

The Private Returns to Education in Kenya

By

Peter Janet Moraa

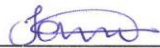
X50/76430/2009

A Research Proposal submitted in partial fulfillment of the requirements for the award of the Degree of Master of Arts in Economics, in the school of Economics, University of Nairobi

November 2014

Declaration

This paper is my original work and has not been presented for a Degree award in any other University.



Peter Janet Moraa



Date

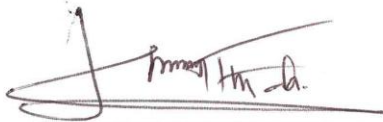
This research paper has been submitted for examination with our approval as University supervisors



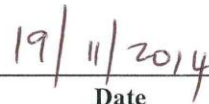
Prof. Damiano Kulundu



Date



Dr. Urbanus Kioko



Date

Dedication

This paper is dedicated to my parents Mr. and Mrs. Peter Marogo for their unrewardable and priceless gift of encouragement and support in ensuring that I accessed higher education. This is all that you wanted for me. In addition I also dedicate this work to my beloved husband Lameck , siblings Amos, Naomi, Dinah and Deborah whose encouragement and inspirations have seen me this far in pursuit of Knowledge.

Acknowledgement

First and foremost I would like to thank God the Almighty for the marvelous things he has done unto me. I will serve him as long as I live.

Secondly, I would like to thank the School of Economics University of Nairobi for giving me an opportunity to pursue my studies in MA Economics.

In particular, I would like to thank my supervisors Prof. Damiano Kulundu and Dr. Urbanus Kioko for their support and guidance, spending time to read this work and providing useful suggestions during the entire period that I have been working on this paper. God bless you abundantly.

Many thanks go to my parents for financing my Masters degree and also for not sparing any penny to ensure that I achieve my academic pursuits to the highest level. To my brother and sisters I cannot thank you enough for the support that you have provided to me while pursuing my studies but I say thank you and God bless you too as you pursue your academics. Also I would not forget mention my classmates and friends Linet, Eva, Marianne and John for your support while writing this paper.

To my beloved husband, thanks for your inspiration, encouragement and also standing by my side for the entire period that I have been working on this paper. May God also stand with you in everything that you set your foot in.

While acknowledging all this support I do solely bear all the mistakes that might be found in this paper.

ABSTRACT

Education has been defined as the process through which knowledge; skills, attitudes and values are imparted for the purpose of integrating the individual in a given society, or changing the values and norms of a society. Education provides both direct and indirect benefits for the individual who receives the education and the society to which this individual connects (Kifle, 2007). The magnitude to which education increases benefits to an individual is referred to as the economic 'return' to education (Colclough et al., 2009). These returns are majorly categorized into private and social returns to education. The current study embarked on the examination of the private returns to education in Kenya using the Mincerian Earnings Function with the Ordinary Least square method in the data analysis with the aim of identifying whether the Kenyan education system bears returns, both to the individual and the society along with the education level in Kenya that bears the highest returns to education.

The data used in the analysis was obtained from the Kenya Integrated Household budget survey 2005/2006 conducted by the Kenya National Bureau of statistics under the Ministry of Planning and National Development. Findings from the study indicate that nationally, university level of education has the highest private returns to schooling (40%) and primary level the lowest at 11%. In terms of gender, the study finds that females earn much higher returns than the males at the primary level of education but males earn higher returns compared to women at the other levels of education.

In addition the study finds out that employees in rural areas have higher private returns to schooling at primary level at 18% compared to 15% percent for their urban area counterparts while urban workers enjoy higher returns to schooling at secondary and university level of schooling than their rural area colleagues. The results drawn from this study do indicate that it is really rewarding for anyone to progress to higher levels of education (university) as it yields higher returns compared to those who complete their studies at the lower levels of education.

Table of Contents

Declaration.....	Error! Bookmark not defined.
Dedication.....	ii
Acknowledgement.....	iv
ABSTRACT.....	v
TABLE OF CONTENTS.....	vi
LIST OF TABLES.....	viii
LIST OF ABBREVIATIONS.....	ix
CHAPTER ONE:BACKGROUND AND CONTEXT.....	1
1.1 Introduction.....	1
1.2 Education in Kenya.....	2
1.3 Statement of the Problem.....	5
1.4 Objectives of the study.....	6
1.5 Justification of the study.....	6
1.6 Scope and limitations of the study.....	6
CHAPTER TWO:LITERATURE REVIEW.....	7
2.1 Introduction.....	7
2.2 Theoretical Literature.....	7
2.3 Empirical Literature.....	9
2.4 Overview of the Literature.....	16
CHAPTER THREE:METHODOLOGY.....	17
3.1 Introduction.....	17
3.2 Estimation Issues.....	18
3.3 Scope, Source and Nature of Data.....	20
3.4 Definition and Measurement of Variables.....	21
3.4.1 Dependent Variable.....	21
3.4.2 Independent Variables.....	21

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION.....	24
4.1 Introduction	24
4.2 Summary statistics	24
4.3 Diagnostic tests	25
4.3.1 Test for normality of data distribution	25
4.3.2 Test for Heteroscedasticity Errors	25
4.3.3 Omitted Variables Test	26
4.3.4 Multicollinearity Test	26
4.4 Inferential Statistics	27
4.5 Findings from OLS estimation of earnings against variables	27
CHAPTER FIVE:SUMMARY,CONCLUSIONS AND RECOMMENDATIONS	31
5.1 Introduction	31
5.2 Summary of major findings.....	31
5.3 Policy Recommendations and Conclusion	32
5.4 Areas for further research	32
REFERENCES	34
APPENDIX 1	39

LIST OF TABLES

Table 1.1: Number of schools and Enrollments 1963-2011

Table 3.1: Priors signs of effects of Independent Variables on the Dependent Variable

Table 4.1: Summary statistics

Table 4.2: Shapiro-Wilk test of normality

Table 4.3: A t-test of differences in earnings by selected variables

Table 4.4: A regression of earnings against predictors

Table 4.5: Returns to schooling at various levels of education

LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
CDF	Constituency Development Fund
CSAE	Centre for the study of African Economies.
EFA	Education for All
FPE	Free Primary Education
FSE	Free Secondary Education
FTSE	Free Tuition Secondary education
GER	Gross Enrollment Rate
HELB	Higher Education Loans Board
IFLS	Indonesian Family life Survey
ILFS	Integrated Labour Force Survey
IV	Instrumental Variables
KIHBS	Kenya Integrated Household Budget survey
MDGs	Millennium Development Goals
MOE	Ministry of Education
NCDS	National child Development survey
NER	Net Enrollment Rate
OLS	Ordinary Least Squares
RORE	Rate of return to education
SSA	Sub-Saharan African
TIVET	Technical, Industrial and Vocational Educational Training Institutions

CHAPTER ONE: BACKGROUND AND CONTEXT

1.1 Introduction

Education has been defined as the process through which knowledge; skills, attitudes and values are imparted for the purpose of integrating the individual in a given society, or changing the values and norms of a society. For individuals, this is a lifelong process which begins at birth and ends at death. Education provides both direct and indirect benefits to the individual who receives the education and the society to which this individual connects (Kifle, 2007). The magnitude to which education increases benefits to an individual is referred to as the economic ‘return’ to education (Colclough et al., 2009). These returns are majorly categorized into private and social returns to education. The private returns to education are those benefits that accrue to an individual alone from obtaining a particular level of education, while the social returns are those returns that accrue to the society as a whole (Todaro,1982). The estimations of the returns to education conventionally measure the benefits of education in terms of higher wages, relative to the combined opportunity (forgone benefits) and direct costs of acquiring it (Appleton et al., 2009).

Returns to investment in education have been estimated since the 1950s. In the 60-plus year history of estimates of returns to investment in education, there have been several reviews of the empirical results attempting to establish patterns of returns to education (Psacharopoulos and Patrinos, 2004). There have been suggestions that education should be provided for its own sake, as a means of improving individuals’ knowledge and developing their full individuality. Others, on the other hand, argue that education should seek to prepare people to perform functions that are fundamental for the changing of the society (Okuwa, 2004). At the microeconomic level, conventional estimates of returns to education have been used to support calls for governments, particularly in developing countries, to prioritize educational spending (Appleton et al., 1999). At the national level, investment in education has been emphasized particularly in developing countries where education is seen as the main instrument used by policy makers to enhance poverty alleviation (Wambugu, 2002). UNESCO (2010) in their report on education and the MDGs states that each additional year of schooling raises the average annual gross domestic product by 0.37 percent, and that 171 million people could be lifted out of poverty if all students in low-income countries left school with basic reading skills. In addition, in their report titled

“Education Counts towards the Millennium Development Goals”, they state that one extra year of schooling increases an individual’s earning by up to 10 percent.

1.2 Education in Kenya

In times of change, complexity and seemingly increasing challenges, one must look for ways to remain afloat and chart a course that will help him or her to achieve his or her goals. This statement depicts the situation that Kenya faced at the time of independence. At independence, the country was in dire and immediate need for skilled workers to hold positions previously held by the British. The shortage of skilled labour was a major impediment to the Government of Kenya in working towards achieving its development goals. To improve on this situation, the government devoted the largest share of its budget to expanding education (Manda et al., 2002). Over time the government has been continuously increasing its investment in education - for instance in 2012 the education sector accounted for sixteen percent of the government’s annual expenditure. (Budget statement, 2012).

In the early times after independence, the Kenyan government mostly expanded the primary and secondary education but higher education was not given much attention. This can be seen from the fact that in the seventies, the only University in existence in Kenya was the University of Nairobi. However, from the 1980’s to date, demands with respect to higher education in Kenya have clearly intensified, as seen from the rise in enrolments in public, the proliferation of private universities and the establishment of parallel programmes (self sponsored programmes) in the public universities (Chacha,2004). In absolute terms, the education sector in Kenya has experienced massive expansion in enrollment rates and also in the number of learning institutions over time (Table 1). The increase in the number of schools and enrollments at independence, 2007 and in the year 2011 is shown in table 1:1

Table 1.1 Number of schools and Enrollments 1963-2011

YEAR	Number of schools		Enrollments	
	Primary	Secondary	Primary	Secondary
1963	6,058	151	892,000	30,000
1967	5,959	542	1,133,179	88,779
1971	6,372	809	1,525,498	140,722
1975	8161	1,160	2,881,100	226,800
1979	9,622	1,927	3,698,246	384,389
1983	11,966	2,230	4,323,822	493,710
1987	13,849	2,592	5,031,400	522,261
1991	15,196	2,647	5,656,100	614,161
1995	16,115	2,878	5,545,000	632,388
1999	17,623	3,197	6,064,100	847,287
2003	19,554	4,071	7,159,500	882,513
2007	26,104	6,485	8,300,000	1,180,300
2011	28,567	7,297	9,900,000	1,700,000

Source: Economic Surveys, 1964-2012

The number of pupils in primary schools increased from 8.3million (4.3 million boys and 4 million girls) in 2007 to 9.9 million (5 million boys and 4.9 million girls) in 2011. The Gross Enrollment Rate (GER) increased from 108.9 per cent in 2007 to 115.0 per cent in 2011. The Net Enrollment Rate (NER) increased from 91.6 per cent in 2007 to 95.7 per cent in 2011 (Economic Survey, 2012).

The increase as noted above has been accelerated by the introduction of Free Primary Education (FPE) and Free Day Secondary Education (FDSE) programmes in 2003 and 2008 respectively. At the Technical, Industrial and Vocational Educational Training Institutions (TIVET) level, enrollments stood at 104,173 in 2011. Enrollment into the university sub sector stood at 198,260 in the academic year 2011/2012. This progressive increase has enabled the Country to make significant progress towards attaining Education for All (EFA)

and the Millennium Development Goals (MDGs) (Ministry of Education [MOE], 2012 and Economic Survey, 2012).

On the other hand, continued implementation of Free Tuition Secondary Education (FTSE) together with other government initiatives such as Constituency Development Fund (CDF) have increased access to secondary education (Economic Survey, 2012). In Addition, the secondary education strategy recommends for the expansion of secondary education by constructing new schools of at least three streams per level and increasing class size from 40 to 45 students (Ministry of Education [MOE], 2012). These are all efforts mainly aimed at increasing access to education. The number of secondary schools increased from 6,485 in 2007 to 7,297 in 2011, with enrollment growing from 1.1 million (0.6million boys and 0.5million girls) students in 2007 to 1.7 million (0.9 million boys and 0.8 million girls) students in 2011. The Gross Enrollment Rate (GER) for secondary education increased from 38.0 per cent in 2007 to 48.8 per cent in 2011. The Net Enrollment Rate (NER) in schools increased from 24.2 per cent in 2007 to 32.7 per cent in 2011. The Technical, Industrial and Vocational Educational Training Institutions (TIVET) institutions also recorded an increase in enrollment from 76,516 (38,942 male and 37,574 female) students in 2007 to 104,173 (53,586 male and 50,587 female) students in 2011. The University's enrollment was 118,239 (70,775male and 47,464 female) students in 2007 and it increased to 198,260 (117,700 and 80,560 female) students in 2011.

After independence the expansion of educational institutions and increase in the enrollment rates in Kenya led to an increase in the supply of educated and skilled labour force that was readily absorbed to both the private and public sectors of the economy. However, for more than four and half decades now, the Kenyan government has continuously been faced with the need to create enough employment opportunities to absorb the country's growing labour force. Unemployment and underemployment have been defined as one of Kenya's persistent problem in the recent years (Republic of Kenya, 2008 a and b).Unemployment in Kenya in the year 2011 stood at 40 percent reaching an all time high rate in the Kenyan history. This unemployment has been linked to; urban-rural migration, skills mis-match, inadequate training and the ensuing lack of skills, shortage of resources like land and the rapid expansion in school enrollments. The increase in unemployment levels which is linked to high enrollment rates as clearly shown in the analysis above ultimately leads to a negative relationship between the rates of enrollment and the private rates of return.

1.3 Statement of the Problem

There has been a worldwide boom in demand for education in the last half a century and Kenya has not been left behind in this expansion as it views it as an important component of the country's future. However, the country in the 21st century has had to battle out with the challenges of meeting the public demand for education and training, both as a human right and as an essential investment in the struggle to improve its economic development. Indeed the education sector has since 2003 been the biggest spender, averaging 18 percent of the total national budget. In order to continue catering for expanded enrollment at all levels of education and training through increased infrastructure and teaching staff, the Kenyan government allocated a total of Ksh 233.1 billion to the education sector, which is a 16% share of the government budget for financial year 2012/2013 (Budget statement, 2012). With the observation that the continuous increase in the budgetary allocation to the Ministry of Education over the years (Economic Surveys, Various Issues), has been coupled with severe budget constraints, rising foreign debt, declining donor funding to the developing economies and a limited distributive capacity, it is of essence for us to investigate whether the Kenyan education system bears returns, both to the individual and the society, which can rationalize such investment in education.

A significant number of studies have been carried out both in developed and developing countries which indicate that an additional year of schooling has a positive benefit to the individual. Studies of estimates for returns to education by (Amin and Awung, 2005; Appleton et al., 1999; Chirwa and Matita, 2009; Ewoudou, 2006; Kifle, 2007; Kimenyi et al., 2006; Lassibille and Tan, 2005; Okuwa, 2004; Siphambe, 2000; Soderblom, Tael, Wambugu, and Kahyarara, 2005; Wambugu, 2003 and Schultz, 2003, 2004) show that returns to education grow with educational attainment. This study builds on previous work done by (Appleton, 1999; Appleton et al., 1999; Manda et al., 2002; Nyaga, 2010 and Wambugu, 2003) with the aim of providing an update on the empirical evidence of the private returns to education in Kenya at different levels of education using more recent data available of 2005/2006 Kenya Integrated Household Budget Survey (KIHBS) for proper policy making today.

1.4 Objectives of the study

The study assesses the nature of the private returns to education in Kenya with a view to providing an explanation for the disparities between the rates of return to education and the different levels of education.

The specific objectives of this study are:

- i) Analyze the determinants of earnings in Kenya.
- ii) To estimate the private returns to education in Kenya.
- iii) On the basis of the study findings, draw policy recommendations.

1.5 Justification of the study

This study focuses on the determination of the private returns to all levels of education in Kenya. The results from this study will be useful as a guide to education policy in Kenya, particularly in relation to efficient allocation of scarce resources to different levels of education. It will also contribute to the discussion as to whether the patterns of the returns to education as provided by Psacharopoulos apply to Kenya given the current labour market economic conditions. The process of calculating the rate of return itself can also help in the determination of the factors that influence the returns to education of an individual. Moreover, given Kenya's dynamic education system, this study will help households, individuals and other stakeholders in the education sector in making decisions in regard to the level of education to invest in, compared to other available viable investments options.

1.6 Scope and limitations of the study

The study is confined to finding the empirical evidence of the private rates of return to education in Kenya. This study will contribute to the existing literature by using 2005/2006 Kenya Integrated Household Budget Survey (KIHBS). The endogenous variable considered will be the earnings (rate of return to education), while the exogenous variables will be the different levels of the years of schooling, the age, residence, the gender of an individual, their years of work experience and the sector of employment. We will also consider the error term that will constitute of the other factors that affect earnings besides the ones listed herein. The rest of the paper is organized as follows: Section 2 provides a literature review, section 3 describes the data and methodology, Section 4 presents the empirical findings and section 5 provides the conclusions and recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The significance of education for economic growth and development and its probable returns to both the individuals and society at large has fascinated the interests of both the developed and developing economies of the world (Okuwa, 2004). There has been a remarkable growth over the last twenty years in both the theoretical and empirical literature on education and this has been associated with the significance that has been attached to education as a means of enhancing economic development in all the world economies and more so, the expected returns to education. This section provides both the theoretical and empirical approaches that have been applied in the determination of the returns to education.

2.2 Theoretical Literature

Investment is conventionally regarded in terms of physical capital, such as plant and machinery, yet the notion that educating and training labour increases productive capacity in a manner analogous to physical capital investment dates back to at least as far as Adam Smith (1776). In his famous book “the wealth of nations” he writes, ‘a man educated at the expense of much labour and time may be compared to one of those expensive machines....and the work he learns to perform should replace to him the whole expense of his education’. He also states that jobs requiring more skilled workers resulted in higher wages.

According to Smith (1994, p.119), in his book on labour economic states that; the systematic analysis of education and training as a form of Human capital investment began in earnest in the early 1960s with the pioneering work of Schultz (1961), Mincer (1962) and Becker (1964). Since then, the concept of human capital as an investment which raises future incomes was developed and empirically tested. Also human capital has played an important role during the neo-classical analysis in the labour markets especially in the wage determination which has also dominated the economic analysis of education. In addition important insights have been gained by viewing education as one of the routes by which human capital may be acquired. Human capital theory linked the investment in its acquisition with productivity and earnings as shown below:-

Education → Human capital → Productivity → Wages

The Human capital theory states that a person's education is an investment (which involves the direct spending on education and the indirect costs such as the forgone income) in his/her human capital (analogous to investment by a firm in physical capital), which makes the individual more productive and accrues to both the individual and the society, a future stream of benefits like superior productivity, higher wages and non- monetary benefits (Mulongo, 2012). Psacharopoulos and Patrinos (2004) in their study on "Human capital and rate of return", concluded that educational quality, (as measured by cognitive skills), has a strong impact on an individual earnings; in particular, more years of schooling are associated with higher individual earnings, and educational quality has strong and robust influence on economic growth with "truly casual relationships"

The modern human capital concept has been elaborated by many writers after Adam Smith's initial work, but in this study we will endeavor to expound on the views of Mincer, Becker and Schultz. Mincer (1957, 1958, and 1974) suggests that the decision to invest in education is a free choice resulting from the profit maximization of an individual. The famous and widely used Mincerian function is derived from the author's theoretical model. The Mincer function presents earnings as a function of education, experience and the square of experience. The inclusion of experience implies that education can be acquired formally through schooling, or informally by the on the job training. The Mincerian function has been overwhelmingly applied in literature in the estimation of returns to education due to its ease use and interpretation. Also with the inclusion of the square of experience Mincer succeeded in the capturing the concavity of the life term earnings, thus recognizing that individual earnings rise up to some threshold level, then begin to decline with the adverse effects of failing health and reduced ability.

Becker (1975) extends on Mincers' work by focusing on the job training. He states that many workers increase their productivity by learning new skills and perfecting old ones while on the job. Becker describes two types of training which are the specific and general. He further explains that the firm bears the specific training costs while the general training costs are borne by individuals or the workers. In regard to the unequal and skewed earnings distributions, Becker states that even when ability is systematically and not too unequally distributed, abler persons receive more education and other kinds of training than their less able counterparts, hence they invest more in human capital. This leads to income distribution having a rather uneven and skewed nature.

Schultz (1961) considered education and human capital explicitly in a general and wider perspective as opposed to Mincer and Becker who narrowed their focus on human capital at the Micro level. From the Macro level perspective, Schultz argued that ‘it has been widely observed that increases in national output have been large compared with the increases of land, man hours and physical reproducible capital. Investment in human capital is probably the major explanation for this difference’. He also states that ‘education increased an individuals’ ability to deal with disequilibria’. Further, he specifically estimated the growth in the US total output and found out that between 36 and 70 percent of the hitherto unexplained rise in earnings of the individual is explained by returns to the additional education of the workers. Also that a fifth of the growth of the US economy was owing to the human capital enhancement by education system.

2.3 Empirical Literature

There is a huge body of evidence on the rate of return on education both in developed and developing countries. Psacharopoulos (2004) in his work on the returns to investment in education, he has documented a comprehensive review of an aggregate pattern on the returns to education with an addition of the need of selectivity in comparing returns to investment in education. Psacharopoulos and Patrinos (2004), states that the returns to Education are: (i) higher in private sector employment than in public sector employment, this is the reason why many graduates opt for employment in the private sector; (ii) highest at primary level and lowest at tertiary level; (iii) higher in developing countries especially in Sub-Saharan Africa, than in developed countries; (iv) higher for women across the board than men, though men have higher returns at the primary level than women.

Boothby and Rowe (2002) analyzed the Rate of return to education in Canada through derived individual rates of return by comparing the simulated lifetime earnings streams of pairs of individuals using the Life Paths model focusing on both the level of education and on the field of study. Their principal finding is that there is a very wide range of outcomes as measured by individual rates of return within each level of study and within fields of study. The range of individual rates of return within fields of study was much wider than the median rates of return among fields of study within a level of study. The median rates of return at the bachelor’s degree level were 12 percent for men and 13 percent for women, whereas for community college diplomas the rates of return were 16 percent for men and 18 percent for women. Further, they found out that in the fields of study where male and Female could be

compared, women had higher rates of return to post-secondary education, but lower lifetime earnings. The limitations in their study includes the lack of data on life time earnings hence using individual level simulations, there was no consideration that was given to differences in ability, background and also tax transfer system within the life paths.

Botchorishvili (2007) estimated the marginal private returns to education in Georgia for the period 1997 to 2006 and also the evolution of these returns overtime. Using the Georgian household survey and applying the Mincerian approach, the study found out that the returns to an additional year of schooling in 2006 was 6.2 percent for both Men and women. In addition, the study found out that the marginal private returns to higher education were higher compared to other levels of education which stood at 6.6 percent for men and 7 percent for women. Moreover, the results were estimated to be increasing over time implying that education in Georgia gets increasingly valued as the transition process progresses. The limitation of their study was that they did not take into account the significant gender earning differentials, the quality of education and also the endogeneity problem due to data limitations.

Blundel et.al (2004) evaluated the effect of education on earnings in the United Kingdoms using the 1958 National child Development survey (NCDS) and by the use of regression, matching, and control function instrumental variables methods for recovering the effect of education on individual earnings. They found out that the average returns to completing higher education are higher compared to the lower levels of education. In addition, they found out that the average return to O-levels were 18 percent, 24 percent for A-levels and 48 percent for higher education. Therefore the returns to education increase as the level of education increases.

Tsakloglou and Cholezas (2000) analyzed the private returns to education in Greece using the Mincer approach and three household surveys (1974, 1988 and 1994). They found out that returns to schooling are found to be higher for females than for males. In addition, they found out that the returns to education are increasing as the level of education rises. With different sensitivity tests and by replacing potential experience with age as the explanatory variable the estimated returns declined by two percent for both sexes. Also they did not find out significant differences between the rates of return to private and public sector employees but the corresponding age earning profiles were substantially different across the sectors. Further, education was found out to act as a screening device for the male employees.

Rita (2000) studied the evolution of private rates of return to education in Finland using the simple Mincer earnings equation framework and cross-sections of the Finnish labour force survey. The study also attempted to examine the sensitivity of educational returns to the specified earnings equation and the adopted estimation technique. The results indicated that the average return to an additional year of schooling has remained roughly unchanged among male workers over the 12-year period investigated. On the other hand, among female workers, it was significantly lower in the 1980s, but increased in the early 1990s to approximately the same level as for men. However, when comparing the average returns to different levels of education both men and women fared equally well. These level-of-education returns further suggested that the marginal return to additional years invested in higher education is rather constant than declining. Lastly with the inclusion of other additional explanatory variables, they concluded that the addition of the broad set of personal and job-related background characteristics to the gender-specific wage equations had a minor influence on the estimated returns to education. However, in their study they did not account for the innate ability and family background due to the limitations of the Finnish Labour Force Survey.

Purnastuti et al (2011) endeavored in their study to provide an empirical update on the private returns to schooling in Indonesia using the sample data from the Indonesian Family life Survey 4 (IFLS 4) and utilizing the augmented Mincerian Model. The results indicated that the return to schooling in Indonesia is relatively low compared to other Asian and Less Developed economies. They also found out that returns to schooling for Females were significantly different from those for males.

Diagne and Diene (2011) reviewed the main microeconomic and macroeconomic principles used to measure returns to education. Using a Meta analysis method to the results of a series of works on returns to higher education in SSA countries, they concluded that the multitude of the results differs and they are not always comparable. Specifically the differences arose from the fact that the model specifications and estimation methods used, the representativity of the sample of the SSA countries and the disproportionate sample data was more than fifteen years old.

Siphambe and Thokweng-Bakwena (2001) analyzed the wage gap between men and women in Botswana's formal sector labour market (both public and private sectors of employment) using the 1995/6 Labour Force Survey and applying the Oaxaca's decomposition

methodology. The results from the decomposition exercise found out that; married workers earning significantly more (16 percent) than those who are single, also 67 percent is accounted for by differences in characteristics between men and women in the public sector. However, in the private sector, more than 66 percent of the wage gap is due to discrimination against women or favoritism towards men. Therefore there was relatively less discrimination in the public sector while in the private sector discrimination against women is a major factor accounting for the differences in their earnings.

Canagarajah and Thomas (1997), estimated the returns to education using data collected from three different surveys for people with different levels of education in Ghana. Using the earnings function model they found out that both years of schooling and experience have positive and significant effects on earnings indicating that earnings increase with schooling and experience.

A number of studies undertaken have heavily implied that the rate of return to education is dependent on the level of education and the experience in the labour Market. However, these are not the only factors that influence the rate of return to education. Schultz (1999), in his study on health and Investment in Africa, argues that the returns to years of education are influenced by the supply of workers with different levels of education. Al-Samarrai and Reilly (2000), Covering both the rural and urban areas in Tanzania, found out that the socio-economic factors also have an impact on an individual's returns to education. These are inclusive of the area of residence of an individual, either rural or urban, the disparities in incomes and the mother's level of education. Mengistae (2001), analyzed the skill formation and job matching effects in wage growth in Ethiopia using the IV estimation method and the Addis Ababa Industrial Enterprise Survey. He found out that both skill formation and job matching have an effect on the wage growth-return to education but the job matching had a greater effect.

In the examination of the gender consideration, Okuwa (2004) and Mani et al (2013), argues that returns are higher for women than men across the board. Using the Mincerian earnings function and the instrumental variables approach for Nigeria and Ethiopia respectively, they found out that there is a positive income effect for schooling and better still the effect of income is larger for girls compared to boys. Further, coefficients of the returns to education on average are higher for women than for men. The same results are reflected by

Psacharopoulos and Patrinos (2004) who found out that returns are higher for women than men across the board.

Chirwa and Matita (2009), estimated the rates of return on education in Malawi from the wage employment using both the basic and the extended Mincerian earnings functions from the national household survey data of 2004/2005. Their results indicated that on average an additional year of schooling increases lifetime earnings by 10 percent. Also, the returns from various levels of education increased from 5 percent at the primary level to 65 percent for university education. In addition the female workers tended to have higher returns to education than male workers, especially at the higher levels of education. Given the high levels of returns to higher levels of education in Malawi, it implies the need to expand higher education infrastructure while at the same time ensuring efficiency of education delivery at all levels. In their study on the private return they only estimated returns for the wage employment only. Also they did not account for the differences in the quality of schooling, ability and the parent's education background.

Foltz and Gajigo (2012), assessing the Returns to Education in The Gambia using the standard Mincer-type equation, arrived at the same conclusion as Psacharopoulos and Patrinos (2004), that the rate of return to education increases with an additional year of schooling. Okuwa (2011), in his study on the Private returns to higher education in Nigeria, found out that the mean monthly earnings of workers increase with more years of schooling. This was true for all categories of workers, whether male, female, public sector or private sector workers. Schultz (2004), assessed the returns to schooling in Africa from various Household surveys and found out that the returns to education are highest at the secondary and post-secondary levels for all the six (Kenya, Ghana, Nigeria, Burkina Faso, Cote d'voire and South Africa) African countries surveyed. He also found out that the returns are generally as high for women as they are for men, though women are less likely to enroll at these higher levels of education, with the exception of South Africa.

Kahyarara and Teal (2008), estimated the returns to vocational education and academic education evidence from Tanzania using the Mincer function and data from the fourth and fifth rounds of survey work on Tanzania's manufacturing sector. They endeavored to address the reason for the continuing strong preference for academic education in Africa, where the level of development is low and there are few wage jobs. In addition they tried to determine

which form of educational investment, academic or vocational level is most profitable. They found out that high levels of academic education have far higher returns than those from either the vocational or lower levels of academic training. However, at lower levels the vocational return can exceed the academic returns.

Appleton et al (1999), analyzed the private returns to education in Kenya for the period 1978-1995. They applied the Mincerian earning function estimation method with data from three Kenyan surveys inclusive of the 1978 labour force survey, the 1986 Urban labour Force survey, and the 1995 Regional Programme Enterprise Development survey. To broaden the study they included data from the self employed sector of the economy and they took into account the education expansion and economic decline in Kenya. They found out that the private returns to primary, Secondary and university were 25 percent, 6 percent and 35 percent respectively. With the incorporation of the private sector employees, they used the data from the 1978 and 1986 because the 1995 survey data had only wage employees. They found out that the Mincerian returns for the self employed in 1978 were strikingly similar to those of the wage employees both for Primary and secondary levels of education. In 1986 the returns to Primary and secondary level of education was similar to the wage employees but the secondary level of education fell sharply compared to wage employees. There are too few university graduates in self employment in the surveys to make any confident conclusion about returns to tertiary education. Finally their findings did not support the conventional pattern that the returns are very high at the Primary level of education and least at the university level of education.

Manda et al (2002) analyzed the returns to education and the effect of human capital externality on earnings and returns to education. They estimated the earnings equation using Ordinary Least Squares (OLS) for a sample of full time workers. They found out that human capital externality has a positive effect on earnings implying that a general increase in the level of education benefits all workers in terms of higher earnings. However, men benefit more from women's education than the women do benefit from the men's education. Also the returns to education were higher in the urban areas than in the rural areas with a substantial variance when the two areas are compared.

Lucas and Mbiti (2012), in their assessment on whether the free primary education narrows the differences in schooling in Kenya, they found out that the FPE increased the educational access but never closed the gender gaps. It increased the completion rates for boys and girls

but with a larger effect for boys hence widening the gender gap in graduation and this had an effect in the long run on the rates of return to education as it is dependent on the level of education. They concluded that FPE programs are not sufficient to narrow the gender gap and their related impact on the returns to education hence there should be other programs to mitigate this underlying factors.

Wambugu (2003), analyzed the impact of education on labour earnings in Kenya based on surveys of manufacturing firms and a household survey in the 1990's. Utilizing the extended Mincerian correlation and multinomial logit approach he found out that returns to education are highest for workers in the top part of the earnings distributions implying that education worsens earnings inequality. He also postulates that family background is a significant determinant of an individual's earnings, returns to primary education are highest in the informal sector while returns to secondary education are highest in the private sector, and women have higher returns to education than men.

Nyaga (2010), using a multinomial logit model and selection-corrected earnings models to determine participation and earnings in various employment sectors using the Kenyan 1998/1999 ILFS. The study found out that there are clear differences between the formal public and private sectors of employment compared to the vast informal sector. The regression results confirmed that education is the key determinant of both participation in employment and wage earnings in the various sectors of the economy. Attainment of higher levels of education is related to a greater likelihood of working in the both private and public sector and earning higher wages in these sectors, relative to working on the informal sector. The results also conclude that gender disaggregated participation and earnings models indicate that in contrast to men, women's participation and earnings in the formal sectors are considerably affected by university education.

Mariara (2003), examines the determinants of wages and the decomposition of the gender gap across the sectors in Kenya. The study tested the hypothesis that women participate less in the labour market partly because of their characteristics and partly because of gender discrimination in wage setting. The study applies multinomial logit and Ordinary Least Squares (OLS) to explain participation and earnings. The results indicated that education and other demographic factors are important determinants of the choice of sector of employment and earnings.

2.4 Overview of the Literature

In the studies reviewed above, some of them concur with Pscharopoulos and Patrinos (2004) study, while others have different conclusions. Most of the studies have argued that the returns to education increase with the level of education, but they are not conclusive on the level of education where the returns are highest. Also, this study found out that apart from the level of education and the years of work experience there are other factors that affect the rate of return to education. Among them are: gender, family background, where an individual lives, that is either in the rural or urban area, skills matching and the sector of employment.

In addition the review indicates that returns to education for women compared to men tend to remain inconclusive across the board. Most of the studies have attributed that the returns to education to women are higher when compared to men, e.g. Wambugu,(2003), Kabubu(2003), Boothby and Rowe, (2002) and Botchorishvili, (2007). Whereas, it is not easy to make a conclusion on the returns to education in the entire Sub Saharan Africa (SSA) because different countries are at different stages of development and the sampled countries may not be representative of the entire SSA, Diagne and Diene, (2011). Lastly with the improvement in the data collection techniques and knowledge analysis the studies conclude that with the most recent and comprehensive data, the results will yield a different conclusion compared to the previous one as there is evidence that the results have been varying overtime, Diagne and Diene, (2011) and Manda et al, (2002).

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The Mincer Earnings function, (Mincer, 1974) is a well known method for estimating the returns to education. This study also applies the standard Mincerian model to estimate the private returns to education in which the co-efficient of years of schooling is an estimate of private rate of return to time spent in school instead of labour force. We may write the basic earnings function in the general form:

$$E = (S, EXP) \text{-----} (1)$$

Using both theoretical and empirical argument Mincer modeled the natural logarithm of the earnings as a function of education and the potential labour market experience. The Mincer semi logarithmic equation for the determinants of earnings is specified in the general form as:

$$\ln E = a + b_1S + b_2EXP + b_3EXPSQ + u, \text{-----} (2)$$

Where $\ln E$ is the logarithm of monthly earnings, S is the number of years of educational attainment, EXP is the number of years of work experience, $EXPSQ$ is the square of experience and u is for measurement error.

This model has been widely criticized for its shortcomings. First, using this method one cannot estimate returns to education at different levels because the coefficient on years of schooling can only be interpreted as the average private rate of return to one additional year of education, regardless of the educational level in which this year of school refers to. Secondly, a person's earnings can also be determined by factors other than years of schooling and years of labour market experience. Due to the above named shortcomings, the extended earnings function method, which converts the continuous year of schooling variables into a series of dummy variables and includes other additional variables, is found to be the best way of estimating returns to education.

The extended version of Mincer's model can be stated as:

$$\ln E = a + b_1ED_i + b_2EXP + b_3EXPSQ + b_4RURURB + b_5GE + u, \text{-----} (3)$$

Where $\ln E$ is the logarithm of monthly earnings, ED_i is a series of educational dummy variables which are $ED1$, $ED2$ and $ED3$ for primary school education, secondary school education and university level education respectively (that allows for wage differences

among three levels of education) , EXP is the number of years of work experience, $EXPSQ$ is the square of experience, $RURURB$ refers to the area of residence of an individual which is either in the urban or rural area and GE is a dummy variable indicating gender. Accordingly, a stands for earnings for individuals that have no education or have not completed primary education, b_2 measures the marginal effect of increase in experience (Proxy for the on job training) on percentage change on earnings. Similarly b_1 , b_2 is expected to be positive since as human capital theory predicts, schooling (both formal and informal) increases productivity which in turn results in higher remuneration. However, b_3 is expected to have a negative sign because the investment in education, like in the conventional capital, has declining marginal returns and also due to the fact that as age increases, (so does the experience), the productivity is adversely affected as an individual ages.

The main aim in the measurement of equation three above is to estimate the private returns to education. The estimations of the returns to education conventionally measure the benefits of education in terms of higher wages as shown in equation (4).

$$RORE = \frac{\exp(\beta_h - \beta_1) - 1}{\alpha_h - \alpha_1} \text{-----} (4)$$

Where β_h is the estimated coefficient of higher education level (dummy for completed Secondary education); β_1 is the estimated co-efficient of a lower level of schooling (i.e., a dummy for completed Primary education). α_h refers to the total number of years taken to attain a given level of higher education and α_1 is the total number of years spent in primary schooling.

For instance, to calculate the return to secondary level of education α_h will be 12 years (i.e. 8 Years in primary school and 4 years in secondary school) and α_1 will be 8 years so that $\alpha_h - \alpha_1 = 4$ years. Generally equation 3 computes the rate of return for a year of schooling at any level of the education system.

3.2 Estimation Issues.

The method widely used to estimate the earning function is the Ordinary Least Squares (OLS). However, the ease of estimation and interpretation of OLS bears a cost. The OLS estimates of the equation are likely to underestimate or overestimate the real returns due to its

simplifying assumptions like the homogeneity of the individuals and the returns to each year of schooling, absence of taxes and problems like heteroscedasticity, ability and selection biases associated with the model specification.

Omission of relevant variables such as ability can bias conventional OLS estimates. Including ability proxies tends to lower the estimated returns to schooling indicating that OLS estimates are biased upwards. OLS estimates of the effect of education on earnings are consistent only if the omitted variables are not correlated to both education and earnings. However, if the unobserved variables like ability or family background have a positive effect on schooling and earnings, then the OLS returns to schooling will be biased upwards. In addition, the measurement error can cause bias this way: if the error term has a negative effect on schooling and education then the OLS estimates will be negatively biased, (Kimenyi et.al, 2006). Alternatively, individual heterogeneity as proposed by Psacharopoulos, 1993 can be addressed by estimating the extended Mincerian earnings function augmented by educational attainment dummies such as gender, occupation and family background. Also separate regressions can be estimated for specific groups like male and female, nationalities, religions and professions in order to trace differences or similarities among them.

Endogeneity of schooling: In estimating returns, it is assumed that investment in education is independent of earnings which simply imply that schooling is exogenous of earnings. However, if an individual takes into account expected earnings in making a decision to investment in education then an individual's level of schooling is endogenous to earnings and such endogeneity can bias the OLS estimates.

The schooling endogeneity can be resolved by selecting a 'selectivity-correction' term from a schooling attainment equation and then including the correction term in the earnings equation (Kimenyi et.al, 2006). Also one can solve the schooling endogeneity problem by using an exogenous variable in educational attainment to provide instrumental variables (IV) estimates of returns to education. In this case one has to look for variables that are strongly correlated to education but which do not directly influence earnings (Botchorishvili, 2007, Card, 2000, Kimenyi et.al, 2006). Unfortunately, the data limitations do not allow for the tackling of the endogeneity problem due to the unavailability of variables that could be used as instruments. Therefore in this paper we will not make an effort in trying to control for the endogeneity problem and our results will be biased downwards when comparing with other results that have been controlled for the schooling endogeneity.

While acknowledging these estimation flaws this study still applies the Ordinary Least Squares (OLS) approach because all the other approaches have stringent data requirements and the survey data does not contain the extensive information required to make careful corrections and estimation. Using OLS has a greater advantage of ensuring that the results are easily comparable with previous studies. In addition the augmented extended Mincerian function using the OLS approach is reasonable and convenient to use.

3.3 Scope, Source and Nature of Data

The study uses cross sectional data of the KIHBS 2005/2006 to estimate returns to education in Kenya. The main aim of the survey was to collect a wide spectrum of socio-economic indicators required to measure, monitor and analyze the progress made in improving the welfare of the Kenyan population in a single integrated household survey. The KIHBS 2005/2006 survey was administered for a period of twelve months starting 16th May 2005 to 16th May 2006 with a total sampling of 13,430 households randomly selected from seventy districts in Kenya.

The KIHBS 2005/2006 provides important information on individual and household characteristics among them; health, child nutrition, gender of the household head, earnings, education and age, which are useful in the estimation of returns to education. This study will use data on individuals in the working age group between 16 and 65 years. In addition, this study is based on secondary data and will not take into account the self-employed workers from the informal sector because (besides lack of data) it is difficult to separate their wages from profit income. Therefore, the above earnings equation is developed in the context of wage and salary income in the formal sector of the economy thus the returns to education estimated here are for formal sector workers only and give no explanation of the rates of return in other sectors.

In order to estimate the returns to education at the household level, analytical samples will be constructed for the monthly earnings of the individuals. The samples will be drawn from the 13,430 households from the KIHBS 2005/2006 survey. The initial step in constructing the analytical samples will be to amalgamate individual data sets with the corresponding data sets containing the household socio-economic characteristics. This involves matching individual qualities with the relevant qualities of their own households. Individual households that do

not have corresponding household qualities with data on the relevant variables used in the estimation in this study will be dropped from the amalgamated data.

3.4 Definition and Measurement of Variables

In this sub section, the study provides an explanation of both the Dependent and explanatory (Independent) variables used in the estimation of the earnings equation.

3.4.1 Dependent Variable.

A dependent variable is the outcome of interest in our study. *E* (Monthly earnings)-This is the total sum of money that an individual or a business receives in exchange for providing a good or a service or through investing capital. Most people between the age of fourteen and sixty five years receive the majority of their income from a salary or wages earned from a job. This is the dependent variable in this study.

3.4.2 Independent Variables

An independent variable is a variable that has an effect on the outcome that is being measured. In this study there are a number of independent variables as follows;

ED- is the explanatory dummy variable for education and it is categorized as primary school education, secondary school education and university level education. The mnemonic names that are given for primary school education, secondary school education and university level education are *ED1*, *ED2* and *ED3* respectively. As the level of education increases it is expected that it will have a positive effect on the level of earnings. The human capital theory predicts, schooling (both formal and informal) increases productivity which in turn results in higher remuneration.

EXP- Number of years an individual has been working. This is measured as the potential experience of an individual. Since the number of years of experience is rarely captured in the household surveys, this study will follow the standard method of estimating years of potential experience, (Appleton et al, 1999, Kahyarara and Teal, 2008, Chirwa and Matita, 2009). The number of years of experience in the labour market is calculated as age less years of schooling less pre-school age (6 years). This study assumes that those completing Primary school do so at the age of 14 years, Secondary school is then completed at the age of 18

years, Tertiary colleges are completed at the age of 20 years and university is completed at the age of 22 years. This assumes that once people complete their education at the different levels, they then enter the labour market. Experience is expected to affect the earnings of an individual positively as the human capital theory predicts that a more experienced individual will result into an increase in productivity which in turn results in higher remuneration.

EXPSQ- The square of the number of years an individual has been working. It is expected to affect the earnings negatively, this is because the investment in education, like in the conventional capital, has declining marginal returns and also due to the fact that as age increases, (so does the experience), the productivity is adversely affected as an individual ages which in turn results in lower remuneration.

RURURB-This refers to the area of residence of an individual (rural or urban). We will be able to determine as to whether the earnings are higher for individuals residing in the urban or rural area in our analysis.

GE- This refers to the gender of an individual (Male or Female).We will be able to determine as to whether the earnings are higher for the male or the female in our analysis.

The explanatory variables and their expected priori sign of their effect on the earnings are presented in Table 3.1.

Table 3.1 Priori signs of effects of Independent Variables on the Dependent Variable

Variables	Variable codes	Description	Expected signs of effects of Independent Variables on the Dependent Variable.
Schooling	<i>S</i>	This are the number of years of educational attainment	-
Schooling squared	<i>SSQ</i>	This is the square of the number of years of educational attainment	-
Monthly Earnings	<i>E</i>	This is the total sum of money that an individual or a business receives in exchange for providing a good or a service or through investing capital.	-
Primary Level	<i>ED1</i>	Primary level,1 If an individual completed primary level, 0 otherwise	Positive
Secondary Level	<i>ED2</i>	secondary level,1 if an individual completed four years of education,0 otherwise	Positive
University Level	<i>ED3</i>	University level, 1 if an individual attained university, 0 otherwise.	Positive
Experience	<i>EXP</i>	- Number of years an individual has been working. This is measured as the potential experience of an individual	Positive
Square of Experience	<i>EXPSQ</i>	The square of the number of years an individual has been working.	Negative
Residence	<i>RURURB</i>	This refers to the area of residence of an individual 1 if a person lives in the urban area, 0 otherwise.	Positive
Gender	<i>GE</i>	This refers to the gender of an individual (Male or Female). 1 if an individual is male, 0 otherwise.	Uncertain

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

The chapter presents findings of data analysis organized as follows. The chapter starts with a summary statistics of the variables used in the model followed by diagnostic tests. The rest of the section has inferential and regression results based on research objectives.

4.2 Summary statistics

Respondent characteristics and key variables used in the regression model are summarized in Table 4.1. The table contains summary of statistics by mean, standard deviation and range.

Table 4.1: Summary statistics

Variable	Mean	Standard Deviation	Min	Max
<i>GE</i> (n= 66248)	.4932	-	0	1
<i>Male</i> (49%)	1	-	1	1
<i>Female</i> (51%)	0	-	0	0
Age (n=66248)	22.1649	18.5871	0	99
<i>S</i> (n=58578)	.7983	.4013	0	1
<i>ED</i> (n=66248)				
<i>None</i>	.0235	.1516	0	1
<i>ED1</i>	.4485	.4973	0	1
<i>ED2</i>	.1486	.3557	0	1
<i>ED3</i>	.0082	.0902	0	1
<i>EXP</i> (n=40919)	17.4078	12.5654	7	99
<i>EXPSQ</i> (n=40919)	460.9163	739.7897	49	9801
<i>RURURB</i> (n=13049)	.6444	.4787	0	1
<i>Rural =1. Urban =0</i>				
<i>E</i> (n=24177)	3271.551	15775.13	0	740,000

Source: Kenya Integrated Household Budget Survey (KIHBS) (KNBS, 2006)

Table 4.1 reveals that from the KIBHS sample, 49.3% of respondents were male with the average respondent being 22 years old. Almost four fifth (79.8%) are educated. Of these, 44.85% have primary level of education, 14.86% secondary “A” level, and 0.86% university level of education. Respondents had a mean experience of 17 years on the job and 64% of the

respondents reported that they are based in the rural areas. Finally the labor earnings were Ksh 3,271 (s.d. 15,775) on average ranging from Ksh 0 to Ksh 600,000.

4.3 Diagnostic tests

To test data for best linear unbiased estimator (BLUE) properties, the following diagnostic tests were conducted: normality, multicollinearity and heteroscedasticity. The findings are reported below.

4.3.1 Test for normality of data distribution

This study makes use of Shapiro-Wilk W test for normal data to assess normality of distribution of the variables of the model. This test is particularly possible for variables whose data is continuous or ratio scale of measurement.

Table 4.2: Shapiro-Wilk test of normality

Variable	Obs	W Statistic	Significance P-value
<i>E</i>	24177	0.2477	0.0000
<i>LnE</i>	9026	0.9736	0.0000
<i>GE</i>	66248	1.0000	0.9999
<i>EXP</i>	40919	0.8185	0.0000
<i>EXPSQ</i>	40919	0.6376	0.0000
<i>A</i>	66248	0.9046	0.0000
<i>RURURB</i> (rural vs. urban)	13049	0.9999	0.0000

Source: Kenya Integrated Household Budget Survey (KIHBS) (KNBS, 2006)

From the results, all continuous data (for earnings, ln earnings, experience, and age) achieved a W score of above 0.8 which were all significant at less than 1% level of testing ($p < 0.000001$). Hence these variables had normally distributed data. Statistics for discrete data such as gender may be disregarded.

4.3.2 Test for Heteroscedasticity Errors

Another requirement of ordinary least squares regression is for the distribution of the error terms of predictor variables to display constant variance (homoscedasticity). The opposite of

this is called heteroscedasticity. To check for this property, the study applied the White test whose null hypothesis claims that the error terms are homoscedastic.

```
White's test for Ho: homoscedasticity
      Against Ha: unrestricted heteroscedasticity

      chi2 (55)      =      66.30
      Prob > chi2 =      0.1413
```

White test Chi-square statistic was not significant at 5% ($\chi^2_{d.f., 55}=66.30$; $p>=0.1$) which indicates that the null hypothesis of constant variance cannot be rejected. Hence the error terms are homoscedastic.

4.3.3 Omitted Variables Test

A Ramsey RESET test was done using powers of the fitted values of log of monthly earnings of respondents (the dependent variable).

```
Ho: model has no omitted variables
      F(3, 671) =      0.44
      Prob > F =      0.7266
```

The calculated F-statistic of 0.44 is not statistically significant ($F_{d.f.(3,671)}=0.44$; $p>0.1$) which means that the null hypothesis of lack of omitted variables could not be rejected. Thus the check for robustness of the model did not display a problem of omitted variables.

4.3.4 Multicollinearity Test

Multicollinearity is a situation where two or more independent variables in a multiple regression model are highly correlated. Any data meant to undergo OLS estimation should not have highly correlated variables (multicollinearity). To check for this requirement the data was subjected to variance inflation factor (VIF) test.

Hair, Anderson, Tatham and Black (1995) states that the maximum value of VIF should be 10. The mean value of VIF for this data is 2.61 which imply that all variables combined display no signs of multicollinearity. However, the variable measuring experience independently has a potential for multicollinearity.

4.4 Inferential Statistics

A t-test of mean differences and Pearson correlation coefficient were applied to explore the existence of relationships between earnings and predictors. Table 4.3 has findings on the t-test statistics and significance levels for variables that provide categories of assessment of returns to schooling for OLS regression.

Table 4.3: A t-test of differences in earnings by selected variables

Variable	d.f.	Mean Difference (0-1)	T Test statistic	Significance Pr(T > t)
<i>GE</i> (male =1, female=0)	9024	.00653	0.2357	0.4068
<i>RURURB</i> (rural =1, urban=0)	1487	.0692	1.0033	0.8421

***Significant at 1% level of testing; **significant at 5% level of testing; *significant at 10% level of testing

Table 4.3 above shows an analysis of mean differences by gender and residence. The difference in earnings when categorized by gender and area of residence do not achieve statistical significance ($\Pr(T > t) < 0.05$).

A correlation of key variables also revealed that the monthly earnings decrease by experience and increase by residence (rural residents earning higher incomes even though they are over represented in the sample). However monthly earnings do not significantly differ by gender, education and age of respondent.

4.5 Findings from OLS estimation of earnings against variables

The interpretation of findings is based on 12,039 valid observations after data cleaning including the exclusion of outliers from the sample data that we have used in this study. This sub sample consists of individuals who are in the labor force (aged between 16 and 65 years) and are educated in Kenya's formal education system up to university level. Those who had indicated their education level as "Other" or "Not Stated" were exempt from analysis.

Table 4.4 presents three OLS models, where; model one (1) contains years of schooling and experience only; model two (2) is extended and measures education in levels while model three (3) is extended and measures education in continuous form. Since the dependent variable (ln earnings) is in natural logarithm form, the resulting OLS coefficients have been adjusted by an antilogarithmic transformation [$\exp(\beta) - 1$].

Table 4.4: A regression of earnings against predictors

Variable	Model Number		
	(1)	(2)	(3)
<i>S</i>	0.130***		0.073
<i>SSQ</i>			0.002
<i>ED1</i>		0.113***	
<i>ED2</i>		0.221***	
<i>ED3</i>		0.401**	
<i>EXP</i>	0.012*	0.193	0.036
<i>EXPSQ</i>	0.0005	0.017	0.002
<i>GE</i>		0.09	0.038
<i>RURURB</i>		0.027	0.079
Constant	695.70***	10346.80***	5941.28****
Number of obs (n)	2218	232	366
F (3, 2214); (8, 223); (7, 230)	2.83**	26.67***	23.55***
Prob > F	0.0369	0.0000	0.0000
Adjusted R ²	0.0947	0.4706	0.3998
Root MSE	1.4273	.77357	.85654

***Significant at 1% level of testing; **significant at 5% level of testing; *significant at 10% level of testing

Source: Kenya Integrated Household Budget Survey (KIHBS) (KNBS, 2006)

Looking at the first model, the measure of goodness of fit ($F\text{-statistic}_{d.f.(3,2214)} = 2.83$) is significant at 5% level which means that years of schooling and experience are highly jointly significant determinants of earnings. The coefficient of determination (adjusted R-squared) indicates that, 9.4% of variance in ln earnings in the population are a result of changes in education and experience alone. Ceteris paribus, an extra year of schooling increases earnings by 13% while an additional year of experience increases earnings by 1.2%. The optimal year of experience can be calculated by dividing the coefficient of experience with two times the coefficient of experience squared ($0.012/[2*(0.0005)] = 12$ years). This means that cumulative earnings have a hyperbolic shape and the peak earnings occur when the worker attains 12 years of experience. From the constant term, the typical worker has Ksh 695.70 in the absence of the effect of other predictors in the model.

The second model [column 3 – Model number (2)], indicates that predictors of the model result in very high joint significance ($F_{(d.f. 8, 223)} = 26.19$; $P < 0.01$) whereas 47.06% of variance in ln of earnings is accounted for by variance in education level, experience, gender

and area of residence combined. Primary level of education has a 0.11 times return to education compared to lack of any education, holding other things constant. Similarly, secondary and university levels of education have 0.22 and 0.40 times private returns to education, respectively, compared to no education. The implication is that the mean rate of return in secondary school is $[(0.22-0.11)/4=0.0275]$ ¹ or 3% at every year of secondary level. Average rate of return to schooling at university level is 5% respectively. Every year of experience increases earnings by 19% with optimal years of experience being 11 years². When all other factors are held constant, male workers have 9% earnings while those in rural areas have 3% earnings overall. The autonomous level of earnings in model 2 is Ksh10,346.80 regardless of experience, schooling, residence and gender.

Finally the third extended model indicates that every year of schooling increases earnings by 6% *ceteris paribus* and that the optimal years of schooling is $0.036/[2*(0.002)]=9$ years. Every extra year of experience results in 3.6% increase in earnings with the peak earnings arising at the 16 years. The male workers have 3.8% higher earnings while workers in rural areas have 7.9% higher earnings, *ceteris paribus*. Workers have an autonomous level of earnings of Ksh 5941.28.

Private returns to schooling were further determined according to gender, sector of employment and residence. Table 4.5 has the comparative results.

Table 4.5: Returns to schooling at various levels of education

Category	Level of Education		
	Primary	Secondary	University
National	11%	22%	40%
Males	14%	26%	50%
Females	16%	27%	42%
Rural	18%	23%	20%
Urban	15%	25%	34%

¹ The denominator “4” refers to the number of years schooling at primary level of education in Kenya

² Calculated as $0.193/(2*0.017) = 11$

The values of returns to schooling have been computed by taking the antilogarithm of coefficients of various levels of education [$\exp(\beta) - 1$] and then dividing the result by the number of years of schooling [primary 8 years, secondary 4 years and university 4 years]. This procedure was adopted from previous works including those by Manda et al. (2006). In addition the levels of education have been taken as the highest educational qualification as per the KIBHS 2005/2006.

Findings indicate that nationally, university level of education has the highest private returns to schooling (40%) and primary level the lowest at 11%. In terms of gender, the study finds that females earn much higher returns than the males at primary and secondary levels of education, but males earn higher returns than females at the University level of education. This may be due to the fact that males who have university education take more risks and are able to find more than one income earning opportunity compared to the females. Also, the flexibility and ease of travel of men compared to women, especially those who are married, provides the male university graduates more opportunities to earn more income than their female counterparts.

Workers in rural areas have higher private returns to schooling at primary level (18%), compared to 15% percent for their urban area counterparts. This has the effect that the primary graduates are better able to be employed and reside in the rural areas rather than in the urban areas. Given the fact that the employers in the urban areas have raised the qualifications for their employees, it makes it very difficult for the primary graduates to secure employment in the urban areas hence lower returns to the primary graduates in the urban areas. On the other hand, urban workers enjoy higher returns to schooling at secondary and university level of schooling than their rural area colleagues. The study finds that the highest returns are at the university level for the urban residents at 34% which might be due to the fact that many graduates reside in the urban areas where there are many income earning opportunities and also higher compensation for the university graduates compared to the few opportunities that might be available at the rural areas hence the decline in returns to the graduates in the rural areas as per the findings of this study.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The aim of this study was to estimate the private rate of returns to education at different levels in Kenya using the KIHBS 2005/2006. Mincer (1974), estimated the relationship between education and earnings by developing the standard earnings function. The standard 'Mincer regression' was a milestone in research; nevertheless it attracted a lot of criticism from other researchers in the same field. The standard Mincer earnings function was criticized due to its inability to include other factors that influence returns apart from schooling and experience. This exclusion of other factors from the earnings function biases the results upwards. In addition, the standard earnings model could not measure the returns to education at different levels. This study employed the extended earnings model with the additional variables of gender and area of residence of the respondents. This model also introduced education dummies that indicated various levels of schooling.

5.2 Summary of major findings

Using the extended Mincerian model the following are the findings of the study:

- ❖ The private rate of return to investment in education in Kenya is significant. Moreover, any additional year of schooling causes a considerable increase in earnings, and higher rates of return to education are related to higher levels of education. Nationally, the study finds out that primary, secondary and university levels of education have 11%, 22% and 40% private returns to education respectively.
- ❖ The mean monthly earnings for labor are Ksh 3,271, ranging from Ksh 0 to Ksh 600,000 for the period covered by the KIBHS 2005/2006.
- ❖ The study found out that workers in rural areas have higher private returns to schooling at primary level than in the urban areas when compared to the other levels of education. On the other hand, urban workers enjoy high private returns to schooling at the secondary and university level of schooling than their rural area colleagues.
- ❖ The results drawn from this study indicate that it is more rewarding for someone to progress to higher levels of education (university) as it yields higher returns than to have lower levels of education.
- ❖ The study shows that females earn higher returns to education at primary and secondary level compared to the males while the males earn higher returns at the university level.

5.3 Policy Recommendations and Conclusion

This study has found distinctly that the higher the level of education, the higher the rate of private return to education. This makes investment in higher education by individuals a worthwhile venture. Thus it is important for individuals to invest more in education to the highest level as it has high returns in the long run. Also, the government needs to find ways of increasing access to the higher levels of education by making available free government buildings to private universities at a lower cost, co-ordinate the fees and other charges levied on students, subsidize the research programmes to enable more students access university education, and also create more institutions like the Higher Education Loans Board (HELB) that can enable students obtain repayable loans to fund their studies at a lower interest rates. This will enable more students obtain higher education, which this study has found out reaps high returns in the long run.

This study also found out that the urban workers enjoy higher private returns to schooling at the university level than their rural colleagues. This may be due to the fact that there is a lot of centralization of resources and availability of income generating opportunities at the urban areas as opposed to the rural areas. The national and county governments need to decentralize resources to the rural areas so that we can have equal distribution of resources and this will attract the University graduates to opt to move to the rural areas as they will be able to find opportunities that will give them returns to their schooling.

5.4 Areas for further research

This study sought to find out the private returns to education using the KIHBS 2005/2006. It was impossible to exhaust all factors that influence the private returns to education in this single study. In future, further research needs to be carried out on the other socio-economic factors that influence the private returns to education.

In addition there is need to find out the social returns to education that accrue to the society using the KIBHS 2005/2006, also both the private and social returns to education using the updated upcoming data of KIHBS 2015/2016 survey as well as labour market surveys conducted by the Ministry of Labour Services to see whether they will yield different results from the ones reflected in this study.

Finally, further research needs to be carried out on the skills that match with the current labour requirements to enable academicians and other students to advance their studies in areas that will give them an upper hand in the terms of employment opportunities and in return receive better earnings, be more productive and in return receive higher returns to their investment in education.

REFERENCES

African Child Policy Forum (2010). *The African Report on Child Wellbeing: Budgeting for Children*. The African Child Policy Forum, Addis Ababa.

Amin, A, A. and Awung, W, J.(2005) Economic Analysis of Private Returns to Investment in Education in Cameroon. *Regional Conference on Education in West Africa: Constraints and Opportunities*. November 25-26. Dakar, Senegal.

Appleton, S., Bigsten, A., and Manda, D. (1999), Education expansion and economic decline: returns to education in Kenya 1978-1995, Centre for the study of African economies working papers 99-6, and University of Oxford.

Badescu, M., D'Hombres, B., Villalba, E. (2011), Returns to education in European countries Evidence from the European Community Statistics on Income and Living Conditions (EU-ILC), European Commission Joint Research Centre Institute for the Protection and Security of the Citizen. European Union, Italy.

Becker G (1975) Investment in Human Capital: Effects on earnings. In: Becker G (2nd ed) *A theoretical and Empirical Analysis, with special reference to education*. NBER

Birdsall, N. and Hamoudi, A. (2004) AIDS and the Accumulation and Utilisation of Human Capital in Africa, *Journal of African Economies* 13(1): i96 –i136.

Blundell R, Dearden L and Sianesi B. (2001) Estimating the Returns to Education: Models, Methods and Results, Centre for the Economics of Education, London School of Economics.

Boothby, D. and Rowe, G. (2002) Rate of Return to Education: A Distributional Analysis Using the LifePaths model, HRDC Publications Centre, Canada.

Botchorishvili, V. (2007) Private returns to education in Georgia, Economics Education and Research Consortium, National University “Kyiv -Mohyla Academy.

Canagarajah, S., and Thomas, S. (1997), *Ghana's labour market: 1987-92*, The World Bank.

- Card, D. (1999) The causal effect of education on earnings. In *Handbook of Labor Economics*, vol. 3 (eds O. Ashenfelter and D. Card). Amsterdam: Elsevier.
- Chacha, N. 2004 Reforming *Higher Education in Kenya Challenges, Lessons and Opportunities*.
- Chirwa, E. W. and Matita, M, M. (2009) The rate of return on Education in Malawi. Department of Economics Working paper No.2009/01, University of Malawi.
- Colclough, C., Kingdon, G. and Patrinos, H. A. (2009), The Pattern of Returns to Education and its Implications, Research Consortium on Educational Outcomes, Poverty policy brief 4, Cambridge.
- Diagne, A. and Diene, B. (2011), Estimating Returns to Higher Education: A Survey of models, Methods and Empirical Evidence, *Journal of African Economies*, 20(3): iii80 – iii132.
- Ewoudou, J. and Vencatachellum, D. (2006) An Empirical Analysis of Private Returns to Education in Cameroon. Department of Economics, University of Montreal and Research Division, African Development Bank.
- Foltz, J. D. and Gajigo, O. (2012) Assessing the Returns to Education in The Gambia, *Journal of African Economies* 21(4): 580–608.
- Hair, J.F; Anderson, R; Tatham, R.L.; Black, W.C. (2006). *Multivariate Data Analysis*. Upper Saddle River, NJ.
- Kahyarara, G. and Teal, F. (2008) The returns to vocational training and academic education: Evidence from Tanzania, Centre for the study of African economies working papers 2008-07.
- Kifle, T. (2007) The private rate of Return to schooling: Evidence from Eritrea. Essays of Education (21), The University of Queensland.

Kimenyi, M, S., Mwabu, and Manda, D, K. (2006) Human Capital Externalities and Private returns to Education in Kenya. *Eastern Economic Journal*, 32 (3).

Kimenyi, M, S. (2011) Contribution of Higher Education to Economic Development: A survey of International Evidence. *Journal of African Economies*, 20(3): iii14 –iii49.

Lucas, A. M. and Mbiti, I. M. (2012), Does Free Primary Education Narrow Gender Differences in Schooling? Evidence from Kenya, *Journal of African Economies*, Vol. 21, number 5, pp. 691–722, Oxford University.

Lassibille, G.and Tan, J. (2005) The returns to Education to Rwanda. *Journal of African Economies* Vol 14(1)92-116.

Manda D. K., Mwabu, G.and Kimenyi.M.S. (2006), Human Capital Externalities and Returns to Education in Kenya, *Eastern Economic Journal* , Vol 32(3)493-513.

Mani, S., Hoddinott, J. and Strauss J.(2013), Determinants of Schooling: Empirical Evidence from Rural Ethiopia, *Journal of African Economies* 0 (0): 1–39.

Mariara, J, K. (2003), Wage determination and the gender wage gap in Kenya: Any evidence of gender discrimination?, *AERC Research Paper 132*, African Economic Research Consortium, Nairobi.

Mengistae,T. (2001), Skill Formation and Job Matching Effects in Wage Growth in Ethiopia, *Journal of African Economies* 10(1): 1–36.

Michaelowa, K. (2000) Returns to Education in Low Income Countries: Evidence for Africa, *Draft paper for German Economic Association*, 30/6/00 Hamburg Institute for International Economics.

Mincer, J.(1958) Investment in Human Capital and Personal Income Distribution. *Journal of Political Economy* 66 (4): 281-302.

Montenegro, C. E. and Patrinos, H. A. (2013). *Returns to Schooling around the World*. The World Bank Group.

Mulongo G. (2012), *The Human Capital Theory in Education: Principles, critiques and current Thinking*, Institute of Education University of London.

Nyaga, R, K. (2010), *Earnings and Employment Sector Choice in Kenya*, *AERC Research Paper 199*, African Economic Research Consortium, Nairobi.

Ojiambo, P. O. (2009). *Quality of Education and its Role in National Development: A Case study of Kenya's Educational Reforms*. *Kenya Studies Review*: 1, 1, 133-149. Kenya Scholars and Studies Association.

Okuwa O.B. (2004), *Private returns to higher education in Nigeria*, *AERC Research Paper 139*, African Economic Research Consortium, Nairobi.

Pscharopoulos, G. and Patrinos, H.A. (2004), *Returns to Investment in Education. A Further update*. *Education economics* 12 (2), The World Bank.

Psacharopolous, G. and Ng Ying Chu. 1994. "Earnings and education in Latin America: Assessing priorities for schooling investment". World Bank Policy Research Paper, December.

Reilly, B. and Al-Samarrai, S (2000), *Urban and Rural Differences in Primary School Attendance: An Empirical study for Tanzania*. , *Journal of African Economies* 9(4): 430-474.

Republic of Kenya (2012), *Aligning Education and Training to the Constitution of Kenya (2010) and Kenya Vision 2030 and beyond*, *Draft Policy Framework for Education*. Ministry of Education.

Republic of Kenya (2012), *Budget Statement for the fiscal year 2012/2013*, Government Printer.

Rita, A. (2000), Private returns to education in Finland: Back to Basics, The Research institute of Finnish (ETLA) ETLA Discussion papers No.720, Helsinki.

Schultz, T. (1961). Investment in Human Capital. *The American Economic Review* 51 (1):1-17

Schultz, T. (1999). Health and schooling investments in Africa. *Journal of Economic Perspectives*, 13 (3): 67-88

Schultz, T.P. (2004), Evidence of Returns to schooling in Africa from Household surveys: Monitoring and Restructuring the Market for Education, *Journal of African Economies*, AERC Supplement 2, pp.ii95 –iii148, Centre for the study of African Economies.

Siphambe, H, K. (1999) Rates of Return to Education in Botswana. *Economics of Education Review* (19) 291-300

Smith A.,(1776) *An inquiry into the nature and causes of the Wealth of Nations*, London:W.Strahan and T.cadell.

Smith, S, M., (1994) *Labour Economics* , London: Routledge.

Soderbom, M., Teal, F., Wambugu, A. and Kahyarara, G. (2005) The Dynamics of returns to education in Kenyan and Tanzanian Manufacturing. *Global poverty Research Group Working papers* No.017, University of Oxford

Wambugu, A. (2002), Real wages and Returns to Human capital in Kenya Manufacturing firms. Department of Economics Working papers No.75, Goteborg University.

Wambugu, A. (2003), Essays on earnings and Human Capital in Kenya, Department of Economics, Goteborg University.

Walker, D. (2001), Federal Government Challenges in the 21st Century, *Journal of Public Affairs Education* 7(4): 219-227.

APPENDIX 1: RAW Analysis Outputs

1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
prov	13103	5.091124	2.135453	1	8
district	13103	515.219	215.0799	101	808
rururb	13049	.6444172	.4787079	0	1
cycle	13099	8.650966	4.850287	1	17
id_clust	13103	669.4724	386.5843	1	1339
id_hh	13103	5.466687	2.860802	1	10
doi	13099	1270.582	3.408545	1265	1276
hsize	13103	5.052125	2.810525	1	29
gender	66248	.4932375	.499958	0	1
age	66248	22.1649	18.58719	0	99
birthyear	66242	2002.495	395.0997	1902	9999
distofbirth	10415	546.7997	231.616	101	999
religion	45875	2.333886	1.272664	1	7
maritalsta~s	45858	4.452549	2.825562	1	7
schoolings~s	58578	.798269	.4012959	0	1
gradecompl~d	42400	7.39658	4.503428	1	21
yearcompl~d	40919	1995.592	12.56537	1914	2006
highestvoc~n	42401	3.688687	.8249166	1	4
highesteduc	46698	1.888154	1.668689	1	11
agestarted~h	46681	6.657184	5.263496	1	99
empstatus	22089	2.859523	1.556393	1	9
emplsector	24622	7.369263	3.903442	1	15
monthlyear~s	24177	3271.551	15775.13	0	600000
experience	40919	10.40781	12.56537	0	92
no_educ	66248	.0235479	.1516368	0	1
pri_educ	66248	.4485117	.4973456	0	1
sec_educ	66248	.1486384	.3557344	0	1
tert_educ	66248	.0161967	.1262324	0	1
univ_educ	66248	.0082116	.0902456	0	1
experiencesq	40919	266.207	573.9365	0	8464

2. Variance Inflation (multicollinearity)

Variable	VIF	1/VIF
expe	13.06	0.076559
expesq	12.62	0.079227
_Ihigheste~6	1.15	0.867320
_Ihigheste~2	1.15	0.873096
_Ihigheste~3	1.08	0.927775
gender	1.03	0.967198
_Ihigheste~7	1.02	0.981365
rururb	1.01	0.986104
_Ihighest~11	1.01	0.987715
_Ihighest~10	1.01	0.987968
age	1.01	0.989680
_Ihigheste~5	1.01	0.991625
_Ihigheste~9	1.01	0.992508
_Ihigheste~8	1.01	0.993300
Mean VIF	2.61	

3. Pearson Correlation

```
pwcorr gender monthyearns expe no_educ pri_educ sec_educ tert_educ univ_educ sector
> rururb age, sig
```

	gender	monthyearns	expe	no_educ	pri_educ	sec_educ	tert_educ	univ_educ	rururb	age
gender	1.0000									
monthyearns	-0.0008 0.9004	1.0000								
expe	0.0002 0.9671	-0.0254 0.0011	1.0000							
no_educ	0.0039 0.3164	-0.0000 0.9958	-0.0327 0.0000	1.0000						
pri_educ	0.0069 0.0738	0.0130 0.0427	-0.0854 0.0000	-0.1400 0.0000	1.0000					
sec_educ	-0.0047 0.2219	-0.0023 0.7149	0.0719 0.0000	-0.0649 0.0000	-0.3768 0.0000	1.0000				
tert_educ	-0.0041 0.2884	-0.0124 0.0532	0.0575 0.0000	-0.0199 0.0000	-0.1157 0.0000	-0.0536 0.0000	1.0000			
univ_educ	-0.0041 0.2887	-0.0084 0.1931	0.0268 0.0000	-0.0141 0.0003	-0.0804 0.0000	-0.0263 0.0000	0.6601 0.0000	1.0000		
rururb	0.0013 0.8786	0.0360 0.0114	0.0103 0.3539	-0.0062 0.4766	0.0140 0.1099	0.0049 0.5728	0.0020 0.8162	-0.0012 0.8906	-0.0355 0.1807	1.0000
age	-0.0091 0.0188	-0.0063 0.3286	-0.0034 0.4929	0.0020 0.6103	0.0123 0.0015	-0.0033 0.3904	-0.0012 0.7569	-0.0017 0.6621	-0.0086 0.4202	-0.0132 0.1304

Monthly earnings decrease by experience, decrease by sector and increase by residence.
 Monthly earnings does not significantly differ by gender, education and age of respondent

4. T-Test of mean differences

```
. ttest llearnings, by(gender)
Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	4568	8.163553	.0199181	1.346203	8.124504	8.202602
1	4458	8.157029	.0192017	1.282062	8.119384	8.194673
combined	9026	8.160331	.0138397	1.314846	8.133202	8.18746
diff		.0065247	.0276829		-.0477401	.0607895

```
diff = mean(0) - mean(1)
Ho: diff = 0
Ha: diff < 0
Pr(T < t) = 0.5932

Ha: diff != 0
Pr(|T| > |t|) = 0.8137

Ha: diff > 0
Pr(T > t) = 0.4068

t = 0.2357
degrees of freedom = 9024
```

. ttest lnearnings, by (sector)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	1410	9.25676	.0217909	.818249	9.214014	9.299507
1	5078	8.007458	.0162299	1.156547	7.975641	8.039276
combined	6488	8.278962	.0149897	1.207396	8.249577	8.308347
diff		1.249302	.0328718		1.184863	1.313742
diff = mean(0) - mean(1)					t = 38.0053	
Ho: diff = 0					degrees of freedom = 6486	
Ha: diff < 0		Ha: diff != 0		Ha: diff > 0		
Pr(T < t) = 1.0000		Pr(T > t) = 0.0000		Pr(T > t) = 0.0000		

. ttest lnearnings, by (rururb)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	445	7.813056	.0619615	1.30708	7.691281	7.93483
Rural	1044	7.882314	.0365195	1.179981	7.810654	7.953974
combined	1489	7.861615	.0315988	1.219322	7.799632	7.923598
diff		-.0692583	.0690295		-.2046638	.0661472
diff = mean(0) - mean(Rural)					t = -1.0033	
Ho: diff = 0					degrees of freedom = 1487	
Ha: diff < 0		Ha: diff != 0		Ha: diff > 0		
Pr(T < t) = 0.1579		Pr(T > t) = 0.3159		Pr(T > t) = 0.8421		

5. Analysis of Variance (earnings vis-à-vis education)

anova lnearnings highesteduc1

Source	Partial SS	df	MS	F	Prob > F
Model	25.467481	4	6.36687026	3.71	0.0051
highested~1	25.467481	4	6.36687026	3.71	0.0051
Residual	12143.2096	7069	1.71781151		
Total	12168.6771	7073	1.7204407		

6. Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
lnearnings	9026	0.97362	120.182	12.785	0.00000
gender	66248	1.00000	0.041	-8.897	1.00000
expe	40919	0.81849	2877.619	22.012	0.00000
expesq	40919	0.63760	5745.515	23.923	0.00000
highesteduc	46698	0.82208	3121.878	22.289	0.00000
age	66248	0.90459	2173.868	21.410	0.00000
rururb	13049	0.99995	0.340	-2.910	0.99819

7. Coefficients of returns to schooling of various levels of education

Level of education	Gender		Residence	
	Females	Males	Urban	Rural
Primary	1.28	1.12	1.20	1.44
Secondary	1.08	1.04	1.00	0.92
University	1.68	2.00	1.36	0.80
Model Fit statistics				
Adj R-squared	0.2127	0.1739	0.1678	0.1783
F- statistic	94.59	70.82	7.79	19.37
Degrees of freedom	3,1036	3,992	3,98	3,251
Prob >F	0.000	0.000	0.000	0.000
RMSE	1.0799	1.072	1.0426	.96926
n (obs)	1040	996	102	255