



Return to Schooling for Public and Private Sector Higher Education Institutions of Khyber Pakhtunkhwa-Pakistan

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ABSTRACT

Human capital is a widely used concept in labor as well as in economics of education. The study examined return to schooling using data of 653 sample of higher education institutions of Khyber Pakhtunkhwa-Pakistan. The study also focused on estimating return to schooling with and without considering the endogeneity bias in schooling variable and compared the estimated return for public and private sector higher education institutions. Data was collected using well-designed questionnaire and the current study adopts Mincerian earning functions with its modified and extended forms using parental education as an instrument. The study found higher return to schooling for public sector respondents and reported considerable variation in estimated return after considering the endogeneity bias in schooling variable. Using an extended Mincerian earning function, the study found that higher return is associated with highest level of schooling and vice versa. Further investigation needed at micro and macro level along with critical evaluation of other instrumental variables for testing the endogeneity bias of schooling variable.

Keywords: Modified Mincerian Earning Functions, Endogeneity Bias, Instrumental Variable, Return to Schooling, Parental Education, Pakistan

JEL Classifications: I26, J24, C36

1. INTRODUCTION

Human capital theory and earning functions with empirical equations and extended form are extensively used concepts adopted for the first time by Mincer (1958) and his followers Becker (1975) and Ben-Porath (1967). Many pioneer economists including Adam-Smith, Jean Baptiste Say, Nassau William Senior, Friedrich List, Johann Heinrich von Thünen, Ernst Engell, Léon Walras, Irving Fisher and Karl Marx also valued human capital in their work (Walsh, 1935). However, the concept of human capital was less understood in economic history, this type of capital possessed by human beings were considered unrealistic due to the non-market value (Kiker, 1966). But now the trend in labor economic research changed and diverted to functional distribution of income between labor and income from the earning distribution across workers. Recently, labor economic research greatly emphasized on how workers' productivity enhances by motivating employees for investment in human capital. Human capital is a set

of skills and characteristics, helpful in enhancing productivity and earning of workers. It covers all type of investment in human being. Education, training, skills, age and experience are among important aspects of such investment. Because, it is a type of knowledge and skills of people added through education, various types of training and experience-beneficial in the production of goods, services and advance knowledge (de La Fuente and Ciccone, 2002). Among all different factors of human capital, education, potential experience and training are considered the most researchable and significant determinant of earning. Because, it is the returns to these factors which enable individuals to make decision regarding their future investment in education (Bhatti et al., 2013b) and beneficial for scholars and policy makers (Wang et al., 2019).

Researchers used Mincerian earning function and reported schooling has positive and significant effect on earning of individual world-wide (Bhatti et al., 2013b). Likewise, majority of studies reported positive and significant estimated return

to schooling for Pakistan. But most of them used traditional Mincerian earning function (OLS) without considering the bias occur due to endogeneity of schooling variable, which led to a serious issue as traditional Mincerian (OLS) underestimate the estimated return as reported in different studies (Chen et al., 2017).

Keeping in view the above, the current study analyzed and compared return to schooling for employees working in public and private sector higher institutions of Khyber Pakhtunkhwa Province of Pakistan. The study also considered the problem of endogeneity bias in schooling variable using modified Mincerian earning function with parental education as an instrumental variable and compare the estimated returns with estimated return obtained from traditional Mincerian earning function. Similarly, return to different completed levels of schooling was also analyzed using extended form of Mincerian earning function.

2. LITERATURE REVIEW

This segment is comprised of brief review of literature on return to schooling, including empirical work on important aspects closely related to the study of human capital and methodology used for endogeneity bias in education (explanatory variable).

Liu et al., (2019) used primary survey data collected in 2016 to estimate the rates of return to education in rural China. The study found highest return to education for tertiary level and reported 3.1% estimated average returns to education. Aslam et al., (2012) investigated the economic outcomes of education for wage earners in Pakistan by analyzing the relationship between schooling, cognitive skills and ability using stratified random sampling to collect data from 9 districts of Punjab and Khyber Pakhtunkhwa provinces. The study used OLS, IV and household fixed- effect and reported estimated economic rate of return about 5%. Chen et al., (2017) addressed schooling endogeneity and off-farm work self-selection to estimate the returns to rural schooling using geographical proximity as an instrumental variables (IV) for individuals' years of schooling in China. The study used two-step procedure (2SLS) and found 7.6% estimated schooling return.

Similarly, Afzal (2011) used primary data of 3358 sample of teaching and non-teaching employee of universities, colleges and schools in Lahore district. A variety of regression models were used and found that respondent's education, age, experience, occupation, gender, spouse education, family background and working hours are positive and significant contributors to earnings. Asghar and Chughtai (2012) collected data from 120 randomly selected respondents subjected to human capital model and found 19.7% increase in return to education with each additional year of education. Significant impact of different levels of education on earning were observed with 1.1% for intermediate, 23% for graduation, 78.4% for master, 93.7% for M. Phil. and 131% increase in earnings were found for the teachers having PhD degree. Hoogerheide et al., (2012) investigated the effect of use of instrumental variable using data from 2004 German Socio-Economic panel and Bayesian analysis. The study provides ground and confidence for using family background i.e. Father education as instruments for education of respondents. Similarly,

Fiaschi and Gabriellini (2013) adopted OLS and instrumental variable technique and found positive and significant impact of education, levels of education and experience on earning in industry sector. Montenegro and Patrinos (2014) compared the estimates of return to schooling of the basic and modified Mincerian models and found higher/lower returns for higher/lower schooling levels. Similarly, Houcine and Zouheyr (2019) adopted basic and extended Mincerian earning functions in their study and found 10.35% economic rate of return for university education in KSA compared to international return reported by Psacharopoulos which is 9.6%.

Bhatti et al., (2013b) examined and compared the economic return to education for French labor market using OLS and instrumental variables to address the problem of endogeneity in the Mincerian wage model. The study reported downward biased in return to education obtained from OLS and found 14% more after correcting for endogeneity bias. Significant difference was found in the OLS and two-stage OLS estimates of return to education in case of male and female. Likewise, in another study of Bhatti et al., (2018a) used instrumental variables and two stage least squares to address the problem of endogeneity of education in the Mincerian wage model for Pakistan's labour market. Using a recently new data set and new independent variables, the study found biased downward trend in return to education due to endogeneity. Significant difference was found in the OLS and two-stage OLS estimates of return to education in case of male and female. Wang et al., (2019) examined changes in returns to education for off-farm wage employment in rural China using nationally representative survey data from 2004 to 2015. They observed 6% and 3% decrease in returns to education in 2004 and 2011 and found a rise of nearly 4% in 2015. Estimated return to tertiary education was high i.e. 10% and a gradual decrease reported for senior high school education.

Despite of the availability of wide range of studies, the concept of human capital and its return is yet inconclusive and need more research to understand the true impact on earning of individuals. Similarly, studies for other sectors are available but literature on return to schooling for higher education institutions is scant. Additionally, few of the studies compared the rate of return to schooling for public and private sector. Hence, there is dire need of the study for capturing the effect of schooling on earning for public and private sector higher education institutions. The current study is designed with the intends to bridge this gap by re-examining the rate of return to schooling and consider the issue of endogeneity bias in schooling variable using data of higher education sector.

3. METHODOLOGY

3.1. Universe and Sample Size of the Study

Using well-designed questionnaire, primary data was collected from 653 sample respondents including 171 from private and 482 from public sector higher education institutions of Khyber Pakhtunkhwa province of Pakistan. Therefore, all the existing public and private sector higher education institutions of Khyber Pakhtunkhwa constitutes universe of the study.

3.2. Econometric Models

This study adopted traditional/basic as well as modified Mincerian earning functions for estimating the rate of return to schooling for sample respondents of public and private higher education institutions of Khyber Pakhtunkhwa-Pakistan. Basic Mincerian earning function is given as:

$$\text{Ln } Y_i = \delta_0 + \theta_s S + \beta_0 x + \beta_1 x^2 + \varepsilon_i \quad (1)$$

Where:

$\text{Ln } Y_i$ = Natural logarithm of monthly income earned by ith respondents in Rs./month

S = Years of schooling completed by ith respondent

x = Potential Experience (Years)

x^2 = Square of Potential Experience

θ_s , β_0 and β_1 = Coefficients used for above explanatory variables

ε_i = Disturbance term.

Similarly, for Modified Mincerian earning function, we made modification in basic traditional linear Mincerian equation given in equation (1) i.e.

$$\text{Ln } Y_i = \delta_0 + \theta_s S + \beta_0 x + \beta_1 x^2 + \varepsilon_i \quad (2)$$

Where, S is an endogenous variable, affected by factors not included in the list of explanatory variables, i.e. $\text{Cov}(S, \varepsilon_i) \neq 0$,

In this case, OLS will yield biased and inconsistent estimates.

For consistently estimating the basic Mincerian earning function, an instrument variable Z will introduce in the first stage assuming not to be correlated with ε_i , i.e. $\text{Cov}(Z_i, \varepsilon_i) = 0$, but correlated with S .

An instrumental variable fulfils the above conditions will generate a better and good estimate (Wooldridge, 2013).

With addition of instrument, the first stage of equation will be given as:

$$\hat{S} = \alpha_0 + \alpha_1 Z_i + v_i \quad (3)$$

Where:

\hat{S} = years of schooling completed

Z_i = variables used as an instrument

v_i = error term

And after putting the estimated values of \hat{S} , derived from 1st stage, the original basic Mincerian regression equation will become:

$$\text{Ln } Y_i = \delta_0 + \theta_s \hat{S} + \beta_0 x + \beta_1 x^2 + \tau \quad (4)$$

Where τ is the composite error term that is uncorrelated with \hat{S} , x and x^2 .

More than one instrument variable can be used subject to the satisfaction of the two conditions referred above earlier.

The current study used Parental education as an instrument for education, as suggested by many studies and also because educated household heads or parents being more aware of future returns pay full attention and also may have higher incomes be in a better position to devote more resources to their children's education (Khan and Jehangir, 2016; Bhalotra, 2003; Dabalen and Miluka, 2010).

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics of Important Variables

Table 1 shows descriptive statistics of important variables for overall, public and private sector sample respondents. Average Schooling was 15.74, 15.49 and 16.42 years for overall, public and private sector sample respondents. Similarly, average potential experience and earning of overall sample respondents were 13.53 years and Rs. 47370.69/- thousand respectively. Likewise, average age, father and mother education, average pre-job and current job experience of overall, public and private sector sample respondents are also given.

4.2. Estimated Results of Basic Mincerian Earning Function

Table 2 shows that schooling and potential experience are positive and significant determinants of earnings. The positive and significant impact on earning can be seen for overall as well both for public and private sector sample respondents. On the other hand, the potential experience squared has a negative relationship with earning, indicating concavity of the Mincerian human capital model. Estimated result shows that earning increased by 8.25%, 9.04% and 7.41% with additional year of schooling of overall, public and private sector sample respondents. Similarly, earning increases by 3.74%, 3% and 5.56% with each additional year in potential experience. Results of the current study are closely in agreement with the study of Farooq (2010), Bhatti et al., (2013b) and (2018a), who also reported similar trend in their studies, but estimated return to schooling are more than reported by Chen et al., (2017), who reported 2% as return for Rural China.

4.3. Estimated Basic Mincerian Earning Function for Completed Level of Schooling

Using extended form of Mincerian earning function, the study also found return to different completed level of Schooling. Results of the estimated return to different completed levels of schooling are reported in Table 3 below showing positive and progressively increasing return to different level of schooling. Similarly, potential experience had positive and significant effect while square of potential experience had negative effect on earning in all cases. Low rate of return is associated with low level of schooling while higher return is associated with highest level in all cases. Results also indicated highest return to schooling for sample respondent working in public sector compare to private sector sample respondents. Results of the current study are also in-line with the study of (Wang et al., 2019), Naqvi and Shahnaz (2002), Chaudhry et al., (2010), Jamal (2015) and Asghar and Chughtai (2012), who also reported highest return for highest level of education. Likewise, findings of the study are contradicted with the study conducted

Table 1: Descriptive statistics

Variables	Overall		Public sector		Private sector	
	Mean	SD	Mean	SD	Mean	SD
Schooling (years)	15.74	4.54	15.49	4.60	16.42	4.35
Potential experience (years)	13.53	9.30	13.79	9.49	12.80	8.76
Earning	47370.69	26388.77	49849.05	27759.28	40384.91	20591.01
Age	35.26	8.77	35.28	8.55	35.22	9.39
Father education (years)	10.04	6.48	9.52	6.52	11.54	6.16
Mother education (years)	4.28	5.26	4.23	4.99	4.40	5.97
Variables related to occupation						
Pre-job experience (years)	2.05	3.12	1.84	2.73	2.62	3.97
Current job exp (years)	6.03	6.80	6.42	7.26	4.91	5.11
Number of sample respondents	653		482		171	

Source: Author's calculation

Table 2: Estimated results of traditional mincerian earning function

Variables	Coefficients		
	Overall	Public sector	Private sector
Schooling (years)	0.0825* (0.0026)	0.0904* (0.0031)	0.0741* (0.0031)
Potential Experience (years)	0.0374* (0.0042)	0.0300* (0.0047)	0.0556* (0.0058)
Potential experience square	-0.0002*** (0.0001)	-0.0003** (0.0001)	-0.0007* (0.0001)
Constant	8.8903* (0.0540)	8.8746* (0.0622)	8.7333* (0.0744)
R-squared	0.6611	0.6732	0.8387
F-statistics	421.92*	328.19*	289.46*
Number of observations	653	482	171

*Significant at 1%, **Significant at 5% and ***Significant at 10%, St. Error in parenthesis ()

Table 3: Estimated results of mincerian earning function with different schooling levels

Variables	Coefficients		
	Overall	Public sector	Private sector
Edu_D ₁	0.2675* (0.0679)	0.2818* (0.0788)	0.2977* (0.0896)
Edu_D ₂	0.4025* (0.0547)	0.4315* (0.0644)	0.4489* (0.0677)
Edu_D ₃	0.8254* (0.0496)	0.8612* (0.0593)	0.8609* (0.0629)
Edu_D ₄	1.4749* (0.0542)	1.5892* (0.0665)	1.3920* (0.0641)
Potential experience (Years)	0.0318* (0.0043)	0.0271* (0.0050)	0.0446* (0.0058)
Potential experience square	-0.0002** (0.0001)	-0.0001** (0.0001)	-0.0005* (0.0001)
Constant	9.5036* (0.0587)	9.5570* (0.0669)	9.2237* (0.0842)
R-squared	0.6729	0.6728	0.8700
F-statistics	221.45*	162.79*	182.92*
Number of observations	653	482	171

Dependent variable= Natural log of earning
Edu_D₁ = 1 if schooling level is between 5 ≤ E ≤ 10, 0 otherwise
Edu_D₂ = 1 if schooling level is between 10 < E ≤ 12, 0 otherwise
Edu_D₃ = 1 if schooling level is between 12 < E ≤ 16, 0 otherwise
Edu_D₄ = 1 if schooling level is 18 and above, 0 otherwise

*Significant at 1%, **Significant at 5% and ***Significant at 10%, St. Error in parenthesis ()

by Houcine and Zouheyr (2019), they found highest return for secondary level followed by primary and the lowest for University level education. Similarly, the value of coefficient of determination (R^2) shows a good fit and reported that 67.29%, 67.28% and 87% of the variations in earnings of sample respondents were explained by the explanatory variables while remaining by other factors. As per F-statistics the overall models were highly significant in all cases.

Analysis of our study shows that there exists a positive correlation between education and earning but seems to be different across different sets of data (Figures 1-3). Income increases with increase in education and this relationship is even more significantly pronounced for the data set of public sector compared to private sector (Figures 2 and 3).

4.4. Estimated Modified Mincerian Earning Functions

This study also adopted modified form of Mincerian earning function in order to address the problem of endogeneity in schooling variable using parental education as an instrument. It important to note that, relevancy and validity of the instrument is the first step of estimation while using instrumental variable technique for tackling the endogeneity bias. It is very difficult task to find the instrument having strong correlation with endogenous variable (schooling). This condition can be confirmed by testing the degree of correlation with endogenous variable and can be examined by the fit of the first stage equation (Bound et al., 1995; Patrinos and Sakellariou, 2005).

Table 4: Estimated results of modified mincerian earning function (first stage)

Variables	Coefficients		
	Overall	Public Sector	Private Sector
Potential experience (years)	0.0140 (0.0589)	0.1149*** (0.0593)	0.3994* (0.1421)
Potential experience square	-0.0035** (0.0014)	-0.0066* (0.0014)	-0.0091** (0.0034)
Father education (years)	0.2545* (0.0282)	0.3031* (0.0298)	0.0403*** (0.0617)
Mother education (years)	0.0447** (0.0339)	0.0732*** (0.0380)	0.0396*** (0.0634)
Constant	13.7591* (0.5349)	12.5743* (0.5414)	18.7068* (1.2814)
F-statistics	65.07*	95.37*	53.43*
Number of observations	653	482	171
Dependent variable = Schooling			

*Significant at 1%, **Significant at 5% and ***Significant at 10%, St. Error in parenthesis ()

Table 5: Estimated results of modified mincerian earning function (second stage)

Variables	Coefficients		
	Overall	Public sector	Private sector
Schooling (years)	0.0951* (0.0063)	0.1040* (0.0060)	0.1021* (0.0388)
Potential experience (years)	0.0371* (0.0043)	0.0282* (0.0048)	0.0665* (0.0166)
Potential experience square	-0.0001*** (0.0001)	-0.0001*** (0.0001)	-0.0009** (0.0004)
Constant	8.6800* (0.1114)	8.6559* (0.1033)	8.1924* (0.7520)
R-squared	0.6484	0.6599	0.7610
Wald-statistics	438.75*	426.51*	216.97*
Number of observations	653	482	171
Dependent variable= Natural log of earning endogenous variable = schooling			
Instruments used = Parental education			

*Significant at 1%, **Significant at 5% and ***Significant at 10%, St. Error in parenthesis ()

Figure 1: Relationship between schooling and earning for overall sample respondents

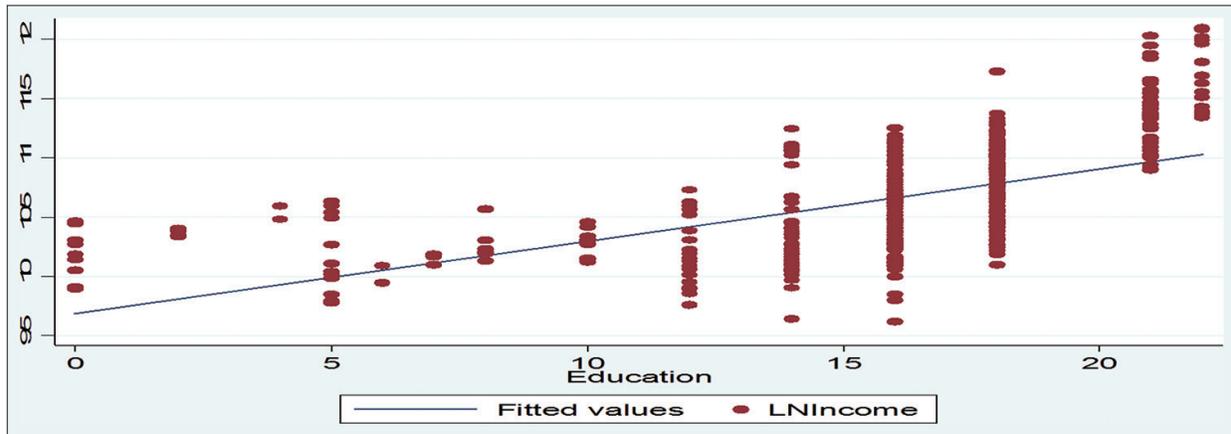


Figure 2: Relationship between schooling and earning for private sector sample respondents

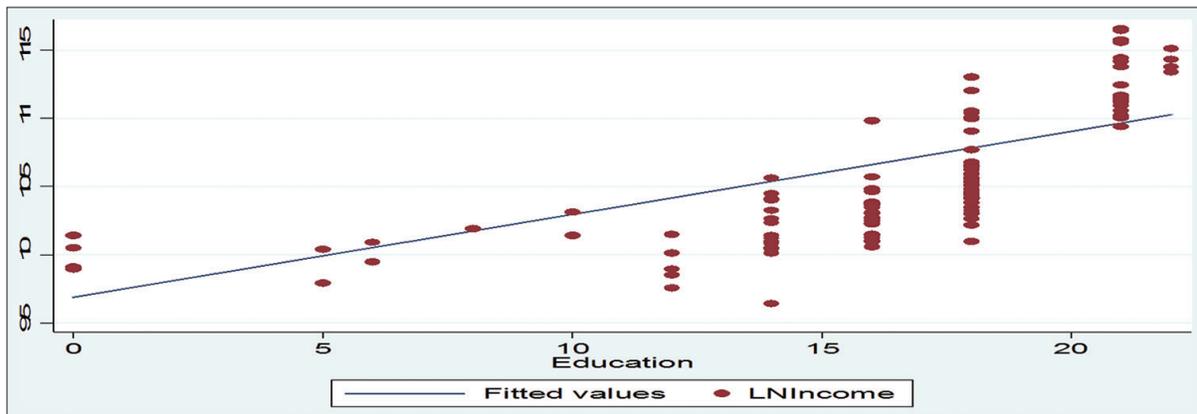
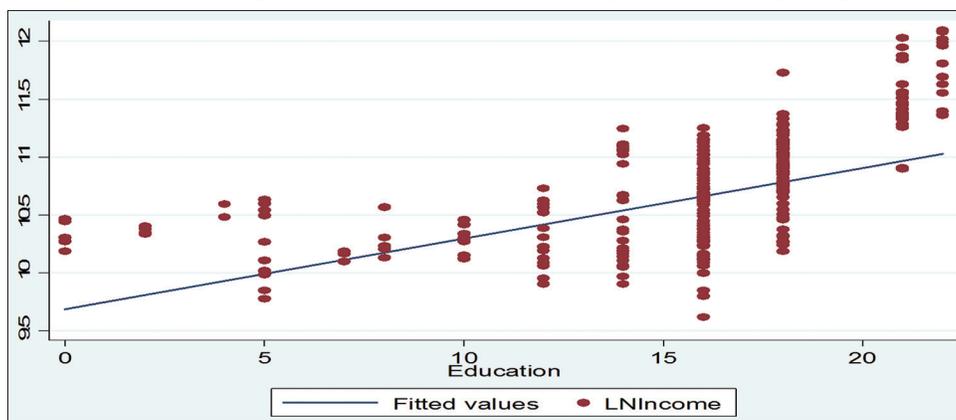


Figure 3: Relationship between schooling and earning for public sector sample respondents

Results of the first stage regression is reported in Table 4 reveals the value of F-statistic >10 indicating IV (Parental education) as a strong and favourable instrument for the endogenous variable i.e. schooling.

Table 5 reported results of the second stage of the modified Mincerian function after instrumenting the endogenous variable (i.e. schooling). Both schooling and potential experience have positive and significant while square of potential experience has negative correlation with earning. Estimated result shows that respondents with an additional year of schooling and potential experience have 9.51% and 3.71% point higher returns compared to others. Disaggregation of data also shows stronger impact of schooling on earning for both public and private sector respondents i.e. 10.40% and 10.21%. Finding of the current study endorsed and confirmed results of the studies conducted by Abbas and Foreman-Peck (2008) and Aslam (2007). Result of the study for return to schooling are more than estimated by Chen et al., (2017), who reported 7.6% as return for Rural China.

5. CONCLUSIONS AND RECOMMENDATIONS

The study used traditional and modified Mincerian earning functions to estimate the rate of return to schooling and potential experience on earning using data of 653 sample respondents of public and private sector higher education institutions of Khyber Pakhtunkhwa-Pakistan. The study found positive and significant empirical relationship between earning, Schooling and potential experience for overall, public and private sector sample respondents.

Significant differences observed in rate of returns to schooling for public and private sector and the estimated rate of return to schooling remained higher for public sector compared to private sector using both traditional and modified Mincerian earning functions.

It is concluded that traditional Mincerian earning functions underestimate the estimated return to schooling as significant differences in empirical estimates were observed. Increase in estimated return was observed after considering the endogeneity

bias in schooling variable but even after treating schooling as endogenous variable, modified Mincerian technique also verify the relationship between Schooling and earning.

Using extended form of traditional Mincerian earning function, the study reported higher return associated with higher Schooling level while lower with lowest Schooling level.

The study was conducted at micro level restricting to some selected institutions of higher education sector of Khyber Pakhtunkhwa, Pakistan. Further investigation needed at macro level including data from other sector along with critical evaluation of other instrumental variables for testing the issue of endogeneity bias of schooling variable. The study also recommended for increasing and homogenous return to schooling both in public and private sector higher education institutions. Moreover, the government must pay attention to invest in human capital especially in the higher education sector.

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