Private Returns to Education in Pakistan: A Statistical Investigation

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Abstract

The paper statistically evaluates the trends in private returns to education in Pakistan for the period 1990-91 to 2012-13. The data of 16 nationally representative Labor Force Surveys during this period are utilized to estimate the standard Mincerian Earning Functions with some modifications. Trends are also disaggregated for gender, region, province, sectors and educational attainments. In addition, the study also employs the pseudo-panel approach for the first time in Pakistan for estimating overall returns to education to control unobserved individual heterogeneity which is common to estimate returns from data on individuals. The estimate using the traditional approach with individual LFS cross-section data suggests 5.5 percent yearly returns for wage earners after controlling for the heterogeneity in the regional and provincial labor markets in Pakistan. Nonetheless, the study found considerably larger returns to education from the pseudo-panels with year fixed effects. The estimates of earning equation with birth specific cohort data reveal about 9.2 percent returns for overall Pakistani labor market.

JEL Classification Codes: J31, I21
Key Words: Returns to education, Mincerian Earnings Function, Pseudo-Panel, Pakistan

1. Introduction

The analysis of returns to investment in education is useful to assess the productivity of education in a particular labor market. It also provides incentive for individuals to invest in their own human capital. The findings of these studies may be used for overall policy guidelines as well as to design specific reforms or public interventions in the education sector.

Based on human capital theory, the rate of return on investment in education implies that an increase in the investment in education and payment of the related costs incurred in the current time is motivated by the potential increase in the compensated benefits in productivity and earnings in the future. Thus, the theory of human capital accumulation (Becker, 1975) suggests that the choice of educational attainment is based on the intersection of the marginal rate of return and the marginal cost of education.

The conventional approach used to estimate the marginal rate of return to education is the standard Mincerian earnings function, introduced by Jacob Mincer (1974). Despite many concerns regarding the estimation methodology, potential biases and problems of measurement errors; Mincerian returns remain popular and have been widely used in hundreds of papers which studied the issue of rate of returns to investment in education in different countries, for different time periods, and with different estimation methods.

Almost all studies in Pakistan, which employed national representative data for estimating returns to schooling, utilized two household data sources: Pakistan Integrated Household Surveys (PIHS) and Pakistan Social and Living Standard Measurement Surveys (PSLM). These datasets report only monthly or annual income and do not collect information necessary to estimate hourly wages. In contrast, Pakistan Labour Force Surveys (LFS) provides information regarding hourly wages which should be preferred as it removes the effect of market fluctuations and individual preferences for leisure. Hourly wages are also important to control for the earning in case of under or over employment.

This study uses sixteen nationally representative Pakistan Labour Force Surveys (LFS) for estimating the private returns to education in Pakistan. Additional analysis of returns is also carried out through pooling data (time-series of these cross-section surveys) which would help in removing sampling errors and other aggregation biases in the individual surveys.

Furthermore, the recent international literature on returns to investment in education highlights one major problem in the estimation of standard Mincerian earnings function. It is argued that an unobserved "ability" variable, which correlates with years of education and with earnings, is omitted from the estimated earnings function. As a result, the coefficient associated with years of education from least squares regressions on individual data suffers from "ability bias". Thus, in the absence of an appropriate proxy for ability in large household data, many studies in developing countries employed a pseudo-panel approach as an alternative means for estimating the rate of return to education. In this approach, individuals sharing some common characteristics (e.g. year of birth) are grouped into cohorts, after which the averages within these cohorts are treated as observations in a pseudo panel. The pseudo-panel approach controls for

unobserved ability or other individual specific effects that may otherwise bias the estimated rate of return to education in individual cross sectional regressions.

For the first time in Pakistan, this paper additionally presents the estimates of the rate of returns to education by constructing a pseudo-panel (synthetic cohort data set) from 16 repeated cross sectional surveys of LFS during the period 1991 and 2013.

The paper is organized as follows. The next section presents findings of relatively recent studies on return to education in Pakistan. Section 3 describes the estimation methodology and also provides information about the data used in this study. The inter-temporal information on educational attainment of the wage earners are provided in Section 4, while empirical estimates of the returns are furnished and discussed in the subsequent section. The last section is reserved for concluding remarks and for some policy implications.

2. Studies on Returns to Education in Pakistan

Globally, Psacharopoulos Patrinos (2004) have reviewed and presented the estimates of the returns to education for 98 countries. They concluded that "overall, the average rate of return to another year of schooling is 10 percent". The highest returns are recorded for low-income and middle-income countries, while average returns to schooling are highest in the Latin America and the Caribbean region and for the sub-Saharan Africa region. Returns to schooling for Asia are at about the world average (10 percent). They also found that the returns are lower in the high-income countries of the OECD. Interestingly, average returns to schooling are lowest for the non-OECD European, Middle East and North African group of countries. Moreover, they also noted that women in general tend to have a higher rate of return than men.

In the context of Pakistan, various estimates of private returns to schooling are available. There are at least three consistent findings from these studies; returns to schooling attainment are low as compared to other developing countries, returns increase with the level of education, and investments made in female education accrue higher marginal returns in comparison to males. Approximately 5 to 7 percent average rate of returns to another year of schooling is estimated in the studies conducted in Pakistan. The conclusions drawn by the recent and relevant studies, conducted in Pakistan are furnished below. These studies estimated the returns to education in the Mincerian framework.

Qureshi (2012) used Pakistan Social and Living Standards Measurement Survey (PSLM) 2005-06 to determine gender difference in school enrollment and returns to education in Pakistan. Regarding returns to education, she concluded that returns increase with increase in the level of education from primary to secondary and secondary to tertiary level for both males and females and the incremental increase being higher for females than males. She found that each year of education raises salary by approximately 6 percent.

Ashraf (2011) used data from the Pakistan Integrated Household Survey (PIHS) 2001-02 to compute returns from different levels of education. His study also confirms that returns to education are higher for females than for males at the lowest level of schooling. According to the study, the returns for females at 13 percent are considerably higher than for males (5 percent) at

the Middle level of education. He suggested that policy makers should devote more resources toward female education, in a country where large numbers of women go without any formal education.

Khan (2008) used Pakistan Social and Living Standards Measurement Survey (PSLM) 2004-2005 to examine labor market earnings. His estimated earning function controls for educational qualifications in addition to years of schooling and other conventional correlates. He estimated 5 percent returns to additional years of schooling which is slightly lower than previous estimates for Pakistan.

Abbas and Foreman-Peck (2007) also used data from the PSLM 2004-05. Consistent with other studies, they found the rates of return to be consistently higher for females than for males. Among paid employed workers, they found the returns for males to range from 5.7 percent for primary education to 6.5 percent for higher secondary education.

Hyder (2007) used Labor Force Survey (LFS) 2001-02 data and defined seven levels of education for computing the rate of return to each, relative to the preceding level. The gains ranged from 1.5 percent for primary education to 9.23 percent for professional education. Much of her paper however is dealt with differences between the public and private sector.

Aslam (2007) used four statistical methods to estimate rates of return to males and females. She found that the estimated return to additional years of education ranged between 7-11 percent for men, and between 13-18 percent for women. She also found the education-earnings profile to be sharply convex for both males and females, and provided explanations for this pattern. Aslam's data were from the PIHS 2001-2002.

Nazli (2004) used data from the Pakistan Socio-Economic Survey (PSES) 1998-99. The survey used a two-stage stratified random sampling design to select a sample of 3,564 households. She examined the effect of education, experience and occupation on individual earnings for wage earners and salaried individuals. She found that the education-experience interaction had a positive and significant impact on earnings. When she stratified the earnings functions according to experience groups, she found the returns to education declined as experience increased.

Jamal et al (2003) used two household surveys (PIHS 1990-91 and 2000-01) to conduct a macro-analysis of returns to education. They documented relatively higher returns to investment in education. The study notes an increase of about 6.4 percents in the monthly earning due to the increase of one year additional schooling. They also estimated returns associated with the level (credentials) of education. For five levels, the estimated returns are 3, 4, 16, 11 and 13 percent respectively for primary, secondary, higher secondary, tertiary-general and tertiary-technical.

The datasets used by Khan and Toor (2003) were also from PIHS 1990-91 and 2001-02. They examined the changes in private rates of return to wage earners having different levels of human capital represented by educational attainment. The findings of the paper indicate that each additional level of educational attainment does not result in consistently higher returns as indicated by previous studies of educational returns in Pakistan. Consistent with other studies in Pakistan, their findings also indicate "although the wage structure may be biased in favor of

males, additional investments made in female education accrue higher returns in comparison to males".

Nasir and Nazli (2000) used data from the PIHS 1995-96. They examined the effect of education, technical training, and school quality on the earnings of wage earners and salaried individuals. Their study differed from previous ones in that they were able to estimate the increase in earnings resulting from an additional year of education at different educational levels. They concluded that "the analysis confirms the positive role of education as each year of education brings approximately 7 percent returns for wage earners". Their results also indicate that not only every additional year of schooling causes a significant rise in earning but also higher earnings are found to be associated with higher levels of education.

3. Data and Methodology

Returns to education are estimated in the framework of classical human capital investment model, in which an individual is assumed to make a human capital investment decision in such a manner as to maximize the discounted present value of future earnings, given the opportunity cost of time and goods spent acquiring such capital, and the rate of interest (Becker, 1964). Mincer (1974) proposed an approximation for this framework which can be readily quantifies from a cross-sectional sample. Hundreds of household surveys from all regions of the world have been examined wage and earning structure using his specification. The standard Mincerian earnings function is modeled as follows:

$$LnW_i = \alpha + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^2 + \mu_i \qquad (1)$$

Thus the conventional wage or earning (W) equation can be expressed as a linear function of complete years of schooling (S) and quadratic expression of labor market experience (X). Usually a semi-logarithmic framework is applied to estimate the returns to schooling. The coefficient associated with the schooling variable (β_1) estimates the marginal rate of returns. However, most of the studies on returns to investment in education used this core model with addition of some controlling variables such as regions, locations, gender etc.[1]

This study estimates three specifications (equations 2, 3 and 5) of this earnings function. The first empirical specification (equation-2) assumes that the wage return is constant across different levels of education, while the next specification (equation-3) relaxes this restrictive assumption and addresses the question whether returns to different levels of education differ within the Pakistani labor market.

$$LnW_i = \beta_o + \beta_1 S_i + X_i\beta_x + Z_i\beta_z + \mu_i \qquad (2)$$
$$LnW_i = \beta_o + C_i\beta_c + X_i\beta_x + Z_i\beta_z + \mu_i \qquad (3)$$

[1] Pereira and Martins (2004) has argued in their study that when more covariates are used in Mincer equation, which depend on education (e.g. sectors), then the coefficient of the education should fall. And in meta-analysis on Portugal data they found that the coefficient decreases with all combinations of variables used and can drop to half of its size, especially when the sector of activity is one of the covariates used. Therefore, only locational and gender variables are used in this study to reflect divers labor market characteristics.

where, LnW_i in equation-2 is the log of the labor market earnings (hourly wages for this study) for an individual i, S_i stands for completed years of schooling, X_i is a matrix of personal characteristics other than schooling, namely, labor market experience[2] (age), experience squared, and gender. Z_i represents a matrix of provincial and regional dummies. The last component, u_i is a random disturbance term that captures unobserved characteristics.

In equation 3, a spline form of years of schooling is estimated to quantify returns of schooling to one additional level instead of one additional year. $\boldsymbol{B_1 S_i}$ is replaced with a vector of dummy variables C_i for various levels of education (credentials), i.e. Primary, Middle, Matric, Intermediate, Graduate, Degree in agriculture, Degree in Engineering , Degree in Medicine, Degree in Computer, Post Graduate and M. Phil/Ph. D. Illiterate and persons below primary level are treated as a reference category[3]. The marginal rate of returns per year of schooling (r_c) for the c^{th} level can be measured as:

$$r_c = \frac{\beta_c - \beta_{c-1}}{S_c - S_{c-1}} \qquad (4)$$

where S_c is the number of years of schooling at the c^{th} level.

The wage equation approach to returns to education has a number of limitations which warrant attention. These include the following: the bias arising from non-competitive labor markets where marginal products do not equal wages; the inadequacy of wages as a proxy for labor compensation; the impact of institution and norms of wage determination; and changes in relative wages for educational attainment groups (and hence relative productivity due to changes in labor market supply conditions).

Moreover, there are other sources of potential biases. Two common problems which are frequently cited in the literature (see for example, Stanovnik, 1997) relate to the equation specification and estimation procedure. The second problem relates to the sample selection bias. Since the Mincerian model is typically estimated for subpopulations with given characteristics (e.g., wage earners). The sample, in this case may not be representative of the whole population of wage earners. This problem can be solved and estimates with desirable asymptotic or consistent properties can be obtained using a procedure described in Heckman (1979). In some empirical research this procedure produced certain corrections of the original estimates. Nevertheless, household data often do not contain the required information to apply the Heckman procedure[4]. Moreover Psacharopoulos and Patrinos (2004) notes that "Selectivity bias has been accounted for in the case of women in most Latin American countries, although such correction was not statistically significant".

[2] AGE is used as a proxy for experience in most of the studies because the data often did not contain a more precise variable to capture the effect of work experience. Nonetheless, in some studies labor market experience is defined as potential experience which is equal to age minus years of schooling minus 5.

[3] The structure of education in Pakistan is briefly described in the Appendix.

[4] The Heckman procedure requires the estimation of a Logit model to determine the factors affecting the selection of earning career (paid employed v/s self-employed). Besides age and education (used in core model), a number of other factors, which may affect the decision, are not usually available in the household surveys.

The main problem which is associated with the specification of Mincerian earnings function is that an unobserved "ability" variable, which correlates with years of education and with earnings, is omitted from the estimated function. Given the expected positive correlations between ability and both earnings and years of schooling, an upward bias is expected. However, the correlation between ability and education could be negative because of the other factors besides ability that could cause a bias of a different nature, possibly downward[5].

The relevant literature suggests two conventional methods for correcting the bias; Instrumental Variables (IV) estimation and panel estimation with individual fixed effects. IV estimation however faces the problem of selecting a valid IV. In particular, if the instrument positively correlates with earnings, the estimates can become even more upward biased (Ashenfelter et al, 1999). Panel estimation with fixed effects can eliminate the bias caused by the different abilities across individuals, but the main limitation is the availability of the data, especially in developing countries that usually have only cross-sectional data.

In the absence of panel data, Deaton (1985) suggested to crate pseudo panels or synthetic cohorts for estimating returns under certain assumptions that control for unobserved individual specific effects including those such as ability and motivation. In his approach, individuals sharing some common characteristics (e.g. year of birth) are grouped into cohorts, after which the averages within these cohorts are treated as observations in a pseudo panel[6]. Pseudo panels are typically constructed from a time series of independent surveys conducted under the same methodology on the same reference population but in different time periods such as labor force and household surveys that can be found in many developing countries.

Following Deaton (1985) and Verbeek (2007), the specification of Mincerian earnings function can be expressed as:

$$\overline{LnW_{ct}} = \alpha + \beta_1 \overline{S_{ct}} + \beta_2 \overline{X_\iota} + \beta_3 \overline{X_{ct}^2} + f_t + f_c + \overline{\mu_{ct}} \qquad (5)$$

where LnW_{ct} is the average of hourly earnings for all individuals in cohort *c* at time *t* and similarly for the other variables in the equation. In addition, inclusion of cohort dummies (f_c) and year dummies f_t extracts time and cohort effects from the error term, leaving only the idiosyncratic error $\overline{\mu_{ct}}$ [7].

[5] Ashenfelter et al. (1999) quoted some empirical studies. In case of Thailand, Warunsiri and Mcnown (2010) also found that the failure to control for unobservable individual characteristics results in a downward bias of the estimated returns to education.

[6] Verbeek (2007) argues that estimation techniques based on grouping individual data into cohorts are identical to instrumental variables approaches where the group indicators are used as instruments. Consequently, the grouping variables should satisfy the appropriate conditions for an instrumental variables estimator to be consistent.

[7] All error components that are correlated with explanatory variables have been purged from the error term, so that fixed effects estimation of this equation expressed in terms of cohort means is consistent. Not only does estimation of equation-3 deal with problems of individual heterogeneity while controlling for year and cohort effects, the use of cohort means can "average out" individual measurement errors (Antman and McKenzie 2007).

The error term in equation-5 can be assumed normal, independent and homoskedastic if the cohort size is fixed over time. However, if the cohorts differ in size, this will mean that the error term is heteroskadistic and needs to be corrected by weighting each observation with the square root of cohort size (Deaton, 1985). As cohort size is different over time in the data of this study, weighted least square (WLS) is used to estimate the earning equation for the synthetic cohorts[8]. For this study, cohorts are defined by those born between 1951 and 1973. This gives a pseudo panel of 23 one-year cohorts, based on 16 cross section household surveys during 1991 and 2013.

The data are drawn from nationally representative Pakistan Labor Force (LFS) surveys conducted by Pakistan Bureau of Statistics (PBS). Table-3.1 furnishes information regarding the sample size for various years[9] used in the study.

Table–3.1
Realized Sample of Pakistan Labor Force Surveys

	Households			Members		
Survey Years	Urban	Rural	Total	Urban	Rural	Total
1990-1991	9576	10664	20240	63503	65477	128980
1991-1992	9567	10656	20223	63275	66211	129486
1992-1993	9558	10521	20079	63028	66081	129109
1994-1995	9520	10592	20112	61395	67169	128564
1996-1997	10255	11805	22060	61985	71503	133488
1997-1998	8699	10261	18960	52934	60195	113129
1999-2000	7817	9627	17444	53774	57699	111473
2001-2002	7817	9627	17444	53774	57699	111473
2003-2004	8309	12131	20440	56429	82694	139123
2005-2006	13008	19631	32639	85628	134341	219969
2006-2007	13027	19731	32758	87165	137115	224280
2007-2008	14319	21749	36068	96790	154030	250820
2008-2009	14348	21906	36254	95632	153584	249216
2009-2010	15241	23518	38759	100876	162625	263501
2010-2011	15214	23603	38817	100233	160661	260894
2012-2013	15649	19416	35065	99608	128616	228224

Data are collected by direct interview method. Generally, the head of household is chosen to provide information about all members of the household. The total sample for the year is evenly distributed for enumeration on quarterly basis to offset the effect of seasonal variations. The information collected however relates to the week preceding the date of enumeration.

These surveys record the educational attainment of each household member. The year of schooling has been constructed using information of the individual's highest level of completed education. The sample is purged from self-employed persons, and pensioners. The analysis is,

[8] Himaz and Atuupane, 2012 also used WLS for estimating returns to education using pseudo panel approach in case of Sri Lanka.

[9] For detail methodology on sampling, visit the following link
http://www.pbs.gov.pk/sites/default/files/Labour%20Force/publications/lfs_Annual_2012_13/methodology.pdf

therefore, confined to paid employees (wage earners) aged 18 to 64 years with positive income and working minimum 40 and maximum 84 hours per week.

4. Earnings and Educational Attainment of Wage Earners

According to various waves of Pakistan Labor Force Surveys, the share of wage earner in the structure of labor force is around 40 percent. Table 4.1 furnishes inter-temporal picture of the status of employed labor force. The table reveals that the trend in non-agriculture related categories is more or less constant. The shares of employees, employers and self-employed remained unchanged during the last two and half decades. However, significant changes are observed in agriculture related activities.

Table – 4.1
Work Participation and Structure of Labor Force
[Percentages]

	1990-91	2001-02	2006-07	2012-13
Employees – (Wage Earners)	40	40	39	41
Employers	2	1	1	2
Self-Employed (Non-Agriculture)	23	23	21	23
Owner Cultivators	14	12	12	9
Share Croppers	6	6	4	4
Unpaid Family Workers	15	18	23	21

Table 4.2 displays composition of educational attainments of wage earners. Currently, About 11 percent of wage earners possess tertiary education, while about 30 percent have no schooling. However, the composition has significantly changed during last 25 years. For instance, the share of illiterate and below primary has been reduced from 47.5 to 34.5 percent. In contrast, the share of employees having tertiary education has increased from 8.8 to 11 percent. Similarly, 3 to 4 percent increase in shares of employees having primary, middle and matriculation attainment is observed.

Table – 4.2
Wage Earners By Education Level
[Percentages]

	1990-91	2001-02	2006-07	2012-13
No Schooling	42.5	40.1	33.3	31.2
Below Primary	5.0	3.5	3.9	3.3
Primary	12.4	14.0	16.2	16.3
Middle	10.0	11.7	12.5	13.8
Matric	14.7	15.2	16.5	16.7
Intermediate	6.6	6.2	7.4	7.7
Tertiary General	7.3	7.7	8.6	9.6
Tertiary Technical	1.5	1.6	1.6	1.4

Real wages of employees according to the educational attainments are furnished in Table 4.3. Highest growth (35 percent) in the average earnings is observed in the category of tertiary-technical during the period 1990-91 to 2012-13. The table also reveals a declining trend in the average real wages of employees that possess below primary, primary and middle credential. It may be also observed that relative growth in average earnings associated with tertiary-general is slightly lower than higher secondary education level.

Table – 4.3
Average Real Wages by the Level of Education
[1990-91= Base, Rupees per Week]

	1990-91	2001-02	2006-07	2012-13	Percent Growth 1991-2013
No Schooling	317	295	309	328	3.5
Below Primary	363	352	333	334	-8.0
Primary	350	332	342	343	-2.0
Middle	381	366	379	366	-3.9
Secondary	419	397	431	433	3.3
Higher Secondary	509	468	530	539	5.9
Tertiary – General	816	851	993	862	5.6
Tertiary – Technical	966	1072	1199	1304	35.0
Overall	410	392	433	435	6.1

5. Estimates of Returns to Education

Figure 5.1 portrays marginal rate of returns to investment in education estimated from individual year-wise (1991-2003) Labor Force Survey data. Mincerian earning function with gender, provincial and regional dummy variables (Equation-2) is applied to determine the estimates of returns. The figure reveals that each year of education brings approximately 5.5 percent (average of 16 years) returns for wage earner after controlling for the heterogeneity in the regional and provincial labor markets in Pakistan. The previous studies have estimated returns to education in the range of 5 to 7 percent, thus the finding of this research is not inconsistent with the earlier studies which were based on monthly wage instead of hourly wage data in estimating earning function.

Nonetheless, two concerns here need to be addressed. First, question arises that whether we can attribute the variations in the rate of returns to labor market response. For instance, highest returns (6.1 and 6.2) are estimated with the LFS 2005-06 and 2006-07 data; whether this is due to high growth (Figure 5.2) in the economy or it may be due to some sampling or non-sampling errors in particular surveys. Similarly, marginal rate of returns to education has dropped from 5.7 to 4.4 for the year 2011. Incidentally, lowest GDP growth rates were observed for the years 2009 and 2010 and thus one should be curious regarding the relationship between growth and labor market reaction. It is difficult, however to justify the link between marginal rates of returns and GDP growth in the short-run due to the rigidity in the labor market in terms of pay and employment structure and in the absence of any statistical test[10]. The other concern is regarding the choice of particular survey year for the analysis of returns. If one researcher, for instance

[10] Other macroeconomic and structural variables which reflect recession and boom in the economy may also be tested for the presence of statistical relationship with the estimated returns to education. Nevertheless with the series of only 16 observations and returns which represent partial labor market (only wage earners), the rigorous analysis is not feasible. Ideally the returns to investment to education should be regressed on the determinants of labor supply and demand and labor market characteristics such as supply of skilled labor, demand for education, technological change, size of government, labor market regulations etc. This exercise is however is beyond the scope of this paper.

chooses LFS data for the year 2011 instead of 2010, then significantly different (4.4. versus 5.7 percent) rates would be estimated. It may therefore be argued that estimation of marginal rate of returns from single year data should be avoided[11], as it may leads toward an inappropriate conclusion.

The issue of choice for the dataset may be managed by pooling cross-section data over a suitable time period. This study estimates the marginal rate of return after pooling 16 datasets of Labor Force Surveys, conducted during the period 1991 and 2013. The analysis is also extended for the two decade-wise sub-periods; 1991-2002 and 2003-2013.

Table 5.1 presents the overall and disaggregated estimates of the standard Mincerian earning function. According to estimates of pooled data for the period 1991-2013, each year of schooling raises salary by approximately 5.3 percent. The marginal rate is however is slightly higher for the period 2003-2013.

Consistent with earlier studies in Pakistan and worldwide, marginal rate for female workers are substantially higher than male, especially in the period 2003-2013. Almost all studies conducted in Pakistan and analyzed disaggregated picture found similar results. In terms of regional differences, the rate of returns in the urban labor market is quite high as compared with the rural counterpart.

The international research on returns, reviewed by Psacharopoulos Patrinos (2004), reveals that returns are lower in the high-income countries, while highest returns are recoded for low-income and middle-income countries. The provincial picture or the rate of returns in Pakistan, however did not confirm this phenomenon. The rate of returns to investment in education in Balochistan, which is relatively least developed province of Pakistan are lower than Punjab and Sindh provinces. The estimated marginal rate of returns in Punjab is also higher than Sindh, although Punjab seems to be more developed than Sindh. This may be due to the existence of large urban sector in Sindh province.

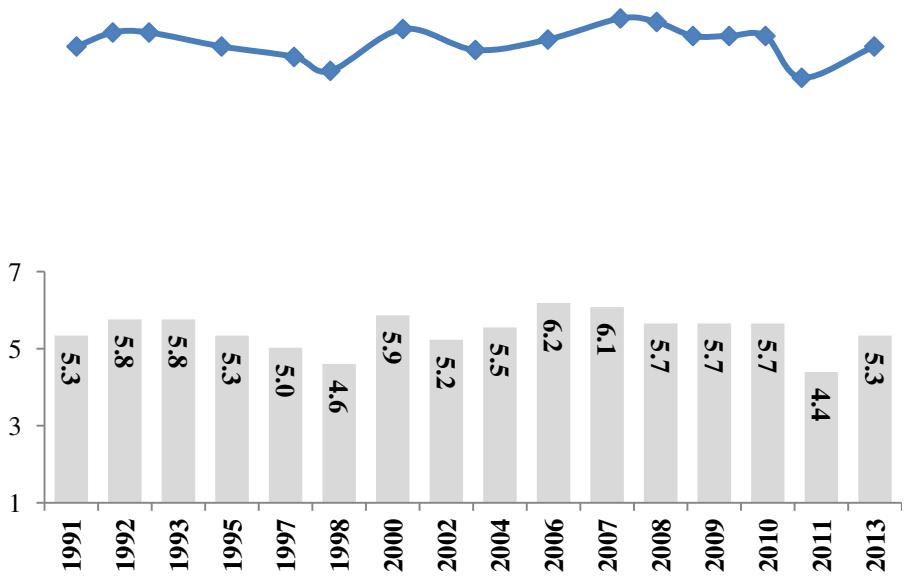
The disaggregated results in terms of economic activity reveal that returns are quite high in the service sector. In the period 2003-2013, returns in the service sector are more than doubled in comparison with agriculture and approximately one percent higher as compared with the manufacturing sector.

Table 5.2 furnishes yearly returns to investment in education for various educational attainments or credentials. These estimates are obtained using the specification of Equation-3, while the average rate of return per year of schooling for the c^{th} level is computed by employing Equation-4. The table also reveals the premium[12] or percentage earning gain from different levels of education.

[11] Almost all studies in Pakistan used one particular year for the analysis of returns to education.

[12] These are estimated coefficients (β_i) associated with educational attainment. The reference category in the equation is illiterate and below primary employed persons.

Figure – 5.1
Private Returns of Wage Earners to Years of Educaiton
[Equation-2]



Estimated Equations

$$Ln\,(Hourly\ Wages)_t = \alpha + \beta_1\,(Age)_t + \beta_2\,(Age\ Squared)_t + \beta_3\,(Years\ of\ Education)_t + \beta_{it}\,(gender, regional\ and\ Provincial\ Dummy\ Variables)_{it}$$

Figure – 5.2
Private Returns and GDP Growth Rates

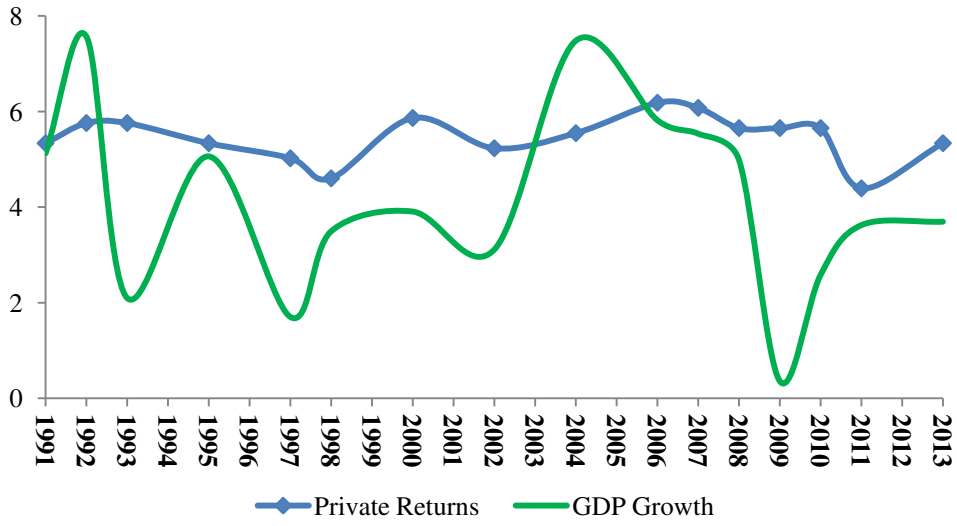


Table 5.1
Disaggregated Trends in Private Returns to Years of Education
[Equation-2]

	1991-2013	1991-2002	2003-2013
Overall	5.3	5.2	5.4
Male	5.1	5.0	5.1
Female	7.7	7.2	7.9
Urban	6.0	5.5	6.3
Rural	4.0	4.3	3.8
Punjab	5.4	5.2	5.4
Sindh	5.6	5.3	5.7
KPK	4.6	5.1	4.3
Balochistan	4.9	4.4	5.1
Agriculture	3.4	4.6	2.5
Manufacturing	4.6	4.5	4.7
Service	5.3	5.1	5.3

Notes: Separate regressions are estimated for each disaggregated component. Pooled data are used with year (fixed effect) dummy variables.

Table – 5.2
Premium and Returns to Credentials - Percentages
[Equation-3]

	1991-2013		1991-2002		2003-2013	
	Wage Premium	Yearly Returns	Wage Premium	Yearly Returns	Wage Premium	Yearly Returns
Primary	10	2	12	2	10	2
Middle	17	3	20	3	17	2
Matriculation	31	7	36	8	30	6
Intermediate	52	11	53	9	52	12
Graduate (BA/BSC.)	87	19	83	16	90	21
Degree in Agriculture	98	12	91	10	105	14
Degree in Engineering	114	17	102	13	128	21
Degree in Medicine	139	19	122	15	151	22
Post Graduate	119	18	111	15	124	19
Degree in Computer					112	16
M. Phil/Ph.D.					157	18

Notes: Pooled data are used with year (fixed effect) dummy variables.
Computer degree and M. PHIL/Ph.D. categories were included in the LFS questionnaire after 2002.

According to the Table 5.2, private returns to education level are 2, 3, 7, 11, 19 and 18 percent for primary, middle, matriculation, intermediate, graduate and post-graduate respectively[13]. Moreover, temporal changes in returns indicate sharp increase in returns to graduate level (16 to 21 percent) during the period 2002 and 2013.

Returns to education increase with education level upto graduate level, while a decline is observed for post-graduate level. Thus the findings indicate the convex relationship between education and earning. It implies that additional education has a much stronger proportionate impact on earning at higher than at lower education level.

In terms of professional degrees, highest returns are observed in the degree of medicine while, as expected, the returns of agriculture degree are significantly lower than graduate. After 2003, two categories have also been added in the LFS questionnaire; degree in computer and M. Phil/Ph.D. Although, returns to M. Phil/Ph.D. are comparatively low, the premium is the highest among all categories of educational attainment.

The preceding work on returns to education in Pakistan has been based on estimating returns using the Mincerian earning function with individual cross section data. It has been discussed in the relevant literature that an unobserved "ability" variable is omitted while estimating these models with cross-section data. Alternatively, pseudo-panel approach is recommended for developing economies where the panel data is not available to capture the individual specific ability or motivation effects on wages. Table 5.3 presents the estimated results of pseudo panel or cohort-specific equation. For comparative purpose, the table also presents the estimated results of the standard Mincerian earning function[14] (Equation-1).

It is evident from the table that the estimated returns to education from the pseudo-panels with year fixed effects are considerably larger than those from regressions with individual cross-section pooled data. About 5.6 percent returns to additional years of schooling are estimated from individual data while the estimates of pseudo-panel equation reveals about 9.2 percent returns for overall Pakistani labor market. It certainly indicates that the failure to control for unobservable individual or cohort-specific characteristics result in a downward bias of the estimated returns to education in Pakistan[15].

In addition the table also reveals that the marginal returns estimated with the cohort specific or pseudo-panel data are significantly high (13.4) in the period 2002-2103 as compared with the earlier period (1991-2002). However, virtually no change in returns is evident in both periods with respect to the standard Mincerian estimation approach.

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[13] Besides magnitudes, the trend is very mush similar with the results of Hyder (2007) for the year 2001-02 which is the only comparable study in which LFS data is used in the context of Pakistan. She estimated 1.5, 2.24, 3.94, 5.81, 9.02 and 5.44 for the respective categories of primary, middle, matriculation, intermediate, graduate and post-graduate.

[14] For comparative purpose, this equation only contains year dummy variable and does not include regional and provincial dummy variables.

[15] Similar results are reported by Warunsiri and McNown (2010) in case of Thailand. However in case of Sri Lank, the difference is not so large (Himaz and Aturupane, 2011).

Table 5.3
Estimated Coefficients of Standard Mincerian Earning Functions

	Individual Observations – Pooled Data [Equation-1, OLS]			Pseudo-Panel Based on Birth Cohorts [Equation-5, WLS]		
	1991-2013	**1991-2002**	**2003-2013**	**1991-2013**	**1991-2002**	**2003-2013**
Years of Education	0.056	0.056	0.057	0.092	0.074	0.134
Age (Experience)	0.057	0.054	0.058	0.029	0.027	0.072
Age-Squared	-0.001	-0.001	-0.001	-0.000	-0.000	-0.001
Intercept	0.402	0.515	0.184	0.829	0.970	0.468
Adjusted R-Squared	0.246	0.256	0.240	0.864	0.874	0.780
Observations/Cohorts	199574	67702	131872	368	184	184

Notes: Both regressions include year dummy variables (fixed effect).
Estimates are based on real wage data.
All coefficients are highly statistically significant, except few year dummy variables.
Pseudo-Panel equation is estimated using Weighted Least Square (WLS) technique.

Unfortunately, disaggregated estimation by constructing panels for women and those in rural areas is not feasible due to very low shares of these categories in the wage earners. The literature on pseudo-panel suggests that cohort with less than 100 observations may create sampling error problem and results in inaccurate standard errors in pseudo panel analysis[16].

6. Conclusions and Policy Implications

It is a first attempt to utilize large number of household cross-section datasets for estimating returns to investment in education in Pakistan. Sixteen nationally representative Pakistan Labour Force Surveys (LFS) which provide information regarding hourly wages, educational attainments and demographic characteristics of wage earners are analyzed.

The study not only attempts to estimate returns based on cross section data using the Mincerian conventional equation for 16 LFS surveys, it also provides estimates by pooling the data for the period 1991 to 2013. Overall and disaggregated analyses of returns are carried out by utilizing the pooled data. In addition, a pseudo-panel data is also constructed with the help of these 16 surveys. Thus the paper is also a first attempt in the context of Pakistan to furnish the estimates of returns derived by the birth specific cohort data.

The estimates using the traditional approach with individual LFS cross-section data suggest 5.5 percent yearly returns for wage earners after controlling for the heterogeneity in the regional and provincial labor markets in Pakistan. This is an average of 16 estimates of individual household surveys conducted during the period 1991 to 2013. Moreover, it is also attempted to derive one estimate of returns with the pooled data and with fixed effect year dummy variables to control

[16] This aspect is discussed in Verbeek and Nijman (1993)

for sampling errors and other biases in the individual surveys. This exercise suggests that each additional year of schooling raises wages by approximately 5.3 percent (Table 5.1).

Consistent with earlier studies in Pakistan and worldwide, estimated marginal rate for female workers are substantially higher than male. In terms of regional differences, the rate of returns in the urban labor market is quite high as compared with the rural. The returns are comparatively higher in service sector as compared with agriculture and manufacturing sector. Moreover, estimates from provincially disaggregated data indicate relatively lower returns to education for employees in the labor market of Balochistan.

An important finding of the study is that returns to education increase with education level upto graduate level, while a decline is observed for post-graduate level. Thus, the estimated returns associated with the educational attainment or credentials indicate the convex relationship between education and earning. It implies that additional education has a much stronger proportionate impact on earning at higher than at lower education level. In terms of professional degrees, highest returns are estimated for the degree of medicine. Although, marginal returns to M. Phil/Ph.D. are low as compared with graduate and degree in engineering and medicine, the wage premium is the highest among all categories of professional degrees.

All the above estimates of returns however possess a downward bias by omitting the unobservable individual or cohort-specific characteristics. This study found considerably larger returns to education from the pseudo-panels with year fixed effects. The estimates of earning equation with birth specific cohort data reveal about 9.2 percent returns for overall Pakistani labor market. Unfortunately, estimation by constructing disaggregated panels, especially for women is not recommended technically due to very low shares in the wage earners.

Some policy implications may be derived from the main finding of this study. The evidence from this study suggests that estimated returns are quite low for primary and middle levels of educations. One possible explanation for the low returns to school at these levels is the fact that the curriculums are designed only as a selection mechanism for the entry into tertiary educational institutions and not to acquire skills required for entrance into the labor market. Consequently, the current curriculum should be revisited to allow students at secondary education level to acquire some forms of labor market relevant skills. This step will raise the poverty-mitigating scope of primary and secondary education, as poor households especially in rural areas generally educate their children up to these levels. Moreover, low returns to primary and secondary education causes disincentive to invest on education among poor households. Thus it is also important to design policies that support increased government investment at the lower levels of education such as free education made available up to secondary education. In contrast the findings that additional education has a much stronger proportionate impact on earning at higher than at lower education levels is inspiring since investment up to completing tertiary education is vital for higher levels of economic welfare of households. Thus policy should be designed to facilitate students who choose to pursue tertiary education with study loans, scholarships or grants.

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Appendix

THE STRUCTURE OF EDUCATION IN PAKISTAN:

The structure of education system in Pakistan consists of primary, secondary, higher secondary and tertiary levels. Primary education lasts for five years. Secondary education is divided into two cycles: three years at middle school and two years of secondary education. On completion of the second cycle, pupils take the Secondary School Certificate or Matriculation Examination. Pupils may then study for a further two years, specializing in Science, Arts or Commerce. At the end of this period, pupils take the examination of the Intermediate Certificate or Higher Secondary School Certificate. Universities, their constituent and affiliated colleges, provide Tertiary or higher education. There are three stage of tertiary or higher education. Bachelor's Pass Degrees are normally obtained after a two years course and Honours Degree after a three-year course in Arts, Science, and Commerce. First degrees in Engineering take four years and in Medicine five years. A Master's Degree is obtained in two years after a Pass Degree and in one year after a Honours Degree. At the third stage, the Master of Philosophy degree is awarded after two year of the Master's degree. The PhD (Doctorate of Philosophy) is a research degree and requires three years' study beyond the master's degree.