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## Endogeneity and Human Capital in Higher Education

A Critical Analysis of Investment Returns Among Teacher's in Uasin Gishu County, Kenya

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### Abstract

The concept of human capital presupposes that formal schooling and experience enhances the productive capacity of individual workers through acquisition of knowledge and skills. Empirical studies on private rate of return to investment in education, around the world, indicate that an extra year in formal education has a positive benefit to the individual. This is in terms of increased lifetime earnings. Employing the Mincerian wage equation, this research article seeks to establish and empirically compare the private rate of return to investment in higher education for teachers in public secondary schools in Uasin Gishu County of Kenya. The research article employed a comparative research design. The target population and data sampling was taken from all the public secondary school teachers from the above County. Primary data from a sample of 574 secondary school teachers was collected by use of a questionnaire. The multivariate regression results showed years of schooling that negatively affected the private rate of return to schooling for secondary school teachers; while experience and experience squared had positive effect on private rate of return. Teachers who hold Diploma certificates earn an average of Kshs31, 231.250, Bachelor's degree holders earn Kshs54, 047.879. The mean earning difference from teachers having Diploma certificates to teachers having Bachelor's degrees was Kshs 22,816.629 (73.06%). The rate of return for a Diploma teacher was calculated at 4.20% and Bachelor's degree at 8.37%. This research article suggests the presence of varying monetary benefits accruing to investment in higher education. Policy implications are discussed.

**Keywords:** *Private Rate of Returns; Investment in Higher Education; Mincer Regression, Secondary School Teachers; Uasin Gishu County of Kenya*

## 1. Introduction

Over the last half-century, labor economics has undergone a major transformation. Rather than view labor as an amalgam of homogeneous workers in an aggregate economy-wide production function, modern labor economics considers labor as a conglomeration of heterogeneous human beings, each differing in on-the-job productivity (Gumbrell-McCormick & Hyman, 2013). Nowadays, labor economists emphasize on how economies enhance worker productivity, employee-by-employee, by motivating workers to put out the effort and invest in human capital. As result labor economists concentrate on the earnings distribution across workers rather than the functional distribution of income between labor and capital.

The Kenyan government has continued to expand access to tertiary and University education due to the perceived payback ensuing from advanced education (Engebe, 2015). According to Knight and Sabot (1987), earnings inequality in Kenya has been very high, a phenomenon that has necessitated many teachers in public secondary schools to enroll for higher education in anticipation of higher returns in the long run.

According to the concept of human capital theory, it is envisaged that individuals will identify the kind of time allocated to formal schooling that will maximize the earnings in the long run. However, Fatai and Gibson (2006) conducted research in urban New Papua Guinea on private rate of return to investment in formal Schooling. The study findings were not consistent with the findings of Psacharopoulos (2006), which established that investment in formal education decrease with the increase in the level of educational attainment. The question many people would ask is: what is the rate of return to higher education? Is it worth investing in higher education? Is the University education a good investment option? The Kenyan government has continued to expand access to tertiary and University education due to the perceived benefits accruing from higher education.

Statistics from the department of education in Uasin Gishu County of Kenya revealed that the number of students who have enrolled for advanced education has grown significantly over the last few years. Available statistics thus indicate that the majority of public secondary school teachers in Uasin Gishu County have enrolled for advanced education in anticipation of higher returns. This is because earnings vary significantly; and this is based on the level of educational qualifications. This research article therefore seeks to empirically determine and compare the private rate of return to investments in tertiary education among public secondary school teachers in Uasin Gishu County of Kenya, especially in regard to the holders of Bachelor's degree and Diploma Certificates.

## 2. Literature Review

Mincer (1958, 1966); and Schultz (1962), have argued that the theory of human capital assumes an increase in wage earnings with the rise in years of schooling. The theory of human capital assumes that most educated workers earn more wages as compared to their colleagues with less or no formal education. The concept of human capital identifies education as an investment of time and resources. Education enhances the productivity of workers by imparting necessary skills and training in form of formal Schooling. Increased productivity therefore enhances earnings for individual employees (Mulongo, 2012). Further, earnings are determined by individual productivity. Becker (1962) and Schultz (1961), suggest that additional years of schooling raise the productivity of workers due to the quality and quantity of their education and job training. It is assumed that differences in workers' productivity are usually associated with differences in terms of education and training invested by each employee.

The results of Shahar (2008) Employing the Mincerian earning function, in order to study the private rate of return to investment in education, suggests that the private and social rates of return to investment in education for polytechnic Diploma graduates are 14 per cent and 13 per cent respectively. The rate of return for Diploma graduates who are employed in the public sector showed that the rates are 5 and 6 per cent for the private rate and the social rate. The rates of return for female Diploma polytechnic graduates are better than the male graduates either for the private or the social rate between 4 to 8 per cent. Generally, the findings indicated that the investment in polytechnic Diploma education is still viable and could be one of the favorable personal choices of investment.

Borland (2002) investigated new estimates of the private rate of return to University education in Australia and found that the average private rate of return for a three-year Bachelor's degree programme was 14.5 per cent.

Underlying this estimate is a lifetime net monetary gain of \$380,958 from undertaking the degree (assuming a zero rate of discount). Estimates of the rate of return to a Bachelor's degree are robust to alternative scenarios. Rates of return do however show a wide variation across the field of qualification categories. The estimated returns are relatively high for business and administration, and engineering graduates, and relatively low for graduates in the fields of society and culture, and science

Research studies by Rugar, Ayodo, and Agak (2010) on the financial profitability of higher education among academic staff members in two public Universities established that, as the level of education rises the earnings of the staff members also increase. The study concluded that the University Level of education provided a more private rate of return as compared to other levels of education at 47.8 percent. The study further revealed that the Doctorate program was the most profitable, and was followed by the Master's degree. The finding of this study has motivated many prospective students to pursue a higher level of education in anticipation of enhanced earnings.

There are several issues to be borne in mind when relating the Mincerian coefficient to earnings (Card, 1999; Harmon et al., 2003). First, as an investment-decision variable, years of schooling and education attainment should be considered endogenous, implying a possible bias in OLS estimates of the schooling coefficient. The endogeneity bias may arise either from unobserved variation in ability or from unobserved heterogeneity. If those who extend education beyond compulsory schooling have a greater ability than others, the estimated Mincer coefficient is biased upwards since part of the productivity differential is actually due to innate abilities or skills acquired outside school (ability bias). The ability bias may interact with heterogeneous subjective discount rates that result in under-estimating the true effect of schooling on earnings if the more impatient individuals happen to be the more able ones (heterogeneity bias). The total direction of bias in OLS estimates is ambiguous. Nonetheless, the consensus from the empirical literature is that this bias in the estimated Mincerian wage premium is likely to be small (Card, 1999; Woessmann, 2003).

Utilizing the Mincerian earning function, where years of schooling is used as a proxy to analyze returns to schooling; this research article sought to establish and compare the private rate of return to investment in higher education for teachers who are holders of Bachelor's degree in public secondary schools in Uasin Gishu County of Kenya.

### 3. Methodology and Data

A structured questionnaire was used to collect primary data and was further piloted to establish reliability. Piloting of research instruments was done in Nandi County to identify any ambiguity in the questionnaire. 80 public secondary School teachers, employed by the Teacher's Service Commission from the neighboring Nandi County, were engaged for the pilot study. The results presented showed an average of 0.0945; and the total reliability coefficient was 0.7285. Uasin Gishu County is one of the 47 Counties in Kenya and has six administrative Units, also called sub-counties or Constituencies: namely, Kesses, Turbo, Ainabkoi, Kapseret, Moiben, and Soy. The study population comprised of all Public secondary schools teachers in Uasin Gishu County, specifically those who are employed by the Teacher's Service Commission. The data from the County education office established that the County has a total of 158 public secondary schools with a total population of 3000 teachers. The study employed a stratified sampling technique (Stratified random sampling, also called proportional random sampling or quota random sampling) to draw the relevant group(s) under consideration. The sample size for each stratum was calculated using the stratified sample formula by Mark (2010) where a generic sample of 574 teachers, drawn from six constituencies in Uasin Gishu County with a 5% Margin of error. The unit of analysis was the secondary school teacher.

Regression analysis was used to determine the effect of education on earnings. Multivariate regression analysis was used to analyze data for the study.  $R^2$ , the coefficient of determination provided a measure of the predictive ability of the model. Data was analyzed using SPSS software version 22.0. The following variables were controlled age, union membership, gender, and cost. The level of education was measured in complete years of schooling for a Bachelor's degree it was equivalent to 16 years and Diploma certificate was 14 years. Data screening was done to examine whether there was extremely high or low correlation or uncorrelated items. The assumptions of the Multivariate Linear

Regression were also tested. The study employed Jacob Mincer’s regression model given below in estimating the private rate of return for teachers with Bachelor’s degrees and Diploma Certificate.

$$\ln Y = \alpha + \beta_1 X + \beta_2 Exp + \beta_3 Exp^2 + \varepsilon \dots\dots\dots \text{Equation 1}$$

Where,

Ln Y is the natural logarithm of earnings

$\alpha$ = the constant

$\beta_1, \beta_2, \beta_3$ , are model estimates or coefficients

X Is the years of schooling

Exp Is the teaching experience

Exp<sup>2</sup>The teaching experience squared

$\varepsilon$ Is the error term assumed to have zero mean and independent.

#### 4. Findings and Discussion

The purpose of this study was to establish and compare the private rate of return to investments in higher education for teachers in public Secondary Schools in Uasin Gishu County Kenya who are holders of either Bachelor’s degree or Diploma certificate. The outcome variable was private rate of return (annual earnings) in Ksh measured in an interval scale. The other variables are summarized in the table below.

##### 4.1 Sample characteristics

**Table 1 Descriptive Statistics**

	Category	Diploma Certificate		Bachelor’s degree Holder	
		Frequency	Percentages	Frequency	Percentages
Gender	Male	72	45	215	51.93
	Female	88	55	199	48.07
	<b>Total</b>	<b>160</b>	<b>100</b>	<b>414</b>	<b>100</b>
Age	20-29	45	28.13	13	3.14
	30-39	96	60	267	64.49
	40-49	19	11.87	122	29.47
	50-59	0	0	12	2.9
	<b>Total</b>	<b>160</b>	<b>100</b>	<b>414</b>	<b>100</b>

From the findings, it can be established that Male teachers with Diploma certificates were 45 percent while female teachers were 55 percent. Further, the findings suggest that majority of teachers were aged between 30-39 years (60.00%) followed by those with 20-29 years at 28.13%. This is explained by the fact that in this age category (30-39 years), individuals seem more energetic and productive. Out of 574 teachers in public secondary schools in Uasin Gishu County who participated in this study, 414 were holders of Bachelor’s degrees. There were more male teacher than female teachers with Bachelor’s degree (male = 215, female = 199). It was also observed that the majority were aged between 30-39 years at 64.49 percent.

**Table 2 Statistical Mean differences in Private Rate of Return for Teachers with Bachelor’s degree and Diploma Certificate**

	N	Descriptive		ANOVA	
		Mean	Std. Deviation	F	Sig.

Duration	Diploma	160	2.931	0.254	7360.338	0.000
	Bachelors	414	4.000	0.000		
	Total	574	3.702	0.498		
Years in schooling	Diploma	160	2.931	0.254	7360.338	0.000
	Bachelors	414	4.000	0.000		
	Total	574	3.702	0.498		
Experience	Diploma	160	5.131	5.528	109.683	0.000
	Bachelors	414	11.314	6.629		
	Total	574	9.591	6.917		
Exp2	Diploma	160	56.694	125.688	66.120	0.000
	Bachelors	414	171.841	161.146		
	Total	574	139.744	160.533		
Costs	Diploma	160	116468.750	42749.809	147.606	0.000
	Bachelors	414	283225.657	171484.571		
	Total	574	236742.896	165236.626		
Starting salary	Diploma	160	26343.750	7053.298	38.796	0.000
	Bachelors	414	30343.285	6837.251		
	Total	574	29228.432	7121.852		
Gross pay	Diploma	160	31231.250	8498.037	248.750	0.000
	Bachelors	414	54047.879	17512.725		
	Total	574	47687.843	18599.534		
Promotion	Diploma	160	2.000	0.000	27.024	0.000
	Bachelors	414	1.855	0.352		
	Total	574	1.896	0.306		

Table 2 provides descriptive statistics for continuous variables. The study findings indicated that there was a statistically significant mean difference in years of schooling between teachers who are holders of Diploma certificate (mean = 2.931 years) and holders of Bachelor's degree (mean =4.000) (ANOVA=7360.34, p=000<0.05). The cost of attaining Diploma certificate was averaged at Kshs 116,468 while Bachelor's degrees was averaged at Kshs 283,225.7, the difference was statistically significantly (ANOVA=7360.338, p=000<0.05). The findings also revealed a statistical difference in average starting salary of a Diploma teacher of Kshs 26,343.75 and average starting salary for Bachelor degree holder of was Kshs 30,343.29.

The average gross earnings for Diploma holder was Kshs 31,231 which was significantly lower that average earning or gross pay for Degree holder of Kshs 54,047(ANOVA=248.750, p=000<0.05). For promotion, 87% of teachers with Bachelor degree had been promoted while No Diploma teacher in Uasin Gishu who participated in this research had been promoted.

#### 4.2 Multivariate Modeling for Teachers with Bachelor's degree and Diploma Certificate

**Table 3 Multivariate Modeling for Teachers with Bachelor's degree and Diploma Certificate**

Dependent variable (Ln(earnings))	Bachelor's Degree (model 1)			Diploma Certificate (model 2)		
	Coef. (s.e)	T	P t	Coef. (s,e)	T	P t
Constant	10.9782 (.1044)	105.16	0.00	9.2344 (.5745)	16.07	0.00
Years of schooling	-.0641 (.0109)	-5.87	0.00	.2196 (.0969)	2.27	0.03
Experience	.0182 (.0091)	2.00	0.05	-.1246 (.0323)	-3.86	0.00

Exp2	.0008 (.0004)	2.18	0.03	.0066 (.0014)	4.61	0.00
Observations,	414			160		
R-squared,	.4553			.5434		
Adj R-squared	.4513			.5286		
F (3,410)	114.23,			16.73,		
Prob>F	.000,			.000,		

Table 3 presents Jacob Mincer’s model estimation in calculating the private rate of return to investment in education for teachers with Bachelor’s degrees and Diploma Certificate. The study employed Jacob Mincer’s regression model given below.

$$\ln Y = \alpha + \beta_1 X + \beta_2 Exp + \beta_3 Exp^2 + \varepsilon \dots\dots\dots \text{Equation 1}$$

Where,

- Ln Y is the natural logarithm of earnings
- $\alpha$ = the constant
- $\beta_1, \beta_2, \beta_3$ , are model estimates or coefficients
- X is the years of schooling
- Exp is the teaching experience
- Exp<sup>2</sup> the teaching experience squared
- $\varepsilon$  is the error term assumed to have zero mean and independent.

From table 3 in model (1) for teachers with Bachelor’s degree, the number of observations was 414 indicating the total number of teachers teaching different subjects in Uasin Gishu. F-statistic of 114.23 and its significance indicates the Mincer equation was fit to estimate parameters. Further, the R square was at 45.53 percent indicating experience, years of schooling, and experience squared explained a total of 45.53 variations of the private rate of return to schooling for teachers having a Bachelor’s degree.

From model 2, teachers who are holders of Diploma certificates, the probability for the F test was significant at <0.000 indicating that Mincer’s model was fit. The R-square was at 54.35 percent implying that the independent variables such as years of schooling, experience, and experience squared explained 54.35 % of the variations. From the results, the private rate of return for teachers with Diploma certificate had highly significant coefficients. Years of schooling were found to be positive and significant with  $\beta = 0.2196, p - \text{value} = 0.025 < 0.05$ ). Experience and experience square were also significant.

**5. Rate of return to investment in Education**

**Table 41: Private Rate of Return to Education**

		GROSS PAY			
Education level	N	Starting		Cost of Investment	
		Salary	Mean annual Earnings		Rate of Return
Diploma	160	26343.8	31231.250	116468.7	4.2%
Bachelors	414	30343.3	54047.879	283225.7	8.37%

Table 4 presents the rate of return to investment for secondary school teachers in Uasin Gishu. The rate of return (ROR) was calculated by subtracting the initial value of the investment (starting salary) from the final value of the investment (mean annual earning which equals the net return), and subsequently dividing this new number (the net return) by the cost of the investment; and multiplying it by 100. It shows the rate of profit at which a teacher

realizes return. For a Diploma teacher, the rate of return was 4.20%, Bachelor’s degree holder 8.37%. The estimated results suggest that the private rate of return on education investment in Kenya is high for Bachelor’s degree holders as compared to Diploma holders. Individually, the causal effect of education is large enough that education is beneficial. Not only does each additional year of education result in a significant increase in earnings, but higher rates of return are also associated with higher levels of education. According to Porter (2002), educational benefits are futuristic in that the said benefits will be realized after the successful completion of formal education and training. Additionally, many researchers and economists in the field of education have established a positive and statistically significant relationship between the wages of individual workers and the level of formal education. Workers with a higher level of education are expected to earn more salaries than those with less education.

**6. Marginal Rate of Return to Schooling**

**Table 52: Marginal Rate of Return to Schooling**

		GROSS PAY			
Education level	N	Mean	Mean differential	earning Percentage differential	Rate of return
Diploma	160	31231.250			
Bachelors	414	54047.879	22816.629	73.06%	4.55%

Marginal rate of return accruing to schooling was calculated using the information given. The mean earning difference from teachers having Diploma certificates (base level) to teachers having Bachelor’s degrees was Kshs 22,816.629 (73.06%). This gives a rate of return of 4.55% from a Diploma to a Bachelor’s degree. The rate of return was calculated by dividing the percentage differentials by the number of years to attain it (mean an average year in obtaining a Bachelor’s degree was 16.06 years).

**7. Discussion**

The above findings concur with studies conducted by Montengo and Patrinos (2014) based on a World Bank development report for 139 countries spurning from 1970-2013. The study findings established that the rate of return to investment in schooling was about 10.5 percent on average. More recently Patrinos (2016), while employing the Mincerian earning function, established that the average rate of return to investment in education around the world was about 5 to 8 percent. However, while estimating the same returns to education using proxies, Patrinos (2016) established that average returns to higher education were around 17 percent on average (Montengo & Patrinos, 2014).

The findings are also in continuum with Research studies by Rugar, Ayodo, and Agak (2010) on the financial profitability of Higher education among academic staff members in two public Universities in Kenya. They established that, as the level of education rises, the earnings of the staff members also increase. The study concluded that the University’s higher qualification provided a more private rate of return as compared to other levels of education at 47.8 percent. The study further revealed that the Doctorate program was the most profitable, followed by the Master’s degree.

Chenane (2008) conducted an empirical study on the private rate of returns to investments in schooling of public primary school teachers in Mumias sub-county, Kakamega County Kenya. The study findings established that the return to a Master’s degree was higher, as compared to a P1 certificate. The above findings suggest that investment in higher education is a profitable venture, as private rate of returns tends to increase with rise in educational levels. These findings concurs with the concept of human capital theory which presupposes that formal schooling and experience improves the productive capacity of individual workers through acquisition of knowledge and skills hence raising the lifetime earnings of workers (Becker, 1994; Psacharopolous & Woodhall, 1985). The theory of human capital postulates that earnings rise with the rise in educational qualifications; hence advocates that there exists a positive correlation between higher educational qualifications and earnings. In quoting the Greek philosophers on matters to

do with education, Gathogo (2018) cites Heraclitus who viewed it as the second sun to its possessors. Further, as philosopher Antiphon, in Greek philosophy (cited in Gathogo 2018, p.1), noted thus:

The first thing, I believe, for [humanity] is education. Whenever anyone does the beginning of anything correctly, it is likely also that the end will be right. As one sows, so can one expect to reap. If in a young body one sows a noble education, this lives and flourishes through the whole of his [or her] life, and neither rain nor drought destroy it.

## 8. Conclusions

Diploma holders, though significant, had a negative correlation with the private rate of return to investment in education; a phenomenon that implies that teachers with Diploma certificates hardly experience positive returns. They are paid less, which is contrary to the expected salary for them to realize positive returns ( $\rho = .545$ ). The cost to of attaining this certificate was averaged at Kshs 116,468, with a minimum cost of Kshs 40,000 and a maximum of Kshs 180,000. An average of Kshs 26,343.75 was the starting salary of a Diploma teacher. The gross earnings had a mean of Kshs 31,231. The rate of return to investment in education for Diploma holders was 4.20%,

Teachers with Bachelor's degrees had a mean experience of 11.31 years with the least experience of 2 years and the most experienced teacher had 25 years of teaching experience. The cost of attaining Bachelor's degree was averaged at Kshs 283,225.7. On average, the starting salary was Kshs 30,343.29. Mean earning or gross pay was Kshs 54,047. The rate of return to investment in education for Bachelor's degree holders was 8.37 %,

The study found a positive correlation between the age and the experience, age, and gross pay with  $\rho = .698$  and  $\rho = .673$  respectively. The rate of return for a Bachelor's degree holder was 8.37%. The mean earning difference from teachers having Diploma certificates (base level), to teachers having Bachelor's degrees, was Kshs 22,816.629 (73.06%). The marginal rate of return for a Bachelor's degree holder was 4.55%. Clearly, these findings encourages aspiring scholars to take investments via a return to school, even at the Middle Ages, as of paramount importance. Certainly, investment in higher education and research will help reduce unemployment and poverty as well as facilitate peace and prosperity in the twenty-first century Africa.

## Policy Recommendations

Since the study established that there exists a negative correlation between Diploma holders and private rate of returns which suggests that Diploma teachers hardly experience positive returns. This study suggests that individuals wishing to maximize returns should invest in attaining a Bachelor's degree.

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The authors declare no potential conflict of interest with respect to authorship of this Article.

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