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**PUBLIC EXPENDITURE ON EDUCATION AND EDUCATION OUTCOMES  
IN KENYA**

**JOYCE KAROKI MBAYA**

**A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF  
ECONOMETRICS AND STATISTICS IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF  
ECONOMICS (ECONOMETRICS) OF KENYATTA UNIVERSITY.**

**APRIL, 2016**

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## DECLARATION

### Students' Declaration

This project is my original work and has not been presented for an academic award in any other university.

Signature: 

Date: 27/07/2016

Joyce Karoki Mbaya

Master of Economics (Econometrics)

Reg no: K102/22696/2011

### Supervisor's Declaration

This research project has been submitted for our approval as supervisors

Signature: 

Date: 27/7/2016

Dr. Jennifer Njaramba

Department of Econometrics and Statistics

Kenyatta University.

Signature: 

Date: 28/7/2016

Dr. Perez Onono

Department of Applied Economics

Kenyatta University.

## **DEDICATION**

To my husband Dominic Mwiti and our children: Wendy Mwendwa, Vicky Kathure  
and Olivia Kanana.

## **ACKNOWLEDGEMENT**

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## ABBREVIATIONS

<b>ECM</b>	Error Correction Term
<b>FDSE</b>	Free Day Secondary Education
<b>FPE</b>	Free Primary Education
<b>GDP</b>	Gross Domestic Product
<b>GER</b>	Gross Enrolment Rate
<b>HELB</b>	Higher Education Loan Board
<b>MDG</b>	Millennium Development Goals
<b>NER</b>	Net Enrolment Rate
<b>PEE</b>	Public Expenditure in Education
<b>TSC</b>	Teacher service commission
<b>PCR</b>	Primary Completion Rate
<b>MOE</b>	Ministry of Education
<b>PGER</b>	Primary Gross Enrolment Rate
<b>PNER</b>	Primary Net Enrolment Rate
<b>SGER</b>	Secondary Gross Enrolment Rate
<b>SNER</b>	Secondary Net Enrolment Rate
<b>STR</b>	Secondary Transition Rate

## **OPERATIONAL DEFINATION OF TERMS**

*Public Expenditure on Education:* refers to the financial allocations from the government to support education and educational institutions

*Recurrent Expenditure in Education:* financial allocations on school resources used within a year

*Capital (Development) Expenditure On Education:* allocations on assets that last longer than a year.

*Gross Enrolment Ratio:* Number of students enrolled in school regardless of age expressed as a percentage of the official school age population for that of education level ie primary or secondary.

*Net Enrolment Ratio:* Number of children of official school age who are enrolled in school as a percentage of the total children of the official school age group.

*Literacy Level:* A person is considered literate who can with understanding both read and write a short, simple statement about everyday life.

*Dropout Rate:* The proportion of pupils leaving school without completing a given grade in a given school-year expressed as a percentage of those who were enrolled in the same grade at the beginning of that grade at the beginning of the same school-year.

*Gross Completion Rate:* The total number of students completing (or graduating from) the final year of primary or secondary education, regardless of age, expressed as a percentage of the population of the official primary or secondary graduation age.

*Pupil-Teacher Ratio (PTR)*: Otherwise called “student-teacher ratio” or “students per teacher. This indicator expresses the average number of pupils (students) per teacher at a specific level of education in a given school-year.

*Repetition Rate*: the proportion of pupils from a cohort enrolled in a given grade in a given school-year who are studying in the same grade in the following school-year.

*Transition Rate (TR)*: The number of pupils (or students) admitted to the first grade of a higher level of education in a given year, expressed as a percentage of the number of pupils (or students) enrolled in the final grade of the lower level of education in the previous year.

*Output/Outcome*: measure the immediate quality and quantity of learning purchased publicly or privately. Shows what the educational process is producing, when combined with input on time, money, and participation, which are key to understanding the value of a country’s education system.

*Input Measures*: Inputs are indicators of investment in the educational system.

*Education Indicators*: statistical measures that provide information on what are widely agreed to be important features of the functioning, development, and impact of the education system.

## ABSTRACT

An improvement in the quality of education is associated with many benefits including increased productivity, reduced poverty and inequality of income, improved health and economic growth. It is for these reasons that the Kenyan government has over the years put emphasis on education sector through various policies expected to promote education outputs and outcomes. Several policies like Free Primary Education (FPE), Free Day Secondary Education has been introduced with an expectation of improving education outcomes. Despite the government efforts, education outcomes have not kept the pace with the governments set goals. This is evident from failure to achieve set targets of 100 percent Net enrolment rate and 100 percent completion rate in primary levels which leads to better translation rate in secondary levels. The objective of this study was to find out the effect of public expenditures on education outcomes in Kenya from 1980 to 2013. To achieve the objective, time series data from economic surveys and World Bank indicators was used. Stationarity test was carried on all the variables. Longitudinal research design was adopted and Ordinary Least Squares multiple regression technique was applied. The findings of the study were that public expenditure in education affects education outcome positively. The research finding revealed that public education expenditure has positive and significant relationship with both primary completion rate and secondary transition rate though with the primary completion rate it was in the long run but with the secondary transition rate it was in short run. The coefficient of teacher quality was positive and significant in both primary completion rate and secondary transition rate. School resources proxied by teacher pupil ratio had positive and significant coefficients which can help in improving educational outcomes. Per capita income was found to affect primary completion rate and secondary transition rate positively. Urban population growth rate was found to be reducing both primary completion rate and secondary transition rate. The study recommends that apart from public expenditure in education other factors should be considered for better education outcomes to be realized. Understanding the effects of public expenditure on educational outcome is important because educational attainment and human capital accumulation are linked to economic well-being and this will help in policy formulation. The outputs of this study will therefore be useful in reviews of expenditure on education by government.

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background

Investing in education is recognized as a key component for a country's development. An improvement in the quality of education is associated with many benefits including increased productivity, reduced poverty and inequality of income, and improved health and economic growth (Onsando, 2007). Education and training provides the knowledge, skills and attitudes necessary to drive economic growth. Through education and training, citizens develop skills and mind-sets conducive to the creation of a cohesive knowledge-based economy. Education may make citizens more informed and active voters, which will have positive benefits for other citizens through improving the quality of the democratic process. It is also essential for political growth, as they help citizens to be tolerant and to uphold democratic values. It is for these reasons that government in developing countries pays some part of the cost of utilizing education services (World Bank, 2013).

Globally, education outcomes have received great attention, this has been supported by the emphasis placed on education in two of the eight Millennium Development Goals (MDGs) adopted at the United Nations Millennium Summit in September 2000 focus on education in which Kenya is a signatory ; to increase completion rates in primary school to 100 percent by 2015, and to achieve gender equality at all levels of education by 2015( World Bank, 2001).World Education Forum in its 2000 Dakar meeting expressed the international commitment to ensure that Education For All (EFA) goals are achieved and also incorporated aspects of quality into the targets (Al-Samarrai, 2006). Kenya being a signatory to the MDGs and a partner to the world education Forum has set out policies and a framework focussing on the social pillar of Vision 2030 to ensure that the set objectives are achieved.

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In Kenya, several education service financing methods have been adopted which includes; out-of-pocket expenditures, taxation, donor funding and education insurance. However, the socioeconomic analysis of poverty dimension reveal that just like other developing countries, majority of Kenyans live below the poverty line (Republic of Kenya, 2009). The poor are unable to pay high education expenses required in order to obtain the much needed basic education. This thus calls for government intervention to help achieve equitable distribution of learning opportunities to all its citizens. Global development efforts towards the achievement of the MDGs have reached and Kenya has put in place policies to ensure that the set objectives are achieved.

### **1.2 Kenya's Public Education Expenditure Policies**

The current system of education (8-4-4 system) was introduced in 1985 with an aim of improving education outcomes that would meet economic needs of the country (Republic of Kenya, 2008). The implementation of the policy sought to address ways in which education would make graduates from different levels self-sufficient, through vocational subjects offered in schools. Education system was expected to ensure that students acquired technical and practical skills for self and salaried employment. This resulted into increased PEE arising from infrastructure needed for practical subjects. However after a curriculum review between 2002-2005 vocational subjects were removed from the curriculum.

Kamunge Report of 1988 focused on education and training for the next decade and beyond. It sought to give direction on improving education financing quality and relevance of education and training in Kenya (Republic of Kenya, 2012). This led to the introduction of the cost sharing policy between the government, parents and the community in the education system in Kenya hence reducing PEE (Osando, 2007).

In poverty Reduction Strategy Paper of 2001-2003 it was underscored that poverty and illiteracy are highly correlated among adults (Republic of Kenya, 2008). Basic education and

adult learning were found to be the key strategies towards poverty reduction. More emphasis focused on education as a way of reducing poverty through policies like Economic Recovery Strategy for Wealth and Employment Creation (ERSWEC) of 2003-2007 which led to the introduction of Free Primary Education in 2003. The government embarked on these reforms which were geared towards attaining the education related Millennium Development Goals (MDGs) and Education For All (EFA). The government abolished user charges, which had come into existence with the advent of the cost sharing in education in 1988. This move was meant to give access to approximately 3 million children of school-going age who were out of school due to their inability to raise school fees under the cost sharing system (Onsando, 2007).

The Sessional Paper No. 1 of 2005 on Education and Training has led to major reforms in the education sector which have enabled Kenya to make significant progress towards attaining the Education for All (EFA) and Millennium Development Goals (MDGs). It also outlined the sector targets as reported in table 1.

**Table 1.1: Kenya Education Progress Indicators**

Education indicators	Target	Expected year
Universal Primary Education		2005
Education For All (EFA)		2015
Net Enrolment Rate (NER)	100%	2010
Secondary transition rate	70%	2008
Primary completion rate	100%	2015
Gender parity at primary and secondary levels	Ratio of 1:girls to boys	2015

*Source: Kenya policy Framework for Education 2012*

These targets were to be achieved through enhancement of access, equity and quality in primary and secondary education through improvement of infrastructure (Republic of Kenya, 2012). This is the policy that led to the introduction of Free Day Secondary Education in 2008 which was meant to increase transition rates from primary level.

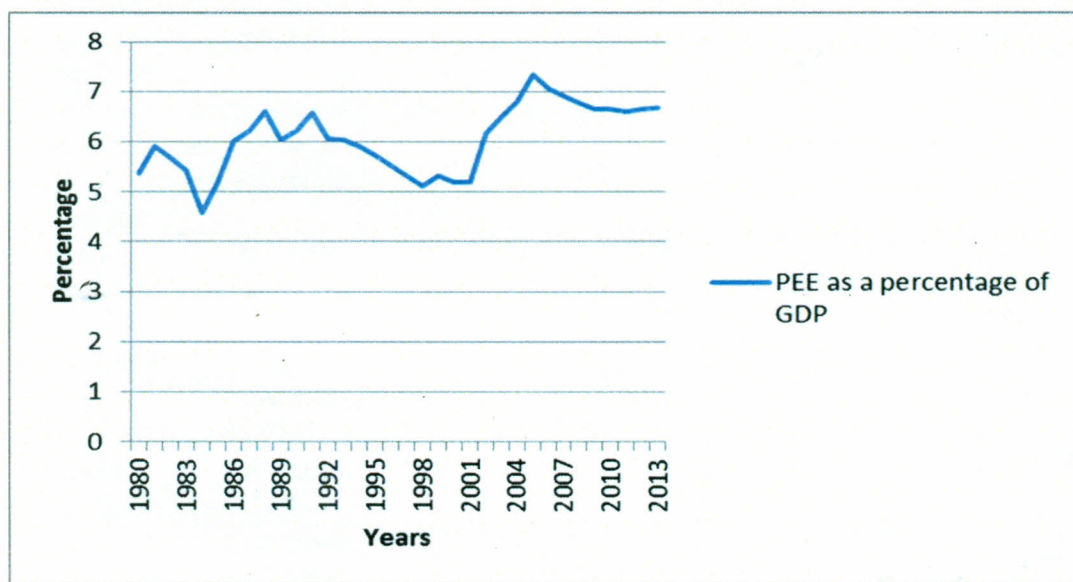
Following a successful implementation of Economic Recovery Strategy for Wealth and Employment Creation (ERSWEC), the government through a consultative process developed the Kenya Vision 2030” in 2008 to guide the country in its long-term development (Republic of Kenya 2008). The Vision places great emphasis on social services such education and the labour market. The Vision also recognizes the need for a literate citizenry and had set targets for enhancing adult literacy to 80per cent by 2012 (Republic of Kenya, 2012). The Social Pillar in the Vision 2030 singles out education and training as the vehicle that will drive Kenya into becoming a middle-income economy. Education and training sector is expected to provide globally competitive quality education and training for sustainable development which is in line with international commitment on education and training like EFA and MDGs, hence the need to reform PEE to give the required support at all levels of education sector (Republic of Kenya, 2008). In addition, the Constitution of Kenya 2010 has provided for free and compulsory basic education as a human right to every Kenyan child. This is expected to raise PEE as more children access education. Achievement of vision 2030 educational goals can only be evaluated on the basis of educational outcomes. Effectiveness of interventions towards the targets can also be evaluated on the extent they impact the outcomes.

### **1.3 Overview of Public Education Expenditure**

The Government through the ministry of education (MOE) has, over the years, demonstrated its commitment to the development of education and training through sustained allocation of resources to the sector. However, despite the substantial allocation of resources and notable achievements attained, the sector still faces major challenges. Some of these challenges relate to access, equity, quality, relevance, efficiency in the management of educational resources, cost and financing of education, gender and regional disparities, and teacher quality and teacher utilization and demographic factors such as increased population

of school going children to approximately 14million ( World Bank, 2013 ; Republic of Kenya, 2012). Macroeconomic factors such as inflation and national debts have also been a major challenge towards the achievement set out policies by the government.

In Kenya public education expenditure constitutes over 20 per cent of the total government expenditure and 6.5 per cent on average of GDP (Republic of Kenya, 2012). The recurrent expenditure has been consistently higher than development expenditure taking over 90 per cent of the total education expenditure while development expenditure takes the remaining 10 per cent in real terms (Republic of Kenya, 2012).Irrespective of the fact that the government has been giving the highest allocation to education, it has failed to achieve the 29 per cent of the annual budget as agreed upon in the United Nations Education Science and Cultural Organisation (UNESCO) recommendations (Dauda,2011). Public education expenditures trend for period 1980-2013 as shown in figure 1.1.



**Figure 1.1 Trends in Public Education Expenditure as a Percentage of GDP.**

*Source: Statistical Abstract Various Issues .*

Public education expenditure as a percentage of GDP rose from about 5.38 percent in 1980/81 to about 6.5 percent in 2012/13 with the highest being 7.33 percent and 7.04 percent

in 2005 and 2006 respectively. This increase in expenditure has been due to increased population and governments' effort to improve the quality of education. On the subsector allocations, primary education receives the highest allocation of PEE followed by secondary, universities and tertiary receives the lowest allocation. Higher percentage of these allocations goes to personnel and staff with a minimal percentage going for other inputs to education such as building of classrooms and buying of books. Government allocations of PEE to various levels of education is as shown on Table 1.2

**Table 1.2: Education Expenditure in Kenya (2005-2010)**

Expenditure Type/Financial year	05/06	06/07	07/08	08/09	09/10
Education expenditure as a % of GDP	6.1	6.0	6.2	6.3	6.2
Education expenditure as a % GOK total expenditure	28.0	26.0	23.2	25.0	26.7
Education recurrent expenditure as a % of GOK recurrent expenditure	32.1	32.8	31.0	31.7	32.6
Education development expenditure as a % of GOK development expenditure	10.3	7.4	6.0	7.9	7.8
Education recurrent expenditure as a % of total education expenditure	93.0	92.4	91.9	91.0	93.1
Primary Education expenditure as a % PEE	53.70	56.03	52.01	49.81	46.60
Secondary Education expenditure as a % PEE	19.26	16.98	22.97	24.67	23.98
Total Education Expenditure(kshs,billions)	92.60	103.86	121.32	136.89	160.33

Source: Ministry of Education Accounts

From the Table 1.2 on average the education sector takes slightly over 6 per cent of the total GDP and over 25 per cent of the total government expenditure. Recurrent expenditure in education is over 30 percent of the total government recurrent expenditure, giving an indication that this is one of the major consumers of public resources, while development

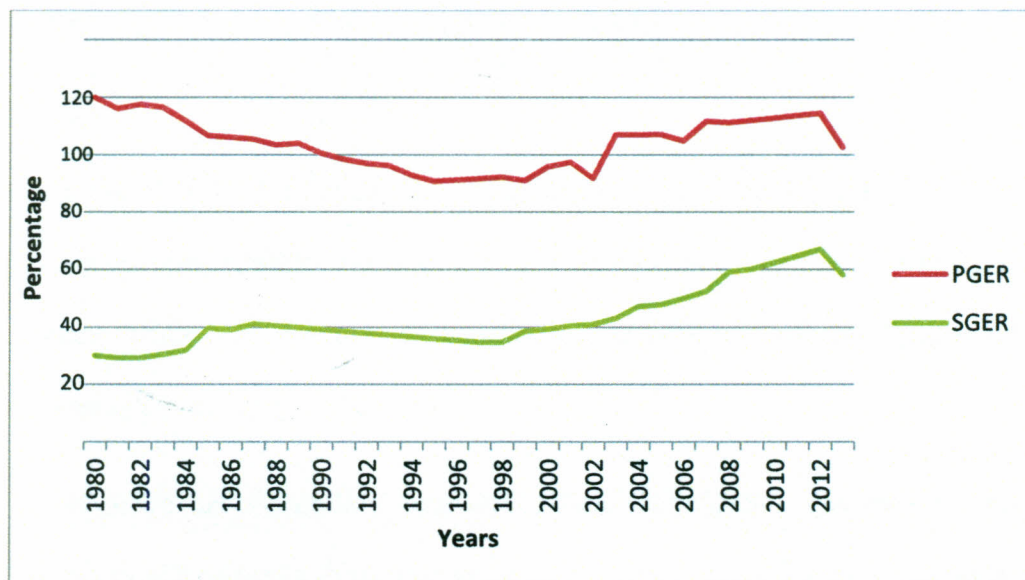
expenditure averages below 10 per cent of the total development expenditure .Recurrent expenditure is above 90 per cent of the total PEE. Primary education takes the highest share of PEE with secondary education increasing its share from 2008 to cater for increased enrolment due to Free Day Secondary Education (FDSE). The high allocation to primary education is consistent with the MDGs and EFA goals of attaining 100% NER and completion rate by 2015.

#### **1.4 Indicators of Education Outcomes in Kenya**

The Kenyan education sector has developed its education policies to guide the attainment of long term education outcomes targeted by the government as outlined in the *vision 2030* and the constitution (Republic of Kenya, 2010). The target for the education outcomes as indicated in the Kenya education Policy are measured by: primary school Net Enrolment Rate (NER) of 100 per cent ,primary completion rate of 100 per cent , achievement of a transition rate from primary to secondary of over 70 per cent ,gender parity of 1 at primary and secondary level , and achievement of adult literacy of 50 per cent (Republic of Kenya, 2012) .

Key education outcomes in Kenya suggest relative improvement or decline in the education status. On average Primary Gross Enrolment Rate (PGER) is more than Secondary Gross Enrolment Rate (SGER) because of over age children and repeaters (Asian Economic Survey, 2003). This means that all those who complete primary education do not join secondary level which may be due to lack of school fees or failure to attain the minimum points required for admission to secondary school. Additionally, lack of facilities in schools and an uninteresting curriculum discourage students from continuing with their education (Asian Economic Survey, 2003). This raises the issue of retention in schools which affects the school completion rate. This is more severe in rural areas than in urban areas (Republic of Kenya,

2012).Gross enrolment rate in primary and secondary trends in Kenya for period 1980-2012 is as shown below.



**Figure 1.2 Trends in Primary and Secondary GER levels of Education in Kenya.**

*Data source: World Bank Indicators*

From Figure 1.2, Primary Gross Enrolment Rate(PGER) was higher in 1980 with about 120 per cent but decreased to below 100 per cent up to 2001 when it started increasing. The increase continued up to 2012 but not over the 120 per cent attained in 1980, but declined slightly in 2013 to about 101 per cent. Because of Free Primary Education (FPE) in 2003 there was an increase in primary Gross Enrolment Rate (PGER) . Secondary Gross Enrolment Rate (SGER) is lower than PGER, despite the introduction of FPE, a factor that indicates the low level of transition from Primary to Secondary (Keriga and Bujira, 2009).

Gross Enrolment ratios reveal neither the quality of education gained by students nor how many students actually complete their particular levels of education ,hence, Primary school completion rate (PCR) can be taken as a measure of progress towards achieving the MDG target( Amin and Ntilivamunda, 2009).

**Table 1.3 Trends in Primary School Education Outcomes in Kenya (2002-2007)**

	2002	2003	2004	2005	2006	2007
<b>PGER</b>	88.2	102.8	108.0	107.6	107.4	107.6
<b>PNER</b>	77.3	80.4	82.1	83.2	86.5	91.6
<b>PCR</b>	62.8	68.2	76.2	76.3	76.2	81

*Source; Ministry Of Education*

From the Table 1.3 Primary Gross Enrolment Rate (PGER )is higher than Primary Net Enrolment Rate (PNER) because it is the enrolment of all pupils even the over age and repeaters while NER does not. PCR is the lowest since it is affected by dropout but has been increasing gradually over the years.

To improve on Secondary Transition Rate (STR), the government introduced Free Secondary Education in 2008. Transition rates from primary school to secondary school has been improving, though not all children who complete class eight have been able to access secondary education. Access to secondary school education still remains limited due to the cost sharing policy between parents and the government in which parents are expected to cater for uniform and upkeep of the child (Keriga and Bujira ,2009).

**Table 1.4 Trends in Secondary School Education Outcomes in Kenya (2004-2010)**

	2004	2005	2006	2007	2008	2009	2010
<b>SGER</b>	28.0	28.8	32.4	38.0	42.5	45.3	47.8
<b>SNER</b>	19.4	20.5	22.5	24.2	28.9	35.8	32
<b>PCR</b>	73	77.6	76.8	81.0	79.8	78.0	76.8
<b>STR</b>	45.8	57.3	59.6	59.9	64.1	66.9	72.5

*Source: Ministry of education*

From the Table1.4 Secondary Gross enrolment Rate (SGER) is lower compared to Secondary Gross Enrolment Rate (SER). In addition, secondary gross enrolment rate has been increasing gradually from 28 per cent in 2004 to 47 per cent in 2010. This is partly because of the free primary education introduced in 2003 which resulted into an increase in the number of students completing primary education and also due to the introduction of free day schools

(FDS) education by the government in 2008. Primary completion rate increased from 73 per cent in 2004 to 81 per cent in 2007 and then started decreasing gradually to 76.8 in 2010. Irrespective of the fact that secondary transition rate has been increasing over the years PCR is more than STR implying that not all pupils who complete primary level of education enrol in secondary level of education indicating dropouts after class eight.

### **1.5 Statement of the Problem**

Sessional Paper No.1 of 2005 on a Policy Framework for Education, Training and Research set education targets like primary school Net Enrolment Rate (NER) of 100 per cent, completion rate of 100 per cent and a transition rate of 70 per cent and above. The Kenyan government has been committed to the achievement of these targets by increasing public education expenditures to more than 20 per cent of its national budget and an average of 6.6 per cent of country's the GDP. Despite increase in PEE, education outcomes such as completion rate which measures the progress towards achieving MDGs is below the target. Also, PCR does not match the Secondary Transition Rates (STR) though it has been on the rise. This gives rise to the question of whether public spending on education affects education outcomes. Following the trend of these outcomes the country is still far from meeting the set out Millennium Development Goals as well as the attainment of *vision 2030* since education in the social pillar is expected to play a major role.

Otieno and Colclough (2010) examined how internal financing and international aid affects education outcomes like enrolment, gender parity, primary completion rates, repetition rates, dropout's rates and transition to secondary school in Kenya using descriptive statistics. The study showed a positive relationship between internal spending of both parents and government financing and education outcomes. Anyanwu and Erhijakpor (2007) investigated the effect of education expenditure on school enrolment in Africa using panel data of African countries from 1990-2002. The results showed that government expenditure on education has

a positive and significant direct impact on primary and secondary education enrolment rates. Both studies used different methods of estimation and different variables and none used time series data. This study thus, linked PEE to education outcomes; primary school completion rates and secondary school transition rate in Kenya by using time series data and OLS method of estimation.

### **1.6 Research Questions**

(i) What is the effect of public education expenditures on primary school completion rate in Kenya?

(ii) What is the effect of public education expenditures on secondary school transition rate in Kenya?

### **1.7 Research Objectives**

The main objective of the study was to analyse the effect of Public education expenditures on education outcomes in Kenya. The specific objectives are:

(i) To determine the effect of public education expenditures on primary school completion rate in Kenya.

(ii) To determine the effect of public education expenditures on secondary transition rate in Kenya.

### **1.8 Significance of the Study**

Much progress has been made towards Education for All (EFA) goals, with an intention of increasing education outcomes like enrolment rates in primary and secondary education. The question is: is public expenditure on education effective on attaining education outcome? If yes, more resources should be allocated to education and if not what are the other factors affecting education? It is therefore important to examine the relationship between education expenditures and outcomes to see what could be done to better the educational outcomes with the given education expenditure. The results of this study will help education policy makers

and other policy makers from different ministries such as the Ministry of Finance as well as other government agencies and stakeholders interested in the development of the education sector, non-governmental organizations, and private organizations to better understand the ways to improve education outcomes. This study sought to add knowledge to the body of existing knowledge by showing different methods of estimation can give results similar to other researchers who have used other methods of estimation

### **1.9 Scope of the Study**

This study used time series data specifically for Kenya to achieve its broad objective of the effect of public education expenditure and education outcomes for the period 1980-2013. In order to determine the education outcomes the study majored on primary completion rate and secondary transition rate.

### **1.10 Organization of the Study**

The study is organized as follows: Chapter 1 introduction the topic, background of the study, statement of the problem, significance of the study, scope and organization. Chapter 2 describes literature review, both theoretical and empirical literature and overview. Chapter 3 focus on the methodology such as research design, theoretical frame-work, model specification, definition and measurement of variables and data source. Chapter 4, data analysis and report writing and chapter 5 described the conclusions and recommendations from the study.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter presents the theoretical literature, empirical literature and an overview of literature on the relationship between public expenditure in education and education outcomes in Kenya.

#### **2.2 Theoretical Literature**

The theoretical framework discussed was intended to explain the important interrelationships between public education expenditures as inputs to education and education outcomes which are based on education production function (EPF) models. The reason why EPF models are used is because an analogy is drawn between the knowledge acquisition process of a human being and the production process of a firm with the primary goal of combining school inputs to create education outcomes. The production function analogy provides a conceptual framework that guided the choice of variables and enabled a coherent interpretation of their effects.

Schools are seen as production units on the supply side which transforms a student to obtain the desired outcomes through some policy processes. Thinking of schools as producers of education services naturally leads to the application of production functions as often used in microeconomic theory. In this case schools are treated like organisations that try to maximise output which is outcome, given the budget constraints.

##### **2.2.1 The household production and time-allocation theory (Becker Model, 1965)**

This model was used to model household activities engaged in producing outputs denoted as  $Z$  which comprises of goods and time. Outputs of the activities are produced using different inputs and the commodities produced can be produced at different time period. The

household is assumed to produce and consume a vector of commodities ( $Z$ ) associated with different levels of activities performed by the state. Utility is a function of these commodities:

$$\text{Max } U = u(z) \dots \dots \dots (2.1)$$

where

$$Z = f(X; T) \dots \dots \dots (2.2)$$

where  $X$  is a vector of inputs used to produce  $Z$  and  $T$  is time and  $U$  is utility. The price of  $Z$  depends on the prices of its components. The household faces both time and budget constraints but Becker assumed that state faces one constraint. Under that assumption  $T$  is scalar, and that the price of time is  $w$  across all uses, and the maximum amount of income that the person can earn is full income  $B$

$$B = wT + V \dots \dots \dots (2.3)$$

where  $V$  is the amount of unearned income accruing to the household.

The household is assumed to maximize (2.1) subject to (2.2) and (2.3). The demands for inputs  $X, T$  are derived from the demands for  $Z$ . The responsiveness of the demands for different activities in response to changes in the prices of goods and time depends, on the time and goods intensities in producing the commodities. The household production and time allocation theory helps one to understand that education outcome requires inputs like PEE to be produced.

**2.2.2 A Simple Model for the School-Quality-Achievement Relationship (Todd and Wolpin, 2003)**

The theory was developed to examine the productivity relationship between schooling inputs and test score outcomes for school-age children. The model assumes that children's

achievement, as measured by test performance at some particular age, is the outcome of a cumulative process of knowledge acquisition.

Assuming that  $t = 0$  correspond to the time before the child enters school,  $t = 1$  correspond to the first year of school, and  $t = 2$  to the second year.  $Y$  denotes school outcome level at a point time just prior to entering the first year of school. Let  $P_0$  represent parental inputs into the cognitive achievement production. Let  $A$  be a measure of the child's own characteristics or mental capacity. Achievement at the time of school entry depends only on family inputs and child ability

$$Y=f(P_0,A) \quad (2.4)$$

A family can chose where to send their children to school whether to public or private schools which partly determine the level of school inputs the child requires. Apart from school input provided by the parents the state also provides school inputs to education under some specified restrictions. These can be denoted as  $S_1$ . It is assumed that achievement at the start of the second year of school depends on family inputs  $P_0$  and state inputs  $S_1$  as well as on own endowments or child's ability.

$$Y=f(P_0,S_1, A) \quad (2.5)$$

Along with the technology for combining inputs to create achievement outcomes, both parents and state should determine the level of inputs to education.

In the simple model education outcomes are determined by parental input state input together with child's ability which may not be possible to measure since it varies from one child to another. This study will borrow from the two theories by modelling education outcomes as a function of PEE, parental input and school input.

### 2.2.3 Empirical Literature

This part introduces the studies that have been done by others to determine the effect of public expenditure on education outcomes. For instance, Kaur and Misra (2003) analysed the

impact of public expenditure on primary and secondary school enrolment rates using panel data from fifteen states in India for the period between 1985-86 and 2000-01. They controlled for variables such as the level of economic development and quantity of physical infrastructure in a state. They found that, public expenditure has a greater effect on primary education than secondary education and especially in poor states.

Roberts (2003) in an attempt to find out the determinants of educational outcomes carried out a global survey and found out that, developing countries not only need to commit more resources to primary education but also to focus on how to improve educational quality. The study found out that even though developing countries have been spending more (relative to GDP) since 1970 on education, there is no strong relationship between expenditure levels and primary school enrolment and completion rates. Thus, increasing public investment alone does not seem to be enough on improving the quantity and quality of primary education, implying that other factors are involved which were not captured in the study.

Mariara(2006) investigated the determinants of demand for schooling in Kenya. The study used household survey and the method of analysis was ordered probit. Impact of household characteristics, household welfare indicators and community variables on a school child were the variables. It was found that household characteristics, quality and cost of schooling are important determinants of demand of schooling in Kenya. The results further showed that regional and gender differences also affect demand of schooling.

Anyanwu and Erhijakpor (2007), investigated the effect of education expenditure on school enrolment in Africa using panel data of African countries from 1990-2002. They used education expenditures, ethno fractionalisation, democracy, urban population and GDP per capita in dollars as variables. The results showed that government expenditure on education has a positive and significant direct impact on primary and secondary education enrolment

rates. They also revealed that other policy interventions, such as sustaining democracy and accelerating national income improves school enrolment.

Baldacci *et al.*, (2008) used a non-linear model to estimate the effect of government spending on health care and education outcome. They used panel data from 118 developing countries for the period between 1971–2000. To find the effect of government spending in education and health, fixed effects model was used to control for governance. They found that public expenditure on education directly results in increased educational outcomes. However, the positive effects of education spending are reduced in countries suffering from poor governance. They concluded that, higher spending alone is insufficient and therefore other policy interventions, such as improving governance are necessary.

Rajkumar and Swaroop (2008) used a sample of 101 observations from annual data for 1990, 1997 and 2003 from 57 countries to determine whether public expenditure on education is more effective in improving educational outcomes in countries with good governance. The direct effect of governance on educational outcomes was measured using the governance variable, measured index of corruption as an independent variable together with other variables such as per capita GDP, share of public primary education spending and vector of non-education related country specific factors. OLS and 2SLS was used to estimate the impact of spending on outcomes such as the primary school completion rate, controlling for the level of corruption, and the bureaucratic quality of the government. Their results indicated that the coefficient of primary education spending becomes significant only when the interaction term between spending and good governance is included. This implies that as the level of corruption falls, public spending on primary education becomes more effective in increasing primary education completion.

Amin and Ntilivamunda (2009) carried out a study to determine the effect of education spending and education outcome in Senegal using time series data and OLS. They used per capita income, GDP growth rate, ratio of education expenditure over GDP, pupil teacher ratio, literacy rate (adults), current education expenditure divided by total number of primary pupil to give unit cost in education, and education expenditure divided by total public budget as variables for their study with the dependent variables being GER and completion rates. Their study revealed that, adult literacy rate, per capita GDP, the growth rate of GDP, education expenditure as a ratio of GDP, and educational expenditure as a ratio of total public budget all tend to have a positive impact on the gross enrolment rate, while an increase in unit cost per pupil tends to reduce primary school gross enrolment.

Iyer (2009) investigated the effectiveness of public spending on primary education in India. The following factors were controlled: primary education spending, per capita income, student –teacher ratio and ratio of government to private primary schools. The independent variables were enrolment rate, primary school transition rate and performance of student exams. Results showed that private primary schools had better outcomes and per capita income is correlated with education outcomes, but teacher- student ratio had no effect on education outcomes due to teachers' absenteeism and lack of teachers' motivation.

Otieno and Colclough (2010) carried a study on financing education in Kenya by looking at how different sources of education financing affects education outcomes like enrolment, gender parity, completion rates, repetition rates, dropout's rates and transition to secondary school in Kenya. This was not an econometric paper though it analysed educational expenditures in Kenya over the past two decades, comparing these with changes in

enrolments and other outputs from the education system. The results showed a direct relationship between public financing and positive outcomes in the sector which cannot be directly attributed to external aid. Though aid has played its part, the major stimulus to sector improvement has been internal.

Dauda, (2011) carried out an econometric analysis of the effect of public educational spending and macroeconomic uncertainty on schooling outcome proxied by illiteracy levels in Nigeria. The study used co- integration and vector error correction model in its analysis. Inflation, GDP per capita, urbanisation and public education expenditures were the explanatory variables and education attainment was measured by adult literacy as the dependent variable. The results showed that public educational spending has a positive impact on schooling outcome while macroeconomic instability impacts education outcomes negatively. The policy implication of this study was that, government should pay attention to policies that enhance educational attainment through adequate public investment under stable macroeconomic environment.

Boateng (2012) investigated the effect of public expenditure and management on education outcomes in primary schools in South Africa. The study used Cross-sectional data from 175 public primary schools and OLS estimation method was used. The results were that there is no significant association between public spending and education outcomes. It was also found that repetition rates are strongly driven by poverty indicators at the district level while dropouts are strongly driven by school inefficiency.

Vaidheesh (2012) carried a study to find out if there exist any relationship between the quality of education from qualified teachers and primary completion rates in Brazil. The

following factors were considered to affect completion rates: Individual factors, household/family factors school factors like quality of teachers and macro-economic factors.

Kirabo, Rucker and Claudia (2015) investigated the effects of school spending on educational and economic outcomes using school spending data in USA. A sample from children born between 1985 to 2011 was used. Their findings revealed that a 10 per cent increase in per-pupil spending in each year of schooling in public school leads to 0.27 more completed years of education, and 7.25 per cent higher wages, decreases adult poverty by 3.67 percent.

### **2.3 Overview of the Literature Review**

Previous studies have shown that public education expenditure affect education outcome both within and across countries positively or negatively. There are several reasons why analysis may fail to detect a positive relationship between public spending on education and education outcomes. Some variables like Parental investments of time, child's innate abilities and peer input as proposed by Hanushek ( 2007) and Todd and Wolpin ( 2003) are hard to capture yet these have effects on education outcomes.

In the empirical literature, studies reviewed have carried their research on outcomes of education like enrolment, completion rates, dropouts rates and Dauda (,2009) on literacy . Apart from Dauda(2011) and Amin and Ntilivamunda (2009) who used time series data the rest of the studies used cross- section and panel data. Rajkumar and Swaroop, (2008) and Roberts (2003) indicated that higher education expenditures could not translate into better educational outcomes in the absence of good governance or if the expenditures are used ineffectively. For increased spending to improve education outcome, it must be accompanied by good governance, detailed monitoring and evaluation projects to improve efficiency.

It is expected that public education expenditure has a an impact on education outcomes,yet

very little has been done to determine its effect in developing countries such as Kenya  
.Therefore this study intend to bridge the gap by using data specifically for Kenya.

## CHAPTER THREE

### METHODOLOGY

#### 3.1 Introduction

This chapter consists of theoretical framework which guided the study to get empirical model. It also consists of description and measurement of variables, type of data, data source and data analysis technique used in the study.

#### 3.2 Research Design

The study used longitudinal research design. This is a research design in which a variable is studied over a relatively long period of time with repeated measurements. Secondary data is used from 1980-2013. An advantage of longitudinal design is its strength in allowing us to assess the change in these variables overtime.

#### 3.3 Theoretic Frame work

To guide the empirical specification, the household production and time-allocation theory by Becker (1965) and the model put forward by Todd and Wolpin (2003) were used. Thus, the determination of education spending is modelled as a government optimization problem, meaning that the decision on the size of a budget on how much to spend on education and other votes is put under consideration.

It is assumed that government maximize utility derived from school outcome (O) a composite good (C), and leisure (L),

$$\max U(O; C, L) \dots\dots\dots (3.1)$$

subject to:

$$O = f(SEF, PEE, SR) \dots\dots\dots (3.2)$$

$$T = H + L \dots\dots\dots (3.3)$$

$$PEE + pC = wH + Y \dots\dots\dots (3.4)$$

Where (3.2) is outcome production function with SEF as social economic factors and SR as school resources. (3.3) is time constraint with T as time, H sum of hours worked and L as leisure. (3.4) budget constraint with p as price w market wage and Y is non-labour income. The amount of education outcome demanded is determined by the amount of PEE social economic characteristics and school resources as in the production function.

### 3.4 Empirical Model

Equation 3.2 helps in coming up with an empirical model 3.5

$$O=f(PEE, PCI, URB, PTR, PQT).....(3.5)$$

In order to achieve the objectives of the study two models are used: one on primary completion rate and the other on secondary transition rate by modifying equation 3.5.

$$PCR=\beta_0+\beta_1PPEE+\beta_2PCI+\beta_3URB+\beta_4PTR+\beta_5PQT+u.....(3.6)$$

$$STR=\alpha_1+\alpha_2SPEE+\alpha_3PCI+\alpha_4URB+\alpha_5STPR+\alpha_6SQT+\varepsilon.....(3.7)$$

where PCR and STR , is education outcome reflecting education attainment measured by primary completion rate, and secondary transition rate which are a function of public spending on education(PEE) , School resources proxied by pupil teacher ratio both in primary and secondary(PTR and STR) and quality of teachers in primary and secondary levels(PQT and SQT).Social economic factors measured using family background is proxied by per capita income(PCI) and urbanisation(URB) which is a proxy for social economic background .The public expenditure is expected to have a positive effect on educational outcomes. Dauda (2012) argued that it reduces the cost of enrolling children to school leading to rise in enrolments as well as improvement in academic achievement. Urbanization and per capita income is expected to have a positive impact on educational attainment, since access to education is better in urban areas than in rural areas. Urban dwellers will likely send their children to school at the right age. Also parents with higher per capita income are able to

provide school requirements for their children easily. School resources are expected to affect education outcomes positively. From the discussion the apriori expectations are that all the variables are expected to be positive.

### 3.5 Measurement of Variables

Variable	Definition	Measurement
Primary Completion Rate (PCR)	Number of students who complete primary Education per year	Enrolment in class eight as percentage of those who enrolled in class one eight years back
Secondary Transition Rate (STR)	Number of students enrolled in form one per year	Form one enrolment as a percentage of class eight enrolment
Teacher quality	Number of trained teachers in primary or secondary school	Qualified teachers as a percentage to total number of teachers in primary or secondary school
PEE in primary	Amount spent by government on primary education	Amount of money spent in primary as a percentage of total PEE
PEE in secondary	Amount spent by government on secondary education	Amount of money spent in secondary as a percentage of total PEE
Per capita income (PCI)	Value of total output of goods and services divided by total population of the same year.	In local unit(Kshs) currency as percentage change from the previous year
Pupil Teacher Ratio	Total number of pupils in a given level (primary or secondary) divided by total number of teachers in the same level	Number pupils/ students per teacher expressed as a percentage
Urbanization (URB)	Increase in urban population.	Percentage growth rate of urban population

### 3.6 Data Type and Source

This study used secondary data for the period 1980 – 2013. Data on Primary and secondary enrolment, per capita income and urbanisation was extracted from World development indicators. Data on public education expenditures, quality of teachers and pupil teacher ratio was obtained from various Economic surveys.

### **3.7.1 Time Series Property of the Data**

#### **Testing for Stationarity**

Most economic time series variables are non-stationary and the use of non-stationary time series leads to spurious regression which cannot be used for precise decision. The first step of empirical analysis is to determine the order of integration of the variables included in the model by using tests like Kwiatkowski, Phillips, Schmidt and Shins (KPSS) (1992). This is preferred to eliminate a possible low power which occurs in ADF and PP test (Brooks, 2008). The null hypothesis is that the series is stationary. When KPSS stationarity test is used it is superior because failure to reject the null hypothesis gives the conclusion that the series is stationary. KPSS is better than Augmented Dickey fuller test for small sample (Brooks, 2008).

#### **3.7.2 Correlation Analysis**

In classical linear regression the presence of high correlation coefficient between two independent variables leads to multicollinearity problem (Gujarati, 2004). The estimates will be unbiased and consistent but the standard errors of coefficient estimates will be large. This results in insignificant t-ratios though R-squared can be high. This could result to an error of failing to reject the null hypothesis which should be rejected. The estimates can be inaccurate. To test for correlation between the independent variables this study will use partial correlation coefficient as suggested by Farrar and Glauber (1967).

#### **3.7.3 Diagnostic Test**

The study used Ramsey Reset test to test for model specification. Serial correlation of residuals was tested using Breusch Godfrey test. Jarque-Bera test was used to check normality while heteroskedasticity was tested using ARCH test.

### **3.10 Data Analysis**

Stationarity test was done to check whether or not the variables are stationary. The study seeks to respond to two objectives. The first objective is to determine the effect of PEE on

completion rates which was analysed using model 3.6. The analysis used ordinary linear squares (OLS) whereby a completion rate was regressed on PEE and other variables. The second objective is to determine the effect of PEE on Secondary transition which was analysed using model 3.7. The analysis used OLS where secondary enrolment was regressed on PEE and other variables.

## **CHAPTER FOUR**

### **EMPIRICAL FINDINGS AND DISCUSSION**

#### **4.1 Introduction**

This chapter presents the findings of the study. Time series property as well as diagnostic tests is presented first. Also discussions on the empirical results from the analysis to determine the effect of public education expenditures on primary school completion rate in Kenya and to determine the effect of public education expenditures on secondary transition rate in Kenya are done.

#### **4.2 Descriptive Analysis of Data**

The study utilised time series data for the period 1980-2013. Descriptive statistics were computed to illustrate the basic features of the data used in the study. The summary statistics for the variables are presented in Table 4.1.

**Table 4. 1: Descriptive Statistics**

Variable	Mean	Standard Deviation	Minimum	Maximum
Primary Completion Ratio(PCR)	54.39	12.51	32.63	75.24
Secondary Transition Ratio(STR)	45.46	13.50	0.04	74.50
Primary Teacher Quality(PQT)	86.62	13.54	66.27	100.00
Secondary Teacher Quality(SQT)	79.23	18.58	46.27	99.76
Public Expenditure on Primary Education(PEE)	25.71	24.68	0.13	63.14
Public Expenditure on Secondary Education(PEE)	7.93	5.89	0.10	16.13
Primary Pupil-Teacher Ratio(PTR)	157.4	8.74	147.7	175.4
Secondary Student Teacher Ratio(SSTR)	132.9	10.67	117.60	153.14

Source: Computed from Research Data, 2015

From Table 4.1, the mean for Primary Completion Rate (PCR) over the period is 54.36 percent with a standard deviation of 12.51, and values ranging from a minimum of 32.63 and a maximum of 75.24. Secondary Transition Rate (STR) had a mean of 45.46 with a standard deviation of 13.50 and minimum and maximum reported values were 0.04 and 74.50, respectively. Both PCR and STR are expected to be 100 percent however this has not been achieved so far.

Public Expenditure on Primary Education had a mean of 25.71 with a standard deviation of 24.68 respectively. The maximum and minimum values were 63.14 and 0.13 respectively. Allocations to primary were the highest in 1984 when the 8-4-4 system was introduced. During this time more teachers were required to teach the class eight pupils'. Besides the additional classrooms that needed to be constructed, each school was expected to have a workshop. Curriculum was also to be changed as well as monitoring its implementation, all of which required funding. For public expenditure on secondary education, mean was 7.93

with a standard deviation of 5.89 with the minimum value as 0.10 and maximum value as 16.13.

Primary Teacher Quality (PQT) had a mean of 86.62, standard deviation of 13.54 and, minimum and maximum values of 66.27 and 100 respectively. The Primary Teacher-Pupil Ratio (PTR) had a mean of 157.4 with a standard deviation of 8.74 with a maximum value of 175.59 and minimum values of 147.71. As for Secondary student Teacher Ratio (SSTR) the mean was 132.9, standard deviation was 10.67. The minimum and maximum values for SSTR were 117.61 and 153.15 respectively. For Secondary Teacher Quality (SQT) mean was 79.23 with a standard deviation of 18.58. The maximum and minimum values reported were 46.27 and 99.76 respectively.

From the descriptive analysis of the data, the variables exhibit variability given the variance in the specified basic descriptive statistics hence can be used for further statistical analysis in a regression framework.

### **4.3 Time Series Property Tests Results**

This study used the classical least square estimation technique to estimate equations 3.6 and 3.7 specified in chapter 3. Under the classical least square estimation, it is required that all the assumptions related to the estimation technique are met and that certain properties must hold for the variables being studied. For time series, it is a requirement that the series must be stationary.

#### **4.3.1 Unit Root Test Results**

It was important to test for stationarity so that data can be analysed with econometric techniques since in case of non-stationarity, some basic model assumptions are not met and this can result to spurious results (Brooks, 2008).

The study adopted Kwiatkowski-Philips-Schmidt-Shin (KPSS) unit root test. This test was preferred to other unit root tests because it eliminates the possible low power against stationary near unit root processes which characterize Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests (Brooks ,2008). Under the KPSS, the null hypothesis is that the variables are stationary . This means if the KPSS statistics is less than the Mckinnon critical variables, the time series is said to be stationary hence the null hypothesis cannot be rejected.

**Table 4. 2: Unit root Test Results**

Variable		KPSS Test	Critical Value at 5%	Conclusion
		Intercept		
Per Capita Income	C-level	0.062998	0.463000	Stationary
Primary Completion Ratio	C-level	0.317737	0.463000	Stationary
Public Expenditure on Primary Education	C-level	0.544785	0.463000	Not Stationary
	C & T level	0.140248	0.146000	Stationary
Primary Teacher Quality	C-level	0.605073	0.463000	Not Stationary
	C & T level	0.125506	0.146000	Stationary
Primary Pupil-Teacher Ratio	C-level	0.412980	0.463000	Stationary
Public Expenditure on Secondary Education	C-level	0.338983	0.463000	Stationary
Secondary Pupil Teacher Ratio	C-level	0.316830	0.463000	Stationary
Secondary Teacher Quality	C-level	0.621167	0.463000	Not Stationary
	C & T level	0.112087	0.146000	Stationary
Secondary Transition Ratio	C-level	0.638580	0.463000	Not Stationary
	C & T level	0.104494	0.146000	Stationary
Urban Population Growth	C-level	0.597058	0.463000	Not Stationary
	C & T level	0.123417	0.146000	Stationary

Source: Computed from research data, 2015.

From the results presented in tables 4.2 the variables were found to be stationary. Per Capita Income, Primary Completion Ratio, Primary Pupil-Teacher Ratio, Public Expenditure on Secondary Education, Secondary Pupil Teacher Ratio, were stationary at levels with

intercept. Public expenditure on primary education, primary teacher quality, secondary teacher quality, secondary transition rate and urbanisation were found to be stationary at levels with intercept. This is because absolute values of the computed KPSS in all series were less than the Mckinnon critical values for rejection of the null hypothesis at 5 per cent level of significance. From the unit roots results it can be concluded that the variables are integrated of order 1(0), hence there was no reason to carry out co-integration analysis of the variables because it is assumed when all the variables are stationary a long run relationship exist.

#### **4.3.2 Correlation Analysis Results**

High presence for correlation between the independent variables was tested based on the partial correlation coefficients as advanced by Farrar and Glauber (1967). To assess the extent of multicollinearity and significant of the variables, correlation analysis test was done on all the models with all the regressors. The findings of correlation analysis are reported in Table 4.3.

**Table 4. 3: Correlation Matrix**

	PCR	STR	PQT	SQT	PPEE	SPEE	PTPR	SPTR	PCI	URBP
<b>PCR</b>	1.00									
STR	0.08	1.00								
Sig level	0.63									
PQT	0.32	0.53	1.00							
Sig level	0.05	0.00								
SQT	0.19	0.55	0.76	1.00						
Sig level	0.28	0.00	0.00							
PPEE	-0.11	-0.51	-0.63	-0.32	1.00					
Sig level	0.02	0.00	0.00	0.00						
SPEE	-0.03	-0.12	-0.72	-0.70	0.83	1.00				
Sig level	0.85	0.00	0.00	0.00	0.00					
PTPR	0.67	0.50	0.43	0.42	-0.34	-0.32	1.00			
Sig level	0.00	0.00	0.00	0.01	0.08	0.88				
SPTR	0.58	0.04	0.32	-0.24	0.13	-0.36	0.00	1.00		
Sig level	0.00	0.05	0.84	0.02	0.46	0.01	0.00			
PCI	-0.12	0.04	0.03	0.00	-0.08	-0.08	-0.009	-0.12	1.00	
Sig level	0.04	0.14	0.02	0.10	0.04	0.07	0.03	0.06		
URBP	-0.18	-0.56	-0.27	-0.48	0.73	0.70	-0.42	-0.26	-0.06	1.00
Sig level	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.05	

Source: Computations from research Data (2015)

From the correlation matrix on Table 4.3 the results shows that the two dependent variables correlates fairly with their independent variables. In the first model the variables were: per capita income, public expenditure on primary education, primary teacher quality, and primary pupil-teacher ratio which were fairly correlated. The second model had the following variables: public expenditure on secondary education, secondary pupil teacher ratio, secondary teacher quality and urban population growth which were all not highly correlated. This is because no two explanatory variables had correlation coefficient to a threshold of 0.8

and their p-values were all significant. Since no two explanatory variables were highly correlated it was concluded that the study will not drop any variable.

#### **4.4 Diagnostic Test Results**

In this study two equations 3.6 and 3.7 were estimated to achieve the first and second objectives. In the first model Primary Completion Rate (PCR) was regressed on the Public Expenditure on Primary Education, Per-Capita Income, Urban Population Growth, Primary Teacher Quality, and Primary Pupil-Teacher Ratio. In the second model Secondary Transition Rate was regressed on: Public Expenditure on secondary Education, secondary Teacher Quality, secondary students-Teacher Ratio, Secondary Teacher Quality, Per Capita Income and Urban Population Growth. Before making any conclusions from the study findings a sequence of diagnostic tests on the models was carried out to determine their statistical soundness.

##### **4.4.1 Residual Property Tests Results**

One fundamental requirement in the classical linear regression is that the regression error term must be normally distributed with zero mean and constant variance (Green, 2008). To guard against the effects of heteroscedasticity and autocorrelation and to ascertain normality, residual based test were performed on the output of each of the estimated equations. The results are as shown on Table 4.4

**Table 4. 4: Residual Properties for Model 1**

Type of test	Test statistics	model 1	model2
Histogram-Normality test	Jarque-Berra statistics	1.537367	6.802051
	Probability	0.764385	0.053339
ARCH LM Test	P-value of the observed R-squared	9.049290	4.402343
	Probability	0.9520	0.6224
Breusch-Godfrey LM test for serial correlation	P-value of the observed R-squared	9.084764	21.28066
	Probability	0.6141	0.07123

Source: Computation from research Data (2015)

The Jarque-Bera statistic from the histogram-normality test was 1.537367 and 6.802051 with p-values of 0.764385 and 0.053339 for the first and second models respectively. Since the probability values for the Jarque-Bera statistics were greater than 0.05 in each equation, the null hypothesis of normality of the regression residuals could not be rejected at 5 per cent significance level. This led to the conclusion that the regression residuals from the two estimated equations followed a normal distribution as required for models under classical linear regression models.

Durbin-Watson (DW) statistics for the two regression equations were 2.022 and 1.9238 respectively. Durbin Watson computed statistic is on the basis of the estimated residuals are in a range of 0 to 4. A value close to 2 represents no autocorrelation, but as these values move closer to extreme end of 0 and 4 it is an evidence of correlation. DW Values observed are close to 2 and a claim of autocorrelation cannot be sustained. However, DW is not useful in testing for higher order correlation which may involve lagged values.

The Lagrange Multiplier (LM) test for serial correlation, according to Breusch (1978) and Godfrey (1978) which is capable of handling higher order autocorrelation was considered appropriate in this study because it allows for lagged variables in the model (Green, 2008). The null hypothesis for this test is that there is no serial correlation, against the alternative that the residuals are autocorrelated. The high probability values for the F- statistic for the BG tests indicated that the null hypothesis of no serial correlation in the models could not be rejected. The B-G test for the models on table 4.4 had p-values of 0.61 and 0.071 which were all greater than 0.05 hence the null hypothesis of no autocorrelation could not be rejected at 5 percent level of significance. This implies that there was no serial correlation in the residual series from the regression.

The LM test for no ARCH was conducted and it included up to fifth lagged value of residuals per equation. From table 4.4, both equations p-value of R-Squared was found to be greater than 0.05. This led to the conclusion that the regression residuals from the two estimated equations were not heteroscedastic as required for models under classical linear regression models.

#### **4.4.2 Model Specification and Stability Tests**

Regression Specification Error Test (RESET) put forward by Ramsey (1969) to establish if there is any departure from the classical linear regression assumptions and detect specification errors in an equation. The test was carried out for the two estimated equations. The results are presented on Table on table 4.5.

**Table 4. 5: Ramsey RESET Test Results**

Dependent variable	No. of terms	Test Statistic		Conclusion
		F-statistic	Prob.(F-stat)	
Primary completion Rate	1	14.75143	0.0921	No misspecification error evidence
	2	7.037716	0.0612	
Secondary Transition Rate	1	5.26677	0.08312	No misspecification error evidence
	2	2.543184	0.1102	

Source: Computation from Research Data 2015

The p-values of the F-statistic were both found to be greater than 0.05. On the basis of the results it was concluded that there was no possibility of specification errors in both the models estimated. It was also concluded that the coefficients of the fitted variables were all not equal to zero at 5 percent significance level for the two models.

Stability of the parameters in the models, recursive estimations were conducted on each of the estimated equations. Recursive residual tests, CUSUM tests, CUSUM of Squares test, One-step probability Tests and N-step Probability Tests and Recursive Coefficient Tests were also performed. The findings are presented in Figures A1 through A12 in Appendix 3. All of these tests pointed at the conclusion of parameter stability or constancy since all the residuals lie within the dual standard error bands.

#### **4.5 Effect of Public Expenditure on Education Outcomes**

This section presents the empirical results on the effects of public expenditure on education outcomes in Kenya. The results are presented and discussed in the following section

#### 4.5.1 Effect of Public Education Expenditures on Primary School Completion Rate in Kenya

To determine the effect of public education expenditures on primary school completion rate in Kenya, Primary Completion Rate (PCR) was regressed on the Public Expenditure on Primary Education (PEE), Per-Capita Income (PCI), Urban Population Growth (URB), Primary Teacher Quality (PQT), and Primary Pupil-Teacher Ratio (PTR). The output of estimation is presented in Table 4.6

**Table 4. 6: Effect of Public Expenditure on Education on Primary School Completion Rate in Kenya**

Dependent Variable: Primary Completion Rate				
Variable	Coefficient	Std error	t-Statistic	Prob.
Primary Teacher Quality	1.71779**	0.625575	2.741171	0.0104
Public Expenditure on Primary Education	0.274068	0.183745	1.4491	0.1470
First Lag of Public Expenditure on Primary Education	0.3244***	1.26590	2.1156	0.0029
Primary Pupil-Teacher Ratio	0.48667	0.242096	0.152427	0.8892
First lag of Primary Pupil-Teacher Ratio	0.031727	0.37809	0.23467	0.7349
Second Lag of Primary Pupil-Teacher Ratio	1.23650**	0.41670	3.7620	0.0421
Per Capita Income	9.7715	17.92847	0.54504	0.3325
First Lag of Per Capita Income	0.157845*	11.6527	3.3399	0.062
Urban Population Growth Rate	-21.1300*	0.41670	-2.5539	0.0767
Constant	-34.3367	17.16402	-3.489022	0.016
<b>Adjusted R-squared : 0.641003</b>			<b>F-Statistic 6.00351</b>	
<b>Durbin-Watson stat : 2.022</b>			<b>Probability (F-Statistic) 0.000014</b>	

Source: Computations from research Data (2015). The asterisks (\*\*\*), (\*\*) and (\*) implies that the coefficient is significant at 1%, 5% and 10%, respectively

From Table 4.6 the coefficients of first lag of public expenditure of primary education, first lag of per-capita income, primary teacher quality, and second lag of primary pupil-teacher ratio (PTR) and urban population growth are statistically significant. This is a pointer that

these variables affect primary completion rate in Kenya. The Adjusted R-squared is 0.641003 which indicates that 64 percent of the variations in primary completion rate in Kenya over the period 1980-2013 can be explained by public expenditure of primary education , per-capita income , primary teacher quality , urban population growth rate and primary pupil-teacher ratio (PTR). The remaining 36 percent of the changes in the primary completion rate are explained by variables not included in the model. The p-value (0.000014) of the F-statistic indicated the overall model was significant in explaining the relationship.

The coefficient of public expenditure on primary education in the immediate period was not significant but in the first lag. The coefficient of the first lag of public expenditure on primary education is positive with a value of 0.324399 at 1 percent level of significance. This indicates that 1 percent increase in public expenditure on primary education leads to about 0.32 percent increase in the primary completion rate but with a lag of one period. This means that the effect would not be felt in the short run. These findings are at par with Kaur and Misra,(2003) whose results were that increased spending in primary education has effects on primary education outcomes in India..

The other variables that were found to be significant in explaining the variations in PCR include primary teacher quality, primary pupil-teacher ratio, urban population growth rate and per capita income. The coefficient of primary teacher quality is positive with a value of 1.72 and significant at 5 percent level. This means that when primary teacher quality improves by 1 percent, the primary completion rate increases by about 1.72 percent. This concurs with Vaideesh (2012) who found out that there is a positive relationship between teacher quality and PCR in Brazil.

The coefficient of Primary pupil teacher ratio in the immediate period was not significant and even for the first lag. Primary pupil-teacher ratio proxied for school resources whose

coefficient is positive with a value of 1.24 at 5 percent. This indicates that a 1 percent change in school resources leads to 1.24 percent increase in primary completion rate but with a lag of two periods. This indicates that school resources affect education outcomes positively which concurs with Todd and Wolpin (2003) that school resources affect education outcome positively

The coefficient of per capita income was found not to be significant in the immediate period but in the first lag. The coefficient of Per capita income was found to be positive with a value of 0.16 at 10 percent level of significance in the second lag. This means per capita income helps in explaining the variations in the primary completion rate and that 1 percent change in per capita income would lead to about 0.16 percent increase in the primary completion rate in the long run. These findings are consistent with previous empirical findings of Dauda (2011) and Iyer (2009) which concluded that PCI affects education outcomes positively.

Urban population growth rate had negative coefficient but significant at 10 percent level which is -21. This indicates that when urban population increase it leads to 21 percent decline in PCR. This contradicts Dauda (2009) that urban population growth rate increases education outcomes in Nigeria. This could be attributed to poverty levels in urban areas due high unemployment rates in Kenya .

#### **4.5.2 Effect of Public Education Expenditures on Secondary School Transition Rate in Kenya**

To determine the effect of public education expenditures on secondary school transition rate in Kenya, Secondary Transition Rate was regressed on, Public Expenditure on secondary Education, secondary Teacher Quality, secondary students-Teacher Ratio, Per Capita Income and Urban Population Growth as shown on Table 4.7

**Table 4. 7: Effect of Public Education Expenditures on Secondary School Transition Rate in Kenya**

Dependent Variable: secondary Transition Rate				
Variable	Coefficient	Std error	t-Statistic	Prob.
Secondary Teacher Quality	0.367435**	0.274075	4.342160	0.0221
Secondary student-Teacher Ratio	0.034422	0.23789	1.453558	0.5625
First Lag of secondary student-Teacher Ratio	0.540277***	0.103572	5.216437	0.0000
Urban Population Growth Rate	-2.86439	2.1564	0.437862	0.2326
First lag of urban population growth rate	-6.23789***	8.278192	-3.55784	0.0013
Public Expenditure on Secondary Education	0.45239	0.1235	0.509237	0.2355
First lag of public expenditure on secondary education	0.797021***	0.261615	3.046551	0.0050
Per Capita Income	0.1922	12.36056	1.487698	0.7549
First Lag of Per Capita Income	0.1867	12.4237	1.792321	0.1478
Second lag of per capita income	2.3978*	1.4532	3.792321	0.07942
Constant	-30.90374	34.78723	-0.888364	0.3819
<b>Adjusted R-squared</b>	<b>0.5960</b>		<b>F-Statistic</b>	<b>6.2297</b>
<b>D-W Statistic</b>	<b>1.9238</b>		<b>Probability (F-Statistic)</b>	<b>0.00000</b>

Source: Computations from research Data (2015). The asterisks (\*\*\*), (\*\*) and (\*) implies that the coefficient is significant at 1%, 5% and 10%, respectively.

From Table 4.7 the coefficients of the variables were found to be statistically significant though some did so after the first lag and others second lag. These variables are secondary teacher quality, first lag of secondary pupil-teacher ratio, urban population growth rate, public expenditure on secondary education, and second lag of per capita income.

The Adjusted R-squared is 0.5960 which indicates that about 60 percent of the variations in secondary transition rate in Kenya over the period 1980-2013 can be explained by public

expenditure on secondary education , per-capita income , secondary teacher quality , secondary student-teacher ratio and urban population growth rate . The remaining 40 percent of the changes in the secondary transition rate are explained by variables not included in the model. The p-value (0.0000) of the F-statistic indicated the overall model was significant in explaining the relationship.

For the public expenditure on secondary education, the coefficient was found to be positive with a value of 0.79 at 1 percent level of significance after the first lag. This shows that 1 percentage increase in Expenditure on Secondary Education would lead to about 0.79 percent increase in secondary transition rate although not in the short run. These results indicate that public expenditure on secondary education is an important factor to consider for improving Secondary transition rate.

The coefficient of secondary teacher quality was found to be positive with a value of 0.36 at 5 percent level of significant. This means that a 1 percent change in secondary teacher quality would lead to about 0.36 percent increase in secondary transition rate in the short run.

School resources seem to be significant in explaining secondary transition rate proxied by secondary pupil-teacher ratio. The coefficient of first lag of school resources was found to be positive with a value of 0.54 at 1 percent level of significant. This implies that a 1 percent increase in the school resources would lead to about 0.54 percent increase in Secondary transition rate after the first period and not in the short run.

Urban population growth rate had a negative coefficient of 6.23 which was not as expected, at 5percent level of significance. This indicates that 1 percentage increase in urban population growth rate leads to 6.23 percent decline in secondary transition rate. The result contradicts

Dauda (2011) whose findings were that urbanisation affects education outcome positively in Nigeria.

The coefficient of per capita income was not significant in the immediate period and also in the first lag but in second lag. This means that per capita income has no effect in the short run but in the long run. The coefficient was significant and positive as was expected with a value of 2.4 at 10 percent level of significance. This means that 1 percent increase in per capita income would lead to about 2.4 percent increase in the secondary transition rate two periods later. These findings concurred with empirical findings of Dauda (2011) and Iyer (2009).

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

#### 5.1 Introduction

This chapter comprises the summary of the study, conclusions, policy implications and areas for further research. The purpose of this study was to establish the effect of public education expenditure and education outcomes in Kenya.

#### 5.2 Summary of findings

This study was carried out to investigate effect of public education expenditure and education outcomes in Kenya. It was motivated by the fact that the government of Kenya had over the years tried to improve educational outcomes through various policies, but the targeted outcomes have not been achieved so far. The study estimated two models, primary completion rates and secondary school transition rates as the dependent variables. The study used time-series data for the period of 1980-2013 applying OLS regression technique. Diagnostic test like assessment of residual properties and stability test were performed on each model before analysing the results.

Empirical findings of primary completion rate (PCR) model and secondary transition rate (STR) model revealed that these education outcomes are improved by public education expenditure. From the first model the coefficient of the first lag of public expenditure on primary education was positive and significant in explaining variations in PCR, meaning the effects of public expenditure on primary education cannot be experienced within the short period. The coefficient of public expenditure on secondary education was positive and significant also after the first lag indicating the effects public expenditure on secondary transition cannot be within the short run.

The coefficients of teacher quality was positive and significant in both PCR and STR. School resources proxied by teacher pupil ratio had positive and significant coefficients which can

help in explaining variations in both PCR and STR though, in PCR it was in the second lag and in STR it was in the first lag. The coefficient of the first lag of per capita income was found to affect PCR positively but in STR it was in the second lag. The coefficient of urban population growth rate was found to be negative but significant in explaining both PCR and STR

### **5.3 Conclusions**

Following the study findings it was revealed that public education expenditure was important in improving education outcomes. The finding of this study as well, agreed with previous empirical results, (Kaur and Misra 2003; Dauda, 2011; Otieno and Colcough, 2010) that public spending on education improves education outcomes. However the study found out other independent variables which are teacher quality, school resources and Per Capita Income all contributes to improving education outcomes with urban population growth rate affecting education outcome negatively.

### **5.4 Contribution to knowledge**

This study reveals that teacher quality, school resources and per capita income are important factors in improving education outcomes. Therefore as education professionals continue to agitate for increased education spending to improve education outcomes, these factors should also be considered. This information will be important to policy makers in allocating education resources for provision and improvement of education outcomes.

### **5.5 Policy implications**

The coefficient of public educational expenditure has a positive and significant relationship impact on education outcome. This empirical evidence supports the argument that the role of public investment in human capital development cannot be overemphasized in a developing nation like, Kenya. For rapid economic and sustainable economic progress, investment in education should be regarded as very important. Public intervention in education can lead to

improvement in living standards, enabling equitable distribution of wealth and help reduce poverty index.

**The vision 2030 places great emphasis on social services like education which would help in improving the literacy levels of the Kenyan citizens. The social pillar in vision 2030 singles out education and training as a vehicle which would drive Kenya into becoming a middle-income economy. Kenyan education professionals should continue agitating the government to increase education budget allocation to 29% of total government budget as agreed upon by United Nations Education and Science Organisation (UNESCO) for provision of education services and improving education outcomes. Therefore this study recommends that policy makers and practitioners should ensure that the reallocations of education resources are done in such a way that the gains from education spending could be optimized.**

The study also found out that there are other factors like teacher quality, school resources and per capita income which have positive effect on education. This study also recommends that government should target to improve teacher quality as it is found to affect education outcomes positively. Stakeholders of schools should ensure schools have enough school resources to help in improving education outcomes. Per capita income was found to affect education positively. This underscores the fact that sustainable per capita income is a necessary condition for enhancing social outcomes and Kenyan government should try and create an enabling environment for private investors to create jobs opportunities in order to enhance the earning capability of the people.

### **5.6 Areas for further research**

A number of issues need to be understood about how public expenditure policies and cultural practises affect education outcomes in Kenya. The study recommends that further research should be done on the effect of public education expenditure on dropout rates and repetition rates which affect primary completion rate and secondary transition rates. This would

provide an understanding on the effect of these factors in affecting education outcomes in Kenya and also to help policy makers design appropriate measures to promote education outcomes in Kenya.

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## APPENDIX 1: ECONOMETRIC RESULTS

**Table A 1: Regression Results for Equation 4.7**

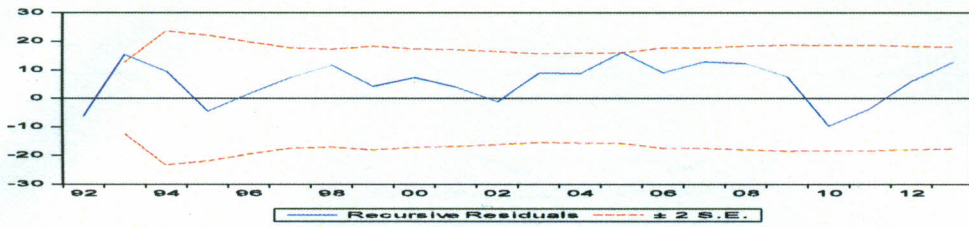
<b>Dependent Variable: PCR</b>				
<b>Method: Least Squares</b>				
Sample (adjusted): 1983 2013				
Included observations: 31 after adjustments				
Convergence achieved after 43 iterations				
MA Backcast: 1982				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
PQT	1.717795	0.625575	2.741171	0.0104
PPEE	0.274068	0.183745	1.4491	0.1470
PPEE(-1)	0.324399	1.26590	2.1156	0.0029
PTPR	0.48667	0.242096	0.152427	0.8892
PTPR(-1)	0.031727	0.37809	0.23467	0.7349
PTPR(-2)	1.23650	0.41670	3.7620	0.0421
PCI	9.7715	17.92847	0.54504	0.3325
PCI(-1)	0.157845	2.6527	3.3399	0.062
URBP	-21.1300	0.41670	-2.5539	0.0767
Constant	-34.3369	17.16402	-3.489022	0.0016
AR(1)	0.57867	0.34767	1.09856	
MA(1)	0.59679	0.29087	1.74589	
R-squared	0.663557	Mean dependent var		54.57658
Adjusted R-squared	0.641003	S.D. dependent var		12.4367
S.E. of regression	8.98734	Akaike info criterion		7.18679
Sum squared resid	886.709	Schwarz criterion		7.45659
Log likelihood	-116.453	Hannan-Quinn criter.		7.28967
Durbin-Watson stat		2.022		
F-Statistic		6.00351		
Probability (F-Statistic)		0.000014		
Inverted AR Roots		.53		
Inverted MA Roots		.57		

Source: Computations from the Research Data

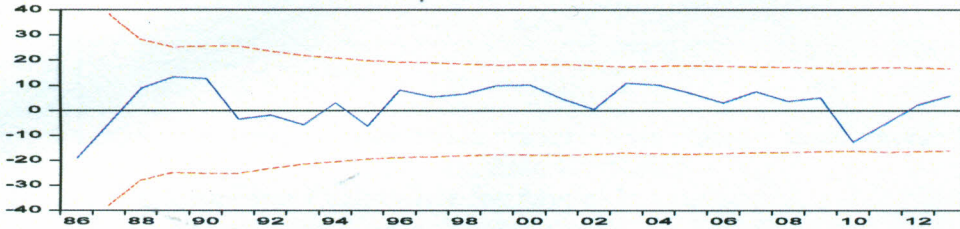
**Table A 2: Regression Results for Equation 4.8**

Dependent Variable: STR				
Method: Least Squares				
Sample (adjusted): 1982 2013				
Included observations: 32 after adjustments				
Convergence achieved after 111 iterations				
MA Backcast: OFF (Roots of MA process too large)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SQT	0.367435	0.274075	4.342160	0.0221
STSR	0.034422	0.23789	1.453558	0.5625
STSR(-1)	0.540277	0.103572	5.216437	0.000
URBP	-2.86439	2.1564	0.437862	0.2326
URBP(-1)	-6.237893	8.278192	-3.55784	0.0013
SPEE	0.45239	0.1235	0.509237	0.2355
SPEE(-1)	0.797021	0.261615	3.046551	0.005
PCI	0.1922	12.36056	1.487698	0.7549
PCI(-1)	0.1867	12.4237	1.792321	0.1478
PCI(-2)	2.3978	1.4532	3.792321	0.07942
Constant	-30.90374	34.78123	-0.888364	0.3819
AR(1)	0.55672	0.325870	2.564776	0.1148
MA(1)	1.4221	0.288676	4.23907	0.0002
R-squared	0.64789	Mean dependent var		47.22398
Adjusted R-squared	0.5960	S.D. dependent var		11.62278
S.E. of regression	7.90654	Akaike info criterion		6.3528
Sum squared resid	1453.775	Schwarz criterion		6.6223
Log likelihood	-102.786	Hannan-Quinn criter.		6.8732
Durbin-Watson stat		1.9238		
F-Statistic		6.2297		
Probability (F-Statistic)		0.0000		
Inverted AR Roots		.56		
Inverted MA Roots		1.47		
	Estimated MA process is noninvertible			

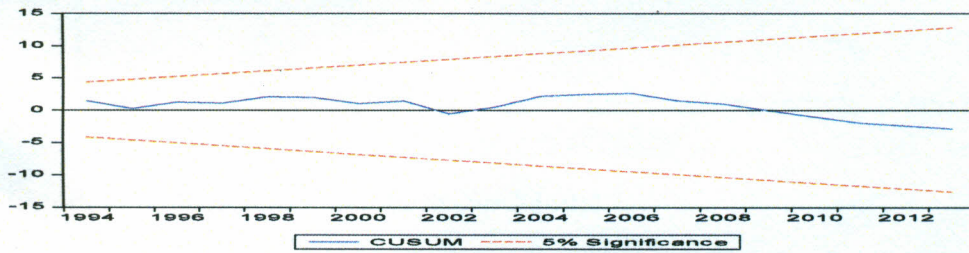
Source: Computations from the Research Data



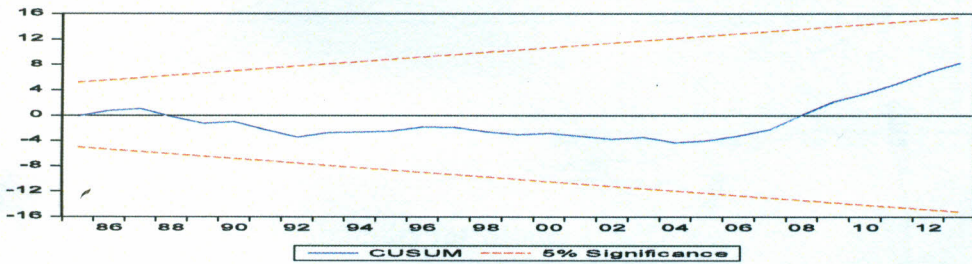
**Figure A1: Recursive Residuals from Model 1**



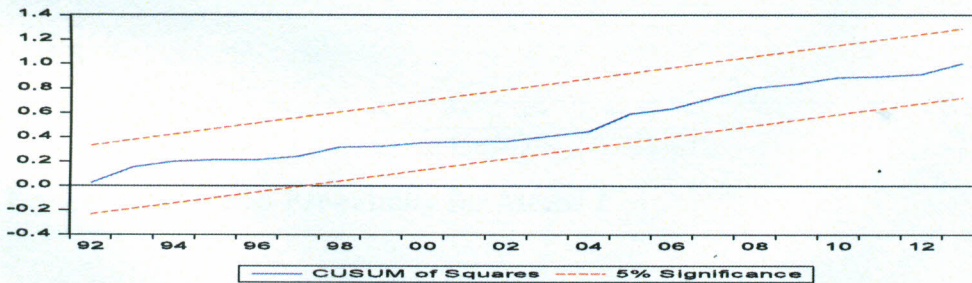
**Figure A2: Recursive residuals from Model 2**



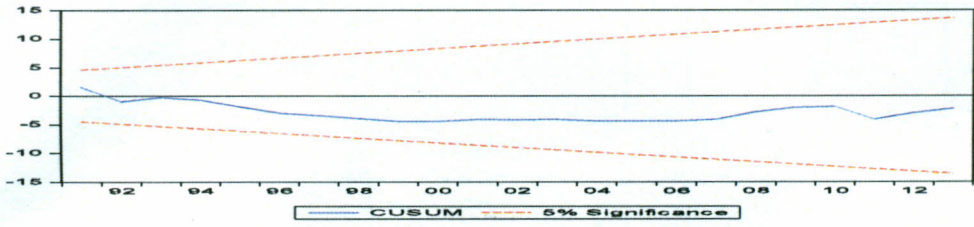
**Figure A3: CUSUM test for Model 1**



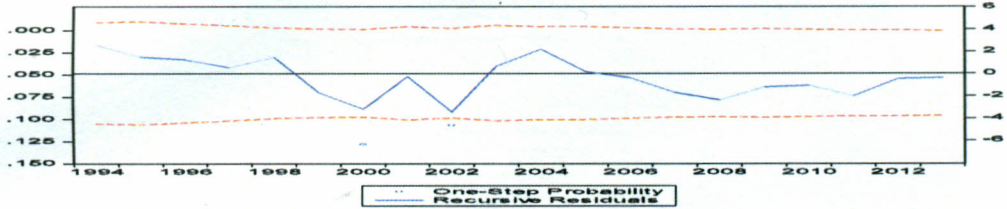
**Figure A4: CUSUM test for Model 2**



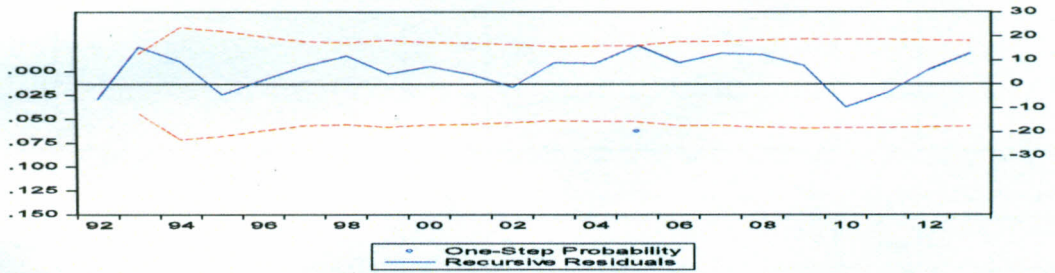
**Figure A5: CUSUM of Squares test for Model 1**



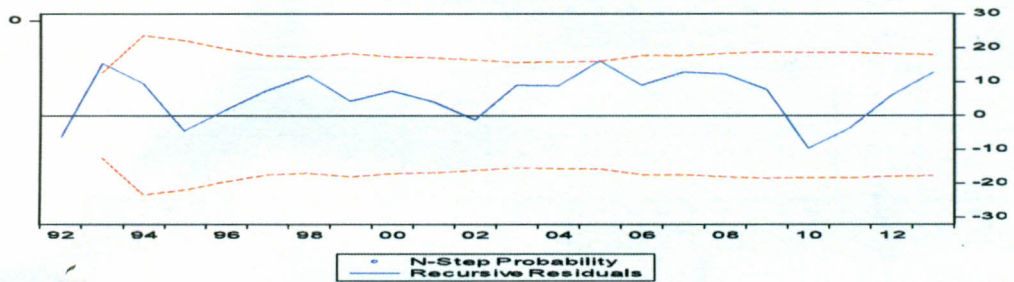
**Figure A6: CUSUM of Squares test for Model 2**



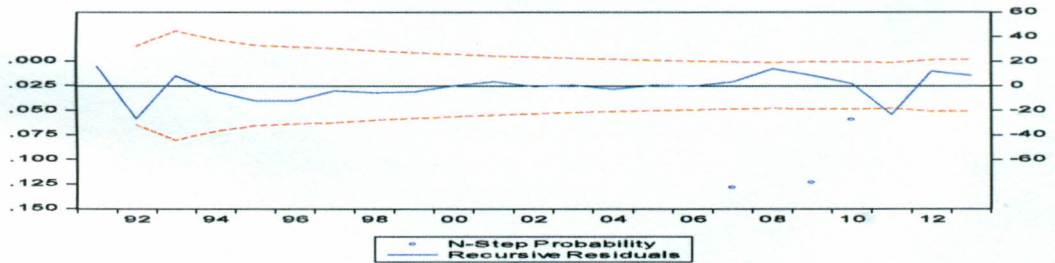
**Figure A7: One-Step Probability for Model 1**



**Figure A8: One-Step Probability for Model 2**



**Figure A9: N-Step Probability for Model 1**



**Figure A10: N-Step Probability for Model 2**

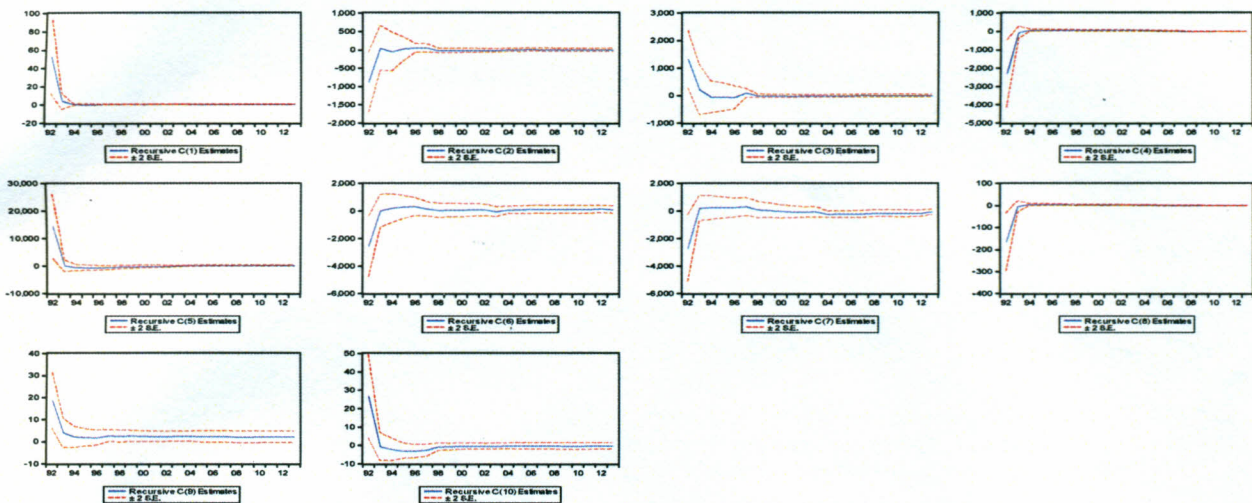


Figure A11: Recursive Coefficient Tests on Model 1

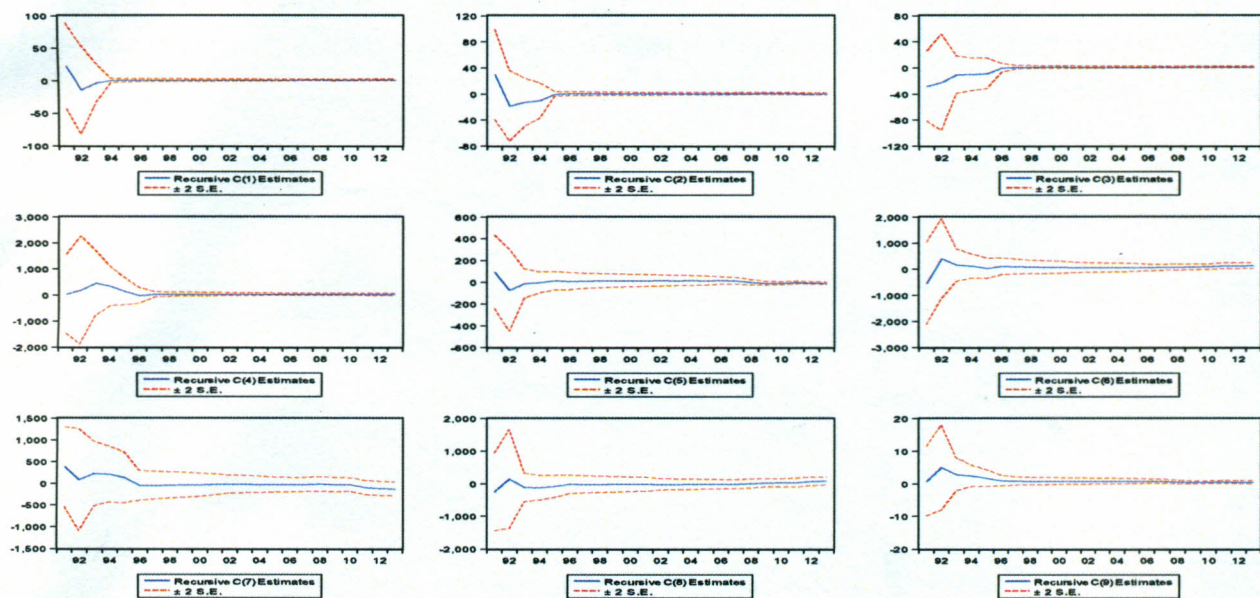


Figure A12: Recursive Coefficient Tests on Model 2

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