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Analysing Econometric Bias and Non-linearity in Returns to Education of Pakistan

MUHAMMAD NAUMAN MALIK and MASOOD SARWAR AWAN

This study estimates the returns to education while controlling endogeneity and sample selection biases in Pakistan, over a time period using Ordinary Least Square (OLS), simultaneous approach using both Heckman Sample Selection and Instrumental Variable, and Fixed Effect techniques. Household Integrated Economic Survey (HIES) data for 2004-05 and 2011-12 time periods have been used in this study. The returns to education have been found downward biased in OLS estimates for both time periods. The unbiased real returns to education have increased on average for wage workers over time period. Landholding and Non-earned income have been used as exclusion restrictions to control for sample selection bias in the Heckman Sample Selection technique. The endogeneity bias has been controlled for with the help of parental education as instrument in Instrumental Variable technique. Both techniques have also been used collectively or simultaneously to get more efficient estimate in simultaneous approach. Household Fixed Effect technique has also been used with the assumption that ability and family characteristics largely remain same within family or household. The increase in the unbiased and real returns to education shows that profitability still exists in investing in education whereas experience via skill enhancement reinforces this rise in wage. Sadly, the historic gender and regional discriminations persist or aggravate in wage market. Married persons are getting more in returns relative to the unmarried individuals. Having negative implications for income inequality, Convexity in education-earning relationship in Pakistan has been confirmed by Indicator Function technique for both time periods. Low education prompt low-earning workers who would be unable to bear the schooling cost of their children. This seriously inhibits earning potential making income inequality worse.

JEL Classification: I26, I24, J24
Keywords: Returns to Education, Human Capital

1. INTRODUCTION

The prominent place of education in Millennium Development Goals (MDGs) and the proposed Sustainable Development Goals (SDGs) is suffice to believe that there has been a global consensus over the countless linkages of education to socio-economic development. Education is a major part of human capital which primarily comprised of education, health and vocational training leading to the rise of labour productivity and earning potential. It is admitted that investment in education can be taken as capital investment with positive implications of human capital over the earnings/wages of

Muhammad Nauman Malik <nauman.malik@uos.edu.pk> is Lecturer in Economics, University of Sargodha, Sargodha. Masood Sarwar Awan <awan811@hotmail.com> is Professor of Economics, University of Sargodha, Sargodha.

individuals. Schooling and training being the human capital inputs from labour are important determinants of earnings/wages therefore the education-wage relationship can be useful in the measurement of the returns to schooling. The significance of returns to education/schooling as an important economic indicator in the context of economic growth and development has been widely accepted and the same has been the continued area of interest of economists for more than fifty years [Heckman, Lochner, and Todd (2003)].

The positive association between education and earnings has been proved by various studies in Pakistan1. Under the ideals of Free Market Economy, incentives are always preferred for the inducement of any task. Returns (or private returns) to education means wages of individuals against their education in the wage sector. In this way, the paper analyse incentives in terms of returns to education (wages) in Pakistan's Labour market for getting more education.

In the context of Pakistan, however, it has been seen that there are some earlier studies which have mixed the private returns to education with returns to capital by including all earners i.e.; taking wage workers with self-employed and employers [Montenegro and Patrinos (2014)]. Some studies used too much control variables which forcefully converted the returns to education regression in to econometric earning modeling [Pareira and Martins (2004)].

The concave relationship between earnings and education shows relatively more returns, at lower levels as compared to higher ones and convexity is an opposite phenomenon having more returns at higher levels of education than at lower levels [Psacharopoulos (1994)]. It is important to assess the country-specific relationship, because of its implications upon income/earning inequality.

This paper intends to purge the returns to education estimate of econometric biases, (endogeniety and sample selection) simultaneously, [Wooldridge (2013)] and also through Household Fixed Effect technique [Aslam and Kingdon (2009); Aslam, Kingdon, and Kumar, (2010) and Kingdon and Soderbom (2007)] in order to get more valid, efficient, reliable and consistent estimate for returns to education in Pakistan. Moreover, this study would also identify the relationship of education and wage earnings in Pakistan [Crespo Cuaresma and Raggl (2014)].

Further, the introduction section is followed by Section 2 dealing with the review of earlier studies; Section 3 describing the data and methodology; Section 4 holding the results and the discussion in the light of our priori expectations, estimations and literature review; and lastly, the study would be concluded with some relevant policy suggestions.

2. LITERATURE REVIEW

After the revolutionary work of Mincer (1974), the estimation of returns to education gets prominence in every sphere of the world. Countless studies have been done by the research community to identify the private returns to education because of its simplicity in understanding and efficacy for economic development [Psacharopoulos

[1] See Ali, Ramay, and Nas (2013); Ali and Akhtar (2014); Afzal (2011, 2014); Aslam, Kingdon, De, and Kumar (2010); Aslam and Kingdon (2009); Awan and Hussain (2007); Aslam (2006); Guisinger, Henderson, and Scully (1984); Haque (1977); Hyder (2007); Khan and Irfan (1985); Nasir (1999, 2000, 2002); Nazli (2004); Qureshi (2012); Shabbir (1994); Sial and Sarwar (2013); Sarwar, Sial, and Hashmi (2014).

(1994); Psacharopoulos and Patrinos (2004)]. In the basic Mincerian function, the log of earnings is regressed on the years of education and the experience which measure accumulation of human capital of an individual. The estimate of years of education would tell us the marginal rate of return as percentage change in earnings due to an additional year of schooling or education.

Card (1999, 2001) discussed the issue related to the endogeneity bias in returns to education estimation and preferred to go for Instrumental Variable (IV) technique to have unbiased results. The instrument should be correlated with the endogenous schooling variable, but unrelated with the earnings. Trostel, Walker, and Woolley (2002) used the education of father, mother and spouse; Dickson (2013) used smoking behaviour; and Soderbom, Teal, Wambugu, and Kahyarara (2006) used distance from school as instruments to control for the endogeneity. The IV estimates are expected to be above the Ordinary Least Square (OLS) estimates approving the downward bias in OLS estimates. While recognising the issue of endogeneity due to variable omission, such as unobserved ability and family characteristics which may cause inconsistency and bias in OLS results, an innovative solution was developed by Ashenfelter and Krueger (1994) who consider twins data. Here, we can difference out or control for the family effects and unobserved ability (owing to the same biological and family characteristics) using fixed effect technique.[2]

Sample selection bias due to non-random selection also arises in returns to education estimation. The returns to education estimate may be biased because we take only those individuals who are getting wage or on-job among those who have received an education. The Two Step procedure of Heckman (1979) helps to cope with this problem [Crespo Cuaresma and Raggl (2014); Kavuma, Morrissey, and Upward (2015)].

Wooldridge (2013) stated that if the model description is such in which both endogeneity and sample selection issues exist than in order to simultaneously control for both biases, we should first estimate the selection hazard or Inverse Mills Ratio (IMR) due to non-random sample selection using the Heckman (1979) two-step method and then explicitly include the IMR into the Instrumental Variable (IV) estimation.[3] Using Pseudo-panel data approach, Warunsiri and McNown (2010), and Himaz and Aturupane (2015) also showed that if we did not control for the unobservables like ability and household characteristics, it would create bias in our estimates. For Proxy method, personal characteristics like age, colour, father's education and occupation and area of upbringing are used as a proxy of unobserved family characteristics which may become a source of bias in OLS results and introduced directly in the wage equation as regressors [Griliches and Mason (1972)]. Scores of intelligence test and the knowledge of labour market test [Blackburn and Neumark (1992, 1995)] whereas job stress and job complication [Peng Yu (2004)] are used as proxies for unobserved ability.

Up till 1994, studies in Pakistan like Guisinger, *et al*. (1984), Haque (1977) and Khan, *et al*. (1985) related with the Mincerian earning function had a drawback that education was taken as dichotomous variable due to data constraints of surveyed data in Pakistan. Shabbir (1994) made the first attempt in this regard and two modules of Pakistan Labour Force and Migration Survey (PLMS) entitled as Household Income and

[2]See also Isacsson (1999, 2004).

[3]See also Arabsheibani and Mussurov (2007), and Foltz and Gajigo (2012).

Expenditure Survey (HIES) and the Migration Survey were merged together to get the first Mincerian Earning Function with 'continuous years of schooling' as a variable. In this shape, this was the first national representative estimation that was done where 'continuous years of education' was taken from Migration Survey and other information was provided by the Household Income and Expenditure Survey (HIES). The study showed the positive relationship of education and experience with the earnings of individuals. The private marginal return to education appears 5 percent to an additional year of schooling and then it went to 8 percent when experience and experience-square variables were introduced.[4]

To ascertain the differences in earnings because of differences in public and private schooling of individuals, Nasir (1999) concluded that private schools imparts quality education relative to public schools as the private schooling provides more earnings to the individuals relative to that of those with public schooling. In case of private education, we see little discrimination in earnings based upon gender differences as compared to the case of public education. The extended Mincerian earning function was estimated by Nasir (2000) with the introduction of different educational level (Primary, Middle, Matric, Intermediate, Bachelors and Professional) dummy variables along with the usual potential experience, regions and provincial control variables. Education increases the earning of the wage sector employees. The status of being male and urban resident has a positive impact upon earnings of individuals. Nasir (2002) used technical training, literacy and school quality variables along with usual education and experience and introduced splines of education levels. Each year of education brings 8 percent wage rise for individuals on average whereas for 'splines of education' ranging from primary education to professional education showed that each year of education at different levels are significantly and positively related with the wages with consistent increase. Moreover, it has been observed that women are earning fewer wages as compared to their male counterparts. Nazli (2004) observed that education has positive effect on earnings and when separate regressions have been run for different experience group.

Aslam (2006) used Heckman's two step procedure,[5] Two Stage Least Square (2SLS) and Household fixed effects[6] along with OLS as separate regressions for Pakistan using Pakistan Integrated Household Survey (PIHS). The estimated return to education was 7 percent to 11 percent for males and 13 to 18 for females. Aslam, *et al*. (2009) used same techniques on Pakistan Social and Living Standard Measurement (PSLM) 2005 and observed positive relation of earnings with education in both male and female regressions and as well as private and public sector regressions. For the decomposition of wage differential between public and private sector wage the Oxaca-Blinder technique was used. It showed that for men the differences in public-private worker characteristics explained about 66 percent of difference in log of wages whereas for female it was at 40 percent. These results were in line with the conclusion made by Hyder (2007) while using Labour Force Survey (LFS) 2001-02 data of Pakistan.

[4]Also see Ali, *et al*. (2013) and Awan, *et al*. (2007).

[5]Aslam, *et al*. (2010) compared Pakistan and India in estimation of returns to education after controlling for the sample selection bias.

[6]Qureshi (2012) compared OLS and Fixed Effect estimates using PSLM 2010-11 dataset and found OLS estimates biased.

Similarly, quantile regression was run by Kingdon et al. (2007) using PIHS for the years 1998-99 and 2001-02 and observed that in wage employment the education is inequality-reducing for women as lower ability women's returns to education is more as compared to the higher ability women[7]. Recently, Sial, *et al*. (2013) and Sarwar, *et al*. (2014) using the same econometric technique, observed that human capital in the form of education is increasing the dispersion of earnings in Pakistan. Education differently impacts the earning distribution as higher quantiles are more affected as compared to the lower quantiles, showing the complementarity between ability and education whereas the same situation appeared in the form of experience.

The Proxy Method has also been used recently by Afzal (2011, 2014) where the supposedly proxy variables are directly included in the Mincerian equation. The study used the Mincerian framework while taking father's education as a proxy for family background and ownership of car as a proxy for family status in the specific socio-economic context of Pakistan. The proxies remain significant in their impact upon earnings.

Summing up, it has been established that returns to education are of prime importance whose continued assessment tells us about the incentive or the profitability of investing in education. It has to be seen that the estimates of returns to education must be cleaned of econometric biases to be valid, efficient and reliable. Assessment of education earning relationship further makes the returns to education studies more relevant in terms of inequality related policies.

3. DATA AND METHODOLOGY

Household Integrated Economic Survey (HIES) is the most credible source of detailed information in Pakistan about the earnings/income and expenditure of individuals in Pakistan. It is periodically conducted across Pakistan by Pakistan Bureau of Statistics (PBS). This data is representative for provincial and regional analysis in Pakistan. For the purpose of this study, we have used the data sets of 2004-05 and 2011-12 years in order to observe the change over time period. The basic objective of the study is to estimate the returns to education in Pakistan while discussing the econometric biases issues with it. Montenegro, *et al*. (2014) mentioned that it is not possible to separate the returns to education and the returns to capital using the Living Standard Measurement Surveys (LSMS). Therefore, it is pertinent to use only wage employees for the assessment of true returns to education as they are employees against their wages and are giving their human services only. We can say that they are getting wages against their human capital (education and skill). Hence, earners like self-employed, employers, etc. would be excluded as their earnings include both the returns to education and the returns to capital. Moreover, individuals like unpaid/paid family workers and apprentices would also be excluded as their wages do not show market productivity. Hence, we will take only wage employees so that the true assessment is done for returns to education. The World Bank stated that the population of age 15 to 64 could potentially be economically active[8] and the same age limit would be used here. We will use real wage returns which

[7]Jaffry, *et al*. (2007) compared the real returns to education estimates using quantile regression and eight Pakistan's Labour Force Survey datasets from 1990 to 2003.

[8]http://data.worldbank.org/indicator/SP.POP.1564.TO.ZS retrieved on 03-07-2015.

would be more valid for comparison over time period. This study used the Consumer Price Index[9] values with the base year 2000-01 to get real wage returns for 2004-05 and 2011-12.[10] In order to have a proper understanding of the variables used in the estimation we have given variable description in Table 1.

Wage earning is used as the dependent variable in the Mincerian earning function. The rationale is to check out how the labour market is rewarding individuals for their education. Potential experience is calculated: Age-Years of Education-6, where 6 is the school starting age for everyone [Awan, *et al*. (2007); Bhatti, Bourdon, and Aslam (2013); Fersterer, *et al*. (2003); Heckman, *et al*. (2003); Mincer (1974)]. Owing to the pervasive regional inequalities in Pakistan, the rural dummy variable is incorporated [Khan, *et al*. (1985) and Shabbir (1994)]. In order to see the gender discrimination in the labour market, we used female as a dummy variable. For Instrumental Variable estimation, the study will use the mean of father's and mother's years of education to form parental education.

Table 1

Variable Description

Variables	Description
Dependent Variable (Wage)	Log of wage has been taken and it is the dependent Variable in our Mincerian model. Wages are monthly and only Paid wage employees have been considered for it.
Education/Years of Schooling	Total years of education attained by a wage worker/employee
Experience	Experience (Potential) = Age – Years of Schooling - 6
Experience Square	Experience * Experience
Female	Female = 1; Male = 0 (Reference Category)
Rural	Rural = 1; Urban = 0 (Reference Category)
Married	Married/Widow/Divorcee = 1 Never Married = 0 (Reference Category)
Dependency Ratio (DR)	Sum of Number of children (1 to 14 age) and Number of Old (65 +) divided by Active Working Age Persons (15 to 64) for each household
Landholding (in acres)	
Landless	(0=< Land < 0.05) Reference Category
Land_49	Dummy = 1 if (0.05=< Land =< 0.49); otherwise = 0
Land_149	Dummy = 1 if (0.50=< Land =< 1.49); otherwise = 0
Land_249	Dummy = 1 if (1.50=< Land =< 2.49); otherwise = 0
Land_25	Dummy = 1 if (2.50=< Land so on); otherwise = 0
Non Earned Income (Rs.)	
Non_earned~1	Sale of Assets/lands/Jewellery and Stones/ Securities
Non_earned~2	Profits/Rents/Transfer Payments including Remittances
Parental Education	Mean mother's and father's education

[9]Economic Survey of Pakistan 2014-15, Statistical Appendices, Inflation, Table 7.1 (A).
[10]Jaffry, Ghulam, and Shah (2007).

In the context of Heckman's two step method, sample selection variables (Exclusion Restrictions) are believed to determine the participation in work but do not directly affect the wages [Lopez Boo (2010)]. Here, we use two non-earned income variables which can influence the decision of participation in the wage market [Duraisamy (2002); Asadullah (2006); Aslam (2006)]. The basic objective of taking number of children / old persons (dependents) in model is to see how the dependents would work to push or pull the working age individuals against wage market [Aslam (2006); Aslam, *et al*. (2009); Khitarishvili (2010)]. In this scenario, we have used the dependency ratio as exclusion restriction. It is pertinent to mention here that the indirect influence on wage market participation is captured by above mentioned exclusion restrictions and the direct influence is undoubtedly the wage incentive in market which would be accommodated by including the determinants of wage in probit regression of Heckman two step procedure which are the Mincerian model explanatory variables i.e, education, experience, marital status, region and gender.

This study employs the conventional Mincerian earning function [Mincer (1974)] for the estimation of returns to education in Pakistan. This function is semi-logarithmic in nature with dependent variable is in log form. The basic Mincerian function can be described as:

$$\ln Y_i = \beta_0 + \beta_1 s_i + \beta_3 x_i^2 + \varepsilon_i$$

Where s_i stands for Years of Schooling of wage workers, x_i stands for Experience of an individual and x_i^2 is its quadratic term (Square of Experience) to incorporate the non-linear earnings-experience relationship. Studies also consider various types of control variables like occupational, Industrial etc. However, it has been discouraged as they greatly mutilate the true returns to education by forcefully converting parsimonious returns to education model into an econometric model of earnings [Montenegro, *et al*. (2014); Pereira, *et al*. (2004)]. We will take up the further discussion with a parsimonious Mincerian model with just three more variables as compared to considering the social circumstances of Pakistan and to remain within the objective of this study.

$$\ln Y_i = \beta_0 + \beta_1 s_i + \beta_2 x_i + \beta_3 x_i^2 + \beta_4 \mathit{female} + \beta_5 \mathit{rural} + \beta_6 \mathit{married} + \varepsilon_i$$

where female, rural and marital status are dummy variables. According to the socioeconomic circumstances, these three additional variables are inevitable to be included in the estimation to assess the possible inequalities within the wage market of Pakistan. The basic OLS technique would be used for the estimation of the above model. Sample selection bias arises when non-random selection occurs in this study if we deliberately consider only those cases in Mincerian regression whose labour market wages (actual) are given excluding all others who possess the potential working age but not participating in labour market i.e.; women working at home, retired persons etc. whereas endogeneity occurs due to unobserved ability and family characteristics.

Simultaneous Approach [Wooldridge (2013)] states that analysis having issues like sample selection bias along with explanatory endogenous variable bias should be treated in such a way to control for both biases simultaneously instead of separate regressions for sample selection (Heckman) and endogeneity bias (IV). The basic advantage is that the

resultant estimates of simultaneous approach would be free of both biases otherwise, Heckman estimate would contain endogeneity bias and 2SLS estimate would contain sample selection bias. We basically combine both strategies to get our results in an efficient manner. We must have separate selection explanatory variables and Instrument variables to be used in the selection equation of Heckman (1979) Two Step procedure and 2SLS technique respectively. The selection equation as explained earlier is the dichotomous probit model equation whose explanatory variables (Selection Variables) would determine the participation in wage market. Using this probit regression, we will construct the Inverse Mills Ratio (IMR) for each individual and then we will introduce the IMR as an explanatory variable in 2SLS regression while instrumenting endogenous education with parental education.

Fixed Effect technique (Household Fixed Effect) would be used to analyse returns to education while controlling for the impact of personality/ability traits and family features of household members with the assumption that largely the family demographic features and ability traits would be same within household or family [Aslam, *et al*. (2009); Aslam, *et al*. (2010) and Kingdon, *et al*. (2007)]. Here, we will use households having two or more wage workers so that the common effect between or among wage workers within household could be fixed.

For the relationship of wage earnings and education, the study would use a more flexible approach in which we are not going to take any predetermined form for the relationship [Crespo Cuaresma, *et al*. (2014)].

$$\ln w_i = a + \psi(ed_i) + v_i$$

where $\psi(ed_i) + \sum_g \beta_g I(ed_i = g)$

$g = 1, \ldots\ldots, G$

$I(\cdot)$ *is an indicator function*

The indicator function $I(.)$ would get value one if the argument is true and zero otherwise whereas g is every possible value of years of education. Plotting of estimates would figuratively describe us convexity or concavity of earning-education relationship.

4. RESULTS AND DISCUSSION

The returns to education in Pakistan has been estimated in this study with the help of Mincerian earning function specification using the HIES dataset of 2004-05 and 2011-12 years (Table 2). Our results show that it is much better, efficient, consistent and reliable to simultaneously control for both these biases instead of separate regressions for Sample selection correction (Heckman Two Step) and endogeneity correction (Instrumental Variable [IV]). Our prime focus is upon the returns to education. In both years, the simultaneous result is more than the OLS results. Hence, in both years the OLS estimates were downward biased as we corrected for both biases, the returns to education improved. Arabsheibani, *et al*. (2007) and Foltz, *et al*. (2012) observed also the rising trend in returns after correction of both biases and concluded that separate regressions would be misleading owing to the presence of one bias or the other. We can see that for both for 2004-05 and 2011-12, the significance of the Inverse Mills Ratio (IMR) and the

endogeneity tests (Wu Hausman) scores confirm the existence of sample selection bias and endogeneity bias. Hence, Simultaneous regression results are valid instead of OLS, Heckman and IV estimates.

Using the bias-free simultaneous results, the returns to education for national sample shows that there has been an increase of 2 percent in the returns to education of wage employees in the span of seven years during 2004-05 to 2011-12 in Pakistan. Hence, profitability in investing in education increases over time even after the simultaneous control of bias. Further elaborating the results (Table 2) of other variables in Simultaneous approach estimates; we have observed that the impact of experience increases as an additional year of experience enhance the wage benefit from 8 percent to 10 percent. Moreover, the negative sign of experience square and positive sign of experience established the fact of concavity in earning experience for both years [Afzal (2014); Sial, *et al*. (2013)].

Table 2

OLS, Heckman, IV and Simultaneous Approach

	OLS	Heckman	IV	Simultaneous
		2004-05		
Years of Education	0.08*	0.08*	0.14*	0.13*
Experience	0.05*	0.05*	0.08*	0.08*
Experience-sq	-0.0008*	-0.0008*	-0.0010*	-0.0009*
Female	-0.60*	-0.56*	-0.55*	-1.18*
Rural	-0.18*	-0.18*	-0.04	-0.13*
Married	0.16*	0.16*	0.13***	0.07*
Inverse Mills Ratio		-0.03***		0.50*
Wu-Hausman Test			24.15*	25.18*
		2011-12		
Years of Education	0.10*	0.10*	0.15*	0.15*
Experience	0.07*	0.07*	0.10*	0.10*
Experience-sq	-0.0008*	-0.0008*	-0.001*	-0.001*
Female	-1.29*	-1.45*	-1.18*	-1.18*
Rural	-0.18*	-0.18*	-0.01	-0.01
Married	0.09*	0.13*	0.18*	0.18*
Inverse Mills Ratio		0.16*		-0.01
Wu-Hausman Test			124.82*	124.06*

Note: (*), (**) and (***) stands for significance at 1 percent, 5 percent and 10 percent level. We have summarised all technique results in this table. The results are for national level sample.

Gender discrimination persists against females over the time period as shown by the negative sign of female dummy variable in both years [Aslam, *et al*. (2009); Ali, *et al*. (2013); Hyder (2007); Jaffry, *et al*. (2007); Nasir (1999)]. Marital status has been associated with positive impact on earnings [Aslam, *et al*. (2009); Ali, *et al*. (2014)] across years. Regional Discrimination owing to the negative sign of rural variable is quite evident in both time periods [Hyder (2007); Qureshi (2012)]. However, there has been reduction in it over time period.

Table 3 shows the Household Fixed Effect technique [Aslam, *et al*. (2009); Kingdon, *et al*. (2007)] results while controlling for the household and ability factors within household. Households having two or more wage workers have been used. The fixed effect regression vehemently supports the result of positive and increasing benefit of acquiring education over time period that we got in Table 2 results. The incentive to invest in education on average, increased by four percentage points. In the same way, experience contributes further in returns to education over time period.

Table 3

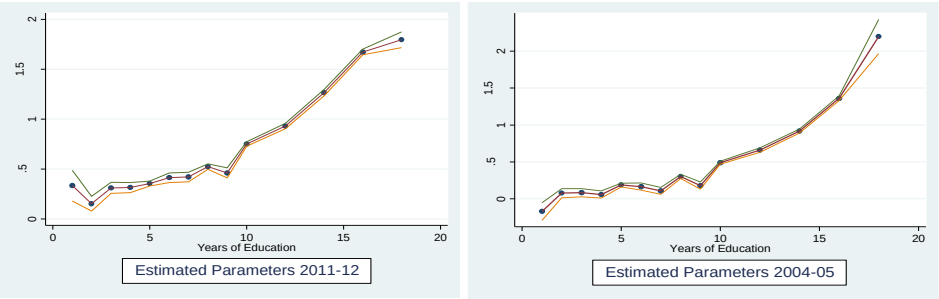
Household Fixed Effect

	2004-05	2011-12
Years of education	0.05*	0.09*
Experience	0.01*	0.02*
No. of Observations	5737	10749
No. of Households	2362	4114

Note. (*), (**) and (***) stands for significance at 1 percent, 5 percent and 10 percent level. We have summarised all technique results in this table. The results are for national level sample. The regression intentionally does not include dummy variables.

In Figure 1, we have plotted the estimated parameters (using indicator function approach) of each year of schooling along with their corresponding standard errors for both years without taking any pre-determined form of between education and wage earnings. This more flexible approach is easily and figuratively depicts us the convex between wage earnings and years of education for both 2004-05 and 2011-12 in Pakistan. Convexity interprets as higher returns for increasingly higher levels of education. Our convexity result is in line with the findings of Aslam, *et al*. (2009), Guisingeret, *et al*. (1984), Haque (1977), Khan, *et al*. (1985), Nasir (1998), Nasir (2002) and Shabbir (1994)].

Fig. 1. Returns—Education Relationship



Note: Relatioship shows that returns are relatively lower in initial years of edcucation and consistently increase with more education. It shows the prevalence of convexity in both years .

The convexity has been explained by RECOUP (2009) who stated that both demand-side and supply-side factors emerged in the last three to four decades which contributed in the lower returns to initial or primary education. Supply-side factor works as the supply of workers having primary education has increased. On the other hand,

Demand-side factor works as the demand for workers having low skills/education reduced. The joint interaction of both demand and supply forces depress the returns to education at lower education level in most of the developing countries. Moreover, Qureshi (2012) mentioned for convexity that there is hunger for higher educated/skilled workers in various sectors of Pakistan economy as higher education is being rewarded in higher monetary values. This logic is quite plausible for the support of our consistent convexity results for both 2004-05 and 2011-12. Convexity perpetuates the educational and the consequent income inequality. It means that poorer families would not be able to educate their children for higher levels hence, they will command low returns in wage market. On the other hand, richer families would be able to educate their children for higher levels and get higher earnings. In this scenario, poorer families would have little incentive to go for even low levels of education and their earnings would remain depress relative to richer families and as a result of it income or earnings inequality would increase along with educational inequality. This is the educational and income inequality across (inter) families. But even within families educational inequality would also increase because low incentive (Low returns to Lower levels of education) and low resources (lack of resources to educate all children and for higher levels) would compel families to choose the child having more ability for education. In the backdrop of gender discrimination, girls' education would suffer in poorer families due to the preference of boys' education. Hence, both intra and inter family inequality worsens [Qureshi (2012)]. Based upon this reasoning, we can also say that educational inequality constitutes a significant component of inequality of circumstances (counterpart to the inequality of efforts) which results in Inequality of Outcomes whereas wage earning is one of the outcomes [World Bank (2009)].

5. CONCLUSION

Returns to education have been the common interest of education economists and labour economists for a long time. The continued investigation of it is premised over how education is being rewarded. This study after the careful adjustment of all those factors inevitably for private and unbiased returns to education observed that returns increase in the time period from 2004-05 to 2011-12. Other results include the observance of concavity in earning-experience, gender discrimination against the status of female, regional inequality with lower wage earnings for rural side workers and wage premia advantage for ever-married as compared to never married individuals over time period. Consequent upon the unfolding of above mentioned results, this study prescribes an active labour management policy from the government for the proper and adequate absorption of educated workers in the labour market. Education expansion is on the way but labour market's hunger exits for educated workers that may aggravate as a consequence of possible job-less growth. Returns to education may also increase due to the shortage of more skill-oriented educated workers. This is of keen interest for employers who knew that newer technology continuously demand labour which is more adaptive to the newer technological production functions. Hence, policy should focus more upon expansion of education which is more skill-oriented and quality-oriented. Support mechanism for the poor households is required in order to spread more equitable access to education which is effective against poverty and inequality. Incentive schemes

for poorer households who are eager to send their children to schools and Scholarship schemes with maximum coverage especially for deprived regions etc. are the policies which can minimise the detrimental impacts of educational inequality.

APPENDIX

Table A1

Estimates of Probit Regression in Simultaneous Approach (2004-05)

Probit Regression			Number of obs		59862	
Log likelihood = -27687.824			LR chi2(12)		14351.28	
			Prob > chi2		0.0000	
			Pseudo R2		0.2058	
Variables	Coefficients	Std. Err.	z	P>z	[95% Conf.	Interval]
Year of Education	.0057026	.0014701	3.88	0.000	.0028214	.0085839
Experience	-.0002633	.0006283	-0.42	0.675	-.0014948	.0009682
Female	-1.309034	.0134947	-97.00	0.000	-1.335483	-1.282585
Rural	.0352129	.0135055	2.61	0.009	.0087427	.0616832
Married	.3534576	.01837	19.24	0.000	.3174531	.3894621
Land_49	-.4510216	.0853688	-5.28	0.000	-.6183415	-.2837018
Land_149	-.5425274	.0403645	-13.44	0.000	-.6216402	-.4634145
Land_249	-.6723232	.0437411	-15.37	0.000	-.7580541	-.5865923
Land_25	-.9314893	.0262892	-35.43	0.000	-.9830152	-.8799634
Non_earned~1	-4.60e-07	1.45e-07	-3.17	0.002	-7.45e-07	-1.75e-07
Non_earned~2	-1.43e-06	6.38e-08	-22.36	0.000	-1.55e-06	-1.30e-06
DR	.0345524	.0087192	3.96	0.000	.017463	.0516418
_cons	-.2314482	.0215473	-10.74	0.000	-.2736801	-.1892163

Table A2

Estimates of Probit Regression in Simultaneous Approach (2011-12)

Probit regression			Number of obs		54862	
Log likelihood = -21773.555			LR chi2(12)		10897.33	
			Prob > chi2		0.0000	
			Pseudo R2		0.2002	
Variables	Coefficients	Std. Err.	z	P>z	[95% Conf.	Interval]
Year of Education	.0309953	.0017087	18.14	0.000	.0276463	.0343444
Experience	.0003459	.0007214	0.48	0.632	-.0010681	.0017598
Female	-1.295631	.0162939	-79.52	0.000	-1.327566	-1.263695
Rural	-.0209138	.0157888	-1.32	0.185	-.0518591	.0100316
Married	.3063452	.0205028	14.94	0.000	.2661604	.3465299
Land_49	-.3888892	.0318539	-12.21	0.000	-.4513218	-.3264566
Land_149	-.4689868	.0266273	-17.61	0.000	-.5211754	-.4167982
Land_249	-.4294069	.0359974	-11.93	0.000	-.4999605	-.3588532
Land_25	-.6387796	.0235253	-27.15	0.000	-.6848884	-.5926708
Non_earned~1	-6.30e-07	3.47e-07	-1.82	0.069	-1.31e-06	4.95e-08
Non_earned~2	-4.87e-07	8.16e-08	-5.97	0.000	-6.47e-07	-3.27e-07
DR	.055753	.0094514	5.90	0.000	.0372287	.0742774
_cons	-.6285794	.0232522	-27.03	0.000	-.6741528	-.583006

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