RETURNS TO EDUCATION IN PAKISTAN:

A NEW DIRECTION

MS/M-Phil Dissertation

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DECLARATION

I, Atif Maqbool Khan, Roll No. 107-MPhD-F-05 student of M.Phil in the subject of Economics, Session 2005-2010 hereby declare that the matter printed in the thesis titled *"Returns to Education in Pakistan: A New Direction"* is my own work and has not been printed, published and submitted as research work, thesis or publication in any form in any University, Research Institute etc in Pakistan or abroad. It is done in partial fulfillment for the Masters of Philosophy in Economics of the International Islamic University Islamabad.

Atif Maqbool Khan: _____ Date: _____

RESEARCH COMPLETION CERTIFICATE

It is certified that the research work contained in this thesis titled "Returns to Education in Pakistan: A New Direction" has been carried out and completed by Mr. Atif Maqbool Khan Roll No. 107-MPhD-F-05 under my supervision.

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DEDICATIONS

I Dedicate this humble effort to my

dear parents and well wishers

whose love, affection and prayers

have been a source of constant

encouragement for me

LIST OF ABBREVIATIONS

CLRM	Classical Linear Regression Model
FBS	Federal Bureau of Statistics
HIES	Household Integrated and Economic Survey
IID	Independent Identical Distribution
IV	Instrumental Variable
LFS	Labor Force Survey
NGO	Non-Government Organization
OLS	Ordinary Least Square
PSLM	Pakistan Living and Standard Measurement
RORE	Rate of Return to Education
UN	United Nation

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ABSTRACT

Jacob Mincer (1958) introduced an important approach to explain the role of human capital on earnings of individuals. The main contribution of Mincer is to introduce the earning function which can be used to explain the distribution of earnings across population. Since Mincer's influential work in 1958, many attempts were made by the researchers to extend the original human capital model. This thesis tests a number of hypotheses (e.g; observing the earning differentials over different levels of education, sexes, regions, provinces etc.) by using Mincerian Earning Function for the Pakistan by making use of latest available Pakistan Social and Living Standard Measurement (PSLM) data for the year 2007-08. Two approaches (the ordinary least squares (OLS) approach and the instrumental variable (IV) approach) are used to test the hypotheses and corresponding conclusions and recommendations are suggested.

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Chapter 1

INTRODUCTION

1.1. MOTIVATION AND IMPORTANCE OF HUMAN CAPITAL

The concept of human capital represents factors of production like different job skills, education, training, experience and health, which are the base of economic productivity and growth. The word capital represents any assets which generate income in future. According to Prof. Fritz Machlup, many people believe that the human capital theory was developed by two famous economist of Chicago University: Gary Becker and Theodore Schultz: Gary Becker extended the human capital theory with help of mathematical and statistical economics. But the reality is that Schultz and Becker were not the first labor experts who presented human capital theory. First of all, Sir William Petty introduced the concept of human capital was most likely made around 1676. The most valuable of all capital is that invested in human beings. (Alfred Marshall, 1890).

Human capital accumulated through educational attainment, training and experience, is now commonly held to be one of the fundamental drivers of economic growth. Therefore, human capital formation is a pre-requisite for the development of physical capital and serves as a key to sustainable development. The human capital approach is based on the view that the number of years of formal education enhances the

skills and productive capacity of individuals. According to famous economist Babalola (2003), the rationality behind investment in human capital is based on three arguments:

i. New generation must be given the appropriate parts of the knowledge which has already been accumulated by previous generations;

ii. New generation should be taught how existing knowledge should be used to develop new products, to introduce new processes and production methods and social services; and

iii. People must be encouraged to develop entirely new ideas, products, processes and methods through creative approaches. [See, Olaniyan. D.A & Okemakinde. T (2008)].

The role of education in human capital is that due to investment in education process, firstly people bear some direct costs in the form of tuition fees, books and also forgone possible earnings in the form of opportunity cost of time. After this investment, people earns high earnings, more pleasant jobs, lower expected unemployment and these individuals benefits are causes of high productivity and growth in the economy.

1.2: HUMAN CAPITAL AND ECONOMY

The concept of human capital is very important for stable economic growth. According to labor economist, technological progress is a strong driver for economic growth. As we know that all the technologies are related with investment in education, skills, experience, which are important factors of human capital theory. (See, Schultz, T.W. (1961).

1.3: HUMAN CAPITAL AND EDUCATION

There are three main types of capital stock; physical, human and social capital. It is fact that education is base of different characteristics of human beings; due to these characteristics life of human beings are distinct from all other creatures of universe in their attitudes, motivation and attaining the fruitful skills. The process of human capital is long term nature and also its impact is continuous in nature on different aspects of life. Education system of any country in this global world is influenced by our economic, political and well as social system. Educational investment is more important and valuable in nature than all other investment like physical capital and provides fuel for sustainable economic growth, as we know that the process of economic growth is like engine of any developing or developed economy. Pakistan also falls in the list of developing economies, where educational process is more necessary and needs more attention than all others sectors because strong educational system will provide us skilled labor for different sectors of economy.

There is lot of natural resources in Pakistan like natural gas, petroleum, coal, copper, iron, silver, rock salt, marbles and one of the most fertile soils of world. We can only utilize optimally these all resources, when our educational system is facilitated with new era requirements like better quality of teaching, training, labs etc. Better educational system provided the strong back to all sectors of economy by producing skilled workers. [(See, Schultz, T.W. (1961), Nasir, Z.M (2002), Hyder, A (2007), etc.]

1.4: HUMAN CAPITAL AND EARNINGS

The role of human capital in economic growth is very important especially for neoclassical growth models. There are two major areas in which earlier work has been done. First: micro level study, which is explained statistically and econometrically by famous economists Gary Becker and Jacob Mincer, where main focus was to explore the wage differentials and income distribution over different levels of education, training and experience. Second: macro level studies which explained the impact of human capital factors on the economic growth of countries. Both micro and macro studies used education as a proxy for human capital, [For Micro studies, See Becker, G.S (1962), Polachek, S.W (2007), etc. and for Macro studies, See Robert J. Barro (1998), Sianesi, B & Reenen and J.V (2002), etc.]. The present study is related with micro level, where we use education, experience as a proxy for human capital and checked their impact on earnings on different levels of education with respect to sex, regions, etc.

Human capital has impact on both individual labor productivity and earnings and also on aggregated economy. In this section, there has been described a brief discussion narrating the impact of the human capital on Pakistan.

1.5: ISSUES WITH EXISTING STUDIES

We analyzed a number of existing studies which were conducted in order to estimate wage differentials in Pakistan. Most of the studies [See for example, Ashraf, J. & Ashraf, B (1993, 2000), Shabbir, T (1994), Chishti, S et al(1998), Nasir, Z.M & Mahmood, R (1998), Siddiqui, R &Siddiqui, R (1998), Nasir, Z.M(1998, 1999,2000 &2002), Khan,F.S

& Toor,I.S (2002), Jamal, H, Toor, I.A & Khan, F.S (2003), Awan, M.S & Hussain, Z.(2007), Shah, R.(2007), Hyder, A.(2007) and Khan, A.J.(2008), etc.] used OLS to estimate the earning function using the data available at their times. The important thing to note is that these studies simply used OLS WITHOUT testing the base assumptions of the classical linear regression model. According to David F. Hendry (1995), the base assumption should be tested in order to get valid estimates while using classical linear regression model.

In particular, the assumption of heteroskedasticity which is likely to occur in cross sectional data and also according to Ahmed, M. (2011),

"Homoscedasticity is potentially unverifiable even with infinite amount of data".

Of course, if homoscedasticity doesn't hold, then all statistics, specially the t and F are misleading and hence the significance of regressors might change, in particular, a significant regressor might appear insignificant or vice versa. Hence the results of these studies are questionable.

To strengthen our claim, we took one particular study by Nasir, Z. M. & Hina Nazli (2000) where the authors estimated the Mincerian earning function using PIHS survey data (1995-1996) using OLS methodology.

We explored the same data for heteroskedasticity using White (1980) test and found that null hypothesis of homoskedasticity is rejected at 1% significance level. We re-estimated their proposed regression model using the same data and using same technique (OLS) but

with heteroskedasicity consistent standard errors (HCSE). Our results indicate that the significance of the regressors changed.

The above is just one example, similarly, if one test the studies mentioned above, their result might change as well because these studies also used OLS without testing for heteroskedasticity and hence significance of the variables in these studies is questionable. But in some cases, where heteroskedasticity is not harmful, the results might not change even in the presence of heteroskedasticity.

In addition to homoscedasticity, the other assumptions, according to Hendry (1995), include:

Correct specification of regression model, the independence and normality of regression errors and structural stability of regression parameters etc.

Most of the studies given in table above, estimated regression models which are mis-specified, in particular, the regressors included in one regression model are excluded in the second model without providing any results regarding their exclusion. [See, Ashraf, J& Ashraf, B (1993), Shabbir, T (1994)]. So the validity of these results cannot be judged.

Similarly, the normality of regression errors must be established but unfortunately, most of the studies do not carry out such tests. This might lead to wrong distribution of t and F statistics and ultimately may affect the significance of regressors.

1.6: OBJECTIVES OF THE STUDY

The present study focused on micro level, where we use education and experience are used as a proxy for human capital and we checked their impact on earnings on different level of education with respect to sex, regions, etc.

This study is an application of human capital approach to find out the correct estimates of returns to education in Pakistan. The empirical estimates of returns to education are important for a number of reasons. **First**, returns to education help the parents in deciding whether to send their children to school or to engage them in earning. [See, Kingdon & Unni (2001)].**Second**, the returns to education also guide the youth in decision making regarding selection of occupation and career. [See, Aslam et al (2008)]. **Third**, returns to education comprise a significant fraction of individual's earnings and are one of the main determinants of the earning differentials among nations, regions and individuals. [See, Ashraf, J. & Ashraf, B. (1993b)].

The usual technique to get the earnings estimates is to use the popular Mincerian Earning Function introduced by Mincer (1974). This function is usually estimated by using the method of Ordinary Least Square (OLS). Later on, it was found that OLS method is not the right approach to estimate Mincerian Earning function due to following issues [See, e.g., Walker, I & Zhu, Y (2001), Card, D (2001) and Harmon et al (2003)]. The most serious ones are:

(1) Omitted variable bias: The problem of omitted variable bias is due to unobserved factors which are related with explanatory variable or some ignorance factors and this is

mostly in multiple regression analysis. Due to omitted variable bias our model is mis-specified and regression coefficients (β) show positive or negative bias. [See, Wooldridge, J.M (3red edition)]. In our research there are some factors are influencing on earnings of laborers like ability but the issue is that we don't have data of true ability of individuals, so, we are using education as a proxy of ability due to high correlation between explanatory variable education and ability.

(2) Measurement error: The problem of measurement error is similar to omitted variable bias but there is slightly difference; the problem of measurement is due to unobserved factors which are related with explanatory variable or some ignorance factors. Due to these important unobservable factors, there is correlation between explanatory variable and error term. The unobserved factors violate the important assumption of classical linear regression model (CLRM), that $Cov\ (Xi,\ Ui\ ) = 0$. [See, Wooldridge, J.M (3red edition)].

(3) Sample selectivity bias: The third problem is Sample selectivity Bias. This arises, when the availability of the data is influence by a selection process that is related to the value of the dependent variable. This selection process can introduce correlation between the error term and the regressor, which leads to bias in OLS estimator. This can be removed by using the two step Heckman's procedure. [See, James J. Heckman. (1979)].

Due to these problems the OLS approach becomes invalid. First and third problem can be overcome by the use of instrumental variable (IV) approach, [See, Aslam, M. (2007), Qaisar Abbas (2007), Flabbi, L (1999), etc], while the second problem of sample

selectivity bias can be handled using the Heckman's 2-step approach. [See, Heckman J. (1997)].

In this study we use the Pakistan Social and Living Standard Survey (PSLM) data for the year 2007-08 to estimate earning function for Pakistan. The data is taken from Federal Bureau of Statistics (FBS). We tested a number of hypotheses of interest, e.g; earning differentials over different levels of education, earning differentials among different sexes, earning differentials over different regions and over different provinces etc. The results are estimated using ordinary least squares (OLS) and instrumental variables (IV) approaches. We used OLS as most of the existing studies for Pakistan used OLS wrongly, i.e without taking into account the heteroskedasticity. So our purpose to use OLS is to introduce the researcher of Pakistan the correct way of carrying out OLS estimation in linear regression model.

The most important contribution of study is that we emphasize that the base assumptions MUST be tested while using linear regression model. Second we highlighted on the importance of correctly specified regression model. We encompassed existing studies in the sense that we used almost all the potential regressors which are used by the earlier studies (with some exceptions to variables of which we have very few observations in our data set) and started with a large model and then we simplified this general model by testing the exclusion restrictions to the regressors by the usual F-test. This approach is referred as general to simple (G2S) approach of model selection, introduced by Hendry (1995). In most of the existing literature, the earning function is estimated in a mis-specified form, i.e., the authors estimated regression models separately for different

characteristics such as regression across gender, province etc without taking into account all the regressors, which of course is not the right way.

1.7: ORGANIZATION OF THE STUDY

The study is organized as follows:

Chapter 1 gives the introduction of the thesis topic. Chapter 2 gives the brief literature survey. Chapter 3 provides the objective of the study and the research hypotheses while chapter 4 explains the methodology used in the study and the relevant data sources along with explanation of variables used in the study. Chapter 5 gives the empirical analysis of the data including graphical, statistical and regression analysis. Chapter 6 provides the conclusion and recommendations.

Chapter 2

LITERATURE REVIEW

2.1: INTRODUCTION

There exists a vast literature on estimating earning function and we summarize here the line of research most relevant to our topic. We are dividing our literature review into the four most important and hot issues, which are related with earning function. These sections are like (1) Impact of Education on Productivity (2) Concavity of Earning Function (3) Endogeneity Problem and its Remedies (4) Heterogeneity across the Population.

2.1.1: IMPACT OF EDUCATION ON PRODUCTIVITY:

Most of the earlier studies particularly those done by Haque (1977), Hamdani, K (1977), Guisinger et al. (1984), Khan, S.R & Irfan, M (1985), Shabbir, T & Alia, H.K. (1991), Ashraf (1993a, 1993b, and 1996), Chishti et al. (1998), Nasir, Z.M (1998, 1999, 2000 & 2002) estimated the earning functions by defining the dummy variables for different levels of education. These studies observe low rates of returns at different levels of education as compared to other developing countries. [See, Psacharopoulos, G (1980, 1985 & 1994].However, these studies show a positive association between levels of education and earnings. [See, Nasir & Nazli (2000)].These studies also explored the positive link between higher earnings and productivity of labor. These studies results show that earning differential is also due to difference of productivity

between the employees. [See, e.g, Siddiqui, R & Siddiqui, R. (1998), Nasir, Z.M (1998, 2000 & 2002)].

According to Kingdom, G.G & Unni, J (2001) that the lower level education like primary is not enough for productivity enhancing and for better earnings reward for labors. Some other studies like Harmon et al (2003) also emphasized this point that for enhancing the labor productivity level, we should emphasized on higher level of education. There is casual relationship that higher educational capability cause of high productivity of labor and this high productivity is a stimulator of high earnings in market, [See, Becker, G.S (1962) & Bonjour, D et al (2002)].According to Walker, I & Zhu, Y(2001) that higher productivity of workers are dependent on higher education and higher education is a signal of individual's ability, the study also explained that it is difficult to interpret the relationship between the education and earning by using the individuals randomly. The study also explained that we should interpret correctly the relationship between education and earning by including the unobserved factors like family background. We will explain in detail about unobserved factors in (Endogeneity problem, section: 2.2.3).

2.1.2: CONCAVITY OF EARNING FUNCTIONS:

The standard Mincerian (1974) earning function shows that due to EXP^2 (square of experience), the earning function is concave curve and negative coefficient. The reason of concavity of EXP^2 is that earnings of labor are increases with respect to their experience increase but with diminishing rate that is why the moving pattern of earnings curve is concave. The concave pattern of earning function is consistent to

almost all the studies, [See, Polachek, S.W (2007), Gautier, P & Teulings, C (2003), Gibson, J & Fatai, O.K (2006) and Licht & Steiner (1991)].

Figure 2.1.2.1: Experience Profile across Log Monthly Earnings

The Figure 2.1.2.1 shows the experience earnings profile and graph indicates the concavity. The above graph also indicates that there are three stages of profile, first stage show that earnings of labor is increasing with an additional year of experience with increasing rate, here approximately at 28 years experience level represents first stage. Second stage represents the constant rate of earnings after 28 to 30 years experience. Third stage represents, where earnings of labor are increasing with diminishing rate, so that is why experience and earning profile is concave shape.

2.1.3: ENDOGENEITY PROBLEM AND ITS REMEDIES:

The endogeneity problem is directly concerned with econometrics issue, so according to literature due to unobserved factors we cannot see the real picture of education and earning relationship by using OLS method. The unobserved factors violate the important assumption of **CLRM**, that $Cov\ (X_i, U_i) = 0$,its mean the correlation between explanatory variable Xi and error term Ui should be zero. If this assumption does not exist than we can say that OLS results are not reliable. So, for removing the endogeneity problem, most of studies used instrumental variable like family background (parental education), spouse education, distance from school, etc.[See, Flabbi (1999), Card, D (2001), Harmon et al (2003) , Torgo (2007), Monazza Aslam (2007&2008), Qaisar Abbas (2007),etc].

For the removal of endogeneity problem, we should use some valid instrument and there are two conditions for valid instrumental variable. **First** condition is $Corr\ (Z_i, X_i) \neq 0$, the correlation between explanatory variable and instrumental variable should not be zero or in other words there should be existence of strong correlation between them. **Second** condition is $Corr\ (Z_i, U_i) = 0$, the correlation between instrumental variable and error term should be zero. [See, Stock J.H & Watson M.W, Chapter no: 12, P- 439].

Many studies show different results by using IV and OLS techniques, some studies show that due to endogeneity problem, the results of returns to education are downward bias by using OLS. [See, Angrist, J & A. Krueger (1991, 1992), Card, D (1993), Butcher & Case (1994), Harmon & Walker (1995)].After applying the IV technique, some studies are showing that coefficients of IV are slightly higher than OLS. [See, (Angrist & Krueger

1991, 1992).Some studies result shows that IV results are double than OLS. [See, (Harmon & Walker 1995)].

2.1.4: EARNINGS HETEROGENEITY ACROSS THE POPULATION:

In this section we will analyze the observed hetereogeneity in returns to education across different variables like gender, region, provinces, type of school, different marital status, industries and different professions.

Shabbir, T (1994) estimated the traditional and extended earning function by using the Pakistan Labour Force and Migration Survey (1979) data set. The study found 7 to 8 % increase in earnings with an additional year of schooling, which is near and consistent with current study results where returns to education are 8.5%. Akbari, A.H & Muhammad, N. (2000), analyzed the educational quality and labor market performance in developing countries by using the LFS (1996) data. The results show that rate of return to schooling is 7.16%, which is not significantly different from current study estimates, where returns to education are 8.5%. Psacharopoulos, G & Patrinos, H.A(2004) reported two Pakistan based studies results, first study of Psacharopoulos (1994), which shows 4.6% rate of returns to education and second study of Katsis et al. (1998) shows 15.4% rate of return. The coefficient on years of schooling shows that 9.9% rate of return for "Asia", similarly 7.1%, 12%, 7.5%, 11.7% and 9.7% for "Europe/Middle East/North Africa", "Latin America/Caribbean", "OECD", "Sub-Saharan Africa" and "World" respectively. The current study also shows the similar pattern of returns to education and representing to Asian earning outcomes with 8.5% returns to education. Jamal et al (2003) analyzed that at each additional level of

education, approximately 6.4% increase in monthly income is observed, which is less than current study estimates, where returns to education is 8.5%.Nazli, H (2004) analyzed that impact of education, experience and occupation on earnings using Micerian earning model. The main findings of the study show that the rate of return to education is 5% whereas it is 7% to the experience. The results also suggest that experienced worker earns 54% more than the inexperienced one. Jaffary et al. (2007) constructed a panel framework using Labor Force Survey (LFS) from 1990-91 to 2003-04 to examine the returns to education. Their results show that with an additional year of education and experience, earning increases.

The current study results are also show similar behavior like above mentioned studies with 8.5% returns to education and 5.3% returns to experience with respect to an additional year of schooling and experience.

Earnings Heterogeneity between different levels of Education:

Most of the study's results show that male earnings are higher than female on the same level of education. We are analyzing the results of different studies about earnings heterogeneity across different level of education.

Khan & Toor (2002) analyzed that at all levels, the rate of return on education increased from 1990-91 to 2001-02.Only at graduation level, the rate of return declines from 18.7% to 15.6% respectively from 1990-91 to 2001-02.Khilji,B.A (2005) analyzed the role of education as a factor of human capital formation in Pakistan since 1951 to 1998. The author suggested that rate of returns to investment in education for primary, secondary and higher levels are 19.9%, 13.3% and 11.7% respectively. Nishat

& Khalid (2006) estimate the earning function for the business graduates working in various companies across different industries in Karachi, Pakistan. The authors used Mincerian model to offer a curious result that better schooling is negatively related to earnings. They also observed that the employees with master degrees have the same earning level as those with bachelor degrees. The current study result shows that the returns to education are 104% and 127% at graduate and master level respectively, these results are consistent with the existing studies, see for example,[See, Ahmad, E & Hafeez, A. (2007)].

So the above study results indicates wrong estimation and show the results, which are against the human capital model. Faridi et al (2010) analyzed the impact of education on earnings by using 200 observations of two public sector universities. The empirical results of the study show that average monthly earning of university graduate rises by 18.11% with an additional year of schooling. Similarly average monthly earning rises up to 9.6% with an additional year of experience .The highest earning people belong to the highest educational level categories such as M.Phil and PhD. The current study also shows the consistent earnings trend. Patrinos, H.A (2008) analyzed that on the average, returns to schooling in developing countries (11%) are considerably higher than in industrial countries (7%), reflecting the relative scarcity of education in low-income countries. In developing countries, on the average the rate of return is highest at the primary level. The rate of return to schooling for men is the highest at the primary level and then decreases for secondary education and increases again for university education. For women, returns are lowest at the primary school level; they are highest

at the secondary level and decrease at the university level. The current study also shows the higher returns to education than industrial countries with 8.5% returns to education.

Earnings Heterogeneity between Genders:

We are observing the earnings differential between the gender variable here with the help of prior and current study results.

Nasir, Z.M (1998) using Mincerian earning function found that there is gender discrimination against females in Pakistan, using Labor Force Survey (LFS) 1993-94 data. Nasir, Z.M (2002) that earnings of male and female workers increased 8.2% and 7.04% respectively and this is due to female are engaged in low level of occupations. Aslam, M (2007) used variety of methodologies (OLS, Heckman correction, 2SLS and household fixed effects) on PIHS 2000 data. The study result shows that return to education of males are 113% higher than female. The study explained the reason of higher earnings of male than female is due to more investment in males schooling from parents. Khan, A.J (2008) tested the "sheepskin" effect by using the PSLM 2004-05 data. The study result shows that overall male workers earn nearly 50 % higher than female workers and the individuals who have higher secondary school certificates earn 10% more than the individuals with education up to a matric level. Similarly, when compared to bachelor degree, a master degree holder gets a premium of 25% over a simple graduate (i.e. BA/B.Sc).

Earnings Heterogeneity between Regions:

In this section we will analyzed the earnings heterogeneity between the regions with the help of prior studies.

Nasir & Nazli (2000) used PIHS (1995-96) data and examined that urban individual's earnings are 31% higher than rural workers. The current study also show consistent results like prior studies, where urban individual's earnings are 20.7% higher than rural individual's. The studies like Nasir, Z.M (1998) suggested that the reason behind the earnings differential between regions (urban & rural) is due to higher job opportunities in urban areas.

Earnings Heterogeneity between Provinces:

In this section we will analyzed the earnings heterogeneity between the provinces with the help of previous and current study.

Sabir, M & Aftab, Z (2006) suggested that increase in level of education has significant and positive impact on earnings for all provinces. The results also show that, in Punjab, returns to education at primary level are the highest, whereas Sindh has the lowest returns at the same level. Sabir, M. (2004) used Labor Force Survey (LFS) for the year 1990-1991 and 1999-2000 and compared rates of returns to education for different provinces. The results indicate that over the ten years, rate of return to education in Pakistan increased from 5.79% to 6.18% and similarly there is an increase in the rates of returns in other three provinces.

The current study results about provinces also show significant results where the individual of Punjab is highest earning (5.4%) with an additional year of education.

Earnings Heterogeneity between types of school:

In this section we will analyzed the earnings heterogeneity between the different types of school (private & public) with the help of previous and current study.

Nasir, Z.M (1999) analyzed the impact of education from the schools in the private sector on earnings by using Pakistan Integrated Household Survey (PIHS) data for the year 1995-96. The main findings of the study show that individual who graduated from private school earns on the average 83% more than the one who graduated from the public school. The study of Awan, M.S & Hussain, Z (2007) reported that in 1998, the males with education from private schools earned 27% higher income as compared to their peers who received a public school education, whereas in the year 2001 male students having education from private schools earned 18.7% higher income as compared to their peers who received public school education. Asadullah, M.N (2008) analyzed the wage differential comparing the public and private graduates between Pakistan and Bangladesh. The study used the HIES 1999-2000 data for Bangladesh, which is conducted by Bangladesh Bureau of Statistics (BBS) and PIHS 2000-20001 for Pakistan, which is conducted by (FBS).The empirical results show that in Bangladesh public graduates earn more than private graduates. However in Pakistan the private graduates earn more than public graduates.

The current study also shows that there is huge difference between the earnings of private and public schools, where private school earnings are 15.7% more than public schools.

Earnings Heterogeneity between different Industries:

In this section we will analyzed the earnings heterogeneity between the different types of industries with the help of previous and current study.

Hyder, A & Javied, Z (2009) analyzed the earnings heterogeneity between the different types of industries. The study analyzed that all the industries like Agriculture, Minning, Manufacturing, Electricity, Construction, Wholesale, Transport, Financing and community are highly significant and positive relationship with log monthly earnings. The current study also shows consistent result with this study.

Earnings Heterogeneity between different Professions:

In this section we will analyzed the earnings heterogeneity between the different types of professions like (white & blue collar) with the help of previous and current study. Gabriel, P.E & Schmitz, S (2004) investigated the differences in the returns to experiences in labor market for men across different occupational categories in USA by using the data of Current Population Survey (CPS 2003). Their study shows 3.24% of returns for white-collar and 2.25% returns for blue-collar and also consistent with current study.

The results of current study show that there is huge difference between white and blue collar, where result shows that white-collar earnings are 37.5% higher than blue-collars.

Earnings Heterogeneity between different Marital Statuses:

In this section we will analyzed the earnings heterogeneity between the different types of marital status with the help of previous and current study.

According to different studies like Lefgren, L & McIntyre, F (2006), who investigated the positive relationship between earnings and marital status, study also, reported that women education is highly correlated with their husband incomes and marital status.

Chapter 3

OBJECTIVES AND RESEARCH HYPOTHESES

3.1: INTRODUCTION

This chapter briefly explains the contribution of our study in the existing literature. As the literature review shows, there exist a large number of studies, which estimated earning function for Pakistan using available data. Major objectives of our study are given below:

3.2: OBJECTIVES OF STUDY

The main objectives of the thesis are as follows:

1. To estimate earning function using latest available data.
2. To test a number of hypotheses of interest (for details see next section).

3.3: RESEARCH HYPOTHESES

We are interested in testing a number of research hypotheses in this study. These hypotheses have been tested before but we are estimating this issue using the most recently available data.

Hypothesis 1: Males earn more than females.

Hypothesis 2: Earning increases with an increase in educational levels.

Hypothesis 3: Individuals belonging to urban areas earn more than the residents in rural areas.

Hypothesis 4: There is an earning differential among provinces of Pakistan.

Hypothesis 5: Private school's graduates earn more than the Public school's graduates.

Hypothesis 6: Earning differentials exist in different industries.

Hypothesis 7: Earning differentials exist in different professions.

Hypothesis 8: Earning differentials exist over different marital status.

Chapter 4

METHODOLOGY AND DATA SOURCES

4.1: INTRODUCTION

A commonly used methodology to estimate earning function for Pakistan is to use Ordinary Least Squares (OLS). But since OLS has many serious drawbacks, some studies used Instrumental Variable Technique and Heckman's 2 Step method to address these issues. Some studies also used household's fixed effect approach to get the estimates when the effect of other variables is kept fixed.

In this study, we used two most famous approaches the ordinary least squares (OLS) approach and the instrumental variable (IV) approach to estimate earning function. Next section provides the theoretical background of the earning function introduced by Mincer (1974). Details of data sources are given in section 4.3 and introduction to the variables used in the study along with their brief description is provided in section 4.4. Section 4.5 gives the brief explanation of OLS method. Instrumental variable technique is discussed in section 4.6.

4.2: THEORETICAL BACKGROUND OF MINCERIAN EARNING FUNCTION

In this section, we provide theoretical background of standard Mincerian function following Heckman et al (2003).

According to Mincer, potential earning of an individual today depends on an investment made in human capital yesterday. Let E_t denotes the potential earning of an individual at time t and kt is his/her share of potential earning that an individual invests in human capital with a return of rt in each period t. So we have;

$$E_{t+1} = E_t\left(1+r_t k_t\right) \text{---------- (1)}$$

Putting t=0, $E_1 = E_0\left(1+r_0 k_0\right)$ ---------- (2)

Putting t=1, $E_2 = E_1\left(1+r_1 k_1\right)$ ---------- (3)

Putting eq (2) in (3),

$$E_2 = E_0\left(1+r_0 k_0\right)\left(1+r_1 k_1\right)$$

Repeating this procedure, we get:

$$E_t = \prod_{i=0}^{t-1}\left(1+r_i k_i\right) E_0$$

Taking natural logarithm on both sides, we get:

$$\ln\left(E_t\right) = \ln\left(E_0\right) + \ln\left(\prod_{i=0}^{t-1}\left(1+r_i k_i\right)\right)$$

$$\ln\left(E_t\right) = \ln\left(E_0\right) + \sum_{i=0}^{t-1}\ln\left(1+r_i k_i\right) \text{--------- (4)}$$

Let's assume that,

1. Schooling is the number of years s spent in full-time investment $(k_0 = k_1 = ... = k_{s-1} = 1)$.
2. The return to schooling in terms of potential earnings is constant over time, i.e. $(r_0 = r_1 = ... = r_{s-1} = \beta)$.
3. The return to the post-schooling investment in terms of potential earnings is constant over time, i.e. $(r_s = r_{s+1} = ... = r_{t-1} = \lambda)$.

   Applying all three assumptions, equation (4) can be written as,

$$\ln(E_t) = \ln(E_0) + s\ln(1+\beta) + \sum_{i=s}^{t-1} \ln(1+\lambda k_i)$$

If β, λ and k are very small then, $\ln(1+\beta) \approx \beta$ and $\sum_{i=s}^{t-1} \ln(1+\lambda k_i) \approx \lambda \sum_{i=s}^{t-1} k_i$, so we have,

$$\ln(E_t) \approx \ln(E_0) + \beta s + \lambda \sum_{i=s}^{t-1} k_i \text{ ---------- (5)}$$

Mincer assumes that post-schooling investment linearly decreases over time in order to develop a link between potential earnings and labor market experience z. i.e.

$$k_{s+z} = \eta\left(1 - \frac{z}{T}\right) \text{---------- (6)}$$

Where, $z = t - s \geq 0$, T is the last year of working life and $\eta \in (0,1)$.

Replacing equation (6) in (5), we have,

$$\ln(E_t) \approx \ln(E_0) - \eta\lambda + \beta s + \left(\eta\lambda + \frac{\eta\lambda}{2T}\right)z - \left(\frac{\eta\lambda}{2T}\right)z^2 \text{ ---------- (7)}$$

To get an expression for net potential earnings, i.e. potential earnings net of post-schooling investment costs, subtract (6) from (7)

$$\ln(E_t)-\eta\left(1-\frac{z}{T}\right)\approx\ln(E_0)-\eta\lambda-\eta+\beta s+\left(\eta\lambda+\frac{\eta\lambda}{2T}+\frac{\eta}{T}\right)z-\left(\frac{\eta\lambda}{2T}\right)z^2$$

Let we have,

$$\ln(npe_t)=\ln(E_t)-\eta\left(1-\frac{z}{T}\right),\ \alpha=\ln(E_0)-\eta\lambda-\eta,\ \delta=\left(\eta\lambda+\frac{\eta\lambda}{2T}+\frac{\eta}{T}\right)\text{ and }\phi=-\left(\frac{\eta\lambda}{2T}\right)$$

So we have,

$$\ln(npe_t)\approx\alpha+\beta s+\delta z+\phi z^2 \text{ ---------- (9)}$$

Finally assuming that observed earnings are equal to net potential earnings at any time t, we have,

$$\ln(w_t)=\ln(npe_t) \text{ ---------- (10)}$$

So equation (9) becomes,

$$\ln(w_t)\approx\alpha+\beta s+\delta z+\phi z^2 \text{ --------- (11)}$$

4.3: DATA SOURCE

The major source of data set used in the study is the most recent Pakistan Social & Living Standard Measurement (PSLM) Survey 2007-08 conducted by the Federal Bureau of Statistics (FBS). The main characteristics of different data sets are discussed below.

Pakistan Social & Living Standard Measurement (PSLM) Survey 2007-08

"The first series of Pakistan Social & Living Standard Measurement (PSLM) Survey was started in July 2004 and the latest available PSLM 2007-08 is conducted under the fourth round and planned to be conducted up to 2009.The report of PSLM 2007-08 is based on

National/Provincial findings. During this round, 15494 households were covered across urban and rural communities. The data essentially measures social indicators. These indicators were also covered under Poverty Reduction Strategy Paper (PRSP). These social indicators include a number of MDGs such as Education, Health, Population welfare, Immunization, Pre/Post Natal care, Family Planning, Water Supply and sanitation." (PSLM-2007-08 Social Indicator Report).

A two-stage sampling technique has been adopted for PSLM survey. At the first sampling stage, 1113 PSUs were selected from different parts of the country. Some 532 clusters from urban and 581 clusters have been taken from rural areas of four provinces of country. At the second sampling stage, 15152, households (SSUs) from each PSU (12 in urban, 16 in rural) were selected for interviews. Therefore 6255 clusters from urban and 9257 clusters have been taken from rural areas of four provinces of country.

The objectives of PSLM 2007-08 Survey is to provide to the government a realistic picture of poverty and help formulate poverty reduction strategy in the overall context of MDGs. Data on some important social indicators such as education, health, water supply and sanitation, population welfare, income and expenditure at both national and provincial levels has been collected in the survey. The population of this survey comprises almost all the urban and rural areas of Pakistan except some militarily restricted areas and some other protected areas.

According to PSLM-2007-08 social indicator report, all urban areas are further divided into the small pockets called enumeration blocks (E.Bs), which were identified from the map. Thus the total numbers of E.Bs are 26,698 and each enumeration block (E.Bs) is further divided into 200 to 250 households of different categories like low, middle and higher

income groups. The rural areas consist of mouzas/dehs/villages, which are chosen according to the sampling frame of 1998's census. This sampling framework consists of 50, 590 mouzas/dehs/villages.

The PSLM 2007-08 is much similar to Household Integrated Economic survey (HIES) conducted during the years 2001-02 and 2004-05 with respect to its format but it introduces for the first time the data related to the education of father and mother which we have used in our study as instrumental variables.

4.4: VARIABLES USED WITH BRIEF EXPLANATION

Variables Explanation:

Definition of variables used in wage work participation and earnings functions	
Age	Age of an individual in completed years.
Edu	Completed years of schooling (education).
Exp	Potential Experience in years.
Exp^2	Square of Potential Experience in years.
Father_Edu	Father's education in Years.
Mother_Edu	Mother's education in Years.
Log_Monthly	Natural log of monthly earnings (in Rupees) of individuals in paid employment in the labor market.
Illiterate	Control variable equals '1' if individual reports zero years of education, '0' otherwise.
Primary	Control variable equals 1 if individual has completed 5 years, 0 otherwise.
Middle	Control variable equals 1 if individual has completed 6, 7 or 8 years, 0 otherwise.
Matric	Control variable equals 1 if individual has completed 9 or 10 years, 0 otherwise.
Intermediate	Control variable equals 1 if individual has completed 11, 12 or 17 years, 0 otherwise.
Graduate	Control variable equals 1 if individual has completed 13, 14,18,19,20 or 21 years, 0 otherwise.
Master & Above	Control variable equals 1 if individual has completed 15, 16 or 22 years, 0 otherwise.
Punjab	Control variable equal to 1 if individual belongs to Punjab Province, 0 otherwise.
Sindh	Control variable equal to 1 if individual belongs to Sindh Province, 0 otherwise.

NWFP	Control variable equal to 1 if individual belongs to NWFP Province, 0 otherwise.
Balochistan	Control variable equal to 1 if individual belongs to Balochistan Province, 0 otherwise.
Urban	Control variable equal to 1 if individual belongs to urban area, 0 otherwise.
Rural	Control variable equal to 1 if individual belongs to rural area, 0 otherwise.
Male	Control variable equal to 1if individual is male, 0 otherwise.
Female	Control variable equal to 1if individual is female, 0 otherwise.
Never Married	Control variable equal to 1if individual is Never Married, 0 otherwise.
Currently Married	Control variable equal to 1if individual is Currently Married, 0 otherwise.
White Collar	Control variable equal to 1 if individual belongs to White collar worker, 0 otherwise.
Blue Collar	Control variable equal to 1 if individual belongs to Blue collar worker, 0 otherwise.
Private Schools	Control variable equal to 1 if individual belongs to Private School, 0 otherwise.
Public Schools	Control variable equal to 1 if individual belongs to Public School, 0 otherwise.
Community Services	Control variable equal to 1 if individual belongs to Community Services, 0 otherwise.
Manufacturing & Construction	Control variable equal to 1 if individual belongs to Manufacturing & Construction, 0 otherwise.

Financing	Control variable equal to 1 if individual belongs to Financing, 0 otherwise.
Agriculture & Minning	Control variable equal to 1 if individual belongs to Agriculture & Minning, 0 otherwise.
Other Industries	Control variable equal to 1 if individual belongs to Other Industries, 0 otherwise.
Wholesale & Retail Trade	Control variable equal to 1 if individual belongs to Wholesale & Retail Trade, 0 otherwise.

The characteristics of the most important variables used in the study are given as follows:

1. Monthly Earnings (Y):

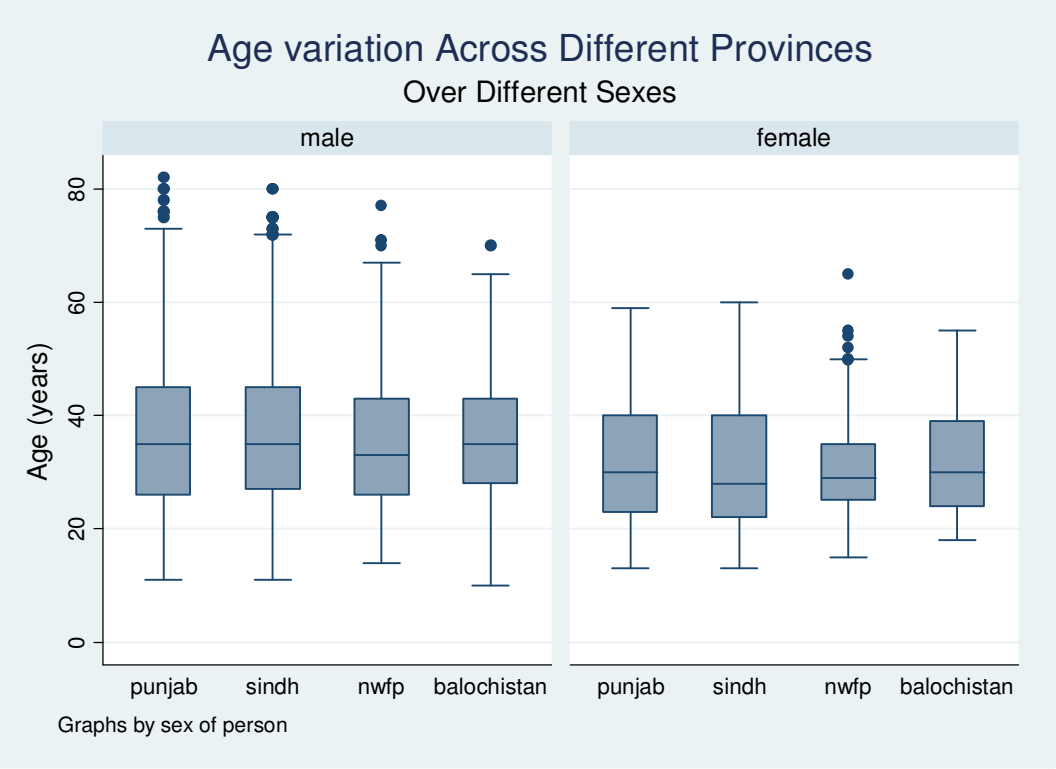
The monthly earnings are based on kind and cash salaries. Household income in cash is based on all types of sources like wages, salaries and rent from land, income from self-employment, gifts and assistance. Household income in kind is based on remittances in kind; gift and assistance, zakat and other transfers in kind are considered income "in kind". We take the logarithmic of monthly earnings for protection of variation in income data because this variation in data is one of the most effective causes of heteroskedasticity and due to this heteroskedasticity results of OLS are not consistent. According to Card, D (1999) the use of log especially on wages is beneficial for estimation because due to distribution of log earnings is very close to a normal distribution.

2. Age:

Age is one of the most important variables for this study because we derive our potential experience with the help of age. Secondly on the different level of ages, we can analyzed the active labor force and also analyze the age-earning profile.PSLM-2007-08 show the age as a

completed years.

Figure 4.4.1: Variation across different provinces over different sexes.

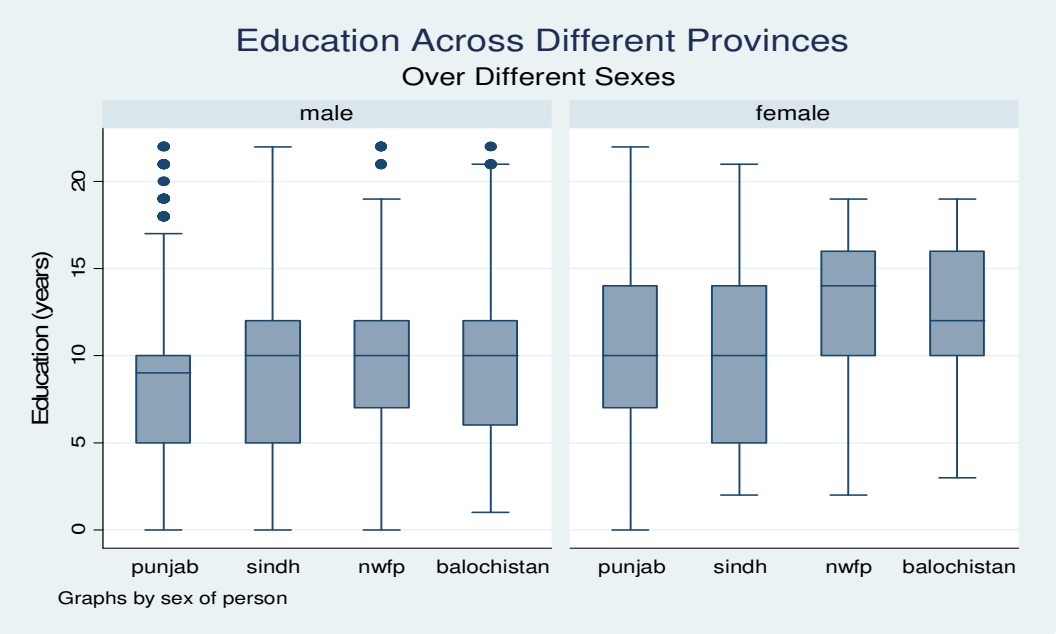


3. Education:

Education is also one of the most important variables for this study namely returns to education. Generally according to our data we consider education as a highest class passed but we also used here different control variables for different levels of education. Firstly about the education categories we define illiterate person who attend no any class. Secondly, for primary education we consider the person who passed 5 classes. Thirdly, for middle level education we consider the person who passed 8 classes. Fourthly, for Matric level education we consider the person who passed 10 classed. Fifthly, for intermediate level education we consider the person who passed the 12 classes. Sixthly, for graduate level education we consider the person who passed 14 classes.

Seventhly, for master & above level education include 16 or more years passed classes.

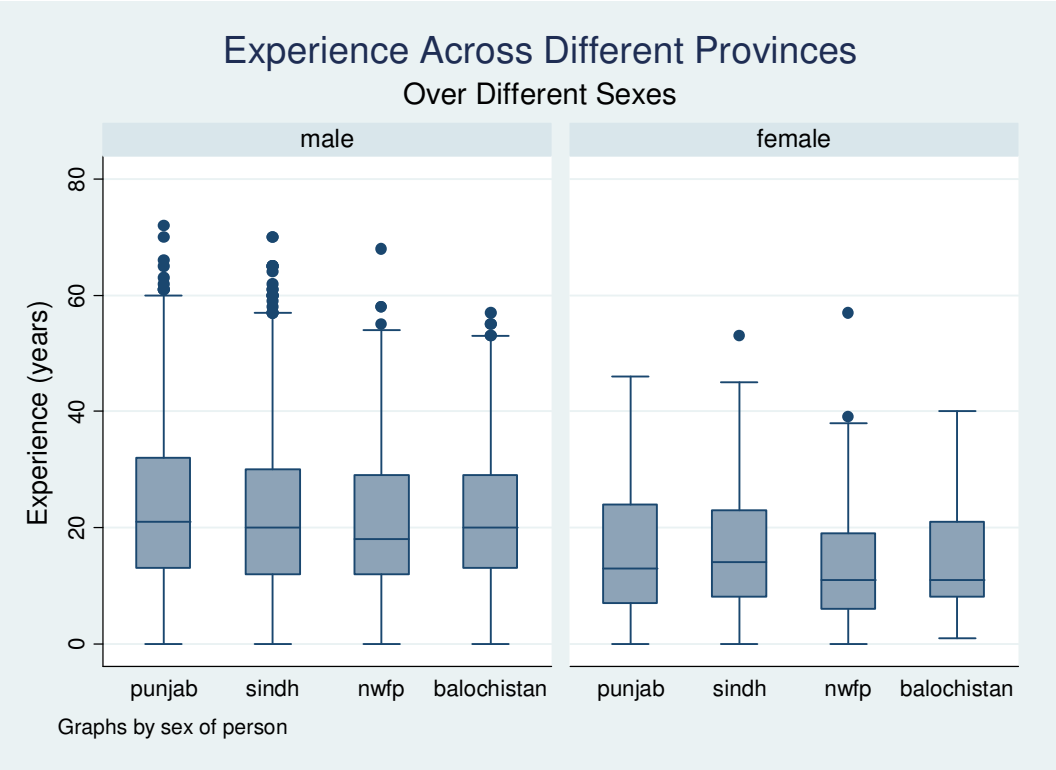
Figure 4.4.2: Educational variation across different provinces over different sexes.



4. Experience:

Experience is also an important variable for this earning function but in PSLM-2007-08 survey, there is no any availability of experience data, so all the studies in especially in Pakistan derived the experience data with the help of school starting age and total years of education. We find the experience data by this formula "age-school starting age-years of schooling. In USA most of the studies considered school starting age from 6 years but according to some studies of Pakistan, 6 years age for school starting age is not suitable for our country research because generally in Pakistan school starting age is 5 years.

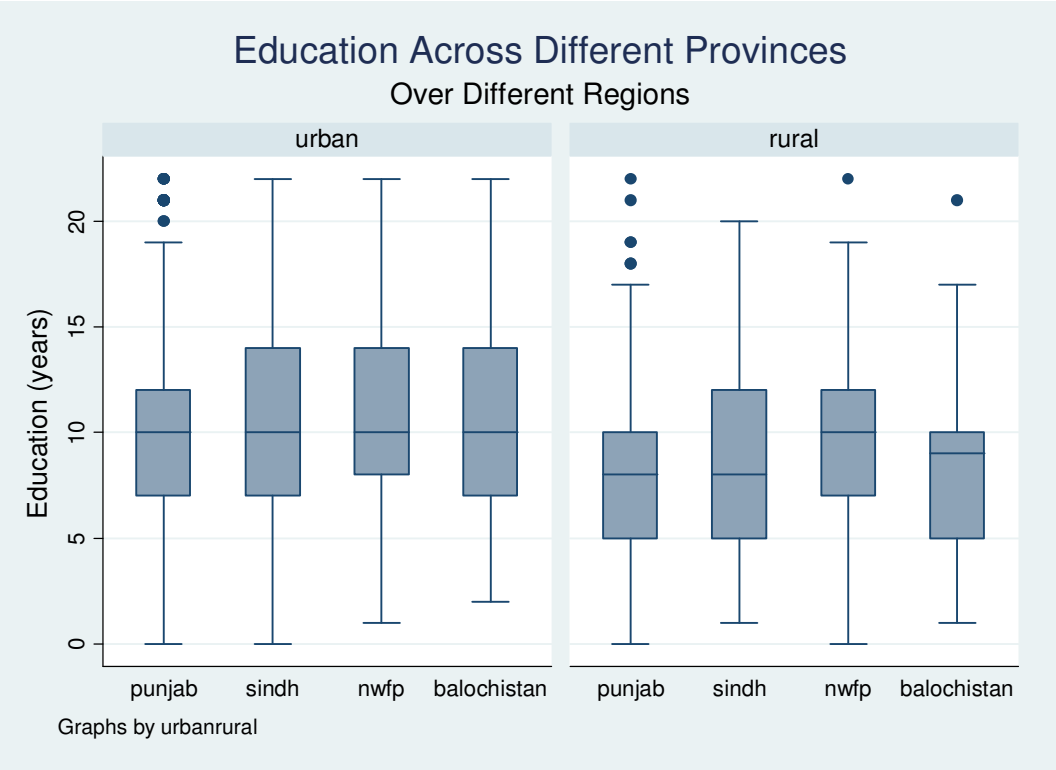
Figure 4.4.3: Experience variation across different provinces over different sexes.



5. Region:

The PSLM-2007-08 data set provided us the data of region and we use this data for estimation of earning differential across the different region like urban and rural areas. We use region as control variable, where "1" stands for urban and "2" for rural area.

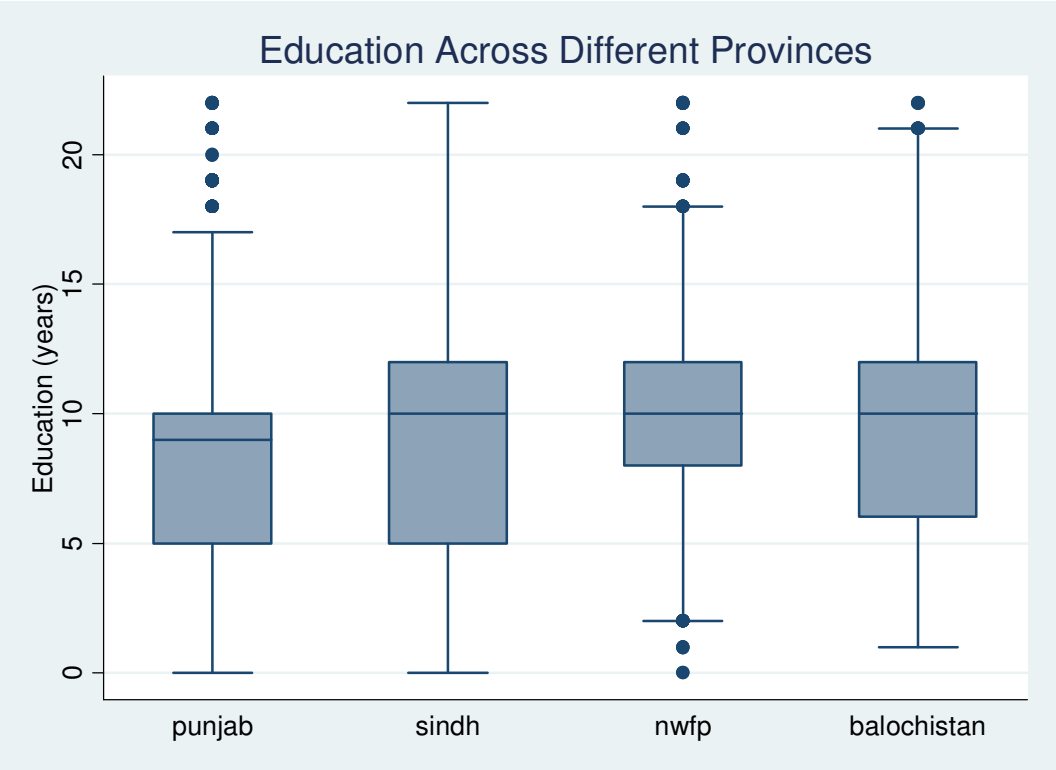
Figure 4.4.4: Educational variation across different provinces over different regions.



6. Province:

The data of Provinces is available in PSLM-2007-08 data and we analyze the earning differentials between the different provinces. In available data set we use different provinces as dummy variables, where"1" stands for Punjab, "2" for Sindh, "3" for NWFP and "4" for Balochistan.

Figure 4.4.5: Educational variation across different provinces.

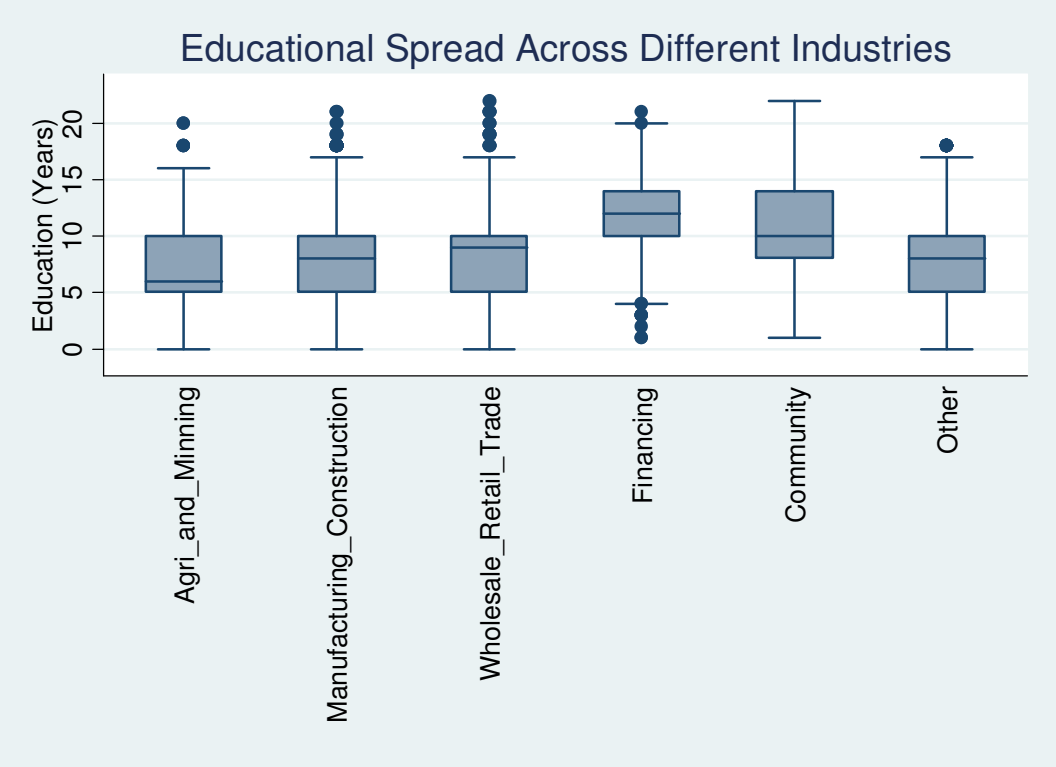


7. Nature of Industry:

Different types of industrial data have been reported in PSLM 2007-08 Survey. In this study, we made 6 categories of different types of industries. In that the Survey, the code No. 11 to 13 represents "Agricultural and Forestry" sectors, 21 to 29 represent the "Mining and Quarrying" industry, where we merged both categories with the name of "Agricultural & Minning" due to low no of observations. Code no 31 to39 represents "Manufacturing" industry and code no 51 to 59 represents "Construction" industry; the study also merged these both categories and makes new category "Manufacturing & Construction". Code no 41 and 42 represents "Electricity" industry and 71 and 72 represents "Transport" industry , the study merged both (Electricity and Transport) with the name of "Other indistries",61 to 63 represents "Wholesale and retail Trade" industry, , 81

to 83 represents "Finance" industry and code no 91 to 96 represents "Community Services" industry in PSLM 2007-08.

Figure 4.4.6: Educational variation across different Industries.

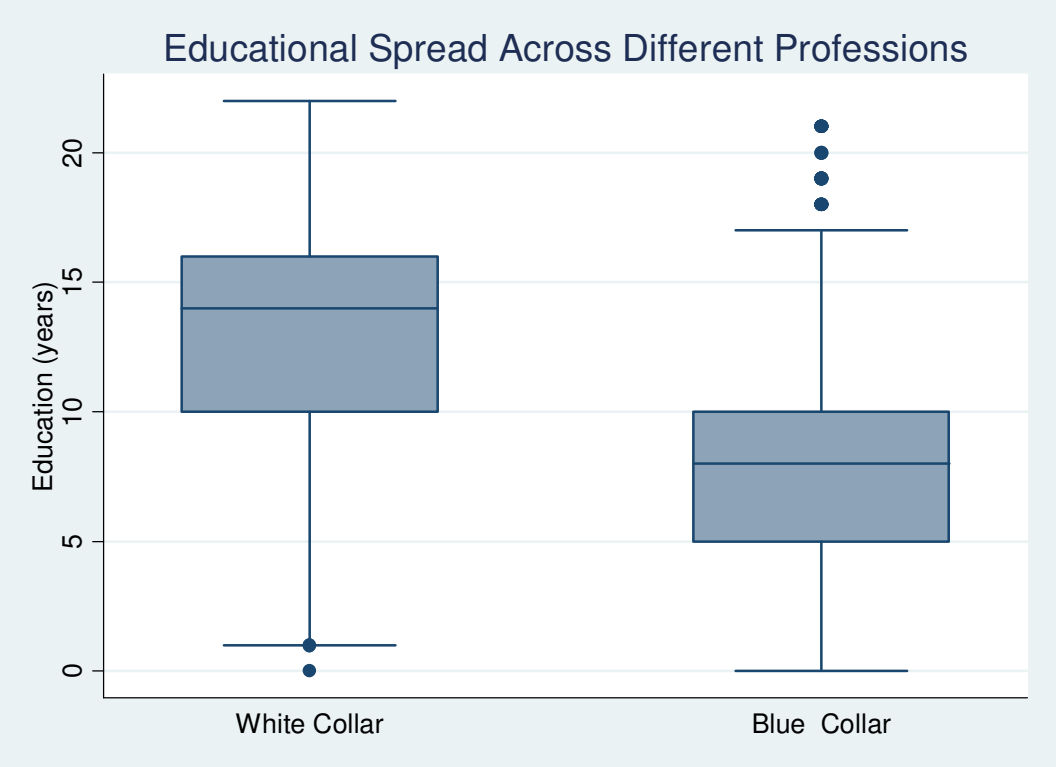


8. Nature of Occupation:

In the PSLM -2007-08 Survey, occupation has been divided into different categories and the two main categories of occupation are "White Collar" and "Blue Collar". The first category includes highly qualified individuals such as "legislators, senior officials and managers", "professionals and technicians" and "associate professionals". In "Blue Collar" category, the study included lower level professions like "Clerk", "Service workers and Shopkeepers" , "Skilled agricultural and

Fishery workers", "Craft and related trades workers", "Plant and Machine operators" and "Elementary occupations" have been included.

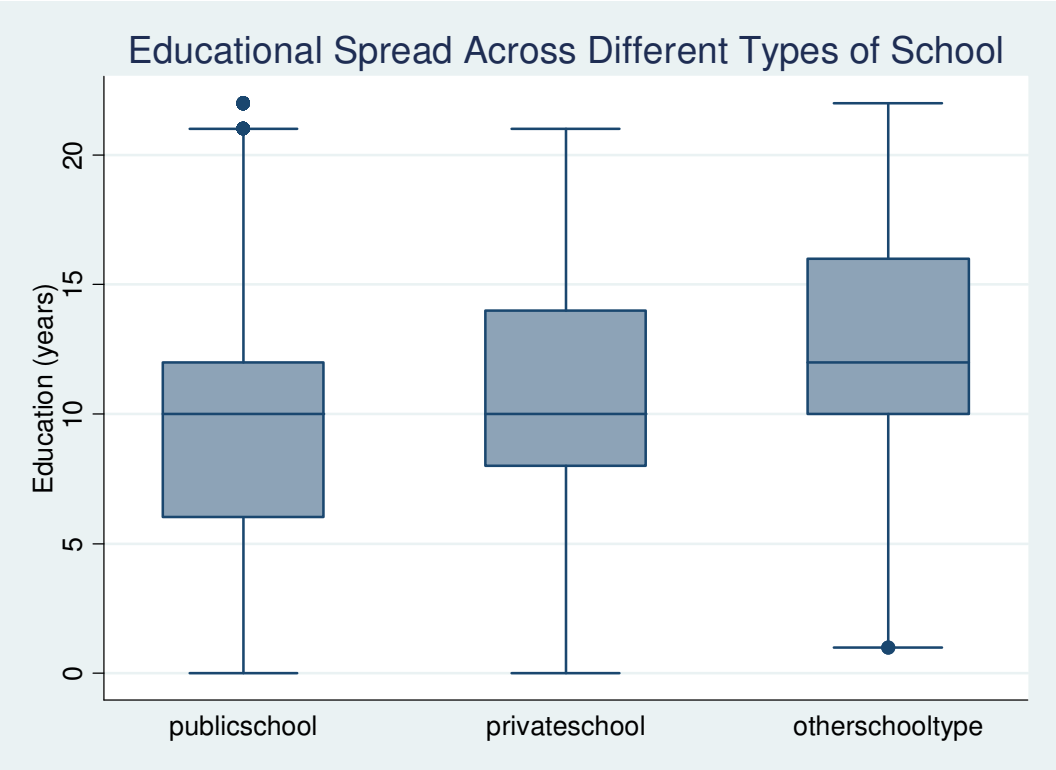
Figure 4.4.7: Educational variation across different professions.



10. Type of School:

The data on different types of school is available in PSLM-2007-08 Survey to analyze the earning differentials. In the Survey, "1" stands for Government schools, "2" for Private schools, "3" for Deeni Madrissa, "4" for NGO, Foundation and Trust run schools, "5" for Non formal Education school, "6" for others and "7" for privately run schools. This study chooses only two types of school (Private and Public schools) for analysis due low observation in other mentioned types of school.

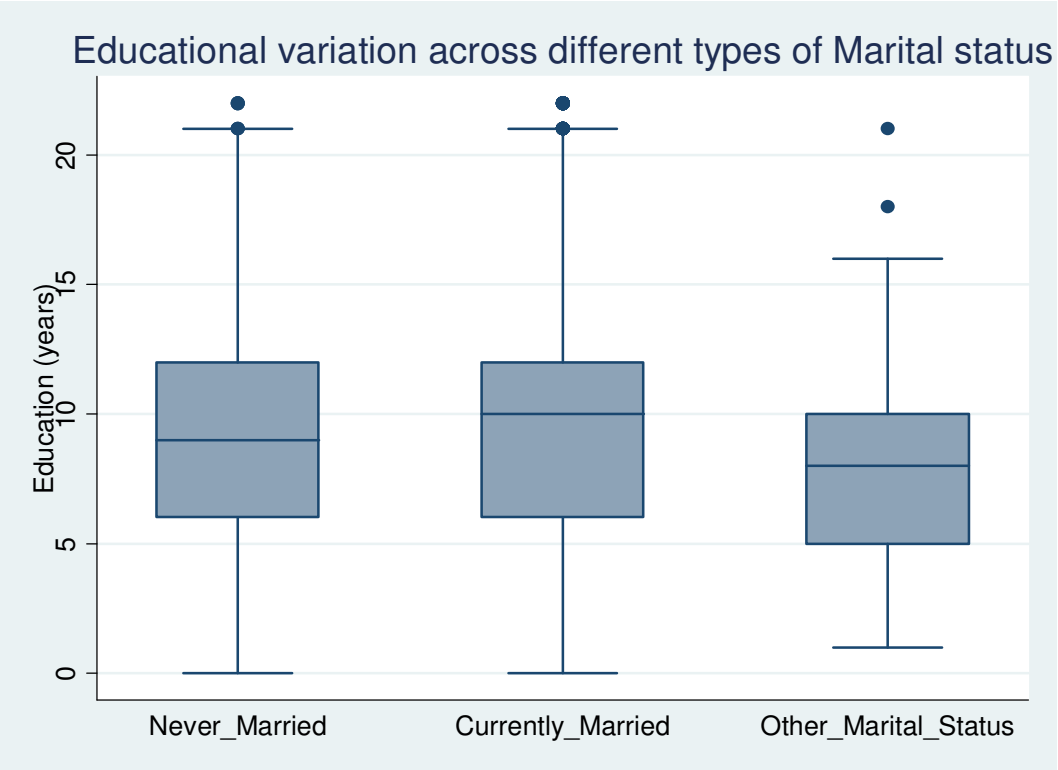
Figure 4.4.8: Educational variation across different types of school.



11. Marital Status:

Data on marital status data has been used in our analysis to measure the impact of marital status on earning of individuals. In the Survey, "1" stands for never married, "2" for currently married, "3" for Widow/Widower, "4" for divorced and "5" stands for those whose Nikkah has been solemnized but where Rukhsati (departure to husband's home or in rare circumstances to wife's home) has not taken place yet. This study chooses only two types of marital statuses like ("Never married" and "currently married") for analysis due low observation in other mentioned categories.

Figure 4.4.9: Educational variation across different types of marital status.



4.5: ORDINARY LEAST SQUARES (OLS) METHOD

Ordinary least squares (OLS) method is one of the commonly used methods to get earnings estimates. This approach is used by most of the existing studies, e.g; Haque (1977), Hamdani,K (1977), Guisinger et al (1984), Khan, S.R & Irfan, M (1985), Shabbir, T & Alia, H.K. (1991), Ashraf, J & Ashraf, B (1993a, 1993b, and 1996),Chishti, S et al (1998), Nasir, Z.M (1998,1999, 2000 & 2002).

We briefly explain this methodology below:

Consider the standard Mincerian Earning function:

$$\ln(Y_i) = \beta_0 + \beta_1 Edu_i + \beta_2 Exp_i + \beta_3 (Exp_i)^2 + U_i$$

Where,

$\ln(Y_i)$: Natural logarithm of monthly earnings.

Edu_i : Completed years of schooling.

Exp_i : Experience in years.

$(Exp_i)^2$: Square of experience (in years).

$\beta_i's, i = 1,2,3$, are marginal rate of each of the variables with β_0 as intercept.

U_i : Error term, which is assumed to be normally distributed with zero mean and a positive variance and is IID.

Since, we are using cross-sectional data; heteroscedasticity is likely to exist. (See, Greene, W.H.

(2003), Chapter: 11, Page no: 238). So we provided here robust (heteroscedasticity corrected) standard errors to judge the significance of the regressors while estimating the earning equation. This way the problem of heteroscedasticity can be overcome.

Most of the existing studies inappropriately used OLS method with conventional standard errors (standard errors using homoscedasticity assumption) for the cross-sectional PSLM data which is likely to have heteroscedasticity1.We replace conventional standard errors with heteroscedasticity consistent standard errors (HCSEs) to address the problem of heteroskedasticity.

In addition to the problem with OLS discussed above, there are a number of other problems as well including the omitted variable bias and measurement error due to which, OLS cannot be used to correctly estimate the earning function. So we used instrumental variable technique to overcome the problem of omitted variable bias as well as the measurement error. Next section provides brief explanation of IV approach.

4.6: INSTRUMENTAL VARIABLE (IV) APPROACH

Instrumental Variable (IV) estimation is used when the model has regressors which are endogenous in nature. We use IV technique to address the following important econometric problems to ensure the validity of the estimates. The omitted variable bias is caused by some unobserved variable that is correlated with explanatory variable X, but which cannot be included in the regression equation.

Simultaneous causality bias occurs as a result of the endogenous explanatory variables, that is, explained variable Y causes the explanatory variable X and vice versa. Errors-in-variables bias (X

[1] We tested for heteroskedasticity using White (1980) test which rejected the null hypothesis of homoscedasticity. So we used heteroskedasticity-consistent standard errors throughout in this thesis.

is measured with error) is also one of the biases identified in the literature. The IV regression removes biases arising from these three sources.

The problems with OLS can be overcome by the use of IV approach.

The basic model for the IV regression is given by:

$$\ln(Y_i) = \beta_0 + \beta_1 Edu_i + \beta_2 X_1 + U_{1i} \quad ---(I)$$

$$Edu_i = \alpha_0 + \alpha_1 X_2 + U_{2i} \quad ---(II)$$

In equation (I), Edu is the education in completed years, ln(y) is the earnings and X_1 represents other control variables including gender effect, province effect and region effect etc and U_1 is the error term. Since education is not a measure of the ability of an individual, the assumption of zero correlation between regressor and the error term fails. Thus OLS becomes unreliable. In order to correct this ability bias (endogenity of education), we introduce some set of valid instruments which determine education. This is represented in equation (II). Education is affected by X_2, where X_2 contains a set of valid instrument(s), usually father and mother education and family background and U_2 is the error term. Commonly used instruments are father and mother education, family background, distance from school, year of birth etc. (See, Aslam, M (2007&2008), Qaisar Abbas (2007), Flabbi, L (1999), Walker, I & Zhu, Y (2001), Card, D (2001), Harmon et al (2003), Ismail, R. (2007) etc).

In our study, we test each variable whether it fulfills the condition of being valid instrument or not and retain only those which will be strong candidates for being a valid instrument. There are two conditions of instrumental validity, that is, instrument relevance and instrument exogeneity.

Instrumental Relevance and Instrumental Exogeneity:

Instrumental Relevance: $Corr\ (Z_{i,} X_i) \neq 0$…….. (1)

Instrumental Exogeneity: $Corr\ (Z_{i,} U_i) = 0$…….. (2)

If an instrument is relevant, then variation in the instrument is related to variation in Xi. If the instrument is exogenous then that part of the variation in Xi captured by the instrumental variable is exogenous. Thus, an instrument that is relevant and exogenous can capture movements in Xi that are exogenous. This exogenous variation can in turn be used to estimate the population coefficient β1. [See, Stock J.H & Watson M.W, Chapter no: 12, P- 439].

Chapter 5

EMPIRICAL ANALYSIS

5.1: INTRODUCTION

This section includes two main sections. The first section called exploratory data analysis and second section called regression analysis. Exploratory data analysis includes three sub sections, including, the statistical analysis using basic summary statistics, graphical analysis using box plots and age earning profiles across gender, provinces, regions, industries etc. The second section provides the regression analysis using two methods, the ordinary least squares (OLS) and the instrumental variable (IV) method.

5.2: EXPLORATORY DATA ANALYSIS

This section includes three subsections, statistical analysis, graphical analysis and the age-earning profiles over different regions, provinces, professions etc.

5.2.1: STATISTICAL ANALYSIS

In this section we provide the statistical analysis of variables in the study and also we explore different hypotheses using tables of summary statistics and graphs.

5.2.1.1: LABOR FORCE PARTICIPATION

Below we provide information about active labor force by sex. According to Labor Force survey of Pakistan, the starting age of labor force participation is 10 years. Various studies in the past take different age limits in Pakistan which ranged from 10 to 60 and sometimes exceeded 60. Following suit, we considered the age limit between 10 and 60 years. The following tables provide the summary statistics of individuals who are a part of labor force.

Table 5.2.1.1.1: Active labor force participation between 10 and 60 years by sex

Sex of Person	Frequency	Percent	Cumulative
Male	7,541	92.70	92.70
Female	594	7.30	100.00
Total	8,135	100.00	

The above table shows that participation of the male in the labor force is disproportionately higher than that of the females with male individuals contributing 92.70 percent to labor force while female's participation rate is only 7.30 percent.

Table 5.2.1.1.2 below gives the distribution of active labor force (having age from 10 to 60) for different provinces by sex. Overall Punjab dominates the other three provinces with labor force around 3463 out of 8135 which is around 42.57 percent. Sindh is the second with contribution of around 28.16 percent to the active labor force. NWFP is the

third with contribution of around 15.92 percent. Balochistan has the lowest labor force participation rate of 13.35 percent (1086 out of 8135). Table also provides the results for both male and female individuals. We can see that in all four provinces, gender is an extremely significant determinant.

Since the p-value of Pearson's Chi-square test is less than 5% (as well as less than 1%), so we reject the null hypothesis that there is no difference between gender across provinces. So we conclude that males and females participation differ across provinces or there is significant difference exists between sexes across provinces.

Table 5.2.1.1.2: Active labor force participation between 10 and 60 years by sex and province

Sex of Person	Punjab	Sindh	NWFP	Balochistan	Total
Male	38.46	26.60	14.74	12.89	92.70
Female	4.11	1.56	1.18	0.45	7.30
Total	42.57	28.16	15.92	13.35	100.00
Pearson chi2(3) = 62.9146			**Pr = 0.000**		

Table 5.2.1.1.3 below gives the labor force participation over different regions by sex. We can see that overall labor force participation rate in urban areas is higher than in the rural areas. Table also shows higher male participation in the labor force in both the urban and rural areas. Table also shows that female participation is higher in the urban areas.

The p-value of Pearson's Chi-square test is very low indicating that differences between gender and region are significant.

Table 5.2.1.1.3: Active labor force participation between 10 and 60 years for region and sex

Sex of Person	Urban	Rural	Total
Male	51.27	41.43	92.70
Female	4.88	2.42	7.30
Total	56.15	43.85	100.00
Pearson chi2(1) = 29.6998		**Pr = 0.000**	

Table 5.2.1.1.4 below gives the distribution of active labor force over different levels of education categories by sex. The male labor participation is 92.70% and as against female participation which is roughly 7.30%. At every level of education, male participation is higher than that of the females. The gender difference is the highest at the middle level education, with the males contributing to 96.04% of the total active labor force and female participation is only 3.96%.

As before, p-value of Pearson's Chi-square test is very small suggesting that there is a significant difference between different educational categories across gender.

Table 5.2.1.1.4: Active labor force participation between 10 and 60 years for education by sex

Education	Male	Female	Total
Illiterate	0.28	0.02	0.31
Primary	22.3	1.51	23.81
Middle	18.18	0.75	18.93
Matric	25.22	1.36	26.59
Inter	11.38	1.03	12.42
Graduate	10.15	1.52	11.68
Master & Above	5.18	1.09	6.27
Total	92.70	7.30	100
Pearson chi2(6) = 168.61		**Pr = 0.000**	

5.2.2. BASIC ANALYSIS

In this section we analyze our data by using the simple statistical tools. Our data set contains a total of 8315 observations. Table below gives the summary statistics (mean, standard deviation, minimum and maximum value) of variables of interest.

Table 5.2.2.1: Mean and Standard Deviation of important variables

Variables	Mean	Std. Dev	Minimum	Maximum
Age	35.13	11.19	10	60
Female	0.07	0.26	0	1
Male	0.93	0.26	0	1
Punjab	0.43	0.49	0	1
Sindh	0.28	0.45	0	1
NWFP	0.16	0.37	0	1
Balochistan	0.13	0.34	0	1
Urban	0.56	0.50	0	1
Rural	0.44	0.50	0	1
Public School	0.98	0.13	0	1
Private School	0.02	0.13	0	1
Experience	20.78	11.47	0	53
Experience Square	563.40	555.76	0	2809
Father Education	9.65	3.96	0	23

Illiterate	0.00	0.06	0	1
Primary	0.24	0.43	0	1
Middle	0.19	0.39	0	1
Matric	0.27	0.44	0	1
Intermediate	0.12	0.33	0	1
Graduate	0.12	0.32	0	1
Master & Above	0.06	0.24	0	1
White Collar	0.24	0.42	0	1
Blue Collar	0.76	0.42	0	1
Never Married	0.23	0.42	0	1
Currently Married	0.77	0.42	0	1
Monthly Earnings	8562.28	11953.64	100	627000
Agriculture & Minning	0.06	0.24	0	1
Manufact & Construct	1.77	0.42	1	2
Financing	0.03	0.17	0	1
Community	0.36	0.48	0	1
Wholesale	0.19	0.40	0	1
Other Industries	0.12	0.33	0	1

Table 5.2.2.2 below gives the average monthly earnings (in Rs.) of workers over different regions by sex. Overall individuals living in urban areas earn more than the individuals in rural areas with urban population earning on the average Rs. 10306 while rural

individuals earning Rs. 6328.68. Also the p-value of pearson's chi-square test indicates that differences between region and gender is significant.

Table 5.2.2.2: Average Monthly Earning (Rs.) of workers by region and sex

Region	Male	Female	Total
Urban	10577.93	7453.72	10306.41
Rural	6509.033	3243.508	6328.683
Total	8759.581	6057.404	8562.274
Pearson chi2(1) = 29.6998		**Pr = 0.000**	

Table 5.2.2.3 below gives the average monthly earnings (in Rs.) of workers over different levels of education by provinces. Overall individuals living in Punjab earn more than the individuals in three other provinces with average monthly earning of around Rs. 9467 rupees while Sindh is at second with average monthly earning of Rs. 7984 rupees. Individuals who belong to Balochistan, there average monthly earnings are Rs. 7880 rupees and the most low earning province is NWFP, where average monthly earnings of NWFP is only Rs. 7737 rupees. We can also see that as education level increases the average monthly income also increases in all the four provinces. The p-value of pearson's chi-square test is almost zero suggesting that there is a significant difference between provinces and educational categories.

Table 5.2.2.3: Average Monthly Earning (Rs.) of workers by education and provinces

Education	Punjab	Sindh	NWFP	Balochistan	Total
Illiterate	4361.36	6000.00	8750.00	--	4778.00
Primary	5721.75	4999.19	5812.45	5892.76	5532.44
Middle	6628.14	5830.76	5276.05	5931.68	6125.42
Matric	9052.10	6479.38	6554.81	7019.08	7722.06
Inter	14878.07	8114.40	8971.94	8070.37	10612.54
Graduate	15755.60	14116.37	11113.19	11339.69	13837.34
Master & Above	20169.31	16862.77	14060.74	16733.33	17290.57
Total	9467.02	7984.04	7737.74	7880.28	8562.27
Pearson chi2(18) = 199.4918			**Pr = 0.000**		

Table 5.2.2.4 below gives the average monthly income of the individuals over different levels of education by region. Overall the average monthly income of urban individuals is more that the rural ones, with urban getting Rs. 10306 while rural individuals' average income is only Rs. 6328. We can also observe that as education level increases, the average monthly income increases in both types of regions (urban as well as rural).

The significance of differences between educational categories and regions is tested via chi-square test whose p-value is very small suggesting that these differences are highly significant.

Table 5.2.2.4: Average Monthly Earning (Rs.) of workers by education and region

Education	Urban	Rural	Total
Illiterate	3962.50	5161.76	4778.00
Primary	6428.72	4830.12	5532.44
Middle	6858.96	5322.02	6125.42
Matric	8647.42	6596.65	7722.06
Inter	12336.43	7681.02	10612.54
Graduate	15246.62	9869.84	13837.34
Master & Above	19098.29	12006.48	17290.57
Total	10306.41	6328.68	8562.27
Pearson chi2(6) = 343.1090		**Pr = 0.000**	

5.2.3: GRAPHICAL ANALYSIS

In this section, we are providing some of the most important observations graphically. Since the data is non-normal[2], so box plots are the best graphical tool to get a quick summary of the different hypothesis of interest.

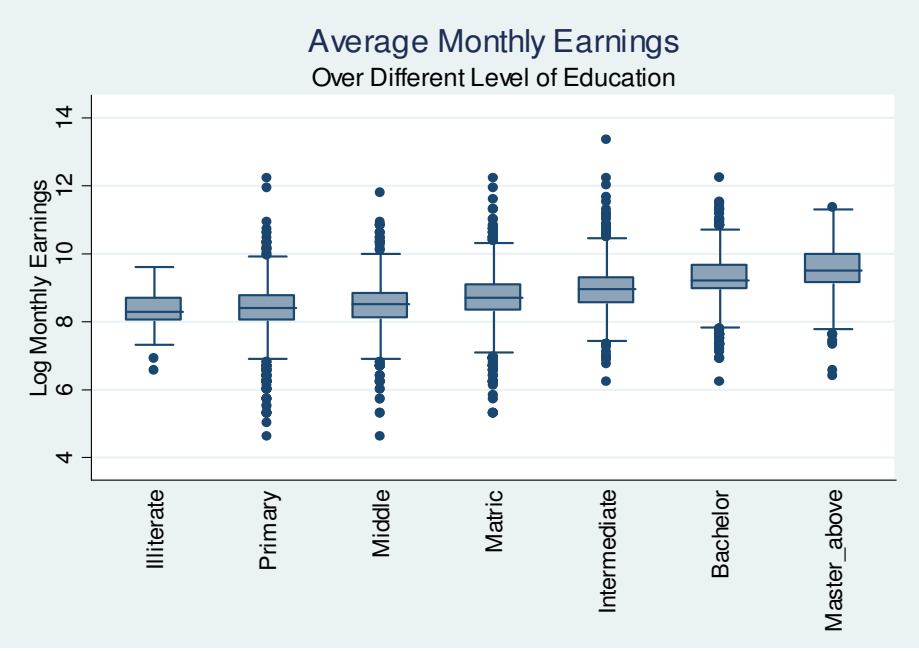
We explain briefly each case below:

1: As education level increases, average earnings also increases.

This is verified by the following box plot which shows the log monthly earnings (Rs.) over different educational levels, namely primary, middle, matric, inter, graduate, "master& above" including illiterates.

Figure 5.2.3.1: Average Monthly Earning (Rs.) over different levels of education

The graph shows that as educational level rises, average monthly income of individuals increases.

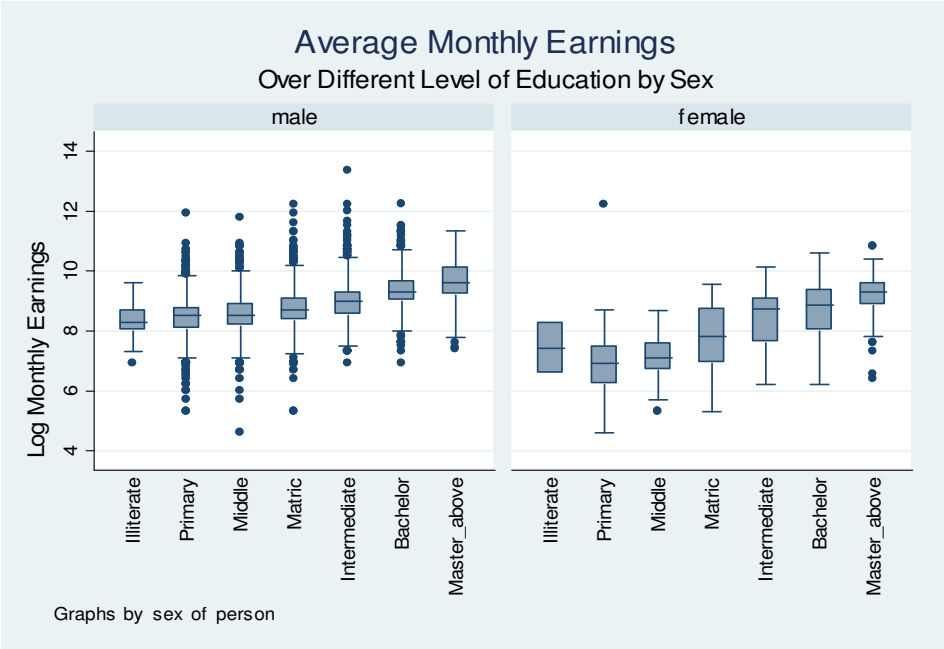


[2] Normality is tested using Jarque-Bera test.

2: Wage differentials over different levels of education by sex.

To show the wage differentials over different sexes (both males and females) over different educational levels, we provide the following box plot.

Figure 5.2.3.2: Average Monthly Earning (Rs.) over different levels of education by sex

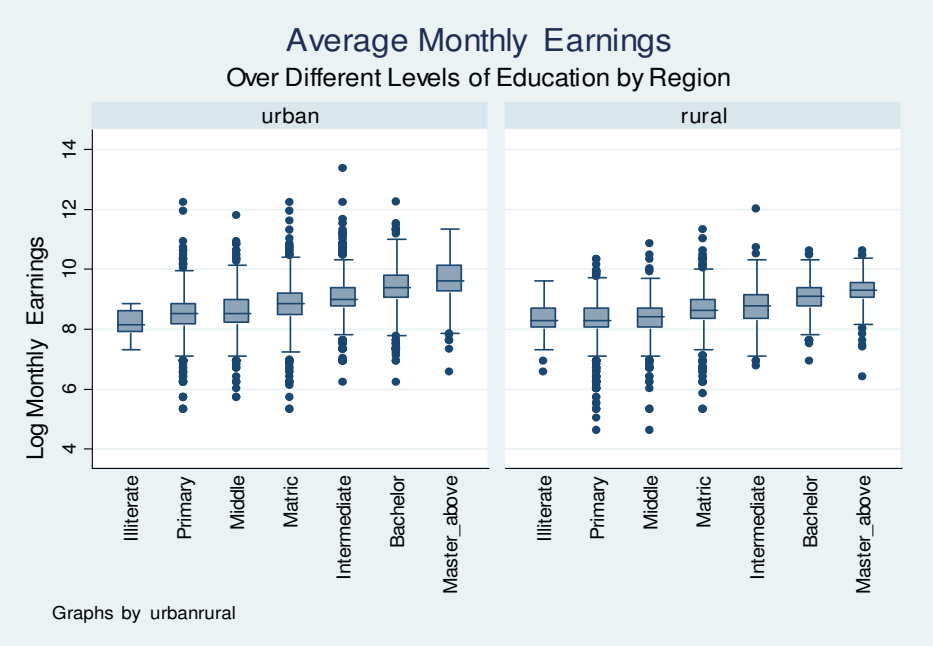


This shows that as educational level rises, log monthly income increases. This pattern is obvious for both sex (males and females). Overall graph shows that as educational level increases, earnings of both males and females increase but the rate of increase in the earnings of males is higher than that of the females. So we can say that males earn more than females with the same level of education in Pakistan.

Graph 3: Wage differentials over different levels of education by region.

This hypothesis is observed by constructing a box plot of logarithm of earnings over different levels of education by sex.

Figure 5.2.3.3: Average Monthly Earning (Rs.) over different levels of education by regions

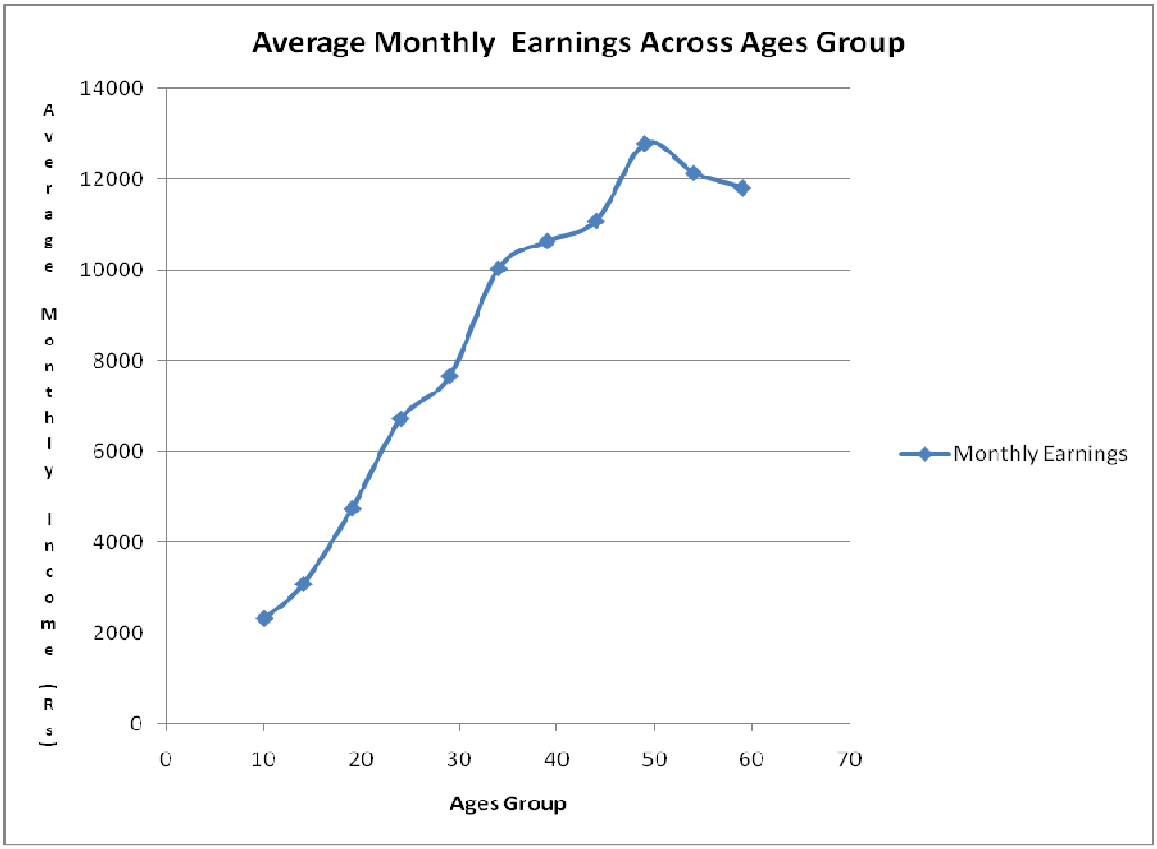


The graph shows that as educational level increases, the logarithms of monthly earnings of individuals belonging to urban areas as well as those of rural areas increase. But from the plot we can see that overall urban individuals earn more than the rural ones with same educational level. This should be the case as urban individuals have more chances of getting diverse and highly paid jobs as compared to jobs available in the rural areas.

5.2.4: AGE-EARNING PROFILES OVER DIFFERENT CATEGORIES

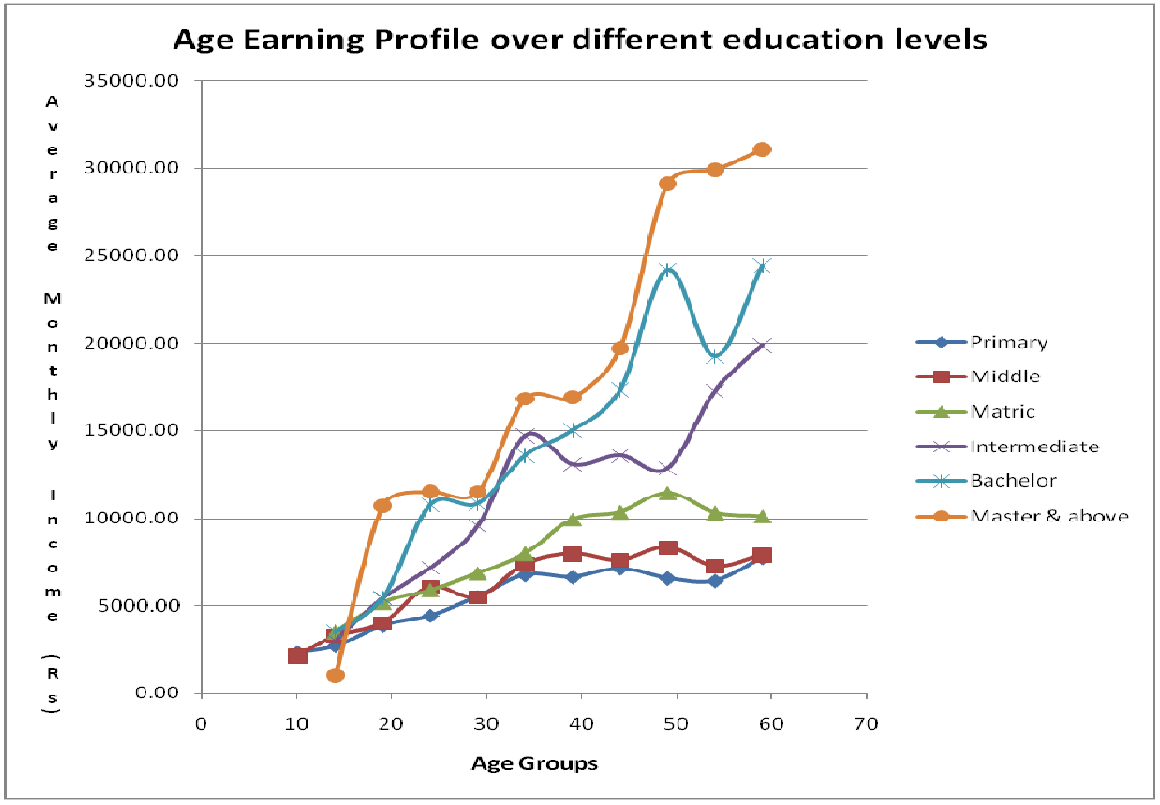
In this section we are providing age earning profiles with respect to different levels of education, provinces, region, sex, industries and professions.

Figure 5.2.4.1: Age Monthly Earnings across Ages Group



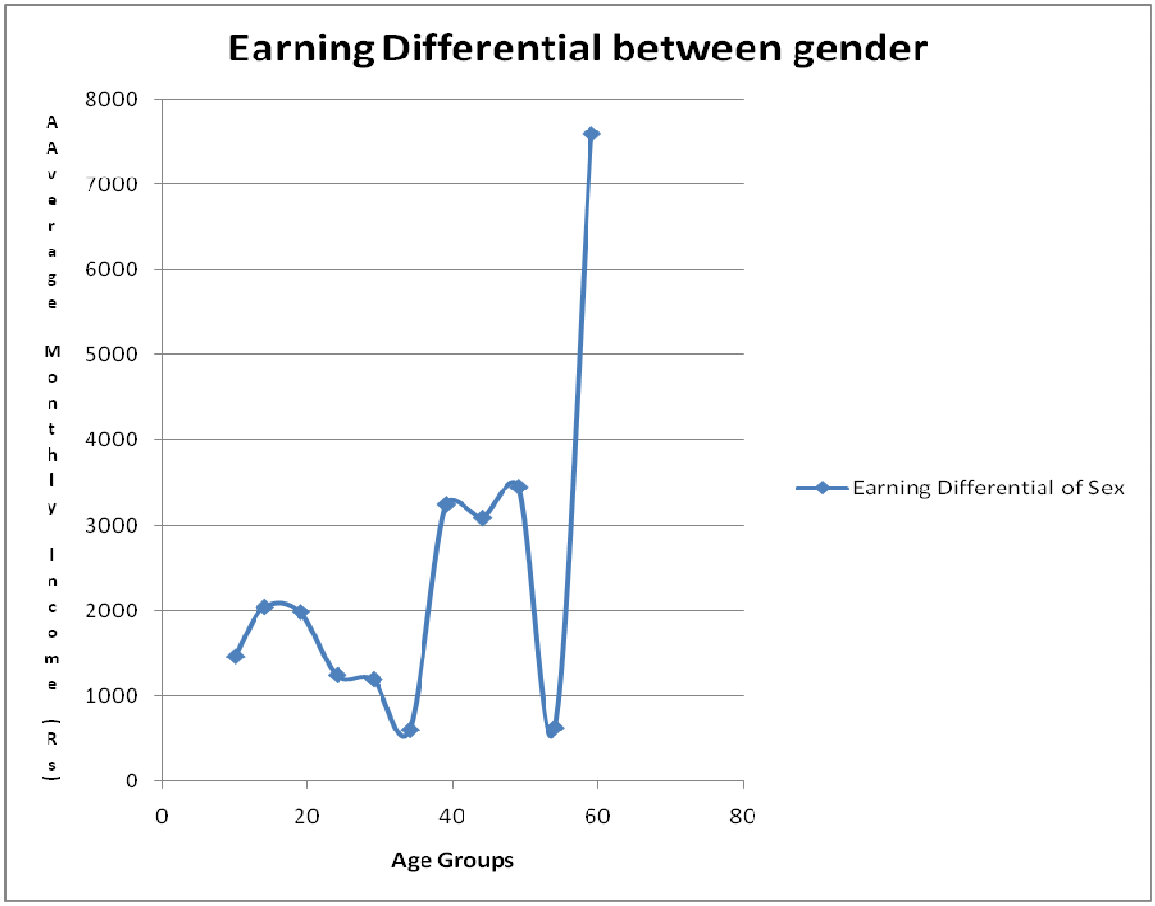
The Figure 5.2.4.1 above explains the average monthly earnings across different age groups. The above figure shows that average monthly earnings are increasing with every additional age group. The figure also shows that at approximately 52 years old workers are higher earnings level than all other age group.

Figure 5.2.4.2: Age Earning Profile over different level of Education



The Figure 5.2.4.2 above explains the average monthly earnings of different level of education by different age groups. The above figure shows that average monthly earnings are increasing with every additional year of education and age group. These results are consistent with the studies like Aslam, M (2007), Ismail, R. (2007), etc.

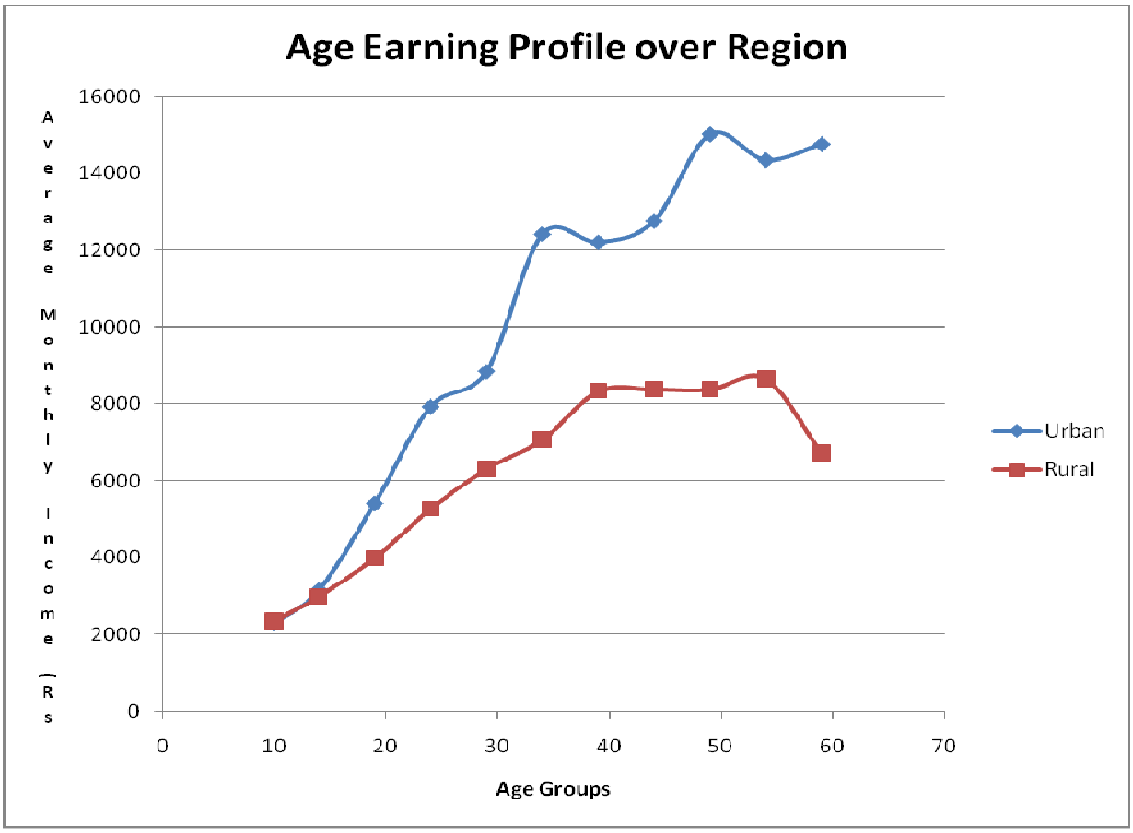
Figure 5.2.4.3: Earning Differential across gender



The Figure 5.2.4.3 explains the average monthly earnings of the difference of males and females earnings, i.e. we subtracted male individuals' earnings from the female individuals' earnings and showed the difference over different age groups. Since the difference is positive, so this means that male individual earn more than female individuals.

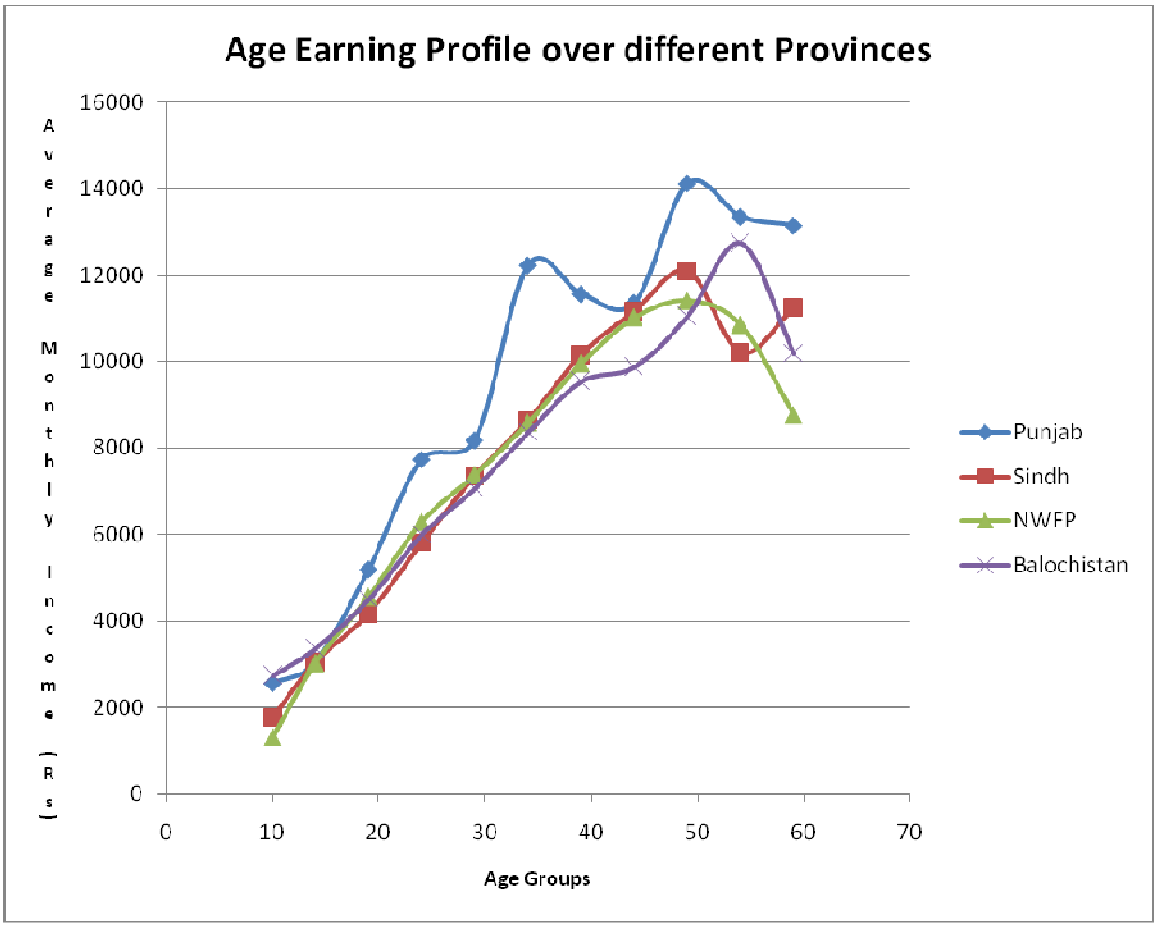
These results are consistent with prior studies, [See, Nasir, M.Z (1998), Nasir, M.Z (2000), Pirmana, V (2006), Aslam, M (2007), etc].

Figure 5.2.4.4: Age earning profile over Region



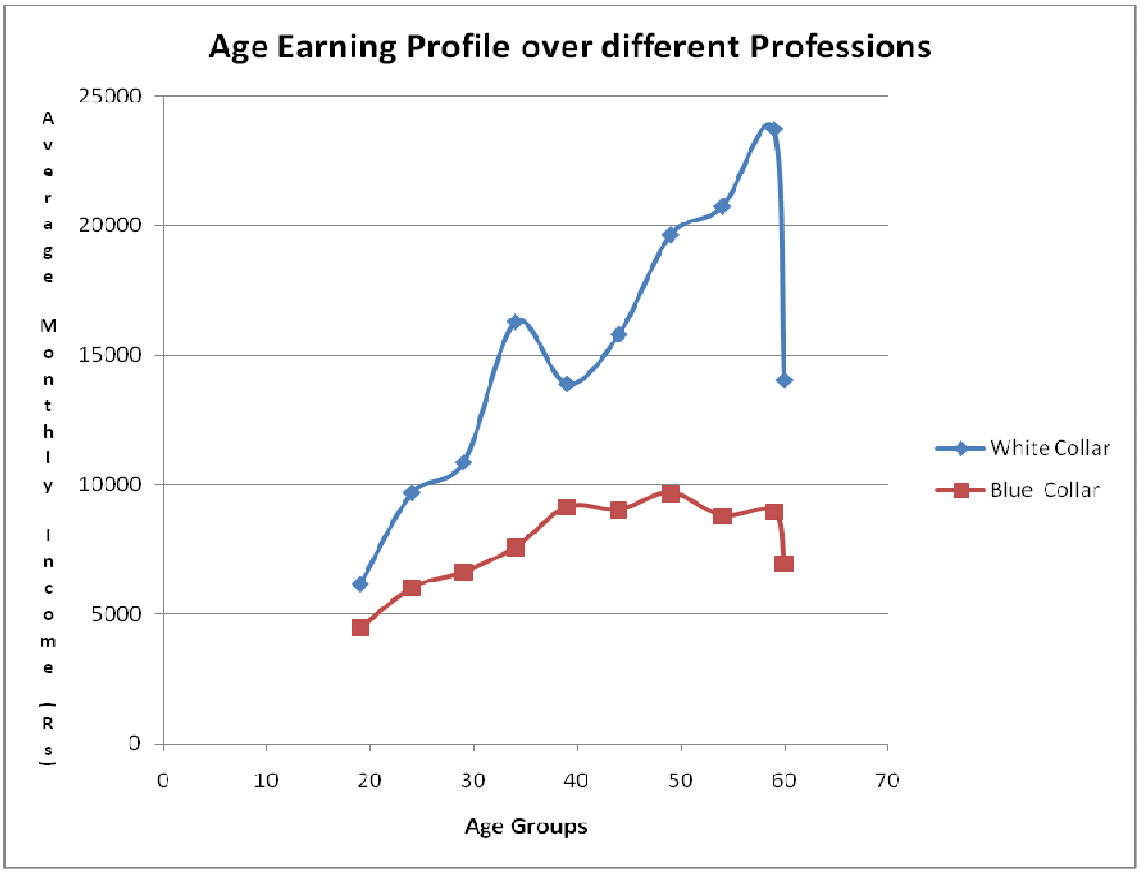
The Figure 5.2.4.4 gives the average monthly earnings of different regions like urban and rural by different age groups. We can see that the average monthly earnings of individuals belonging to urban areas as well as those of rural areas increase with every additional age group. But from the chart we can see that overall urban individuals earn more than the rural ones with same age group. This should be the case as urban individuals have more chances of getting diverse and highly paid jobs as compared to jobs available in the rural areas. These results are consistent with prior studies, [See, Nasir, M.Z (1998), Nasir, M.Z (2000), Jaffary, S et al (2007) etc].

Figure 5.2.4.5: Age earning profile over different Provinces



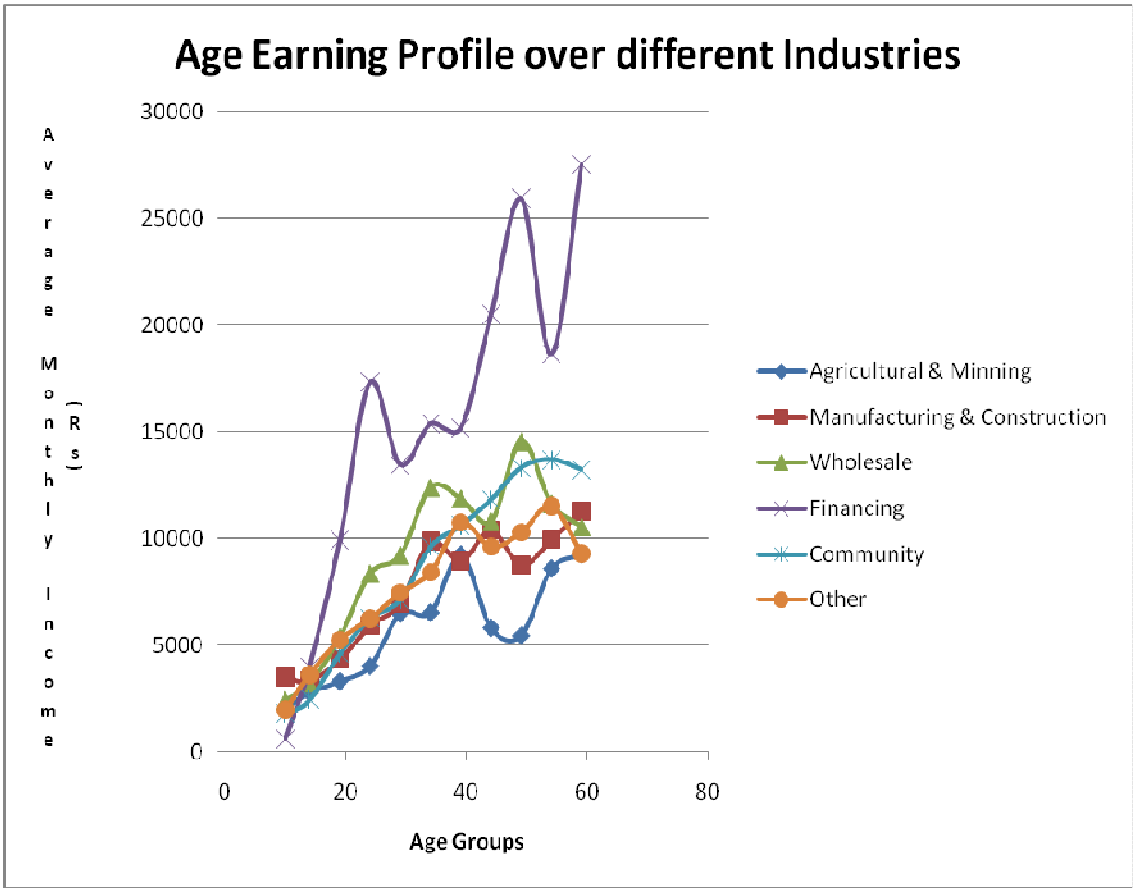
The Figure 5.2.4.5 provides the average monthly earnings of different provinces by different age groups. The above figure shows that average monthly earnings of all the individuals are belonging with any provinces increasing with every additional age group. We can observe that the individuals are belonging with Punjab province is earning more than all other provinces on different age groups.

Figure 5.2.4.6: Age Earning Profile over different Professions



The Figure 5.2.4.6 explains the average monthly earnings of different types of profession (White & Blue Collar) by different age groups. The above figure shows that average monthly earnings of both White & Blue collar are increasing with every additional age group. We can observe that the individuals are belonging with "White Collar" is earning more than individuals are belonging with "Blue Collar" on different age groups. We can see that average monthly earnings of both type of workers (White & Blue Collar) are declining very fatly after the retirement age group (60 years in Pakistan).These studies are consistent with previous studies, [See, Gabriel, P.E & Schmitz, S (2004)].

Figure 5.2.4.7: Age Earning Profile over different Industries

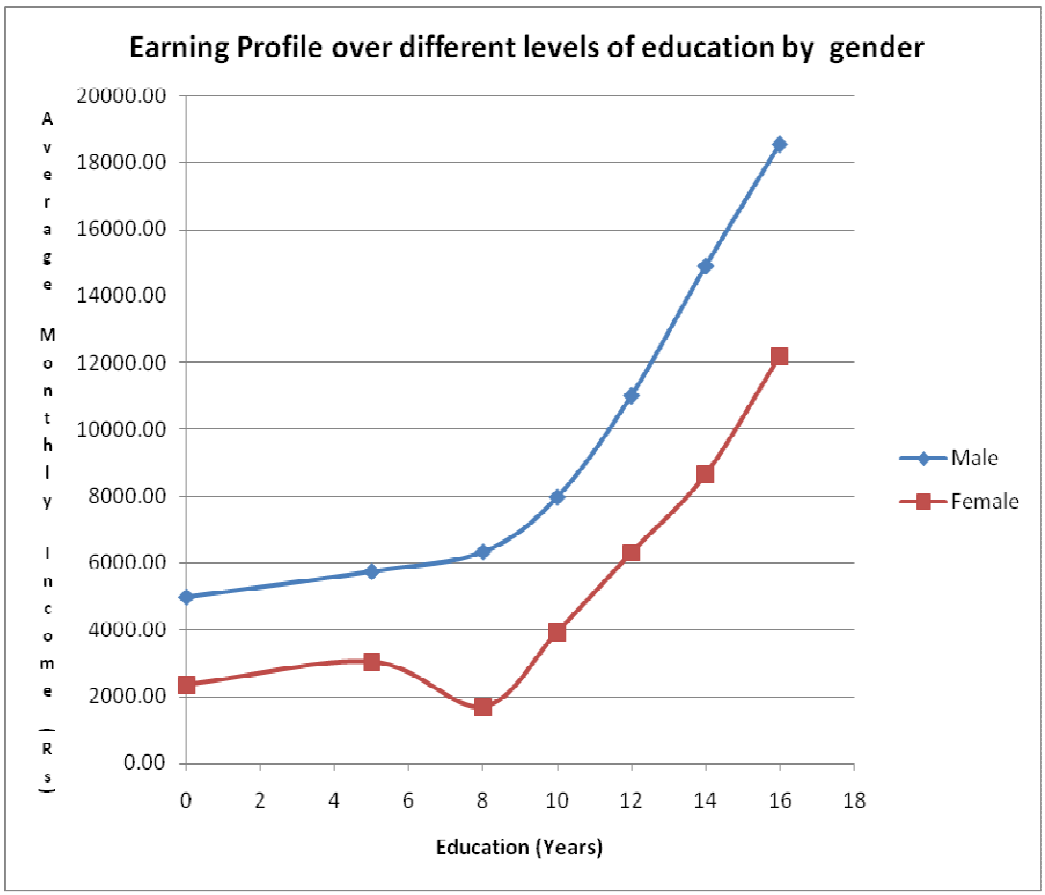


The Figure 5.2.4.7 provides the average monthly earnings of different level of industries by different age groups. The above figure shows that average monthly earnings of all types of industries are increasing with every additional age group. We can see that the individuals who are currently working in "Financing" industries are far higher than all other industries while the return to "Agriculture and Minning" industries is the lowest on every age group.

5.2.5: EDUCATION-EARNING PROFILES OVER DIFFERENT CATEGORIES

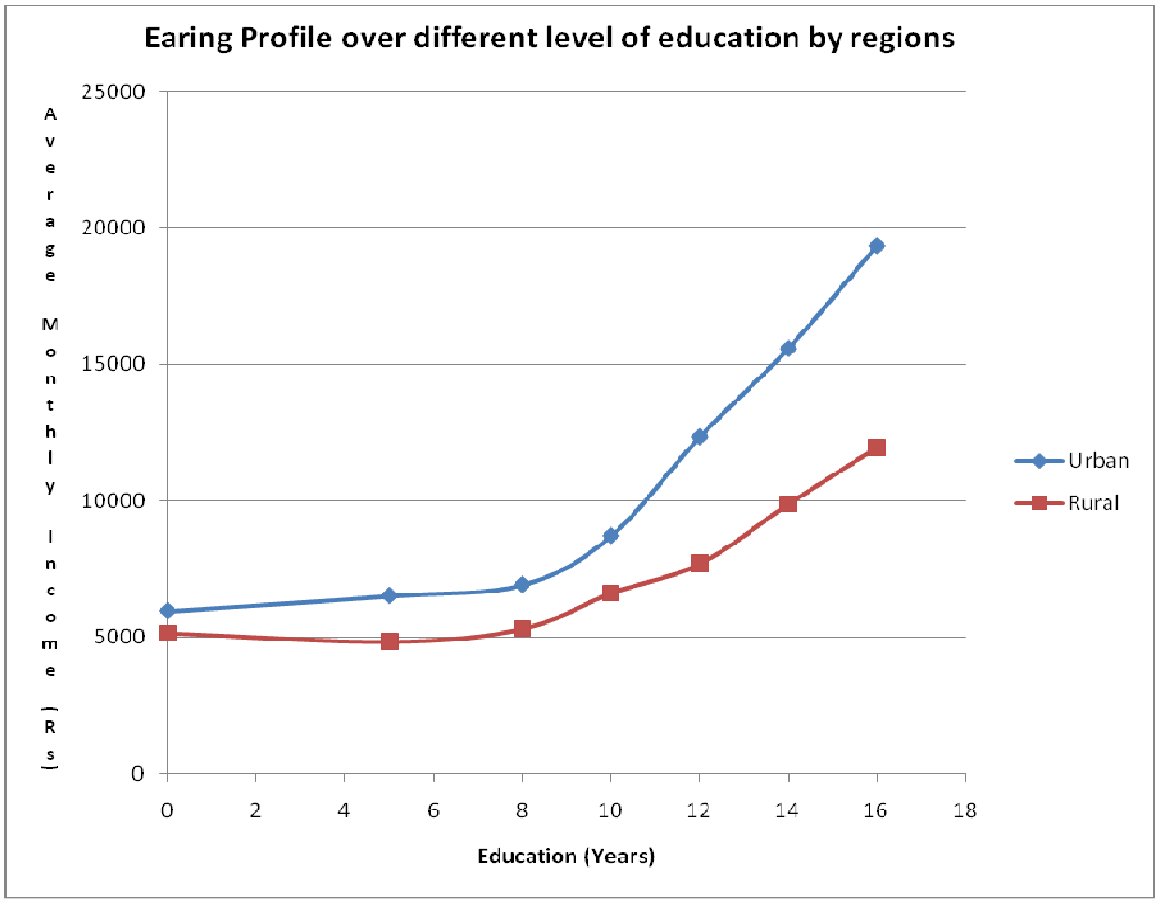
In this section we are providing educational earning profiles with respect to gender and region.

Figure 5.2.5.1: Earning Profile over different level of education by gender



The Figure 5.2.5.1 provides the average monthly earnings of different level of education (years) by gender. The above figure shows that average monthly earnings of both males and female are increasing with every additional years of education but males earnings are higher than female at all the level of education.

Figure 5.2.5.2: Earning Profile over different level of education by regions



The Figure 5.2.5.2 provides the average monthly earnings of different level of education (years) by region. The above figure shows that average monthly earnings of both urban and rural are increasing with every additional years of education but the individuals who belong to urban region earnings are higher than individuals whose belongs to rural area.

5.2.6: REGRESSION ANALYSIS

This section includes the results of estimated regression models using two approaches, the famous ordinary least squares (OLS) approach and the more valid instrumental variable (IV) approach. We are providing OLS regression results with robust standard errors in order to insulate ourselves from making wrong inferences in the presence of heteroskedasticity in cross sectional data. We also used instrumental variables approach since this is considered to be the correct method of estimation for earning equation because education variable is endogenous and we have to use some valid set of instruments for estimating earning function. The following two subsections give the results of these two approaches.

5.2.6.1: ORDINARY LEAST SQUARES (OLS) APPROACH

Ordinary Least Squares (OLS) approach is used by most of the existing studies, e.g; Haque (1977), Hamdani, K (1977), Guisinger et al (1984), Khan, S.R & Irfan, M (1985), Shabbir, T & Alia, H.K. (1991), Ashraf (1993a, 1993b, and1996),Chishti et al (1998), Nasir, Z. M (1998,1999, 2000 & 2002) in spite of the fact that education variable is endogenous which gives rise to simultaneity bias. Most of the existing studies used OLS with conventional standard errors based on the assumption of the homoskedasticity of the standard errors, but address this issue by using OLS methodology with robust homoskedasticity corrected standard errors (HCSEs).

In this section, we are providing results for our desired hypotheses using OLS methodology with robust HCSEs.

Mincerian Earning Model Estimation results

We have the Mincerian earning function given below:

$$\ln(\text{m\_}inc) = \alpha_0 + \alpha_1 Edu + \alpha_2 Exp + \alpha_3 Expsq + \varepsilon$$

Where, ln(m_inc) represents the natural log of monthly income,

Edu_i : Completed years of schooling.

Exp_i : Experience in years.

$Expsq$: Square of experience (in years).

$\beta_i's, i = 1,2,3$, are marginal rate of each of the variables with β_0 as intercept.

ε : Error term, which is assumed to be normally distributed with zero mean and a positive variance and is IID.

Our extended form model is given below after inclusion of different dummies variables.

$$\ln(\text{m\_}inc) = \alpha_0 + \alpha_1 Edu + \alpha_2 Exp + \alpha_3 Expsq + \alpha_4 DMale + \alpha_5 DUrban + \alpha_6 DPunjab + \alpha_7 DSindh + \alpha_8 DNWFP + \alpha_9 Dprivateschool + \alpha_{10} DWhiteCollar + \alpha_{11} DCurrentlyMarried + \alpha_{12} DAgriMinning + \alpha_{13} DCommunity + \alpha_{14} DOtherindustries + \alpha_{15} DWholesale + \alpha_{16} DFinancing + \varepsilon$$

The above model is estimated using OLS method with robust standard errors. The results are given in the following table:

Mincerian Earning Model Estimation results by using OLS

Variables	*Coefficients*	*t Stat*	*P Value*
Constant	6.171	123.320	0.000
Education	0.085	38.130	0.000
Experience	0.053	19.630	0.000
Expsq	-0.001	-13.540	0.000
Male	0.797	20.670	0.000
Urban	0.207	15.770	0.000
Punjab	0.063	3.490	0.000
Sindh	-0.086	-4.800	0.000
NWFP	-0.039	-1.820	0.069
Private School	0.157	2.760	0.006
White Collar	0.375	17.430	0.000
Currently Married	0.132	6.600	0.000
Agri & Minning	-0.054	-2.110	0.035
Community	-0.094	-4.910	0.000
Other Industries	0.078	3.900	0.000
Wholesale	0.152	7.410	0.000
Financing	0.333	8.170	0.000
Number of obs	8135		
R-squared	0.4869		

P value of F-Stat	0.0000
F-Statistics	428.83

All variables are highly significant with expected signs. i.e. education and experience positively affect monthly income. Experience square's coefficient is negative showing the concavity of age-earning profile and concavity is consistent like [See, Gautier & Teulings (2003), Polachek, S.W (2007), etc]. Table also shows that as education level increases by one year, average monthly earnings increases by 8.5 percent approximately. Similarly, we can see that as experience increases by one year, monthly income increases by 5.3 percent approximately. High value of F-statistics and R^2 shows that overall variables are relevant to our regression model. The coefficients of male, urban, private school, "White Collar" and "Currently Married" variables show positive sign and their t-stat indicates more significant results than their base categories like female, rural, public school, "Blue Collar" and "Never Married" respectively. The coefficient and t-stat of Punjab shows positive and significant result and also shows high returns to education than the base category i.e. Balochistan but the coefficient of Sindh and NWFP indicates negative sign which indicates that there low returns to education than base category i.e. Balochistan, where the t-stat shows that the Sindh is significant but NWFP is insignificant. But if we see the P-value of NWFP than we can easily observe that at 90% significant level NWFP is also significant and important variable. The coefficients of "Other Industries", "Wholesale" and "Financing" sectors show positive sign and their t-stat indicates highly significant results, its mean these all sectors are important for human

capital model and also show higher earnings than their base category i.e. “Manufacturing & Construction”. The coefficient of “Financing” sector also indicates the higher rate of returns with respect to all other industrials sectors, which shows 33% returns to education. But if see the coefficients of “Agriculture & Minning” and “Community” sectors that their coefficients indicate the negative sign and their t-stat show the significant results and higher than the standard absolute value of t-stat. The negative sign of these mentioned sectors show that their returns to education are lower than their base category i.e. “Manufacturing & Construction”.

As we know that Mincerian earning function assumed the constant returns to education across different levels, which cannot show the real picture of returns to education at different levels of education. Different studies like Chishti, S et al (1999), Nasir, Z.M (1998, 1998, 2000 & 2002) used different splines of education for estimating the returns to education. Following the spline approach, this study also constructed the six splines of education like (Primary, Middle, Matric, Intermediate, Graduate and “Master & Above”), where due to low observation in those degrees which are higher than master level, we merged the master and higher than master degrees with the name of “Master & Above”.

For estimating the returns to education at different levels of education, we included the educational dummies into our regression model. In particular, we introduced dummy variables for each education level, namely, primary, middle, matric, intermediate, graduation, master and above than master degree (DMaster & Above) as well as the dummy variable for the illiterate individuals. The dummy variable (Dprimary) for primary education is a categorical variable which takes value 1’ when the individual has

primary level education and '0' otherwise. The dummy for other educational levels are similarly constructed.

Treating Dilliterate as reference category and using DPrimary, DMiddle, DMatric, DInter, DGraduate and (DMaster & Above) into our Mincerian earning function, we have the following form of our regression model:

$$\ln(m\_inc) = \alpha_0 + \alpha_1 Exp + \alpha_2 Expsq + \alpha_3 DMale + \alpha_4 DUrban + \alpha_5 DPunjab + \alpha_6 DSindh + \alpha_7 DNWFP + \alpha_8 Dprivateschool + \alpha_9 DWhiteCollar + \alpha_{10} DCurrentlyMarried + \alpha_{11} DAgriMinning + \alpha_{12} DCommunity + \alpha_{13} DOtherindustries + \alpha_{14} DWholesale + \alpha_{15} DFinancing + \alpha_{16} Dprimary + \alpha_{17} DMiddle + \alpha_{18} DMatric + \alpha_{19} DIntermediate + \alpha_{20} DGraduate + \alpha_{21} DMaster\ \&\ Above + \varepsilon$$

The regression results with all educational dummies.

Variables	***Coefficients***	***t Stat***	***P Value***
Constant	6.418	48.160	0.000
Experience	0.052	19.070	0.000
Expsq	-0.001	-13.350	0.000
Male	0.824	21.350	0.000
Urban	0.210	16.000	0.000
Punjab	0.054	2.930	0.003
Sindh	-0.098	-5.410	0.000
NWFP	-0.050	-2.310	0.021
Private School	0.176	3.070	0.002

White Collar	0.360	16.430	0.000
Currently Married	0.150	7.510	0.000
Agri & Minning	-0.075	-2.960	0.003
Community	-0.098	-5.080	0.000
Other Industries	0.085	4.240	0.000
Wholesale	0.153	7.520	0.000
Financing	0.286	7.120	0.000
Primary	0.178	1.420	0.156
Middle	0.332	2.650	0.008
Matric	0.513	4.090	0.000
Intermediate	0.764	6.030	0.000
Graduate	1.040	8.170	0.000
Master & Above	1.277	9.880	0.000
Number of obs	8135		
R-squared	0.4854		
P value of F-Stat	0.0000		
F-Statistics	320.61		

Table shows that all variables are highly significant except dummy variables for primary, which is ignorable in our regression model. We cannot exclude the primary level education from our regression model. Experience square's coefficient is negative

showing the concavity of age-earning profile. We can see that as education level increases, monthly earning also increases.

High value of F-statistics and R^2 shows that overall variables are relevant to our regression model. Our results favor the hypothesis that as education level increases, earnings of the individuals also increases.

After estimating the regression model, we tested the residuals for normality using Jarque-Bera test, on the basis of p-value, we were unable to reject the null hypothesis of normality at 5% significance level. Since we used heterskedasticity consistent standard errors, so problem of heteroskedasticity will not affect our estimates, specially their significance. The structural stability of regression coefficients is tested via chow test and its p-value is found to be more than 5%, indicating that the null hypothesis of structural stability can't be rejected at 5% significance level. The test for functional form mis-specification is tested via Ramsey RESET test whose p-value is also found to be greater than 5%, indicating that the functional form is correct.

5.2.6.2: INSTRUMENTAL VARIABLE (IV) APPROACH

Since education variable is endogenous, we cannot use a single equation to estimate earning function. The most commonly used approach is the instrumental variables approach. This approach considers education as endogenous variable and uses some valid set of instruments to get equation for the variable education. So to incorporate endogenous education a reduced form education equation is added to the wage equation to form a two equation model. Father's education and mother's education are the identifying instruments. To assess validity of instruments, an over identification (OID) test [(See, Deaton, A (1997)] was used. Residuals from the IV wage equation are regressed on all instruments used in the reduced form education equation. The R^2 from this regression is multiplied by the sample size to yield a chi-squared distributed test statistic with degrees of freedom equal to the number of over-identifying instruments. The null hypothesis of valid instruments in case of father education is not rejected. So we used only father education as an instrument in our analysis.

$$\ln(\text{m\_}inc) = \alpha_0 + \alpha_1 Edu + \alpha_2 Exp + \alpha_3 Expsq + \varepsilon \ldots\ldots\ldots\ldots\ldots (1)$$

$$EDU = \beta_0 + \beta_1 FatherEdu + u \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where, ln(m_inc) represents the natural log of monthly income,

Edu_i : Completed years of schooling.

Exp_i : Experience in years.

$Expsq$: Square of experience (in years).

FatherEdu: Education of father (in years)

$\beta_i's, i = 1,2,3$, are marginal rate of each of the variables with β_0 as intercept.

ε: Error term, which is assumed to be normally distributed with zero mean and a positive variance and is IID.

We included other control variables for taking the effect of gender, region, province, industries, etc. This is done by introducing their dummies and so the extended form of model is given by:

$$\ln(m\_inc) = \alpha_0 + \alpha_1 Edu + \alpha_2 Exp + \alpha_3 Expsq + \alpha_4 DMale + \alpha_5 DUrban + \alpha_6 DPunjab + \alpha_7 DSindh + \alpha_8 DNWFP + \alpha_9 Dprivateschool + \alpha_{10} DWhiteCollar + \alpha_{11} DCurrentlyMarried + \alpha_{12} DAgriMinning + \alpha_{13} DCommunity + \alpha_{14} DOtherindustries + \alpha_{15} DWholesale + \alpha_{16} DFinancing + \varepsilon$$

…… (3)

$$EDU = \beta_0 + \beta_1 FatherEdu + u \quad \ldots\ldots (4)$$

We considered only those individuals who are in labor force i.e., the individuals whose age is between 10 and 60 both inclusive. Due to well-known problem of hetroskedasticity[3] in cross-sectional data, we used robust standard errors.

The regression model in equation [3] and [4] is estimated using instrumental variables (two-stage least squares) method. The estimation results are given in the following table:

[3] Heteoskedasticity is tested using White (1980) test and this test rejected the null hypothesis of homoscedasticity at 1% level of significance.

Variables	*Coefficients*	*t Stat*	*P Value*
Constant	6.119	118.63	0.000
Education	0.092	29.87	0.000
Experience	0.054	19.97	0.000
Expsq	-0.001	-13.73	0.000
Male	0.792	20.64	0.000
Urban	0.198	14.92	0.000
Punjab	0.064	3.54	0.000
Sindh	-0.088	-4.92	0.000
NWFP	-0.042	-1.95	0.051
Private School	0.152	2.70	0.007
White Collar	0.347	14.88	0.000
Currently Married	0.119	5.89	0.000
Agri & Minning	-0.052	-2.02	0.043
Community	-0.100	-5.18	0.000
Other Industries	0.076	3.79	0.000
Wholesale	0.148	7.18	0.000
Financing	0.320	7.81	0.000
Number of obs	8135		

R-squared	0.4863
P value of F-Stat	0.0000
Wald-Test	6159.37

All variables are highly significant with expected signs. i.e. education and experience positively affect monthly income. Table also shows that as education level increases by one year, average monthly earnings increases by 9.2 percent approximately, similarly, we can see that as experience increases by one year, monthly income increases by 5.4 percent approximately, while the returns to education and experience are only 8.5 and 5.3 percent respectively by using the OLS. The coefficient of experience square shows negative sign and highly significant, which confirm the concavity of age-earning profile. High value of F-statistics and R^2 shows that overall variables are relevant to our regression model. The coefficients of male, urban, private school, "White Collar" and "Currently Married" variables show positive sign and their t-stat indicates more significant results than their base categories like female, rural, public school, "Blue Collar" and "Never Married" respectively. The coefficient and t-stat of Punjab shows positive and significant result and also shows high returns to education than the base category i.e. Balochistan but the coefficient of Sindh and NWFP indicates negative sign which indicates that there low returns to education than base category i.e. Balochistan, where the t-stat shows that the Sindh is significant but NWFP is insignificant. But if we see the P-value of NWFP than we can easily observe that at 90% significant level NWFP is also significant and important variable. We can also observe that by using the IV

technique the t-stat of NWFP is near to significant. The coefficients of "Other Industries", "Wholesale" and "Financing" sectors show positive sign and their t-stat indicates highly significant results, its mean these all sectors are important for human capital model and also show higher earnings than their base category i.e. "Manufacturing & Construction". The coefficient of "Financing" sector also indicates the higher rate of returns with respect to all other industrials sectors, which shows 32% returns to education. But if see the coefficients of "Agriculture & Minning" and "Community" sectors that their coefficients indicate the negative sign and their t-stat show the significant results and higher than the standard absolute value of t-stat. The negative sign of these mentioned sectors show that their returns to education are lower than their base category i.e. "Manufacturing & Construction".

We are using "Father Education" as an instrumental variable and here education is endogenous variable, so here we cannot use the educational dummies in our regression model. We also check normality of residuals using JB test, structural stability using Chow test and Ramsey's RESET test for functional form. The p-values of all the tests are found to be greater than 5%, favoring the null hypotheses.

5.2.6.3: COMPARISON BETWEEN OLS & IV APPROACH

This section includes the comparison between OLS and IV regression results. In this analysis, we take only coefficient and (t, z, F-statistics) of different variables of study.

Mincerian Earning Model Estimation Results for both OLS and IV

Variables	OLS		IV	
	Coefficient	*t statistics*	*Coefficient*	*Z statistics*
Constant	6.171	123.32	6.119	118.63
Education	0.085	38.13	0.092	29.87
Experience	0.053	19.63	0.054	19.97
Expsq	-0.001	-13.54	-0.001	-13.73
Male	0.797	20.67	0.792	20.64
Urban	0.207	15.77	0.198	14.92
Punjab	0.063	3.49	0.064	3.54
Sindh	-0.086	-4.80	-0.088	-4.92
NWFP	-0.039	-1.82	-0.042	-1.95
Private School	0.157	2.76	0.152	2.70
White Collar	0.375	17.43	0.347	14.88
Currently Married	0.132	6.60	0.119	5.89
Agri & Minning	-0.054	-2.11	-0.052	-2.02
Community	-0.094	-4.91	-0.100	-5.18
Other Industries	0.078	3.90	0.076	3.79

Wholesale	0.152	7.41	0.148	7.18
Financing	0.333	8.17	0.320	7.81
Number of obs	8135		8135	
R-squared	0.4869		0.4863	
P value of F-Stat	0.0000		0.0000	
F/Wald -Statistics	428.83		6159.37	

All variables are highly significant in both OLS and IV with expected signs. i.e., education and experience positively affect monthly income. Experience square's coefficient is negative showing the concavity of age-earning profile. Table shows that as education increases by one year, monthly income increases by 8.5 percent and 9.2 percent approximately in OLS and IV technique respectively. Similarly, we can see that as experience increases by one year, monthly income increases by 5.3 percent and 5.4 percent approximately for both OLS and IV technique respectively. These results are consistent with the study of Card, D (2001).

Hence we conclude that instrumental variables estimates are more effective and show higher returns to education than OLS estimates[4]. In post regression analysis, we used a full battery of tests, normality, structural stability and RESET test. All tests are found to

[4] Hausman test is applied to test the endogeniety of 'education'. Its p-value is found to be almost zero indicating that OLS is an inconsistent estimator for this equation.

favor their respective null hypotheses. [5]

[5] P-value of all tests is found to be greater than 5%, favoring the null hypotheses. Note that null hypothesis of normality test is that data series is normal, while of chow test is that regression parameters are structurally stable and for RESET test, the null hypothesis is that functional form is correct. Since p-value of all tests is more than 5%, so null hypotheses can't be rejected at 5% significance level.

Chapter 6

CONCLUSION AND RECOMMENDATIONS

Human capital is one of the important determinants of economic growth of the country. Jacob Mincer (1974) introduced the earning function which relates the average monthly earnings with education, experience and squared experience.

The present study focused on estimating earning function for Pakistan. A number of hypotheses of interest namely, wage differential over different levels of education, wage differentials among males and females, wage differentials among different provinces, wage differential among different professions, wage differentials among different industries, wage differential over different regions and wage differential for private and government schools' graduates are tested using the latest available Pakistan Social and Living Standard Measurement (PSLM) Survey 2007-08 data.

Two estimation methods are used to test the above mentioned hypotheses; the first is ordinary least square (OLS) approach and second is instrumental variable (IV) approach.

The main conclusions of the study are summarized below:

1. The earnings of the individuals increase with an increase in educational level with primary level having lowest return while the "Master & Above" level having the highest earnings.

2. The male individuals earn more than the female individuals with the same levels of education. The reason of higher earnings of male is due to high job opportunities for male than female.

3. The individuals living in urban areas earn more than the individuals living in rural areas. The reason behind the earnings differential between regions (urban & rural) is due to higher job opportunities in urban areas.

4. The individuals living in Punjab earn more than the individuals living in other three provinces.

5. The wage differential for different industries suggests that individuals working in financing industries are earning more than the individuals in any other industries.

6. The individuals who graduate from the public schools earn less than the ones who graduate from private schools. There are two aspects of this result, one is that Govt should more invest in public schools to enhancing their educational quality and second aspect is that the salaries in public schools are very low, specially at lower level like primary, etc, [See, Nasir & Nazli (2000)].

7. The individuals who belongs to "White Collar" earning more than the individuals who belongs to "Blue Collar".

8. The individuals who belongs to "Currently Married" earning more than the individuals who belongs to "Never Married". This should be the case as the individual who is currently unmarried has no family liabilities and he might not be interested in working or grabbing high opportunities if those chances require

him to put some extra effort at his/her end. Similarly, the individuals who have highest average monthly earnings are those who are currently married, and they obviously have bigger responsibilities of their families and are likely to participate in more productive work and work over-time to get more money for their family. So that's why their average monthly income is high.

9. The results show that the returns to education and experience for IV are 9.2 and 5.4 percent respectively, which is higher than the OLS results, where the returns to education and experience are 8.5 and 5.3 percent. The results are consistent with the study of Card, D (2001), where also the coefficients of IV are higher than the OLS.

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