.1875366*	*0.0326041*	*0.0745*
	(0.073)		*(0.225)*
edu3	*0.282683*	*0.049622*	*0.1169*
	(0.008)		*(0.058)*
edu4	*0.28453*	*0.0499467*	*0.3088*
	(0.006)		*(0.000)*
edu5	*0.53725*	*0.0943088*	*0.4636*
	(0.000)		*(0.000)*
edu6	*0.38964*	*0.0683981*	*0.4327*
	(0.004)		*(0.000)*
edu7	*0.671125*	*0.117809*	*0.4680*
	(0.000)		*(0.000)*
Constant	*-2.9946*	*-2.994576*	*4.8353*
	(0.000)		*(18.408)*

In the tobit model the estimated coefficient of annual income of household head has significant positive effect on education expenditure. The marginal effect shows that if household total annual income increased by one unit (hundred rupees) then it causes to increase the household educational expenditure by 0.000184 percent. According to hurdle model the unit changes in annual income of the household head increases the probability of HHEE by 0.00146. The second part of hurdle model shows that due to unit (hundred rupees) increase in annual income of the household head causes to increases 0.02% educational expenditure per child.

The coefficient estimated results of Tobit model of the provinces have significant effect on HHEE. The marginal effects of household head belonging to Punjab spend 0.932 percent on education more than that household who's belonging to Baluchistan (base line). The marginal effects of households belong to KPK spend 0.868 percent more on education than those households whose belong to Baluchistan with a p-value 0.000. The marginal effect shows that households belong to Sindh spend 0.371 percent more on education than those households whose belong to Baluchistan with a p-value 0.000.According to hurdle model if the household family head belongs to province Punjab, then the probability of HHEE increases 0.09 as compare to Baluchistan. The second part of model shows that the household family head belongs to province Punjab spends 0.56% more on education as compare to Baluchistan per child. If the household family head belongs to Sindh, the probability to spend on education increasing by 0.05 as compare to Baluchistan (base line). Moreover the household family head belongs to Sindh spends 0.12% more on education as compare to Baluchistan. If the household family head belongs to KPK, then it will spend 12% more on HHEE as compare to

Baluchistan. The second part of model shows that household family head belongs to KPK spends 0. 3329 % more on education per child as compare to Baluchistan.

The coefficient estimate of Tobit model shows that the type of child institute has a significant effect on HHEE. The marginal effects of household's head that send their children in government institutes expected to spend 7.43 percent more on education than those households who do not send their children in schools. The marginal effects on households head that send their children in private institutes causes to spend 8.44 percent more on education than those households who have no school going children. The marginal effects of household's head that send their children in both private and government institutes expected to spend 8.22 percent more on education than those households who have no school going children. In above discussion it shows that the households who send their children in private institutes spend more on education than all other categories. The coefficients of hurdle model also show that households' head who admit their children in government school, private school or both have significant effect on HHEE. The coefficient of modeling effects of household head shows that the probability of education expenditure to admit child in Government school is 0.4479. Hence the unit change in child to enroll in Government school causes to increase 1.4466% education expenditure of household. In hurdle model if household family head enroll his child in private school, then probability of education expenditure is 0.05259. Second part of hurdle model shows that due to admission of child in private school causes 2.435% HHEE. If household head admit his children in both Government and private sectors, then the probability to positive increase is 0.459. In second part of hurdle

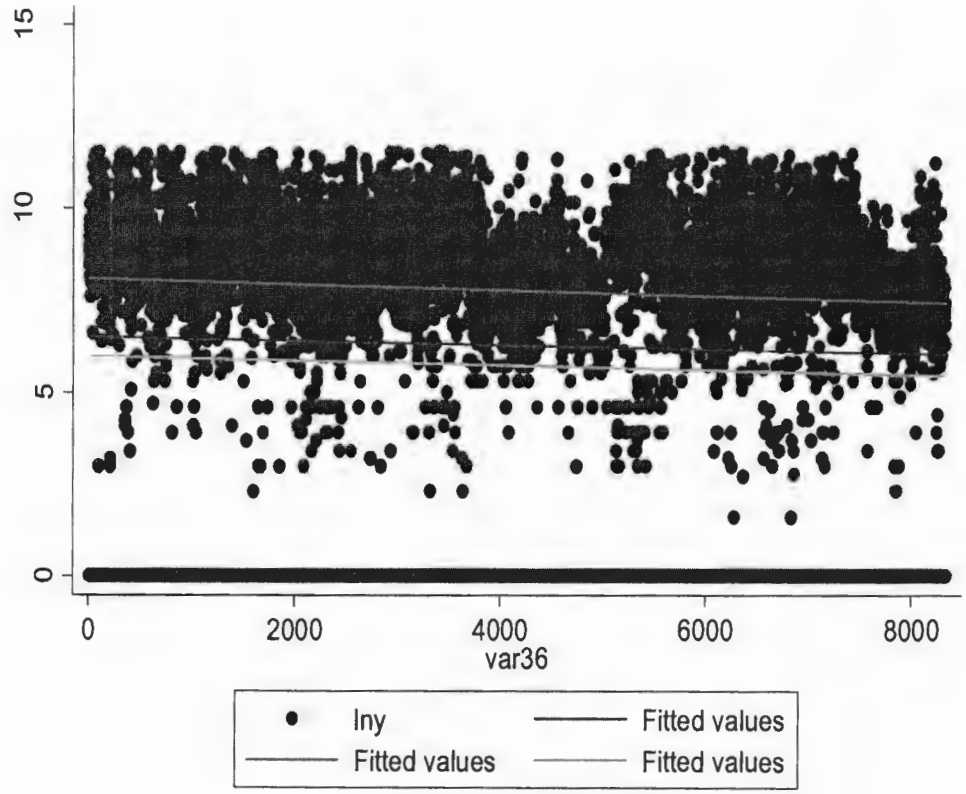
model shows that due to admission of children in Government and private school increase the 2.308% of the HHEE.

According to tobit model coefficients the levels of education of a household head have significant impact on household expenditure on education. Household heads who received education at the primary has found to spend about 0.234 percent more than those who get education below than primary. Household heads who received education at the Lower Secondary expected to spend about 0.391 percent more than those who get education below than primary level. Household heads who received education at the secondary causes to spend about 0.561 percent more than those who get below than primary level education? Household heads who received education at the upper secondary level has found to spend about 0.896 percent more than those who get education below than primary level. Household heads who received education at the graduation (14 years) expected to spend about 0.754 percent more than those who get below than primary level education with a p-value 0.000. Household heads who received education at the graduation master and above has found to spend about 1.001 percent more than those who get education below than primary level. According to hurdle model if education of household head is primary than there will be chance to spend 0.032 more on education than a below primary household head. The second part of hurdle model shows that if education of household head is primary than there will be 0.0745% more HHEE than a below primary household head. If education of household head is lower secondary, there will be 0.049 more probability to spend on education than a below primary household head (base line). Moreover the education of household head is lower secondary there will be 0. 116 % more education expenditure on average as compare to

base line .If education of household head is secondary, there will be 4.99% more chance to spend on education than a below primary household. The second part of hurdle model also shows that there will be 0.308 % more education expenditure on average in the same above situation. If education of household head is upper secondary, there will be 9.4% more chance than a below primary household head to enrolled a child is in school. Then there will be 0.463 % more education expenditure on average by unit change. If education of household head is graduation, there will be 0.068 more probability to spend on education as compare to below primary household head and there will be 0.432 % Rs. more education expenditure on average. If education of household head is master and above, there will be 0.117 more probability than a below primary household head to spend on children education and there will be 0.468 % more education expenditure on average. The Hurdle model shows that educated parents improve the likelihood of enrollment and expenditure.

The regression models provide information about the significance for base category only if the explanatory variables are categorical. The estimated results of categorical variables indicate the overall effect of a province other than base category also has a positive and significant effect on the response variable. The overall effect household head level of education has a highly significant impact on the response variable with. Type of children education institute also influences the response variable positively.

Graphically representation of simple OLS, TOBIT MODEL and HURDLE MODEL.



---------- OLS MODEL

In above graph green line shows hurdle model, red line shows OLS model and orange line shows tobit model. The hurdle model line is the best representative line of the spread data.

The number of family's household along x-axis and the expected household education expenditure (in ln) along y-axis.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Empirical research on HHEE in Pakistan is very inadequate and research work on the key factors that affect of family expenditure is almost nonexistent. In this chapter precise the results of the study and clarifies how they could be used by the government of Pakistan to make changes in the development of Pakistan education related to budget distributions made by the government. Household policies are being formulated based on this empirical study. It also gives recommendation for further research.

The present study of household expenditures on children's education is mainly focused on analyzing the general features of households which have expenditure on education disregarding of the educational level or the gender. Moreover, the present research tries to comprehend factors that affect household expenditures on education by utilizing the secondary sources of data attained from Pakistan Bureau of Statistics (PBS) about Household Integrated Economic Survey (HIES) for the period of (2010-11)

There are three different groups of key factors, based on the related literature review, that assume about the effect of a household expenditures on education. The first group mentions the characteristics of the household head containing sex, age, marital status and educational level. The second group denotes to the factors concerning to the households' characteristics, total size of household, total annual income of household, type of child education institute and the number of the child attending school. The third

and last group mentions the factors concerning the social context which might have an effect on total expenditures. They include region and province.

Data analysis was done through descriptive statistics, for example standard deviation (S.D.), mean, percentage, and frequency, in order to describe the features of the data set. Furthermore, Tobit regression model and hurdle model were applied to assess the magnitude of the factors that affecting the household expenditures on education.

5.2 Summary

In present study the key findings are distributed into two portions results of the overall features of the households, and the findings from empirical analyzing the indicators that affecting the household expenses on education.

5.2.1 The findings of the Overall Characteristics of Households

A data set of 8,342 households of the Pakistan, whose annual expenditure on education were given in Household Integrated Economic Survey (HIES) is used in this study. Expenditure on education and several other variables are included in this study whose effects are being estimated on the HHEE.

This study results indicated that the overall characteristics of household's head, it was measured that over 98% of the households were those with a male household head. The female household head ratio was very low only 2% of the households were those with a female household head. In our data set approximately 50.4% households belong to

rural areas and 49.6% households belong to an urban area. The households belong to Punjab was approximately 44.45%, Sindh 28.04%, KPK 15.51 and Baluchistan 12%.

The average household head age was 44.23 years with Standard deviation 12.48 years and 90% household head age less than or equal 61 years. The estimated results showed that more than 50 % households head education was less than or equal to secondary level. In respect to the features of the families with children going to school, it was analyze that in most of these families the household head was wedded. The average number of school going children in each household was approximately 2 children and 95% households have less than or equal to 5 school going children.

There were on the average approximately 6.7 members in each household and 90% household has less than or equal to 10 members in a household. The average annual income of households was approximately 209015.5 rupees with a Standard deviation 179349.6 and 90% households annually income was less than or equal 396000 rupees. More than 42% households send their children in a government institutes, approximately 18% households send their children in a private type of institute and only 11% households send their children in both private and government types of institutions.

It was calculated that the families with children belonging to a private educational institution had higher education expenditures than the households with children belonging to a government educational institution. The average total expenses on education of a household with children belonging to private institutes were 17267.5 rupees annually, while the average expenditures on education of a family with children

belonging to a government institutes were 5592.2 rupees annually. The difference in expenditures on education was 11675.3 rupees per year.

The estimated results indicated that the households belong to urban area had higher education expenditures than the households belong to a rural area. The average total expenditures on education of a household belong to urban area was 11315 rupees annually, where as the average expenses on education of a family belong to a rural area were 4903 rupees annually. The average difference in expenditures on education was 6412 rupees per year.

The results showed that the female household's head had higher education expenditures than the male household's head. The average total expenditures on education of a female household head were 9885 rupees annually, while the average expenditures on education of a male household head were 8044 rupees annually. The average difference in expenditures on education was 1841 rupees per year.

5.2.2 Determinants of Households Expenditures on Education

The technique of finding out main indicators that affect household expenditures on education applied in this research was a Tobit regression and hurdle model. That is, every explanatory variable was analyzed. The hurdle model estimates are very helpful in identifying major factors that affect HHEE. The results of the analysis are as follows

Household head characteristics, particularly household head age and the educational level were highly significant effect to determinants household expenditures on education. As the level of education increased the expenditure on education also significant increase and the last category master and above spend more income on

education as compared to all other categories. All education levels also individually positive and significantly influenced the expenditure on education. Sex and marital status are also important indicators, but they are not highly significant.

The facts concerning to the households' characteristics, particularly annual income of household was a highly significant effect and positively correlated with the response variable as household income increase expenditure on education also increases. The number of the child attending school showed a quadratic relationship with the response variable the maximum point of quadratic curve also showed at approximately 6.7 children. Marginal coefficients also provide approximately same results. If the households had no school going children, they would not have to take on such expenditure on education. Normally, size of household is supposed to be a much important factor of family expenses on education. While, in our study the impact of size of household of response variable was not very highly significant.

Furthermore, the province of the household, the larger population province, Punjab, was another significant variable. If the families were situated in regions of Punjab, which are educationally and scientifically advanced with numerous grammar schools for households to select from, the outlays from the cost of living were characteristically greater than those of other provinces. All other provinces also have individually significant and conclusive effect on HHEE. All provinces HHEE were also significantly different from each other except KPK and Baluchistan.

5.3 Recommendations

5.3.1 Using the Study Outcomes

The final results of this study about household education expenditures and the key indicators that affecting household expenditures can be utilize to create policies to improve educational structures in province level and both urban and rural regions. Instead of summarizing other outcomes, limited suggestions may be mentioned here. A pair of very important policy insinuations arises obviously and noisily.

The household annual income coefficients obviously and positively correlated with the response variable indicated that they accompaniment each other. Therefore, if the administration desires to mobilize family funds for education, it is important that the administration raises its own funds distribution to education significantly. Contrariwise, and more obviously, if government funds for education are condensed, family's expenditures may also decay resulting in modest below investment in education.

According to the number of school going children, the results indicate that families from this study had a minimum two school going children in both government and/or private institutes. Therefore, the administration plans to contribute and sustain educational plans would be designed professionally and specially focused on those households who have more than two school going children consequently that they can successfully decrease parents' expenditure on education as well as rise the competence of the administration in managing funds and scholarships.

According to the province of household findings indicates that households in the Baluchistan province have the lowest expenditure on education. The administration plans

to contribute and support educational programs must be planned efficiently and especially focused on Baluchistan consequently that they can successfully decrease parents' spending on education and boost the level of education.

5.3.2 Further Recommendations for Researchers

The present thesis is utilizing a cross sectional data set. Some may precisely feel that the dynamics of family investment decision making in education cannot be captured by the covariates that are used in cross sectional data set. But awkwardly, time series or panel data on HHEE in Pakistan are not easily accessible so new researcher must work on time series or panel data.

In this thesis the demand or need of education is not analyzed, neither did the demand equation or function estimate, probably 'actual demand' for education is analyzed by seeing family expenditures. However, it must be acknowledged that the researcher focused completely on family expenses on education. Carefully related indicators, including contribution and nonparticipation in schooling are also studied. In additional researchers, should include some important factors like child's school level, classified into sub layers, such as primary or basic, lower secondary and upper secondary tend to have different details of expenses.

REFRENCES

Aakvik, A., Salvanes, G.K. and Vaage, K. (2005). "Education Attainment and Family Background". *German Economic Review,* 6(3), 377-394.

Andreou, N. S. (2012). "Analysis of Household Expenditure on Education in Cyprus". (Working paper No. 07-12). Economics Research Centre.

Aslam, M. and Kingdon, G. G. (2008). "Gender and household education expenditure in Pakistan". *Applied Economics*, 40 (20), 2573-2591.

Ayaz, S., Anwar, S., Sial, H. M. and Hussain, Z. (2011). "Role of Agricultural Credit on Production Efficiency of Farming Sector in Pakistan- A Data Envelopment Analysis". *Pakistan Journal of Life and Social Sciences*, 9(1), 38-44.

Baby, S. (2014). "A study on expenditure of higher education with special reference to erode district". *International Research Journal of Agriculture and Rural Development,* 3(1), 155-123.

Becker, G. S. (1957)." *Economics of Discrimination".* (2nded.) Chicago: University of Chicago Press.

Bonke, J., Deding, M., Lausten, M. and Stratton, L. S. (2008). "Intra-household specialization in housework in the United States and Denmark". *Social Science Quarterly*, 89, 1023-1043.

Chi, W. and Qian, X. (2015). "Human capital investment in children: An empirical study of household child education expenditure in China, 2007 and 2011". *China Economic Review*, 37, 52-65.

Dang, A. H. (2007). "The determinants and impact of private tutoring classes in Vietnam". *Economics of Education Review*, 26, 684-699.

Elbadawy, A. (2013). "The effect of tutoring on secondary streaming in Egypt". (Working Paper No. 769). Retrieved from the Economic Research Forum.

Floro, M. S. and Miles, M. (2003)."Time use, work and overlapping activities: evidence from Australia".*Cambridge Journal of Economics*, 27, 881-904.

Foster, G. and Kalenkoski, M. C. (2013). "Tobit or OLS? An empirical evaluation under different diary window lengths". *Applied Economics*, 45(20), 2994-3010.

Greene, H. W. (1997)."*Econometric Analysis*".(3rd ed.), Prentice Hall, Upper Saddle River, NJ.

Holmes, J. (1999). "Measuring the determinants of school completion in Pakistan: analysis of censoring and selection bias". (Center discussion paper no. 794). Economic growth center Yale University.

Jung, S. H. and Thorbecke, E. (2003). "The impact of public education expenditure on human capital, growth, and poverty in Tanzania and Zambia: a general equilibrium approach". *Journal of Policy Modeling*, 25, 701-725.

Kim, S. S., Prideaux, B. and Chon, K. (2010). "A comparison of results of three statistical methods to understand the determinants of festival participants' expenditures". *International Journal of Hospitality Management*, 29, 297-307.

Long, S. J. (1997). "Regression models for categorical and limited dependent variables". Sage publications.

Maitra, P. (2003). "Schooling and Educational Attainment: Evidence from Bangladesh, Education Economics". 11(2), 129-153.

Malcolm, M. (2012). "Can buy me love: the effect of child welfare expenditures on maltreatment outcomes". *Applied Economics*, 44(28), 3725-3736.

Nepal, K. A. (2015). "The Impact of International Remittances on Child Outcomes and Household Expenditures in Nepal". *The Journal of Development Studies*

Qian, X. J. and Smyth, R. (2011). "Educational expenditure in urban China: income effects, family characteristics and the demand for domestic and overseas education". *Applied Economics*, 43(24), 3379-3394.

Quang, V. H. (2012). "Determinants of Educational Expenditure in Vietnam". *International Journal of Applied Economics,* 9(1), 59-72.

Rehman, H., Bashir, F. and Faridi, Z. M. (2011). "Saving Behavior among Different Income Groups in Pakistan: A Micro Study". International Journal of Humanities and Social Science, 1(10), 268-277.

Saha, A. (2013)."An Assessment of Gender Discrimination in Household Expenditure on Education in India".*Oxford Development Studies*, 41(2), 220-238.

Tansel, A. and Bircan, F. (2006). "Demand for education in Turkey: A tobit analysis of private tutoring expenditures". *Economics of Education Review*, 25,303-313.

Tilak, J.B.G. (1987). "Costs of Education in India", *International Journal of Educational Development,* 8 (1), 25–42.

Tobin, J. (1958). "Estimation of Relationships for Limited Dependent Variables". *Econometrica*, 26(1), 24-36.

Usman, M., Ashfaq, M., Naqvi, A. A. S., Ali, A., Javed, I. M., Nadeem, N., Raza, H. M. and Waseem. M. (2015). "An Efficiency Analysis of Gladiolus Cut-Flower in Punjab, Pakistan". *Agricultural Sciences*, 6, 663-669.

Welte, A. J., Barnes, M. G., Wieczorek, F. W., Tidwell, O. M., and Hoffman, H. J. (2007). "Type of Gambling and Availability as Risk Factors for Problem Gambling: A Tobit Regression Analysis by Age and Gender". *International Gambling Studies*, 7(2), 183-198.

Wooldridge, M. J. (2013). "*Introductory Econometrics: A Modern Approach*". (5thed.)South Western Cengage Learning.

Yueh, L. (2006). "Parental investment in children's human capital in urban China". *Applied Economics*. 38(18), 2089-2111.