UNIVERSITY OF GHANA - LEGON

THE PRICE AND INCOME ELASTICITY OF DEMAND FOR EDUCATION IN GHANA: EMPIRICAL EVIDENCE FROM HOUSEHOLD LEVEL DATA

BY

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DECLARATION BY CANDIDATE

"I **KUTORTSE, DIVINE KWAKU** declare that this Thesis with the exception of quotations and references contained in the published works which have all been identified and acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere"

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ABSTRACT

Ghana government recognizes the importance of education on social outcomes such as growth, poverty, health, productivity, population growth, among others things, through Human Capital Theory introduced by Becker in 1964. At the household level, price of education and household income are factors household consider in demanding education. In view of that, this study seeks to estimate the sensitivity of household demand for each level of education in Ghana with respect to price of education and household income.

To achieve this, the thesis adopted the Quadratic Almost Ideal Demand System (QUAIDS) model and the Two- Stage Budgeting process factoring a limited number of household demographic factors to analyze household price and income elasticity of demand for education in Ghana. The study found that, education at each level is a normal necessity good in Ghana, the demand of which an increase in household income raises household demand for education. The study found that Ghanaian households are more income elastic to demand for Basic education.

With respect to price effects, the study found that, household demand for all levels of education was price inelastic and demand for education was more price elastic as one moves from basic to secondary education. Notwithstanding, the price elasticities estimated are quite high suggesting that, Ghanaian households are burdened with extra education cost aside the regular school fees they pay. Most especially, the study found that rural household demand for secondary education was more price and income elastic than urban households.

These results are relevant for policy formulation and implications for stakeholders. The study recommends that government should standardize all school fees across all education level in the country whiles eliminating unapproved fees charged by school managers. Also government should consider improving the incomes of household that are financially unstable through entrepreneurship to enable parents make enough money to spend on their children's education. The study further recommends that Government should institute merit scholarship program for rural households especially young girls.

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Finally, much credit goes to all who contributed in one way or the other towards the success of this work. They will forever be fondly remembered.

DEDICATION

This work is dedicated to my late mum Miss Beatrice Enyonam Adzafoli. Her dedication to the teaching profession guided my choice of topic. I also dedicate this work to my two siblings, Patricia Kutortse and Divina Kutortse; my grandmother, Miss Gladys Kutortse and; my uncle Mr. Eric Seddy Kutortse who encouraged me to further my education.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

MDG	Millennium Development Goals
WB	World Bank
PRSP	Poverty Reduction Strategy Policies
WEF	World Economic Forum
UNDP	United Nations Development Program
SSA	Sub Sahara Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
GPRS	Ghana Poverty Reduction Strategy
GSGDA	Ghana Shared Growth and Development Agenda
ERP	Economic Recovery Program
GDP	Gross Domestic Product
GER	Gross Enrolment Ratio
PCI	Per Capita Income
BECE	Basic Education Certificate Examination
WASSCE	West Africa Secondary School Certificate Examination
SDG	Sustainable Development Goals
DFID	Department for International Development
GETFUND	Ghana Education Trust Fund
GLSS	Ghana Living Standards Survey
OECD	Organization of Economic Cooperation and Development
IDA	International Development Association
IMF	International Monetary Fund
QUAIDS	Quadratic Almost Ideal Demand System
GSS	Ghana Statistical Service
HDI	Human Development Index
SHS	Senior High School
JHS	Junior High School

CHAPTER ONE

1.1 Introduction

The recent introduction of human capital economics can be traced far back to the human capital theory introduced by the works of Becker in 1964. Ever since, the study of education in economics remains a prime policy target for all development stakeholders especially those in developing countries. Specifically, education is largely considered as one of the key contributors to human capital improvement and increased productivity for economic growth and equity, social stability and stable democratic values, whiles providing better employment opportunities for individuals, reducing poverty, and improved quality of life. By investment in education, this thesis refers to the financial resources committed in getting an individual (in this case household member) educated. Education in simple terms could be defined as the process of acquiring values, attitudes, knowledge including skills to fully enhance individuals' capacities and societal wellbeing.

Indeed, there are adequate literature to back the crucial role education plays in the socio economic growth and development of developed and emerging countries. The justification for quality and accessible education is premised on its impact on economic growth. (Coulombe et al, 2004). Sianesi and Van Reenen (2003) also estimated that, for every additional year a child spends in school, the economic growth rate rises by 0.3 to 3 percent per year. Schultz (1999) estimated the positive impact of education in fostering poverty reduction and promoting individual life income. Psacharopoulos (1994) and Boateng et al. (2000) similarly established a strong negative correlation between poverty and level of schooling. This suggest that, higher levels of schooling reduce poverty severity. Education equally has a positive impact on the use of modern agricultural

methods and technologies to increase efficiency and output. (Foster and Rosenzweig, 1996). Education have also positively impacted on health systems, resulting in increased life expectancy and reduced birth rates, which further promote strong labor force for increased productivity and growth (Schultz, 1999 and 2002). Overall, Education basically is seen as engine for economic growth and development.

In view of this, the justifiable call in promoting education by development economists, in raising incomes of economies, especially emerging countries, has been equally matched by greater enthusiasm from international development partners, who over the past decades have continuously championed the crusade to improve education in developing countries. This is because, education is perceived to be key in achieving all the various goals set by these international development organizations and not necessarily devoting to increased spending, is the efficient policy intervention to help meet these goals. An example is the United Nations International Children's Emergency Fund UNICEF (2010), which considers clearly the positive impact of education in meeting the seven other goals enshrined in its objectives. In the Human Development Index (HDI) measurement, the United Nations Development Programme also emphasizes on education as one of its measurement indicator. The Dakar Framework for Action in 2000 supported by World Bank, incorporated quality education in its target by "ensuring that by 2015 all children, particularly girls, children in difficult circumstances, and those belonging to ethnic minorities have access to and complete free and compulsory education of good quality" (UNESCO, 2000) . In view of this commitment by development partners and organizations, the scope of international development assistance to developing economies especially Africa, has shifted to improving social conditions such as education. This is because, these development organizations believe that, spending on

social indicators such as education and health will hasten and assist developing economies meet their MDGs.

Over the past years, developing economies have implemented economic reforms to their education systems having identified the significant role of education in promoting economic growth and development whiles alleviating poverty. For instance, the introduction of the Poverty Reduction Strategies Papers, was meant to help emerging economies identify and monitor social priority areas such as education, through increased school enrollment, affordable quality education and increased school participation. The commitment of developing economies in promoting education is evident in their education financing capabilities.

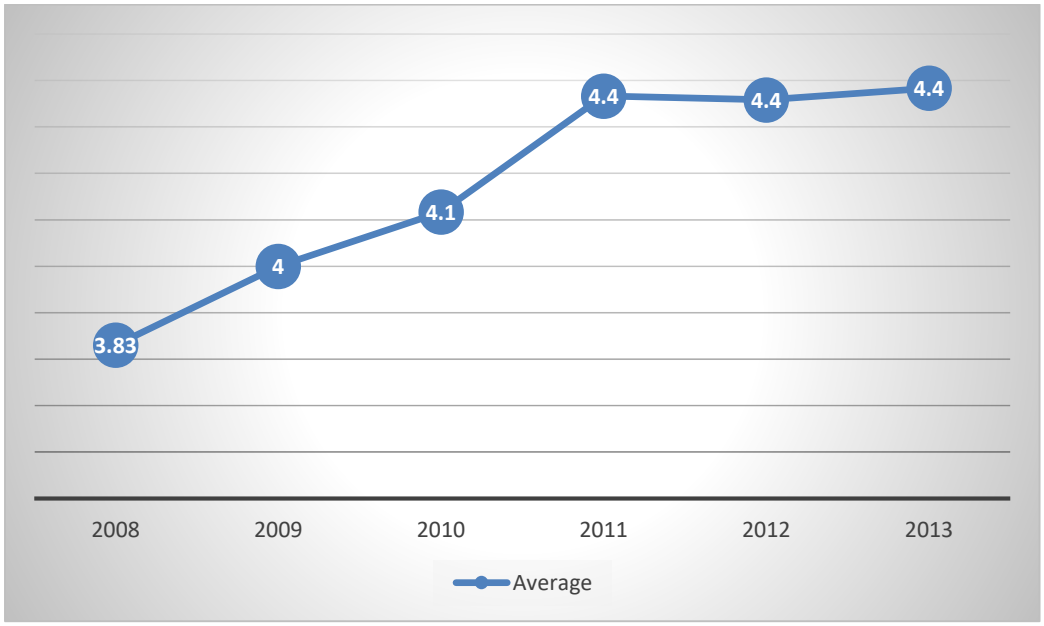
1.1.1 Public Education Financing

One of the ways in identifying government commitment to the education sector is by assessing how much government spends on education out of its total public expenditure in percentage terms. However, to appreciate further the strength of that commitment, then one need to analyze government education financing as percentage of the country's GDP. Over the past years, government education expenditure in Sub Saharan Africa (SSA) has risen and in fact, data suggest that, government education expenditure represents 18.3 percent of government total expenditure. (UNESCO Report, 2011). Even though SSA countries are characterized with low Gross Domestic Product, the good news however is that, SSA countries have budgeted the largest percentage of government education expenditure in the world at 18.4 percent, approximately 0.9 percent above the Pacific East and Asia. (State of Education in Africa Report, 2015) Figure 1.1 and Table1.1 provides data on public education expenditure for some selected Sub Saharan African countries including Ghana, Gambia, Chad, Mali, Senegal, South Africa, etc. It is evident that, government

education as a share of GDP in sub-Saharan Africa on average has been increasing. Overall, Primary and Secondary education expenditure took a chunk of government education expenditure as a share of GDP.

Unfortunately, these high Education expenditure contributions from sub Saharan governments are just not enough to promote quality education needed to spur socio-economic growth. It is discouraging however that, inadequate education funding from most of these developing countries including Ghana, makes them to be victims of poor school systems such as; high number of schools under trees, high number of untrained teachers, high student to teacher ratio and high cost of education especially for the rural poor households.

Figure 1.1: Average Government Educational Expenditures as a Share of GDP, Sub-Sahara Africa



Source: UIS database

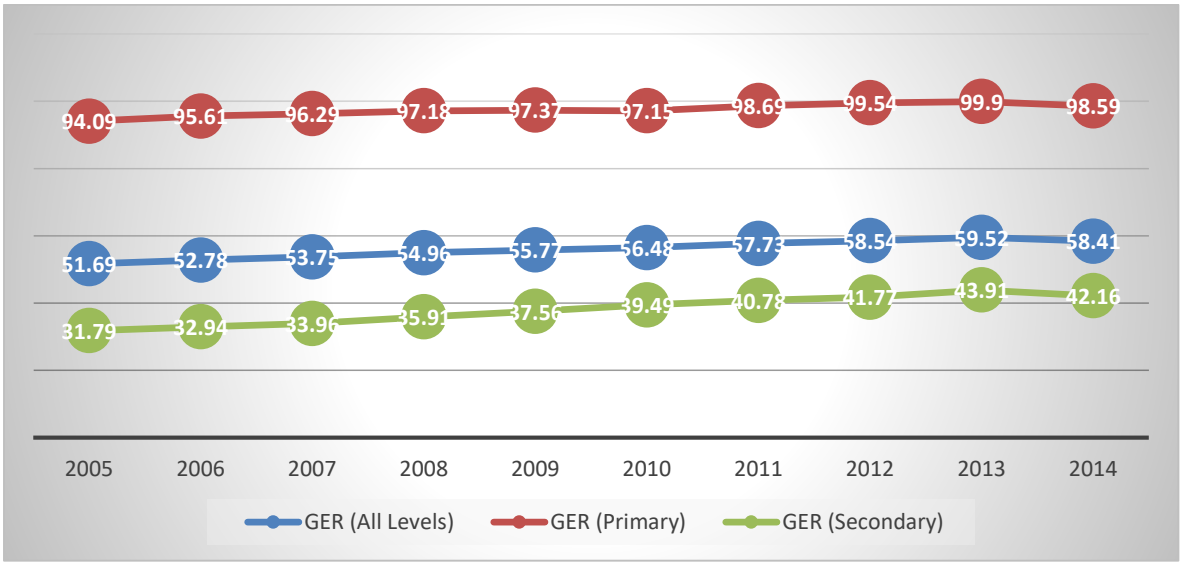
Table 1.1: Intra-Sectorial Allocation of Government Educational Expenditure (% of GDP), 2014

Country	Pre Primary	Primary	Secondary	TVET	Tertiary
Côte d'Ivoire	0.13	1.85	1.76	0.24	0.99
Ghana	0.45	1.34	2.28	0.19	1.18
Mali	0.01	1.61	1.28	0.43	0.81
Niger	0.30	3.50	1.95	0.38	0.93
Senegal	0.21	2.28	2.46	0.60	2.13
South Africa	0.92	2.34	1.85	0.06	0.73
Togo	0.07	2.87	0.85	0.30	1.06

Source: UIS data

Gallagher (1993) and Psacharopoulos and Patrinos (2002) estimated the positive impact of public funding on household education attainment, thus emphasizing the need for government to invest into the sector. The outcome of government education expenditure on school systems is evident in Gross Enrollment Ratio (GER) in SSA. Between the periods 2005 to 2014, the GERs of each education level grew substantially in SSA. Primary GER increased from 94.09% to 98.59%; secondary GER increased from 38.21% to 48.8%; whiles overall, total GER for all levels of education (from primary to tertiary) increased from 52.69% to 58.41% during the said period. This is well explained in figure 1.2.

Figure 1.2: Gross Enrollment in Sub-Sahara Africa by Levels



Source: UIS data (2005- 2014)

1.1.2 Household Education Funding (Private Funding)

Fundamentally, Education funding has both public (government) and private (largely household) sources. Government education funding is usually complemented by other sources including households, external development organizations, religious institutions, non-governmental organizations (NGOs), private companies and other associations. That means, besides government's public funding of formal education, households also contribute significantly to their children education privately, as they see this option as a means of getting out of poverty. Household education expenditure has become a necessary and growing concern in SSA countries simply because of the limited public resources available to government to fully fund the expansion of all education systems in developing countries.

Often times, most of government policies only consider the direct cost incurred by households by way of tuition and registration fees. They often neglect the indirect cost such as extra class fees,

parent teacher association dues, private home tuition fees, teacher motivation dues, school management dues, textbooks fees, transportation cost, etc., often incurred by households. These ignored indirect costs of education incurred by households could rise and be severe enough to discourage household demand for education, no matter the significant effort by government to make public education free. High indirect cost of education raises the opportunity cost of education to households and this is translated into low rate of school participation and enrollment. Citing a typical case of Cambodia, Raja Bentaouet and Nicholas Burnett (2004) found that, indirect household education expenditure accounted for approximately 21 percent of household total education expenditure. With this understanding, it is a right call for this study to investigate household demand for education considering all cost of education and not just the tuition cost**.** Table 1.2 provides a conceptual framework for classifying household education expenditure.

Table 1.2: Conceptual Framework for Household Education Expenditure

	Characteristics Of Expenditure		Types Of Expenditures
Expenditure included as household education expenditure	Payments to public and private educational institutions	Expenditure on educational activities	**Registration fees or any school or tuition fees (public/private)** • Fees, dues and contributions to schools or parents' associations. • Exams fees at each level of education
		Expenditure on ancillary services	• For boarding schools or university hall residences • For canteens, or restaurants • Transport fees to and back from school
	Purchases associated with schooling	Direct expenditure related to attending school	• School Uniforms • Textbooks • School supplies including stationaries. • Sporting equipment • Means of transport to and from school
	Expenditure on services complementary to education		• Private Home Tuition • Extra Classes such as Vacation classes
Expenses that are not captured as direct household education expenditure	Extra expenses associated with schooling.		**Expenditure:** • Lodging away other than that of the family • Meals other than that provided at home • Transportation (other than that requiring payment) • Text books other than those requested by academic institutions • Physical Education activities • Motor Bikes, Bicycle as means of transportation (requiring no money) • ICT such as computers, laptops and other accessories

Source: Author's own Framework

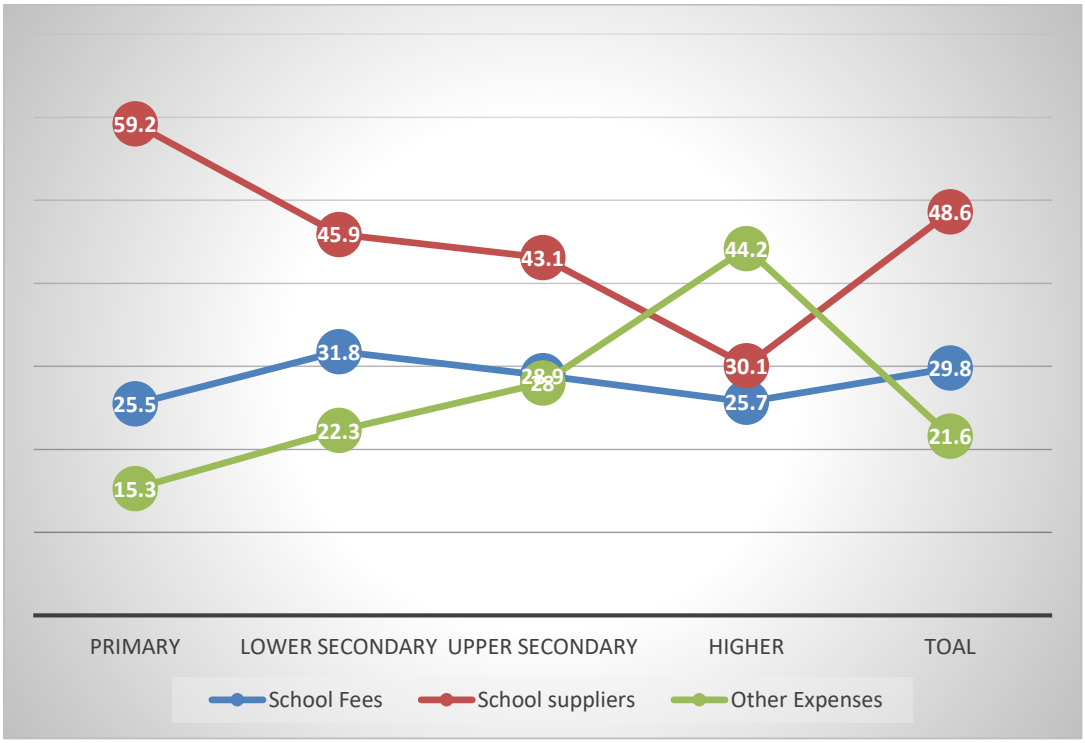
Studies show that, households in most developing countries spend a greater percentage of their GDP per capita on education than those in developed countries. While this reveals how strongly committed households are to the education of their wards, one will have to consider if this is the right signal for developing countries if they desire to achieve the global education goal amidst these high household education expenditures. According to UNESCO Household Survey report (2011), household education expenditure on average in Sub Saharan Africa is almost half (46 percent) government's public education financing. Using 15 countries to do the estimation, it was further found that overall, government public education expenditure represents an average of 3.7 percent of GDP, compared to 1.7 percent of GDP recorded for household education expenditure. That is to say, for every US$ 100 devoted to financing the education sector, households additionally invest US$46 to the sector, a concern which is too substantial to overlook. Household education financing as a proportion of total household expenditure in Sub Saharan Africa (SSA) averages 29.2% for primary education, 49% for junior secondary education and 44% for senior secondary education, despite the increasing call for school fees abolishment in primary schools. (UNESCO, 2011). Comparing this data to world figures, it was found that, household education expenditure as a proportion of overall total education expenditure in rich economies was far less. In fact, developed countries did not record a figure above 5%, thus explaining how costly it is for household education financing in SSA. Overall, between 2001 and 2008, statistics show that on average, households in SSA spend 4.4% of their total income on education. UNESCO (2011).

Figure 1.3 gives detail breakdown of a household survey data on education expenditure based on type of school and types of items spent on for four African countries (UNESCO Household Education Spending Report, 2012). It is clear that whiles household spends higher percentage of

total education expenditure on school supplies such as text books, etc for public schooling, household spend higher percentage on school fees for private schooling also.

Figure 1.3: Household Education Spending by Type of School and Level of Education, Four African Countries, Survey (%)[1]

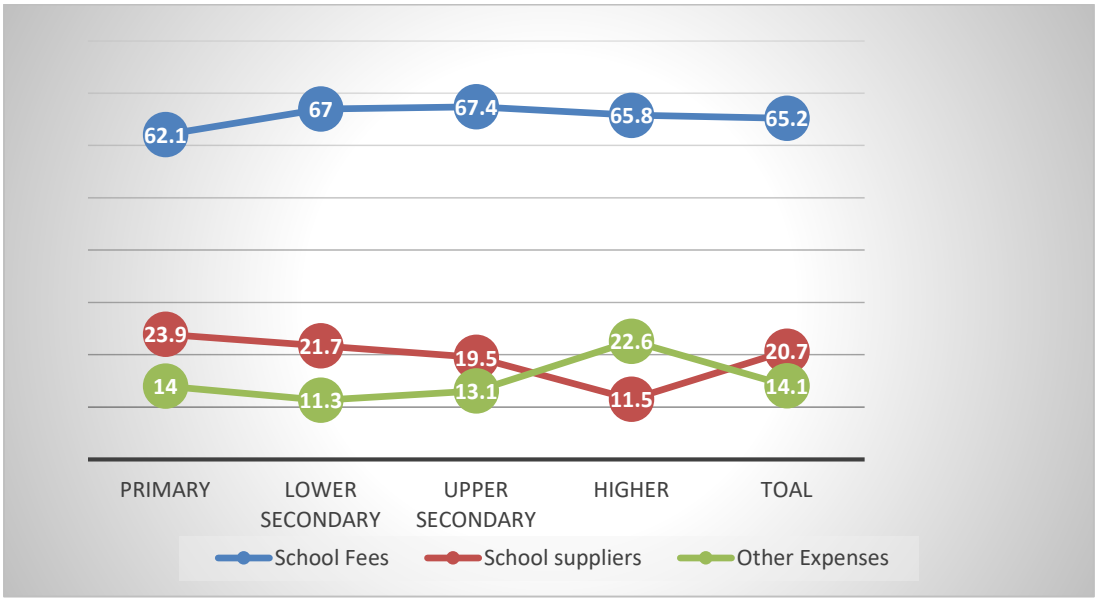
Public Schools



Source: UIS database

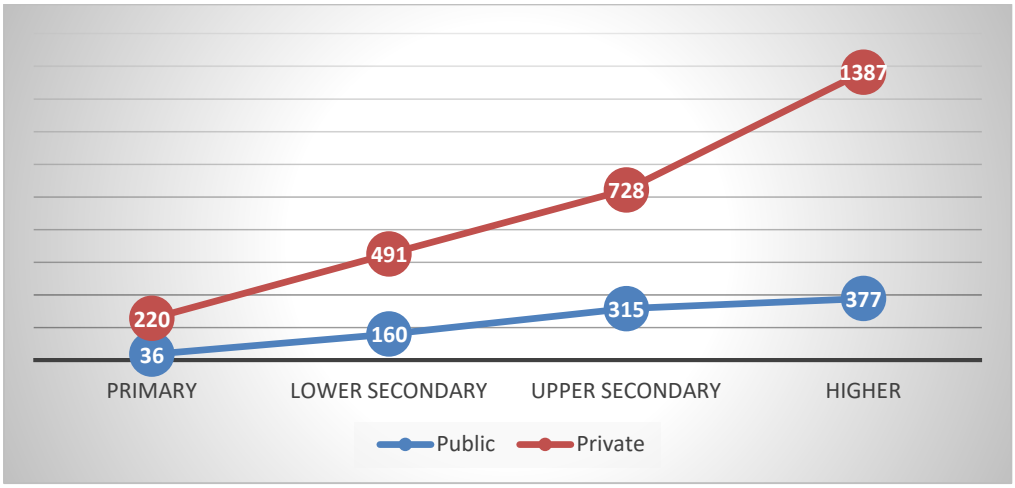
[1] Countries used are: Mauritania (2008), Cote D'ivoire(2002), Madagascar(2001) and Rwanda(2005)

Private Schools



Source: UIS database

Figure 1.4: Average Education Costs by Level per Child and School Type for 11 African Countries, Survey Years (US$), in 2004 PPP[2]



Source: UIS database (UNESCO)

[2] Countries Include: Cote D 'Ivore (2002), Burkinafaso(2003), Mali(2006), Cameroon (2001), Niger (2005), Congo (2005), Gabon (2005), Madagascar(2001), Mauritania(2008), Benin(2003), Rwanda(2005)

In view of the high cost of household education expenditure recorded in developing countries, many have justified the call to abolish user fees at all levels of education in developing countries to reduce the cost burden incurred by households in education financing. Some scholars including Kees (1984) argue that, abolishing of school fees at the public level in developing countries will have a lasting way to improve school enrolment at all levels. To achieve this goal of schooling, SSA countries have implemented the abolishment of school fess in their country. Countries like Ghana, Malawi, and Kenya have government partially assumed the responsibility of replacing revenues for schools which was previously generated from parents or households. This initiative was highly supported by the World Bank and UNICEF in the jointly School Fee Abolishing Initiative (SFAI) in 2005.

However, this policy has been met with stiff inconsistencies in government commitment in delivering on funding for these schools that initially derive their revenue from parents or households owing to the lack of funds. According to Jimenez (1987), user fees serve as source of revenue to promote quality and accessibility to education. Hence aside government defaulting in providing these incomes to schools, the introduction of fees abolishment has affected the quality studies rendered to students. Indeed, there are recent cases where increased enrolments have given rise to concern for deteriorating quality of education. The study can cite recent cases in Malawi where this effect was severe; the rise in enrolments resulted in the following: pupils:desk, 38:1; pupils:teacher, 62:1; pupils:permanent classroom, 119:1; pupils:chair, 48:1and pupils:textbook, 24:1. (Raja Bentaouet Kattan and Nicholas Burnett, 2004)

Notwithstanding, the central question has to do with the fact that, in as much as government is showing commitment in making education less expensive for households, there is the need to also estimate the behavioural structure of household in responding to change in cost of education and

household income. This is what the study seeks to achieve by estimating the price and income elasticity of education for education in Ghana. Estimating these elasticities will guide government shape its education policies in the right perspective and not necessarily abolishing user fee.

1.2 Problem Statement

Just like the financial market, schooling cost (direct and indirect) can also be seen as the price whiles household education expenditure represent the demand for education. Households respond to school enrolment or education expenditure based on the expectation of education cost.

In Ghana, one can identify two important issues characterising the demand for education by way of education expenditure. To begin with, education financing in Ghana have been increasing substantially at both governmental and household levels in the past 3 decades most especially. This increasing trend in household education expenditures is significant, thus raising analytical concerns and further studies that will inform efficient policy formulation.

According the GLSS6 report, households in Ghana spend on average GH 1,271.00 annually on education, representing 10.6 percent of total annual household expenditure comparatively from a lower figure of 8.9% estimated in 2006 under the GLSS 5 report. In per capita terms, household average annual cash education expenditure has more than doubled from 16.73% in 2006 to 35.95% of per capita income in 2013. (GLSS 5 and 6 report). This current figure of 10.6 percent representing household average education expenditure as a percentage of household expenditure is higher than the average proportion of household contribution to education as a percentage of total household expenditure in sub Saharan Africa (4.4%) between 2001 and 2008. This means that, despite the contribution of government in reducing cost of education in the country through the abolishing of school fees at the basic level and other forms of subsidy, the high proportion of

household education expenditure (10.6 %) means that, household are still burdened with high cost of education. It would therefore, be interesting to find how sensitive Ghanaian household demand for education is with respect to cost of education and household income, to guide efficient and effective government policy formulation. Education cost and household income are basic factors that influence household decision to demand education, hence estimating their elasticities is a right call to guide policy makers.

Secondly, Ghana has a structural deficiency of inequality in resource distribution including the distribution of public expenditure among the regions. In effect, poor rural households mostly do not get to enjoy from government resource distribution hence, they are constrained financially to afford quality education for their children. This phenomenon could lead to uneven wider inequality gap among the rich and the poor, which creates further cost problems for the education sector. The cost of education in Ghana is progressively high at higher level as shown earlier, therefore what is the implication for the various income groups in Ghana? Successive governments in Ghana have developed educational policies geared towards lowering high education cost incurred by parents and students who seek quality education. Notwithstanding, most often, these policies take into consideration only the direct cost of education (i.e. tuition fees and enrollment fees) neglecting the indirect education cost, such as, transportation cost to school, teacher motivation dues, school management dues, boarding fees, PTA dues, private home tuition fees, text book and supplies, just to mention a few incurred mostly by households in Ghana. These indirect costs are inevitable and could rise to be a more severe constraint to household education demands in the country especially among the poor, even if direct cost of education is nil.

In addition, there are a few studies that try to estimate household demand elasticity for education. In most of these studies, it was found that one of the prominent factors that affect household

demand for education is cost and household income. For instance, in their study, Donkoh and Amikuzuno (2011) estimated that higher income level leads to higher educational attainment in Ghana. The study further concluded on the impact of household demographic factors on household demand for education. Donkoh and Amikuzuno (2011), estimated that households in urban areas record higher education expenditure per child than their rural counterparts. Another closest study on Ghana is a study by Lavy (1996). In his study, he estimated the price elasticity of education in Ghana to be -0.1 using a household survey. This result shows that household demand for education by way of enrollment is fairly unresponsive to price changes in Ghana. Whiles these studies provide elasticity estimates of demand for education in Ghana, it is worth noting the limitations from these studies that this thesis seeks to address. First is the issue of estimation methodology and data. Lavy (1996), in his demand elasticity estimate, used distance to school as a proxy for price. Using mere distance to school as a generalization of cost of education is just not enough to give much credibility to the results estimated. There are other education costs that households incur including PTA dues, transportation cost, private tuition cost, books and supplies costs and the likes that when incorporated in any study, will makes the estimate more credible, something this study seek to adopt in its estimation. Lavy (1996), again used the GLSS 1 conducted in 1987 in his analysis but then, there has since been more recent and updated household surveys in Ghana reflecting new household education data. As a result, depending on these estimates will not provide a more recent interpretation results, hence this thesis adopts the GLSS 6 to provide more accuracy in our results and interpretation.

The study by Lavy (1996) and Donkoh and Amikuzuno (2011) adopted the Logit and Probit models respectively which estimates probabilistic elasticity which can make the interpretation of results inaccurate in any demand estimate. Probabilistic elasticity only estimates the probability of

an event happening and does not estimate the exact demand elasticity. In contrast, this study focuses on household demand for education by adopting a comprehensive demand model – Quadratic Almost Ideal Demand System (QUAIDS) model developed by Banks et al (1997) and the Two-Stage Budgeting process developed by Strotz, (1957); Gorman (1959) to estimate the price and income elasticity of household demand for education. Indeed, the QUAIDS model has more advantages over the Probit and Logit models used by previous studies as enumerated. These advantages are explained into details in the subsequent chapter.

Against this framework, the thesis tries to understand how sensitive household demand for education is with respect to change in both direct and indirect cost of education and household income. To estimate this in the case of Ghana, the study uses data from GLSS 6 Ghana Household Surveys, and estimate the price and income elasticity of demand for education using QUAIDS model and the Two-Stage budgeting models, incorporating some household demographic factors including location of household, sex of household head, household size and employment status of household head into the model.

1.3 Research Objectives

The objective of the paper is to investigate the behavior of household education expenditure sensitivity to the price of education and household income at three levels of education in Ghana using fresh evidence from most recent GLSS 6 household data. Amidst the debate on free education in the literature, the study critically examines how price of education (direct and indirect cost) and household income affect household demand for education by way of education expenditures at basic, secondary, post-secondary and tertiary education levels in Ghana considering household demographics factors.

In the case of Ghana, most empirical studies focused on various determinants of household demand for education to estimate probabilistic elasticities which is mostly inadequate and do not reflect exact estimates. Examples include the works of Lavy (1996) and Donkoh and Amikuzuno (2011). In effect, the study seeks to widen the discourse to estimate actual elasticities of demand for each level of education in Ghana to reflect exact estimates.

The results of the analyses seek to contribute to economic theory, thus the thesis ensures that the results and findings make economic sense whiles contributing to sound education policy formulation in Ghana. The findings of the thesis will provide first hand practical evidence to guide policy makers to recognize the new challenges and pattern of household demand for education whiles exploring pro-poor policies to assist the vulnerable households in our society. Finally, the study seeks to set the pace for more studies in household demand for education in Ghana whiles contributing to the few existing studies on household demand for education in Development Economics.

1.4 Research Question

- How responsive is household demand for each level of education owing to a unit change in price (direct and indirect cost) of education in Ghana?
- How responsive is household demand for each level of education owing to a unit change in household income in Ghana?

1.5 Type of Data Analysis

The study adopts both qualitative and quantitative methods in its analysis. The qualitative analysis is intended to analyze the content and character of household education demand by way of education expenditures in Ghana. A demand regression model is then adopted using secondary data from the Ghana Living Standard Survey round 6. The Quadratic Almost Ideal Demand System (QUAIDS) and the Two-Stage Budgeting process will be used to estimate demand elasticities using STATA 13. The study captures households whose children were enrolled at the time of the survey for which education expenditure was made.

1.6 Outline of The Study

There are five extra chapters that organize the rest of this study. Chapter two focuses on an overview of the educational system in Ghana drawing on some achievement indicators and the expenditure patterns at both the government and household levels.

Chapter three reviews the related existing literature on similar topic. Chapter four explains the research methodology and details the reason for selecting the variables as used for empirical analysis.

Chapter five presents the empirical results of the analysis on household elasticity demand for education at four levels of education in Ghana. The chapter also discusses the findings obtained from the study after using the proposed econometric model; QUAIDS model and Two-Stage Budgeting process.

Chapter 6 provides a summary of the study, enumerates possible policy recommendations based on the findings, and enumerate the limitations of the study

CHAPTER TWO

OVERVIEW OF EDUCATION IN GHANA

2.1 Introduction

Just like other developing countries, Ghana equally considers education as a relevant means in facilitating socio economic growth and development of the community and the nation at large. Ghana has basically four levels of education; Basic, Secondary, Post-Secondary and Tertiary. The Basic level education includes Kindergarten, Primary and Junior High School. Secondary school level includes Senior High and Technical schools, whiles Post-Secondary schools include Vocational schools, Training colleges and Nursing schools. Tertiary schools include; University, Polytechnic, and other Tertiary institutions. According to the Ministry of Education Sector Performance 2013 Report, majority of local schools are government owned (Public School) and runs mainly on the budget of the Ministry of Education. Notwithstanding, there also exist private schools at all levels owned by private individuals, missionaries/churches and NGOs. Private schools are comparatively more expensive than public schools mostly in terms of tuition and registration fees. (MOE Sector Performance Report,2013)

Over the past decades, Ghana has embarked on successive policies to enhance its education systems. For instance, education was incorporated in Ghana's 1987 Economic Recovery Program (ERP) with the objective among other things to improve and expand an equitable and accessible education system at all level of education.

This policy sought to review the organization structure of the system and also reduce the original pre-tertiary education of 17 years to 12 years whiles increasing hours spent in school. This policy resulted in increased basic school enrollment from 12,997 in 1980 to 18,374 in 2000 and increased government's total education expenditure from 1.4 percent of GDP to 3.8 percent in 1983 and 1992 respectively. (Demery et al, 1995; Akyeampong et al, 2007). The Constitution of Ghana also support Free Compulsory Universal Basic Education under the Free and Universal Primary education (FCUBE) initiative by covering tuition cost and some non-tuition fees. In 2005, the School feeding program and Capitation Grant Scheme was also introduced to absorb extra financial burdens in the name of school fees such as examination registration, games and sports in public schools and also improve the nutrition of children in school (African Education Watch, 2008). Recently is the introduced Free Senior High School policy, school feeding program, free school uniform program, just to mention a few. These are all efforts to prove the commitment of successive governments to make education less expensive and attractive to Ghanaian households.

Notwithstanding the success of these policies, Ghana's educational system remains challenged. Besides budgetary issues, the educational system continue to suffer from inadequate number of trained teachers, rising number of schools under trees, low school completion rates mostly for female students, high teacher to student ratio, poor conditions of service for teachers, high cost of education, shortage of textbooks and infrastructural materials throughout the country. (Akyeampong et al 2007).

Despite these challenges, Ghana has chalked some gains in the education sector. Ghana's education system is fairly good and competitive and relatively considered cheap at lower levels of education.

2.2 Some Key Indicators of the Educational Sector

Having gotten a quick overview of the education sector in Ghana, it is appropriate to assess the performance of the sector based on some indicators such as the pattern of education expenditure and education performances.

2.2.1 Public Education Expenditure in Ghana

For a developing country like Ghana, financing public education can be problematic due to lack of sufficient resources. Notwithstanding, in absolute terms, Government expenditure in the sector has shot up significantly. From Table 2.1, government education expenditure grew by 22.49% from GHS 5.8 billion in 2014 to GHS 7.1 billion in 2015. The largest proportion of overall spending went toward the tertiary level at 25.7%, followed by SHS and JHS. This trend marks a change from 2014 when the largest share of spending went to SHS, Primary and Tertiary education respectively. To further appreciate the commitment of government, it is important to assess government education expenditure based on some economic indicators. From Figure 2.1, it is observed that, the ratio of government education expenditures to GDP increased from its lowest of 5.3% in 2009 to 6.5 % in 2015. Similarly, government education expenditure as a proportion of total government expenditure increased from 22.3% in 2009 to its peak of 27.2% in 2012 before dropping to 22.2% in 2015. This clearly explains how significant Ghana government perceives the role of education to its socioeconomic development.

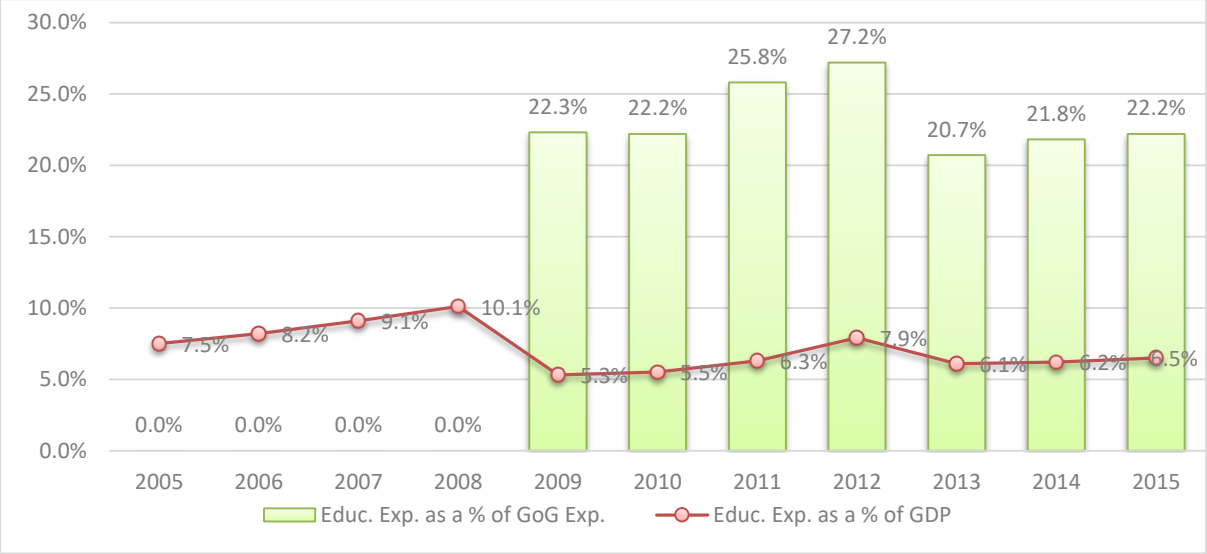
In per unit terms, government's unit cost of education is progressively high at higher levels of education. On average, between 2008 and 2014, government unit cost of primary, JHS, SHS, TVET and Tertiary education was GHS 317, GH531, GHS 954, GH 2,076 and GHS 2,849 respectively. (Ministry of Education Sector Performance Report, 2016)

Table 2.1: Trends in Government Education Expenditure by Level[3]

	2012		2013		2014		2015	
Level	**Exp (GHS)**	**%**	**Exp (GHS)**	**%**	**Exp (GHS)**	**%**	**Exp (GHS)**	**%**
Pre-School	0.44	8.58	0.36	7.45	0.50	8.60	0.4	6.1
Primary	1.30	25.68	1.39	28.48	1.45	24.76	1.3	17.7
JHS	0.97	19.10	0.70	14.25	1.05	18.06	1.7	23.5
SHS	1.06	20.84	1.15	23.62	1.47	25.13	1.7	23.8
TVET	0.16	3.23	0.10	2.11	0.24	4.18	0.2	2.6
SPED	0.02	0.43	0.03	0.58	0.03	0.50	0.03	0.4
NFD	0.04	0.80	0.04	0.82	0.03	0.55	0.01	0.2
Tertiary	1.08	21.33	1.11	22.68	1.06	18.22	1.9	25.7
Total	5.07	100	4.88	100	5.84	100	7.2	100

Source: Ghana Education Sector Performance Report, 2016.

Figure 2.1: Ratio of Government Educational Expenditure to GDP and Ratio of Government Education Expenditure to Total Government Expenditure

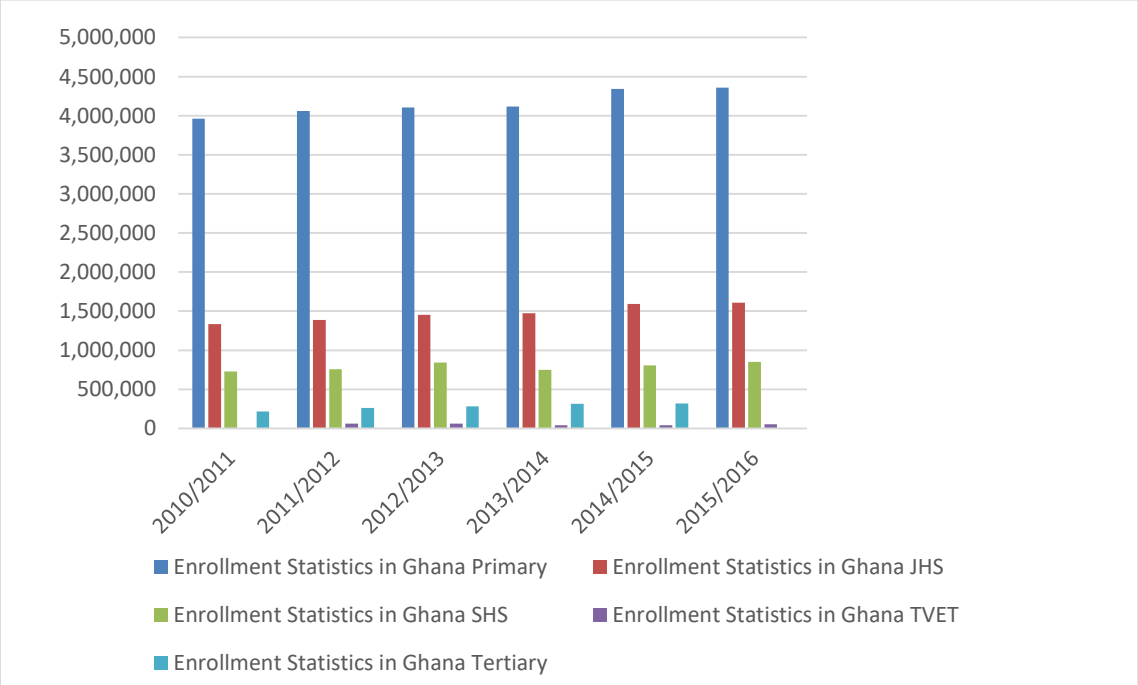


Source: Ministry of Education Sector Performance Report, 2016

[3] Absolute Expenditure Values are in Billions of Ghana cedis

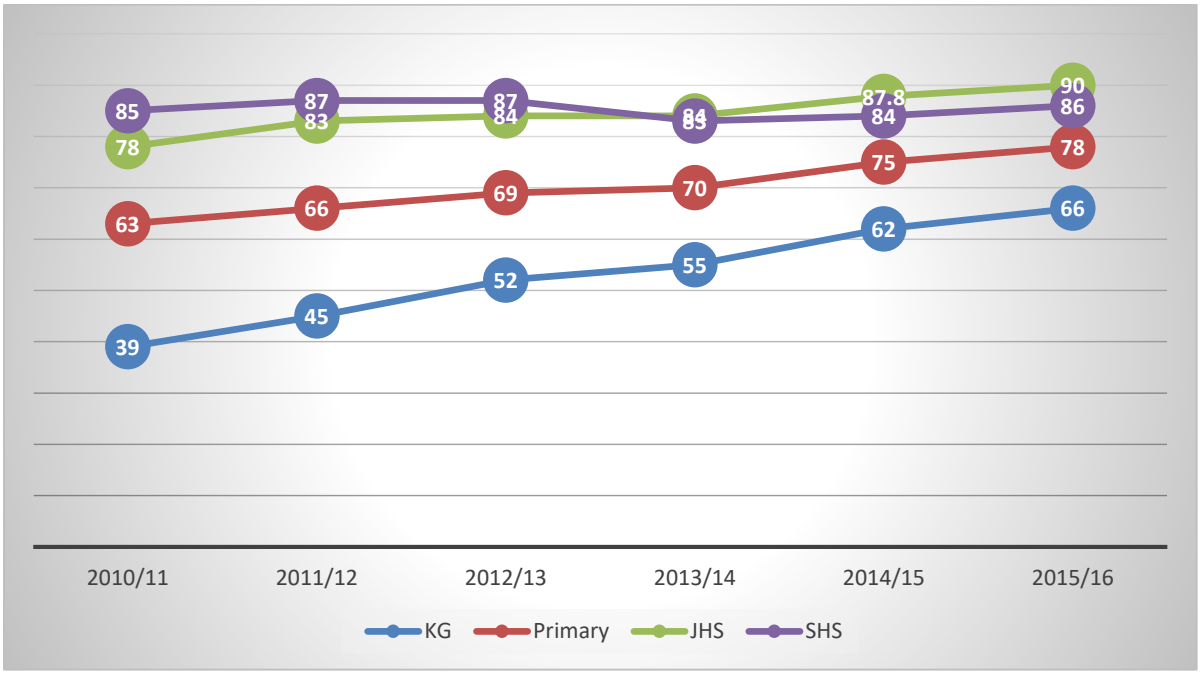
The commitment of these government expenditure and policies are evident in increased enrollments and improved quality of education. For instance, from Figure 2.2, the gross enrollment at the basic level, has since seen a sharp increase for instance from 3,962,779 in 2010/2011 to 4,358,176 in 2015/2016. Primary education continues to record the highest enrollment rates consistently from 2010/2011 to 2015/2016 academic year followed by Junior Secondary Schools. (Ghana Education Sector Performance Report ,2016). The reason being that, basic education has become relatively cheap to acquire by households. In terms of quality education, the total number of trained teachers increased from 123,006 in 2010/2011 to 171,442 in 2015/2016 whiles number of untrained teachers fell from 69,702 to 42,463 in the same years. (figure 2.3). In terms of ratios, figure 2.4 shows government commitment in reducing student to untrained teacher ratio (PTR) in Ghana. That means, students are having access to more trained teachers even though pupil-teacher ratio continue to be high among basic schools.

Figure 2.2: School Enrollment Statistics by Level of Education in Ghana



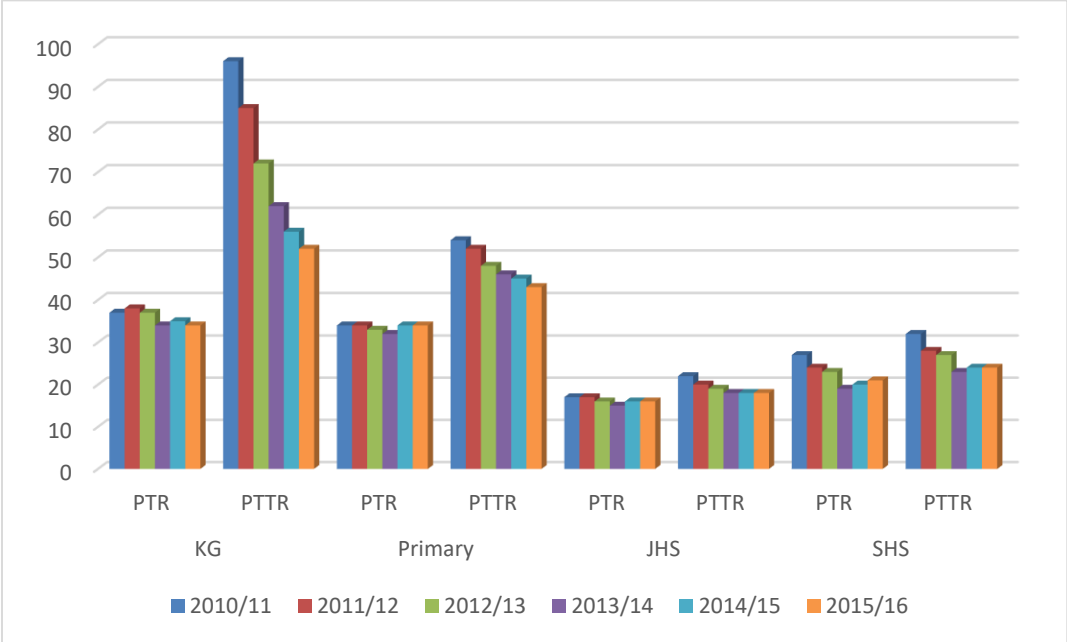
Source: Ghana Education Sector Performance Report, 2016.

Figure 2.3: Percentage of Trained Teacher in Ghana by Level of Education



Source: Ghana Education Sector Performance Report, 2016.

Figure 2.4: Statistics for Student Teacher Ratios in Ghana



Source: Ghana Education Sector Performance Report, 2016

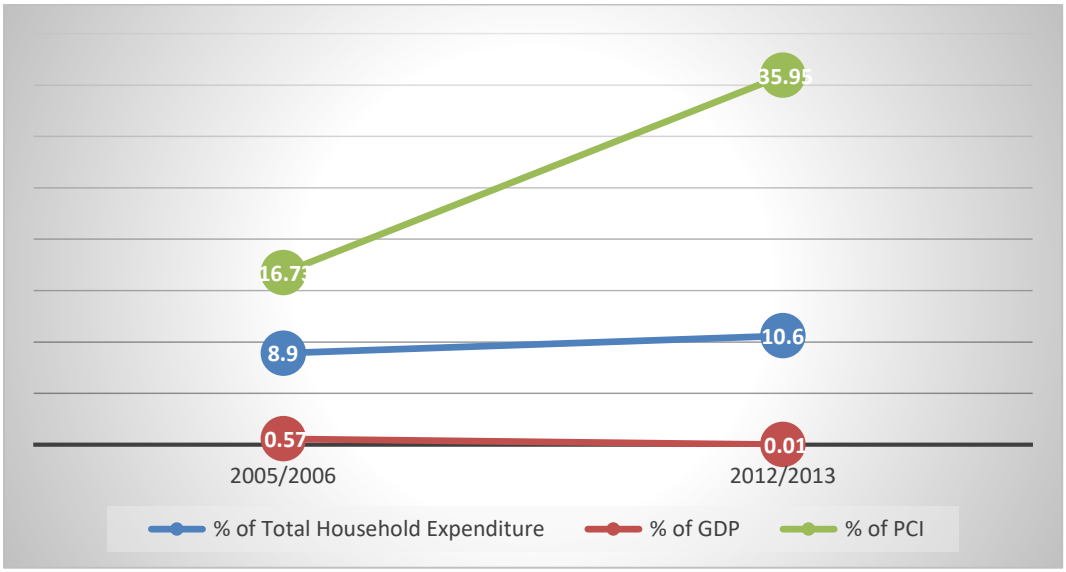
2.2.2 Household Education Financing in Ghana

Household education financing in Ghana just as in most developing countries, take several forms such as school fees, textbook fees, extra classes tuition fees, teacher motivation fees, church building fee (for some mission schools), generator fuel dues, compulsory uniforms, Parent Teacher Association (PTA) dues, and the likes which can become additional financial burden to households especially the rural household. The proportion of household total education expenditure to total household expenditure in 2013 rose to10.6 percent from a lower figure of 7.6 percent recorded in 1999. (GLSS 4 & 6 Report). This percentage of household education expenditure as a share of household total income among Ghanaians is even higher than the 4.4 percent average proportion of household contribution to education financing as a share of total household income in SSA. (UNESCO 2011). This means, despite the resilient efforts by government to reduce the direct cost of basic education in Ghana, households continue to be burdened with high education expenditure. According to GLSS 6 report, from an average household education expenditure of about GH 109.59 for public primary education, expenditure more than doubled for junior high school and then rose to 7 times secondary education before peaking at 16 times the cost of tertiary education in 2013 (GLSS 6 report, 2013). This is because, often times when households are faced with education demand and supply constraints, they are forced to make extra out of pocket spending such as, providing private tuition for their children back at home or patronizing private schools over public schools, providing extra books and supplies for their children, etc (Talick, 2002). Many at times, these ignored indirect costs could be severe enough to discourage school enrollment and household education expenditure. (Aryeetey and Goldstein, 2002). Indeed, it was found that, one of the factors affecting the success of government flagship programme such as the free basic school is these indirect education cost incurred by households. (Akyeampong 2009).

Table 2.2 provides individual lists of items household spend on in acquiring quality education for their members. It is clear that households make extra out-of-pocket education expenditure aside the payment of just school fees. Some of these extra cost could be higher than the actual school fees. For instance, household education expenditure for items other than school fees, costs on average, GH 100 for public primary education. That is, GH 81 more than the actual school fees of just GH 9.00. Just like the demand system, households respond to school enrollment or expenditure based on the expectation of education cost. The higher the cost, the lower the probability of household making education expenditure.

Figure 2.5 gives a qualitative understanding of household education financing as a percentage of household total income, Gross Domestic Product of Ghana and per capita. From all indication, Households in Ghana have been at the mercy of high cost of education expenditure emanating from other cost aside school fees. According to GLSS 6, Ghanaian households spend 10.6% of household annual expenditure on education in 2013 compared to a lower figure of 8.9% recorded in 2006. Similarly, average annual household cash education expenditure as a percentage of per capita income saw a 114.9% increase from 16.73% in 2006 to 35.95% in 2013. (GLSS 5 & 6 report). That means that, if the total income of the country were to be shared among the total population of Ghana, households were spending on average, 35.96% in providing education for their members, an act that raises a lot of concerns.

Figure 2.5: Household Education Expenditure as a Percentage of Per Capita Income, Total Household Expenditure and GDP (%)

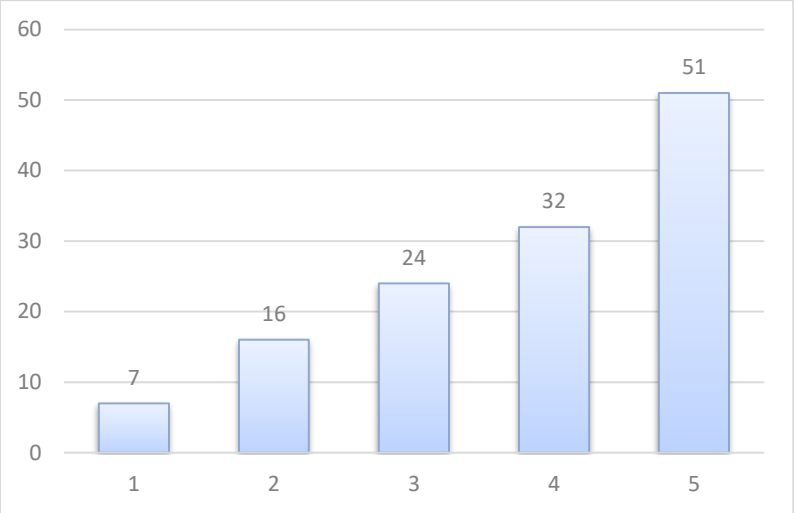


Source: GLSS 5&6 Report, Authors' own calculation, BOG

Data from the Ghana Living Standard Survey 5 report supports previous studies that found a positive relationship between household income and household education expenditure. From figure 2.6, it is observed that high income households in Ghana are willing to spend more on their children's education than poor households. From Figure 2.6, households in the fifth (5^{th}) quintile make education expenditure approximately seven (7) times more than households in the lowest quintile.

In summary, it follows from the tables and figures presented that, despite government commitment in providing quality and affordable education, Ghanaian households continue to make inevitable out-of-pocket expenditure to access quality education for their children to compliment government education expenditure especially at the basic level.

Figure 2.6: Household Mean Annual Per Capita Education Expenditure, By Quintile (Gh¢) 2005/6



Source: GLSS 5, report

Table 2.2: Average Household Expenditure On Education in Ghana by Type of School and Type of Cost for Each Level of Education (GH), 2013

	Item	School and Registration Fees (GHC)	Contribution to PTA (GHC)	Expenditure on school uniforms and sports clothes (GHC)	Expenditure on Books and school supplies (GHC)	Expenditure on Transport to and from school (GHC)	Expenditure on Lodging, Food and boarding	Expenditure on extra classes
Public School	**Basic**	9.07	4.57	11.08	12.73	4.69	56.70	10.30
	Secondary	285.75	14.50	15.96	49.90	24.14	142.07	31.83
	Post-Secondary	444.44	5.60	15.68	81.04	24.02	124.41	3.48
	Tertiary	799.03	1.14	3.16	150.37	85.34	312.79	9.96
	Total	1538.30	25.81	45.88	294.05	138.19	635.97	55.57
Private School	**Basic**	170.45	7.44	23.14	37.65	27.45	137.04	27.02
	Secondary	416.13	9.50	19.71	80.60	70.11	188.64	40.70
	Post-Secondary	597.36	1.13	16.06	106.22	117.76	223.79	4.91
	Tertiary	2020.50	1.28	4.79	218.68	161.51	347.18	8.46
	Total	3204.44	19.35	63.69	443.15	376.83	896.65	81.09

Source: Ghana Living Standard Survey Report, 2012 – 2013

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter essentially reviews a variety of relevant studies on elasticity of household demand for education. It is important to underscore the role of past studies which have proven facts on household demand for education to aid this thesis. This chapter also reviews the Human Capital Theory in line with the objectives of the study, which also serves as the fundamental basis of the thesis. The significant role of education expenditures on national and household welfare and the determinants of household education expenditure were also considered.

3.2 Theoretical Framework-Human Capital Theory

To begin with, it is important to understand the Human Capital Theory which serves as the foundation for the study. Bohlander et al. (2001) define human capital as "knowledge, skills, and capabilities of individuals that have economic value to an organization." Dess and Pickens (1999) also define human capital as "capabilities, knowledge, skills, and experience, all of them embodied in and inseparable from the individual." The Organization for Economic Cooperation and Development (OECD, 2001) defines human capital as "the knowledge, skills, competencies, and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being."

The human capital theory which has been widely discussed in many theoretical and empirical studies takes its root dating back from Adam Smith (1776) and Petty (1962) to the study by Krugman (1994). In the literature, education is taken as an indicator of human capital in growth model (Solow, 1956), in endogenous growth model (Lucas, 1988) and also in total factor productivity model (Krugman, 1994). Basically the Human capital theory argues that, formal education or training has a positive relationship with productivity and income by increasing the level of cognitive stock of economically productive human capability which is a product of innate abilities and investment in human beings (Becker, 1964). In the literature, there are rich studies that suggest the positive role of education attainment on social outcomes such as growth, poverty, health, productivity, population growth, among others.

3.3 Relationship between Human Capital or Education and Growth

The Human Capital Theory by Becker (1964) plays very crucial role in the theories of economic growth. In the literature, education is taken as indicator of human capital in growth models. The Solow growth model (Solow, 1956) and the endogenous growth model (Lucas, 1988) underscore the positive relationship between human capital development and economic growth. Indeed, the Solow growth model considers human capital or level of education as a physical capital in the production function such that an increase in capital through education increases output or growth. The endogenous model on the other hand believes that human capital (education) influences growth by promoting innovation and new technology to spur growth. Mankiw et al (1992), tested the Solow growth model and also established a positive relationship between human capital and growth. However, his study introduced an alternative growth model called the Augmented Solow

model which added other factors such population size, saving and education as a function of production. His model suggests that, an increase in the level of education of a country increases its economic growth. However, in the mid-1990, Benhabib et al (1994) saw some difficulties with the result and methodology of the Solow growth by finding a negative relationship between human capital and growth using the model proposed by Mankiw et al (1992). Their study thus developed an alternative model called the Total Factor Productivity (TFP) Model to answer how education influences growth. The TFP model thus introduced technological progress as a function of human capital or level of education. That means, the TFP model establishes that human capital or level of education contributes to growth through the adoption of locally produced technological innovations (Romer, 1990). It also concluded that, the level of education influences the adoption of foreign technological innovation to promote growth. Based on this understanding, it is means that education has the capacity to develop the skills and abilities of an individual to adopt innovative and technological methods to increase productivity and income in all sectors of the economy, thus explaining why developed countries have higher incomes. The perception is that, education has positive external effect, in the sense that when an individual is educated, the impact affects the nation at large, positively. Educate part of a country and the whole of it benefits. (Olaniyam and Okemakinde, 2008). In view of this, developing nations have paid particular attention to education and this is evident in total of government education expenditure. Just as perceived by Becker which considers human capital as "physical means of production", households perceive education as a means of production where every unit increase in investment in the sector yields additional output and incomes. Based on the human capital theory we now realize that households are more likely to demand education based on the expected returns (rising incomes) the household will reap in future, even though cost of education is also a factor

considered by household in their demand for education by way of education expenditure. Sianesi and Van Reenen (2003) estimated that, for every additional year a child spends in school, the economic growth rate rises by 0.3 to 3 percent per year.

3.4 Relationship between Human Capital or Education and Household Poverty

Mckinney (2014) defines poverty as absence of basic household needs such as food, water, shelter, healthcare and housing which are needed resources for survival. UN also defines poverty as "a denial of choices and opportunities, a violation of human dignity." (UN, 1998). It is estimated that about 1.3 billion people in the world live below $1.25 a day (UNDP Report, 2014). According to UN report, 2016, 24.2 percent of Ghanaians are poor even though this is a reduction from 56.5 percent recorded in 1992. Rural households continue to have higher average rate of poverty of 37.9 percent than their urban counterparts who have an average rate of poverty to be just 10.6 percent. In view of these statistics, studies have concluded that one way of reducing poverty is through education. A world bank study by Kirsten and Alain (2012) concluded that, the probability of a household being poor reduces as the level of education of its members or household head rises. Even though the study adopts a logit method that estimates probabilistic results, the study found that the probability of being poor in Sub-Saharan on average reduces from 46 percent for households without any form of education to about 28 percent in their first 6 years of education. This figure reduces further to 13 percent upon completion of 12 years of education. Based on these studies, it suggests that for a very unit increase in the level of education attained, there is a unit reduction in poverty. Using a household data set between the periods 1980 and 1996, Okojie (2002) considered the role of household demographic including, the education of household heads on

poverty incidence in Nigeria. By adopting the multivariate regression models, he found that the probability of being poor in a family with educated household head was lower than for household heads with no level of education. This conclusion supports the work of Appleton (1997) who found that, every additional year spent in acquiring primary education reduces poverty severity by 2.5 percent and this figure doubles in the case of secondary education. Education also helps in closing inequality gap in an economy. Gundlach, de Pablo and Weisert (2001) investigated the relation between education and income inequalities. Based on their findings, it was found that education serves as the possible means to close income inequality gap whiles creating avenue for the poor to reap the gains of economic growth to a greater extent. This means that, to the poor households, investing in education of their children serves as future investment that will be reaped to address their financial problems. Based on their empirical evidences, it is clear that education develops the individual's employable skill to generate enough income for the household. In as much as this study appreciates the finding of previous studies, the literature gap has to do with estimation methodology. This study estimates actual elasticities of demand for education instead of probabilistic results done by previous studies.

3.5 Relationship between Human Capital or Education and Health

According to World Health Organization, health is defined as "A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" Human capital theory also supports the significant role of education on improving child health, life expectancy ratio and exposure to best health practices. Education is associated with human capital development by improving the individual's range of skills including, personal controls, ability to

solve problems and cognitive skills. (Mirowski and Ross, 2005). Developing personal control or mastery and cognitive skills through education influences the individual's behaviors and attitudes especially in health related matters.

First of all, Education has the tendency of reducing population in countries that have high rates of fertility. Education is linked to spacing of childbirth and postpone childbearing among girls of young age whiles reducing child mortalities as well. Studies for example, Ferré (2009) found that young girls who are educated tend to have delayed childbearing. Education exposes the individual to good health practices and methods that will improve their health conditions. According to Kirsten and Alain (2012), childbirth declines more for every additional year spent in school from 2.9 percent for women with 6 years of education to 2.2 percent for women who spend 12 years in school. This can be attributed to the substantial increase in the use of contraceptives among women who acquire education and are exposed to best health practices. Even though these estimates have policy relevance, the use of logit models do not reflect exact estimates which should be addressed in literature.

In sum, human capital development can be considered as any activity geared towards improving the quality of life and positioning an individual for the job market to increase their incomes. To achieve this, households consider education as a primary mechanism to develop the human capital base of its members, as such are willing to demand for it. Just as perceived by Becker which considers human capital as "physical means of production", households perceive education a means of production where every unit increase in investment yields additional output and incomes.

3.6 Determinants of Household Education Expenditure

There are several reasons for which household choose to invest in education. These reasons could be cultural, economic and social reasons. Whiles the social and cultural factors include household demographics such as education level of household head, employment status of household head, household size and location of household, economic factors on the other hand deals with cost of education and the choice of reducing consumption to increase investment in education for a future returns. Parents make investment in education when the know the benefits outweighs the cost of education. There are wide studies that explains the positive impact of household demographics on the stock of investment in education of household members.

Glick and Sahn (2000) conducted a study in Guinea to assess the impact of education status and income of a household head on education expenditures and enrollment. The study found that, indeed income and education level of household head has positive relationship with education expenditures of that household. Using an ordered and binary Probit model instead of an ordinary least squares model that cannot incorporate several demographic features in its modeling, the study found that, despite the positive relationship between education status of household head and household education expenditure, there is significant difference in education expenditure patterns based on sex of household head. Their study further found that, the higher the education status of fathers, the more both sex of children get improved schooling. On the other hand, daughters benefit more from improved education investment when a female household head advances in education. Narrowing their study to household income, the study concluded that as household income increases, daughters benefit more in education expenditure whiles there is a non-significant increase in household education expenditures for boys.

The findings by Glewwe and Patrinos (1999) are not farfetched from the results of Glick and Sahn (2000) based on household education investment. The only difference in their result is that, whiles the later establishes the gender disparities in household education expenditures, the former considered the difference in household education expenditure based on location of household. Glewwe and Patrinos (1999), in their demand analysis for households in Vietnam using a household survey data between 1992 to 1993 found that, as household income increases, the willingness of that household to spend on children education rises. The study also found that there is the high tendency for households in urban areas to make higher education expenditures than rural households. Quang (2012) with the help of 2006 household living standard survey for Vietnamese households, also found a significant positive impact of household income and education level of household head on education expenditure. He used a Tobit model to establish these findings. These findings suggest that, educated household heads understand the importance of education and its impact on the success of their children, as such are willing to make higher education expenditure for their children. Similarly, urban households are more financially resource and are willing to invest their resources in their children education for a higher future returns. Fikret Bilenkisi, Mahmut Sami Gungor, and Gulcin Tapsin (2015) also found that, the probability of a household being poor in Turkey was lower when household head has some level of formal education. The opposite is also true. In other words, the risk of a household being at risk of poverty or rich in Turkey depends on the whether the household head has some level of education or not.

Aside individual household factors that affect household education expenditure, just like market structures, school fees or cost of education also represent the price within the education market where household respond to education prices just as how consumers respond to market prices of

good. Based on this premise, one can confidently argue that cost of education is also a fundamental determinant of household demand for education. Traditionally it is perceived that there is a strong negative relationship between education cost per child and household demand for education. That is, if cost of education rise, the corresponding demand for education is expected to decrease because education becomes too expensive to afford and this is translated into low school completion rate, high school dropout rates and low school enrollment rate. It is a common practice in developing countries for schools to demand extra resources from parents to cover for auxiliary expenditures such as parents-teacher association fees, school maintenance cost, school uniforms, textbooks writing material, just to mention a few. According to UNESCO (2011) statistics, households in sub Saharan Africa contribute the highest form education expenditure by way of tuition fees, association dues, textbooks expenditure, etc. Households expenditure for each level of education as a proportion total education expenditure in Sub Saharan Africa averages 29.2% for primary education, 49% junior secondary education, 44% senior secondary education and 22% for tertiary education. This means that, household education expenditure is still relatively high despite the education policies such abolishment of school fees implemented in the sub region. (Pôle de Dakar UNESCO-BREDA 2006; World Bank 2001). There are few studies that estimated the price elasticity of demand for education to illustrate the impact of direct fees on school enrollment. For instance, Avenstrup Liang and Nellemann (2004) estimated the price elasticity of demand for schooling in Uganda and Malawi using household data. The study found high price elasticity of demand for schooling in Uganda and Malawi in 1990. Gertler and GLewwe (1990) found that the price elasticity of education among the poor was three times higher that of richer households in Peru.

Similar studies in Africa and Latin America have also found that, female students have higher price elasticity of demand for education than male students. (King and Mason, 2001) This means that, poor households and girls are more price elastic to education than male students and richer households.

In the Netherlands, Canton and De Jon (2005) found that , demand for education was price inelastic using tuition fees as proxy for cost of education. Their study adopted an error correction model approach using a secondary data between 1950 and 2000. Milton (2008) extended the previous research findings by estimating the price elasticity of demand for education based on academic discipline. The study considered some selected academic disciplines such as engineering, physics, business studies, biology and mathematics. The study found that, demand for Biology, Physics and Business studies were price elastic but then, demand for Engineering was estimated to be price inelastic with the highest expenditure and rate of return. His study used data from the Integrated Postsecondary Education Data System and applied an Ordinary Least Squares (OLS) regression to analyze the data.

There are other evidences to illustrate the impact of direct cost of education on household education expenditure and school enrollment in Africa as a result of the introduction of school fees abolishment in Africa. For instance, Kenya user fees abolishment resulted in a surge of 1.2 million student enrollment. Uganda dissolved its user fees in 1996 and recorded a 70 percent surge in enrollment. Net enrollment increased to 85 percent in 2002 from a net enrollment of 57 percent in 2001 in Tanzania as a result of abolishing school fees. (Kattan and Burnett, 2004). This suggests that, cost of education can be a barrier to household demand for education in Africa.

Regarding the objective of the study, the closest literature on household demand for education in Ghana is the study by Lavy (1996) with the help of Ghana Living Standard Survey data conducted in 1987. His study adopted the logit model and estimated the price elasticity of education in Ghana to be -0.1 using distance to school as the proxy for price of education. His result further found that, the cost of higher education such as tertiary and post-secondary levels determines households demand for primary school education in Ghana. He further estimated own price elasticity of demand for education middle school at 0.30 using distance to school as the proxy for price of education. His study also found that, the probabilistic elasticity of a household member to ever attend primary school with respect to distance from primary school as a ratio of the elasticity of the same probability with respect to distance from middle-school is 4.2. Lavy's study supports the conclusion by Kirsten and Alain (2012) who found that, schools more than 5 kilometers from home had only 41% probability of school enrollment, while schools within 1-2 kilometers from home had 66 percent school enrollment for which household education expenditure is made.

Gaddah & Munro (2011) also estimated price and income elasticity of household demand for education using the nested multinomial logit model to explain the willingness of Ghanaian households to pay for education. The study found that, demand for education in Ghana is more price elastic as one moves from pre-school to primary education, followed by secondary education, and then tertiary education using tuition fees as a proxy to price of education. Their study further estimated the price elasticity of demand for primary and secondary education among poorest quintile at -0.147 and -0.850 respectively, whiles the corresponding income elasticities were estimated at 0.521 and 0.005 respectively.

Their study also concluded by emphasizing on the negative impact of indirect education cost on household demand for education. The study explained that, the fact that non-enrolment is still high even after setting prices to zero is a reflection of the negative effect of high opportunity costs on schooling demand among rural households. Akyeampong (2009) also highlighted the inability of the FCUBE to reduce the indirect cost of schooling as a major issue with the programme.

On the other hand, Donkor and Amikuzuno (2011) relying on the 2006/2007 Ghana Living Standard Survey adopted the Probit model and also found that, male household heads make more education expenditure whiles female household head have higher probabilities of making education expenditure in Ghana. The study also found that young household heads with formal education have higher probabilities to invest more in their child education than rural households with no formal education.

The difference between this analysis and that of Lavy (1996), Gaddah & Munro (2011) and Donkor and Amikuzuno (2011) is the estimation methodology and dataset used. Lavy (1996) in his demand elasticity estimate, used distance to school as a proxy for price whiles Gaddah & Munro used tuition fees as proxy for price. Using mere distance to school as a generalization of cost of education is just not enough to give much credibility to the results estimated. There are other costs that households incur aside tuition fees, such as PTA dues, transportation cost, private tuition cost, school management fees, uniform fess, books and supplies costs and the likes that when incorporated in any study, will makes the estimate more credible. This is something this study seek to adopt in its estimation. Lavy (1996) again uses the GLSS 1 conducted in 1987 in his analysis but then, it is obvious a lot of changes has since occurred in the sector, as such, depending on his

estimates will not provide a more recent interpretation results. In view of that, this thesis uses the GLSS 6 to provide more accuracy in the results and interpretation.

Finally, the study by Lavy (1996), Gaddah & Munro (2011) and Donkoh and Amikuzuno (2011) adopted the Logit, Nested Multinomial logit and Probit models respectively which estimates probabilistic elasticity which can make the interpretation of results inaccurate in the demand analysis. Probabilistic elasticity only estimates the probability of an event happening and does not estimate the exact demand elasticity. In contrast, this study focuses on household demand for education by adopting a comprehensive demand model – Quadratic Almost Ideal Demand System (QUAIDS) model developed by Banks et al (1997) and the Two-Stage Budgeting process developed by Strotz, (1957); Gorman, (1959) to estimate the price and income elasticity of household demand for education using a household survey data – GLSS6. Indeed, the QUAIDS model has more advantages over the Probit and Logit models adopted by the recent studies enumerated in Ghana. These advantages are explained into details in the subsequent chapter.

Another major form of cost that influences household education expenditure is the opportunity cost of education. This is because, it is perceived among the rural household that, spending additional year in school reduces the economic contribution of that individual to household welfare hence households make the choice between sending their children to school or engaging them in household economic duties. This practice is common in rural areas where households make a choice between sending their children to school and the choice of sending their children to; herd livestock, fetch water, take care of younger siblings, and other farm and house chores. In fact, studies show that, that the opportunity cost of education rise with age and even worst among rural

households where it is possible to have children as breadwinners of the family. Kirsten Majgaard and Alain Mingat (2012).

Whiles demand factors of education leads to increased enrollment, the supply factors are evident in parents' desire to keep their children at school. The supply factors that influence household education expenditure has to do with factors such as the distance of school from the house of the student, the availability of school infrastructure (i.e. desk for learning, school building, water, etc.), availability of teachers and books and other supplies. All these factors go to affect the quality of education offered. Households are most concerned about quality of the education system before making the choice of sending a household member to school. Some households often "fear that their children may receive a bad education which seems to be a factor which does not motivate parents to send them to school" (Ministere 1989: 37). In sub Saharan Africa, the distance to school generally has negative significant but small impact on education expenditure, Filmer (2004) finds.

3.7 Conclusion and Summary of Empirical Results

Overall, the study derives its motivation from the human capital theory but focuses on the sensitivity of household demand for education at each level owing to changes in cost of education and household income in Ghana. Assuming a normal production function framework, we can say the dependent variable then becomes the household's expenditure shares of the three levels of education in Ghana while household characteristics (location, income level of household head, and education status of household head, etc.) and school characteristics (cost of education) are the inputs (explanatory variables). Thus the study regresses the dependent variable on the explanatory

variables believed to influence the dependent variable by adopting the Quadratic Almost Ideal Demand System (QUAIDS) model in STATA.

The closest study conducted in the case of Ghana on this thesis topic is the work by Lavy (1996) and Donkoh and Amikuzuno (2011). They used Tobit, Probit and Logit model to make probabilistic estimates on household demand for education. This thesis finds this approach to be inadequate to estimate "real" elasticities. Hence the study adopts the QAUIDS model and the Two-stage budgeting process to determine the sensitivity of household demand for education in Ghana owing to change in cost of education and household income.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

The chapter details the methodology used in this thesis. Previous studies have tried to estimate price and income elasticity of education using various methods such as the Translog-LES method, AIDS, Probit & Tobit models, etc. Most of these studies estimated probabilistic elasticities which do not reflect exact elasticities. In view of that, this study adds to the existing debate to estimate the actual price and income elasticity of demand for education in the case of Ghanaian households using the Quadratic Almost Ideal Demand System (QUAIDS) and the Two-Stage Budgeting process.

4.2 Justification for The Quadratic Almost Ideal Demand System Model

Basically, a demand system could simply be explained as a group of demand equations that can be estimated simultaneously. Demand systems are originally measured using Seemingly Unrelated Regression (SUR) and Simultaneous Equation Systems methods. The investigation of household demand for education and the elasticity estimation coefficients provide relevant information on the demand behaviour of household in terms income, price and household characteristics. (Alexandria et al, 2015).

Over the past decades in the literature, some models were developed to estimate demand systems. Demand system models such as the Linear Expenditure System (LES) developed by Stone (1984), the Almost Ideal Demand System (AIDS) developed by Deaton and Muellbauer (1980) and the

combination of these two systems in to a Generalized Almost Ideal Demand System (GAIDS) proposed by Bollino, (1987) were among the commonest models that have received wide attention in the literature because of their empirical expediency. Other models though not widely used included the Rotterdam model of Theil (1976) and the Translog model of Christensen, et al., (1975). By and large the Linear AIDS model and the Quadratic Almost Ideal Demand System (QUAIDS) have also been developed to improve on the weakness of the earlier models. To accomplish the demand analysis in the case of Ghana, this study makes use of the Quadratic Almost Ideal Demand System (QUAIDS) of Banks et al (1997) at household level to assess the sensitivity of household demand for education owing to a unit change in the cost of education and level of household income.

To begin with, the QUAIDS model originated from the AIDS model which was originally developed by Deaton and Muellbauer (1980) to improve conventional demand analysis. The model estimates the budget share of various commodities and shows they are linearly related to the logarithm of real total expenditure and the logarithms of relative prices. It is an extension of the Almost Ideal Demand System proposed by Deaton and Muellbauer, (1980) that allows demand curves to be nonlinear in the logarithmic of expenditure, hence exhibit nonlinear Engel curve. (Poi, 2012).

The choice of the Quadratic Almost Ideal Demand System (QUAIDS) for the study is based on the attributes the model has over other models such as Rotterdam model and the Translog models.

One advantage of the QUAIDS model is that, the homogeneity and symmetry restrictions in the form of linear approach are easily imposed and tested. QUAIDS model also has a functional form which is consistent with household budget data. The model satisfies the axioms of choice exactly.

The model is also able to estimate elasticities that are consistent with consumer theory. Moreover, the model is able to aggregate perfectly over consumers without invoking parallel linear Engel curves. By introducing the quadratic income term, the QUAIDS model gains more flexibility, which positively influences the quality of the estimated model outcomes. Initially, adding demographic variables was difficult with AIDS model but QUAIDS model has been developed to solve these shortcomings. Demographic variables can be specified in QUAIDS and are incorporated using Ray's, (1983) method. Finally, the model can easily be used to estimate own price elasticity and cross price elasticity between two or more goods as well as the compensated and uncompensated elasticities. (Banks et al 1997) . The Rotterdam and Translog models may also have some of these properties at their respective model level but then neither of them satisfies all the properties compared to QUAIDS.

By and large the QUAIDS model by Banks et al (1997) has become the preferred model for many applied demand economist. A lot of studies have used the QUAIDS model to determine the optimal allocation of expenditure among broad commodities. Kamil Dybczak, Peter Tóth and David Voňka (2010) used the QUAIDS model of Banks et al. (1997), to estimate household demand factoring demographic characteristics of consumers such as the age of the head of the household, the number of family members, and the position on the labor market. The study concluded that Clothing and shoes, transportation and communication, and education and leisure are luxury goods, with income elasticity above one, whiles food, energy, and health and body care are necessary goods, as their budget elasticity is positive and below one at the same time. They further estimated own-price elasticity to be negative for all the commodities estimated including Education.

4.3 Derivation of the Quadratic Almost Ideal Demand System (QUAIDS)

The QUAIDS is an extension to AIDS model. It was first formulated by Banks et al. (1997) who incorporated a quadratic term of income to the system. Banks et al (1997) argued that AIDS exhibits a bias as the Engel curves tend to be non-linear. Banks et al. (1997) found this to be true when they tested it against a model with quadratic term of income. They further found that adding quadratic term of income to the demand system, (that is; making the Engel curves quadratic), is sufficient and no higher degree of dependence on income is needed. The QUAIDS is a more flexible and generalized model which includes demographic variables in its estimation. (Ray, 1983; Blacklow et al., 2010).

Existing literature that adopted QUAIDS model in their analyses include the works by Crawford et al. (2010) who adopted the QUAIDS to study the Value Added Tax (VAT) and excise in the UK. Abramovsky et al. (2012) used the QUAIDS to estimate impacts of the Mexico 2010 VAT reforms. This approach was then used by Jansky (2014) on the proposed VAT reforms of 2013 in the Czech Republic.

Following Poi (2012) the QUAIDS model is formulated from an indirect utility function. In applied economics the goal of the dual problem is to minimize costs and in this case the cost of education at each level, subject to a desired direct utility of these levels of education

We set the demand for **k** set of commodities which the household has budgeted **m** units of currency. In this case, **k** is the three levels of education demand by households. The indirect utility for ***k*** set of commodities is defined as;

(1)

$$\ln V(\mathbf{p}, m) = \left[\left\{ \frac{\ln m - \ln a(\mathbf{p})}{b(\mathbf{p})} \right\}^{-1} + \lambda(\mathbf{p}) \right]^{-1}$$

Where ln a(p) is the transcendental logarithm function given as;

(2)

$$\ln a(\mathbf{p}) = \alpha_0 + \sum_{i=1}^{k} \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^{k} \sum_{j=1}^{k} \gamma_{ij} \ln p_i \ln p_k$$

In this function, p_i is the price of good i for i = 1,2,3,4; b(p) is the Cobb–Douglas price aggregator.

(3)

$$b(\mathbf{p}) = \prod_{i=1}^{k} p_i^{\beta_i}$$

$$\lambda\,(p) = \sum_{i=1}^{k} \lambda_i ln p_i\,, \qquad where \sum_{i=1}^{k} \lambda_i = 0$$

where q_i represents the quantity of i^{th} level of education demanded by household with the corresponding expenditure share to be w_i which is calculated as $w_i = p_i q_i/m$.

By Roy's Identity method, the expenditure shares the of i^{th} level of education is formulated as;

(4)

$$w_i = \frac{\partial \ln a(p)}{\partial \ln p_i} + \frac{\partial \ln b(p)}{\partial \ln p_i}(\ln x) + \frac{\partial \lambda}{\partial \ln p_i}\frac{1}{b(p)}(\ln x)^2$$

And the corresponding expenditure share equation is:

(5)

$$w_i = \alpha_i + \sum_{j=1}^{J} \gamma_{ij} \ln p_j + \beta_i \ln\left[\frac{m}{a(p)}\right] + \frac{\lambda_i}{b(p)}\left\{\ln\left[\frac{m}{a(p)}\right]\right\}^2 + \varepsilon_i$$

i= 1….,k(4)

Where w_i, p_i, p_j and m are expenditure shares, price of good 'i', household j and total expenditure respectively, whiles α_i, β_i, and γ_{ij} are coefficient to be estimated. By setting λ_i=0 (i = 1, 2, 3), equation (5) reduces to the original AIDS budget share equation without the quadratic term. Household preferences over *n* consumption bundles are represented, where *m* is total household expenditure and vector ***p*** represents commodity prices.

To make the model consistent with microeconomic theory, some economic restrictions must be satisfied using Shephard's Lemma and duality theory.

i. Additively; This estimates that expenditure shares of goods (in this case each level of education) sums to the total education expenditure.

ii. Homogeneity; this restriction ensures that the education demand equation is homogenous of degree zero. That means the quantity demanded remains the assuming we multiply the price and expenditure function by a constant k and;

iii. Symmetry restriction; the Slutsky symmetry ensures consumer consistency in terms of choice.

This is denoted by:

Adding up: $\sum_{i=1}^{N} \alpha_I = 1$, (6)

Homogeneity: $\sum_{i=1}^{N} \lambda_I = 0$,

$\sum_{i=1}^{N} \beta_{I=0}$

Symmetry: $\gamma_{ij} = \gamma_{ji}$ For i= 1, 2, 3 N= 4 and J=1, 2, 3

An additional restriction guarantees that the indirect utility function is homogeneous of degree zero in *m* and ***p***:

(7) $$\sum_{j-1}^{n} \gamma_{ij} = 0 \quad \forall i$$

4.4 Controlling for Household Demographics Characteristics in Study Model

Demand analysis modeled at the household level has more than one member and not at the discretion of individual consumer. Again, household expenditure pattern varies in terms of the type of good under consideration and this has been highly argued in the literatures.

There are, additional factors that affect household demand for any good aside the cost of that good. In empirical demand study, we are advised to control for the impact of several household characteristics by expanding the model to include, for example, location of household, labor status of house head, education of house head and possession of durable goods, etc. These variables are called demographic factors and are described as any observable attributes of household other than prices and income that determines demand for services and goods. It is important to include demographic factors in the demand analysis, since household consumption behavior differs based on different household characteristics. It has been tested and proven in the literature for example by Abdulai (2002), Moro and Sckokai (2000), Blow (2003) and Luhrmann (2005), that these demographic characteristics are determinants of household aggregate demand as a whole. Thus, specifying demographic factors correctly is relevant for coefficient estimation, projection and simulation purposes. Failure to specify them correctly leads to misleading results. Despite its significance, not all potential demographic factors can be taken into account when estimating a detailed demand system like QUAIDS. This is mainly due to the high number of coefficient to be estimated and the number of coefficient to be estimated increases significantly with each additional variable. Hence one will have to be extremely careful in choice of demographic factors.

Based on these explanations, it is appropriate for the study to consider household demographic as key determinants of household education demand, hence controlling for them will make the study

more accurate to interpret. However, the study is mindful not to throw in demographic factors unnecessarily to avoid mulitcollinearity issues. With respect to the study, the GLSS6 dataset captures variety of demographic factors and other non-income variables representing individual household characteristics. This study considers demographic factors such as, location of household (Rural/Urban), sex of household head (Male/Female), age of household head and employment status of household head as the only variables entering our QUAIDS model.

To begin with, it is worth noting that, household attitude towards education varies with geographical location of households. In the rural areas, education is more likely to be considered expensive, because most of them work in subsistence farming and are relatively poor to finance education of their children, hence they are expected to have lower education budget. Those in the urban areas however are more likely to consider it as a necessity to influence their children's status in the labour market, as such are likely to have higher education budget. Okuwa (2004) supports this and suggest that, the difference in opportunity cost of education in the rural area and urban areas explains the disparity in household educational funding in these two areas. In view of this, the study control for rural and urban household education demand. The study creates a binary variable that assumes the value of 1 for rural households and 0 for urban households.

Secondly, education status of household head is another relevant factor that influences consumer education behavior. Ideally, it is expected that, the more educated the household head is, the more likely they are to demand for education by way of education expenditure, than household head with lower or no form of education. Donkoh and Amikuzuno (2011) and Glewwe and Jacoby (1994) showed that education status of parents (household head) has a positive impact on children education spending in Ghana. In view of that the study create dummy variables (0) for household

heads that have no education qualification, (1) for households that have at most Basic education and (3) for households that have acquired more than basic education. Notwithstanding, the study drops this variable because it is very likely that education is correlated with per capita expenditure of household. As income and prices are the key variables of any demand system, the study exclude the education status variable from the econometric analysis in order to prevent an excessive level of mulitcollinearity among the explanatory variables.

In the literature, consumption pattern of household is noted to be significantly influenced by the labor market status of the household head. The study groups the consumption shares of households into four: (1) employed, (2) the self-employed, (3) the unemployed, economically non-active households and retirees (4). The work of Kamil Dybczak, Peter Tóth and David Voňka (2010), found that, economically non-active and unemployed households tend to spend a smaller share of their budgets on education and leisure compared to high education expenditure by employed and self-employed households. Even though labor market status is usually included in the analysis of consumer demand systems, it may be correlated with the household expenditure variable, notwithstanding the study keeps this variable for further analysis.

The study further control for the sex of the household head. The study identifies how the sex of a household head affect the demand for education in that household. Hence, the study distinguishes between households that have, (1) Male household head and (0) Female household heads. Donkoh and Amikuzono (2011) and Okuwa et al (2015) found in their studies that, female household heads on average spend more on their children's education than male household heads.

With respect to age effects, Luhman (2005) found that age influences the structure of household consumption and not merely the size of the household. In her study, it was found that household

education expenditure shares decreases with the age of individual in the household. Okuwa et al (2015) established a negative relationship between age of household head and household education. In view of this, the study includes age variable into the model. The study creates dummies to cater for the three age groups; (1) young (less than 40 years), (2) middle-aged (41 -60 years), and (3) old (over 60 years).

As already indicated, not all potential demographic factors can be taken into account when estimating a detailed demand system like QUAIDS. This is mainly due to the fact that, the number of coefficient to be estimated increases significantly with each additional variable. In view of that this study used; the age of the family head, the location of the household, and labor market status of household head as the only demographic variables entering the QUAIDS.

Hence, incorporating demographics into our model we use ***z*** to represent a vector of ***r*** demographic characteristics.

Ray's (1983) study modeled the expenditure function for each household in the form;

(8)

$$\mathbf{e(p, z, u) = m_0(p, z, u) \times e^R(p, u)}$$

The function $\mathbf{m_0(p, z, u)}$ scales the expenditure function to account for the household characteristics. He then separated the function as;

(9)

$$\mathbf{m_0(p, z, u) = m_0(z) \times \varphi (p, z, u)}$$

The left hand term accounts for the change in house expenditure in this case education expenditure as a function of household demographics **z**, not controlling for any changes in household expenditure pattern. The right hand term measures the relative change in price; in this case the cost of education and the actual goods consumed (in this case the actual education expenditure made).

Following Ray (1983), QUAIDS parameterizes $m_0(z) = 1 + \boldsymbol{p}'z$ with $\boldsymbol{p}$ being a vector of coefficient to be estimated.

According to Poi (2002), QUAIDS estimates φ (p, z, u) as

(10)

$$\ln \phi(\mathbf{p}, \mathbf{z}, u) = \frac{\prod_{j=1}^{k} p_j^{\beta_j} \left(\prod_{j=1}^{k} p_j^{\boldsymbol{\eta}_j' \mathbf{z}} - 1 \right)}{\frac{1}{u} - \sum_{j=1}^{k} \lambda_j \ln p_j}$$

Equation (10) looks complex but carries a unique advantage of measuring expenditure share equations that is almost equal to the expenditure share equation without demographic factors.

$\boldsymbol{\eta}_j$ denotes the j^{th} column of *r x k* parameter matrix $\boldsymbol{\eta}$.

The QUAIDS expenditure share equation incorporating demographics is given as;

(11)

$$w_i = \alpha_i + \sum_{j=1}^{k} \gamma_{ij} \ln p_j + (\beta_i + \boldsymbol{\eta}_i' \mathbf{z}) \ln \left\{ \frac{m}{\overline{m}_0(\mathbf{z}) a(\mathbf{p})} \right\} + \frac{\lambda_i}{b(\mathbf{p})\, c(\mathbf{p}, \mathbf{z})} \left[\ln \left\{ \frac{m}{\overline{m}_0(\mathbf{z}) a(\mathbf{p})} \right\} \right]^2$$

where

$$c(\mathbf{p}, \mathbf{z}) = \prod_{j=1}^{k} p_j^{\boldsymbol{\eta}_j' \mathbf{z}}$$

The adding up restriction requires that, $\sum_{j=1}^{k} \eta_{rj} = 0$ for r= 1,…, k (4)

Where w_i, p_i, p_j and m are expenditure shares, price of good 'i' and household j and total expenditure respectively, whiles α_i, β_i, and γ_{ij} are coefficient to be estimated. Similarly, *z* denotes the vector of *r* demographic variables. The price index In a(**p)** is well defined in equation (2) resulting in a set of equations that can be fit by linear estimation techniques.

From equation (11), P_i in this present study, denote relative price of education, measured by dividing the household education expenditure for i^{th} level of education by student enrollment of i^{th} level of education. Where $\mathbf{w}_i$ is the proportion in the total education expenditure (i.e., w = p*q / x) of the i^{th} level of education. Similarly, ***q*** represents education demand for a particular level of education measured by school enrollment divided by an appropriate population of that level of education, whiles ***m*** represents the total education expenditures by households.

4.5 Model Assumptions

There are some assumptions of the QUAIDS that must satisfied. The study has already stated some of this restriction which was imposed on the QUAIDS model to make it consistent with micro economic theory. In addition to these assumptions, the QUAIDS further assumes fixed prices for each individual consumer (in this case, household members who are currently enrolled in a school). Therefore, the study assumes education prices to be fixed, i.e., not dependent on the total of demanded quantity. This means that, demand-supply interactions on the market cannot be used as predictions for price in this model.

It is further important for the study to assume that the decision making process on the side of demand for education is not done by individuals but rather by the household as a whole. This can be a single person in case of single households but usually it is done by one of the parents or one of the couple, or relative.

4.6 Model Estimation

The study conducts an education demand analysis using a household survey data from the Ghana Statistics Service, Ghana Living Standard Survey 6 (GLSS6) to estimate the income and price elasticities at household level. This shows the responsiveness of household demand for education owing to a unit change in cost of education and household income.

The study considers four goods demanded by households; Basic Education, Secondary Education, Post-Secondary Education and Tertiary Education. From equation (11) P_i in this present study, denote relative price for each of the levels of education, constructed by dividing education spending for i^{th} good by the student enrollment of i^{th} good. Where $\mathbf{w}_i$ is the share in the total education expenditure (i.e., w = p*q / m) of the i^{th} good and ***q*** denotes quantity demand for education services measured as number of household members currently enrolled in a school whiles ***m*** represents the total education expenditures by households which also serve as the proxy for income.

The Quadratic Almost Ideal Demand Model estimation process was conducted in STATA 13. In the model estimation the study uses each of the budget share equations for all levels of education but state the functional form using the ln a(p) transcendental logarithm function as stated in equation (2).

The analysis assumes there is an additive zero-mean error term associated with each of the k expenditure share equations. To obtain the coefficients, the Iterated Feasible Generalized Nonlinear Least-Squares was used via Stata's **nlsur** command with the **ifgnls** option.

Since all the expenditure shares sum to unity, the share covariance matrix is singular. In order to provide a nonsingular covariance matrix, the expenditure share equation for the fourth good (tertiary education) is dropped, and the nonlinear maximum likelihood method is applied to the remaining expenditure share equations. The maximum likelihood estimates are in- variant to the choice of equation deleted. The parameter $\boldsymbol{\alpha_0}$ is defined as the expenditure required outlay required for a minimal standard of living when prices are unity. According to Banks et al (1997), the value of α_0 should be set at a value lower than the lowest log expenditure value in the base year.

There are different ways of estimating coefficient for given demand system. A commonly adopted approach in the literature is the maximum likelihood approach. Similarly, Banks et al (1997) adopted the two-stage GMM estimation method for non-linear equations so to handle possible endogeneity and non-linearity problems with the dependent variables. Alternatively, Poi (2008) methodology also used the non-linear SUR method. In this study however, the demand system was estimated using QUAIDS model using the maximum likelihood approach adopted by Poi (2012) and the two stage budgeting process.

In view of that, just like Poi (2012), first the study estimates the stochastic version of the QUAIDS Model. Following that, the study re-estimated the model but this time factors demographic characteristics which includes the sex of household head, employment status of household head, age of household head and location of household (rural/urban) whose results gives the actual elasticity estimates for this study.

Moving forward, the study estimated the expenditure and own price elasticity for household demand for each level of education in Ghana. In estimating the own price elasticities, the study used the uncompensated prices elasticities estimated from the QUAIDS coefficient. The results estimated explains the price and income sensitivity of household demand for education at all levels in Ghana.

4.6.1 Wald Test of Model Restrictions and Demographic Factors

There is the need for the study to ensure that all estimated coefficients adhere to economic theory. In view of that, it is necessary to make assumptions and equally test the coefficient to ensure they satisfy economic theory. As described earlier, the demand function applied for the purposes of this study also requires necessary economic restrictions on the coefficient to be estimated. In effect, the study uses the Wald Test ensure these restrictions are fulfilled.

Next, the study test the demographic variables used in the estimation to ascertain their significance to the model and result. Just like any other estimation command, we use the *test* command to perform the Wald test on the coefficient. The Wald Test is a statistical test used to confirm actual values of varying coefficient such that the statistical relationship between these coefficients to be modeled and the estimates under verification are derived from samples of a population of these coefficients. The null hypothesis is that, all the individual demographic variables used in the estimation do not influence household education expenditure patterns in Ghana. If the null hypothesis is true, then all elements of the row of the η matrix corresponding to demographic variables must be jointly zero, together with the corresponding element of the ρ vector.

Table 4.1 provides the estimated parameters of the QUAIDS model factoring household demographics in the model. By inspection, the estimated parameters α, β and λ of the QUAIDS model satisfy the adding-up and homogeneity conditions (6). Using the Wald Test, table 4.2 confirms the relevance of household demographic variables on the study and rejects the QUAIDS model without demographic variables which is the null hypothesis. In effect, all elasticity estimates were done with demographic variables included.

Table 4.1 Coefficients of Selected Parameters for QUAIDS Model Estimated.

Number of observations = 10681
Number of demographics = 3
Log-likelihood = 38531.344

Parameters	Coefficients	Std. Error	z	P> |z|
α_1	.5527591	.0061787	89.46	0.000
α_2	.3898163	.0042367	92.01	0.000
α_3	.2228176	.0045091	49.41	0.000
α_4	-.1653929	.0028813	-57.40	0.000
β_1	-.0726428	.0021174	-34.31	0.000
β_2	-.0660315	.0014902	-44.31	0.000
β_3	-.0165566	.0016161	-10.24	0.000
β_4	.1552309	.0007569	205.08	0.000
λ_1	.0069917	.0002529	27.65	0.000
λ_2	.0090631	.0001992	45.51	0.000
λ_3	.0017925	.0001965	9.12	0.000
λ_4	-.0178474	.0001663	-107.30	0.000

Source: Own calculations.

Table 4.2 Results of Testing the Hypothesis About the Importance of Demographic Variables in the QUAIDS Model

Number of observations = 10681
Number of demographics = 3
Log-likelihood = 38531.344

Wald Test	Chi Sq	Prob > Chi Sq
Location of household	489.41	0.0000
Sex of Household Head	72.33	0.0000
Employment Status of Household Head	153.11	0.0000

Source: Own calculations.

4.7 Elasticity Estimations

As mentioned in Lewbel (1991), interpretation of raw demand system parameter directly is difficult. The study is actually more interested in the income and price elasticities rather than in the coefficient of the expenditure share equations per se. As shown by Banks et al. (1997), uncompensated price and income elasticities is presented as follows;

i. Uncompensated Price Elasticity of good *i* owing to a unit change the price of good *j* incorporating demographic is given as;

(11)

$$\epsilon_{ij} = -\delta_{ij} + \frac{1}{w_i}\left(\gamma_{ij} - \left[\beta_i + \boldsymbol{\eta}_i'\mathbf{z} + \frac{2\lambda_i}{b(\mathbf{p})\,c(\mathbf{p},\mathbf{z})}\ln\left\{\frac{m}{\overline{m}_0(\mathbf{z})\,a(\mathbf{p})}\right\}\right]\times \left(\alpha_j + \sum_l \gamma_{jl}\ln p_l\right) - \frac{\left(\beta_j + \boldsymbol{\eta}_j'\mathbf{z}\right)\lambda_i}{b(\mathbf{p})\,c(\mathbf{p},\mathbf{z})}\left[\ln\left\{\frac{m}{\overline{m}_0(\mathbf{z})\,a(\mathbf{p})}\right\}\right]^2\right)$$

The income elasticity of demand for good *i* is given as;

(12)

$$\mu_i = 1 + \frac{1}{w_i}\left[\beta_i + \boldsymbol{\eta}_i'\mathbf{z} + \frac{2\lambda_i}{b(\mathbf{p})\,c(\mathbf{p},\mathbf{z})}\ln\left\{\frac{m}{\overline{m}_0(\mathbf{z})\,a(\mathbf{p})}\right\}\right]$$

Alternatively, we can use the expression below to quantify household education budget elasticities for the i^{th} level of education.

(13)

$$e_i = \frac{\mu_i}{w_i} + 1$$

The notation, e_i measures the household elasticity of demand for the i^{th} level of education owing to changes in household total expenditure, i.e., it shows how the quantity demanded of the i^{th} level of education owing to 1 percent change in household education expenditure for the i^{th} level of education.

High income elasticity indicates that, households are more income responsive to the demand for i^{th} level of education. A normal good has positive income elasticity. Estimated income elasticity between 0 and 1 shows the i^{th} level of education is a normal necessity good. With such goods, their demand is insensitive to changes in household income. In the same vain, if the value of e_i is greater than 1, it means that, the i^{th} level of education is a luxury good. In this case, demand for the i^{th} level of education is highly responsive to change in household income. Finally, inferior goods have negative income elasticity. Thus, demand for this type of good falls as income rises.

A good is price elastic in absolute terms when its estimated value is greater than 1, while a good is price inelastic in absolute terms if its estimated value is less than one. Elastic goods are highly responsive to price changes whiles inelastic goods are not responsive to price changes of that good. Price elasticities can be derived either from the Marshallian demand equation or from the Hicksian demand equation. To obtain the Marshallian demand equation, one has to maximize the utility of that good subject to the budget constraint, while the Hicksian demand equation is derived by solving the dual problem of expenditure minimization at a certain utility level of a good. In the case of Marshallian/uncompensated price elasticity, positive e^{u}_{ij} indicates gross substitutes and negative e^{u}_{ij} indicates gross complements. A zero value of e^{u}_{ij} suggests independent goods. The uncompensated price elasticity in the case of QUAIDS is defined as follows:

(14)

$$e_{ij}^{u} = \frac{\mu_{ij}}{w_i} + \delta_{ij}$$

4.8 Two Stage-Budgeting as an Economic Decision-Making Process

To broaden the scope of the study, the two-stage budgeting processes as used by José (1997) was adopted. Indeed, most economic decisions taken by consumers correspond to the allocation of expenditure to specific consumption goods. According to Strotz (1957) and Gorman (1959), in order to make rational expenditure decisions, consumers adopt the two-stage budgeting process. According to José (1997), the method follows that consumers distribute total expenditure first to broad groups of goods, based on a price for each group, and then further allocate expenditure

within each of these groups, based on group individual prices and group expenditures. In respect of that, the model first estimates the demand elasticity using total expenditure allocated into a number of main different groups of goods. The same demand system is re-estimated, but now employing only data for one of these groups, dividing the expenditure in this group into different specific good under that one main good group.

In view of that, this study considers household expenditure on five group of goods namely, food (F), clothing (C), housing (H), education (E) and other goods and services (O) and, second, with respect to each level of education that are included in the Education group. That is, the expenditure on each level of education namely, Basic education (B), Secondary education(S), Post-Secondary education (PS) and Tertiary education (TE) where q_i represents the quantity demanded of i^{th} good, and p_i denotes the price and y denotes the total expenditure (or income). Thus, the utility function corresponding to the two-stage budgeting process of the consumer can be written as u = F[UF(qF), UC(qc), UH(qH), UE(qB, qS, qPS, qT), UO(qO)], Based on this model, household first maximize the utility function u = F[UF(qF), UC(qC), UH(qH), UE(qE), UO(qO)], subject to the budget constraint and, second, once household has determined the quantity (qE) and expenditure (yE) destined to education, the household, then allocate this expenditure among Basic, Secondary, Post-Secondary and Tertiary education, thus maximizing U = UE(qB, qS, qPS, qT)

Following the two stage budgeting process by José (1997), first we measure the average expenditure elasticity of demand for each level of education with respect to total expenditure or income. Next, the study now estimates the household average education expenditure elasticity of demand for each level of education with respect to household total education expenditure. In estimating our overall education expenditure for each level of education elasticities, the study

calculates the effects with respect to total expenditure by using $e_{iy} = e_{iYE}e_{EY}$, where e_{iy} denotes total expenditure elasticity for the i^{th} education good, e_{iYE} represents the elasticity of the i^{th} level of education with respect to total education expenditure and e_{EY} denotes the expenditure elasticity of education with respect to total expenditure or income.

4.9 Data

This paper uses data from the Ghana Living Standard Survey (GLSS) round Six (6), a Ghana government funded household survey supported by the United Kingdom Department for International Development (UK-DFID), UNICEF, UNDP, and the International Labor Office (ILO) implemented by the Ghana Statistical Service (GSS). The survey covered a period of twelve (12) months from 18th October 2012 to 17th October 2013.

The GLSS is the most comprehensive household survey ever implemented in Ghana, covering almost all districts in Ghana. Out of the 18,000 households selected for the survey, 16,772 were successfully interviewed. The GLSS 6 questionnaire collects information on all household education expenditure and the categories under which these education expenditures are made. It captures data on household education expenditure as well as household income. It also captures all categories of expenditure including education expenditures incurred by household during the survey period making it possible to estimate the household elasticity of general education in Ghana.

For the sake of the present study, the analysis focuses on a dataset comprising 10,786 observations of currently enrolled students during 2012/2013 period of the survey and for which households make current education expenditures to analyze household demand for each level of education in

Ghana. In the data the study report 6,215 rural households representing 57.6% and 4,571 urban households representing 42.4% of the total 10,786 sample data for the study.

For the purpose of this study the direct and indirect cost of education includes the tuition and registration fees, boarding fees, Parent Teacher Association levy, transportation fees to school, extra classes fees and any other cost of education as captured in the GLSS6. The price of education is calculated by dividing the total household education expenditure by the household enrolment of the respective level of education. These costs are the prices for the respective levels of education. This is denoted by P_B, P_S, PPs, P_T as price of Basic education, Secondary education, Post-Secondary education and Tertiary education respectively.

Ghana's education system is divided into four levels: Basic Education (kindergarten, Primary and JHS), Secondary (Senior High Schools, Technical schools), Post-Secondary (Vocational, Training colleges Nursing Schools) and Tertiary Education (universities, and Polytechnic schools). The variables used are the share of Basic education (W_1), Secondary education (W_2), Post-Secondary (W_3) and tertiary education (W_4) in the total household education expenditure and household income. The demographic variables used in the estimation procedure includes dummy variables for sex of household head, Age of house head, employment status of house head, dummy variables for rural and urban household differences.

4.10 Descriptive Statistics

Table 4.3 below shows the description of the variables used in the estimation process. Table 4.4 shows that on average, observed households spend GH¢896.44 on children's education annually. Table 4.5 shows household mean annual per capita education expenditure by quintile in Ghana.

Table 4.6 shows summary of statistics of household education expenditures in quintiles according to level of education). Following the adoption of the two-stage budgeting model for this study, we make use of data on household food and non-food expenditures to aid in the estimation of elasticities that concerns this study.

Table 4.3: Data Variable Description

Variable	Description
Basic Education	Household total expenditure on pre-primary, primary and JHS education
Secondary Education	Household total expenditure on secondary education
Post-Secondary Education	Household total expenditure on post-secondary (Vocational, Training colleges and Nursing)
Tertiary Education	Household total expenditure on post-secondary
X	Household total education expenditure by Households.
W_1	Expenditure share of Basic Education (Kindergarten, Primary, JHS)
W_2	Expenditure share of Secondary Education (SHS and Technical schools)
W_3	Expenditure share of Post-Secondary (Vocational, Training colleges and Nursing)
W_4	Expenditure share of Tertiary Education (University, polytechnic)
P_B	Price of Basic Education (Kindergarten, Primary, JHS)
P_S	Price of Secondary Education (SHS)
P_{PS}	Price of Post-Secondary Education (Vocational/Technical schools, Training colleges, Nursing)
P_T	Price of Tertiary education (University, polytechnic)
lnP_B	Log of Price of Basic Education (Kindergarten, Primary, JHS)
lnP_S	Log of Price of Secondary Education (SHS)
lnP_{PS}	Log of Price of Post-Secondary Education (Vocational/Technical schools, Training colleges, Nursing)
ln P_T	Log of Price of Tertiary education (University, polytechnic)
lnexpEd	Log of Total Education Expenditure by Households.
HH_age	Age of Household Head: (1) if <41 (2) if age is 41-60 (3) 60+
rural	Dummy:1 if rural household & 0 otherwise
HH_emp_status	Employment Status of Household Head; Employee(1) Self Employed(2), Unemployed(3) Retired and Non active(4),
HH_sexmale	Sex of Household head Dummy:0 if female household head & 1 otherwise
TOTFOOD	Total Household expenditure on food
TOTCLTH	Total Household expenditure on clothing
TOTHOUS	Total Household expenditure on Housing
OTHER	Total Household Education Expenditure on other goods and services under household total expenditure.

Table 4.4: Summary Statistics

Variable	Obs	Mean	Std. Dev.
Total Household Education Expenditure	10786	896.4413	1576.311
Basic Education Expenditure	10786	519.4864	838.8573
Secondary Education Expenditure	10786	204.2032	857.4327
Post-Secondary Education Expenditure	10786	36.54213	315.5002
Tertiary Education Expenditure	10786	136.2095	839.5098
Basic Education Enrollment	10786	2.249954	1.567286
Secondary Education Enrollment	10786	.2009086	.4827705
Post- Secondary Education Enrollment	10786	.0255887	.1636786
Tertiary Education Enrollment	10786	.0605414	.2678001
Price of Basic Education	10786	241.5123	397.5645
Price of Secondary Education	10786	175.0204	788.2225
Price of Post-Secondary Education	10786	35.25139	304.7201
Price of Tertiary Education	10786	118.3029	697.8594
Share of Basic Education	10681	.8214043	.3468522
Share of Secondary Education	10681	.1198602	.2854511
Share of Post-Secondary Education	10681	.0177632	.1206348
Share of Tertiary Education	10681	.0409723	.1826998
Sex of Household Head Dummy: 1(male) 0(Female)	10786	.7184313	.449785
Location of Household Dummy: 1(rural) 0(Urban)	10786	.5762099	.4941808
Education Level of Household Head	10786	2.163731	1.49252

Table 4.5: Household Mean Annual Per Capita Education Expenditure by Quintile

Income Quintile	Per Capita Education expenditures (GH₵)
First quintile	242.894
Second quintile	527.349
Third quintile	877.882
Fourth quintile	1330.611
Fifth quintile	2339.669
Total (Ghana)	896.441

Source: Ghana Living Standard Survey, 2012 /13

Table 4.6: Summary of Statistics (Education Expenditures in Per Capital Expenditure Quintiles According to Level of Education)

	1st Quintile			2nd Quintile			3rd Quintile		
Variable	**Obs**	**Mean**	**Std. Dev**	**Obs**	**Mean**	**Std. Dev**	**Obs**	**Mean**	**Std. Dev**
Basic	2644	175.8497	274.1432	2541	379.7056	508.0055	2327	590.3567	733.6529
Secondary	2644	58.25745	209.0348	2541	117.971	362.0242	2327	204.7214	573.1154
Post-Secondary	2644	4.201815	55.89248	2541	11.24301	135.6768	2327	34.10935	245.7939
Tertiary	2644	4.585098	78.10029	2541	18.42945	178.3574	2327	48.69446	314.8503
	4th Quintile						5th Quintile		
Basic	1998	803.4167	1051.41				1276	936.0622	1405.716
Secondary	1998	330.3013	793.4564				1276	479.9453	2030.24
Post-Secondary	1998	56.38759	426.0334				1276	127.2966	626.1232
Tertiary	1998	140.5052	660.2093				1276	796.3652	2123.273

Source: Authors own estimation from Ghana Living Standard Survey, 2012 – 2013

CHAPTER FIVE

PRESENTATION AND DISCUSSION OF EMPIRICAL RESULTS

5.1 Introduction

Chapter five details the empirical findings and discussion of the results on the price and income elasticity of household demand for education in Ghana following the specification model used in chapter four. The first part of chapter five explains the estimation procedure whiles the second part focuses on the discussion of the major findings on the estimation results based on Quadratic Almost Ideal Demand System model and the Two-Stage Budgeting model.

5.2 Estimation Analysis Procedure

The conceived hypothesis for this study is that, there exists an inverse relationship between cost of education and household demand for education, whiles households with high income, demand more education than households with lower income. To test this hypothesis and estimation, the study adopts the QUAIDS model and the two-stage budgeting model to estimate household demand for education in Ghana.

The principal goal of this paper is to analyze the effects of education cost and household income on household demand for education behaviors. To accomplish this goal, the study concentrates on households who have their members currently enrolled in school for which households make education expenditures using the GLSS 6. The study also acknowledges the role of government

in reducing education cost of children. However most of these government cost intervention are directed at the tuition fees and as the days go by, it is becoming evident households in Ghana incur other associated education cost which could rise to even discourage household demand for education even if tuition fees are zero. From the previous chapter, the thesis explains the significant role played by household characteristics in their demand for education. In view of that, the study incorporates demographics characteristics that includes; employment status of household head, distribution of sex of household head, and further the rural- urban location differences in the analysis. Also an interaction of these characteristics was computed to observe how households would react to price and income changes when demanding education for their members.

5.2.1 Household Demographic Analysis on Household Demand for Education in Ghana

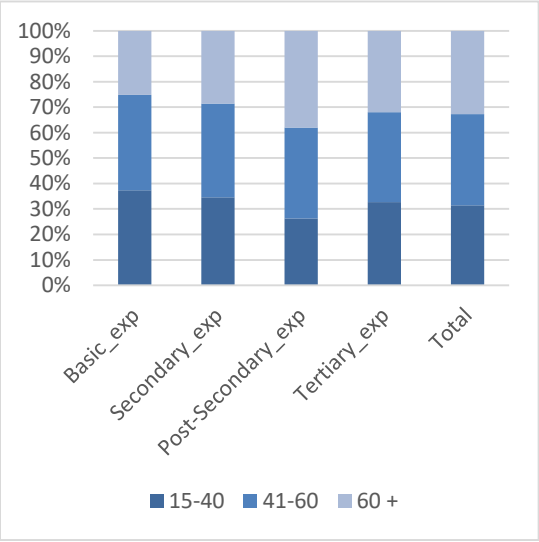
The study acknowledges the age of household head as a significant determinant in the consumption decision-making process of that household. As a result, the study sub-grouped the age of respondents (household head) into 3 groups; young age (15 -40 years), middle age (41-60) and old age (60 +). In terms of the effect of *age of household head* on household education expenditure, the study found from figure 5.1 that, younger household heads tend to spend less on education than the middle and old age household head. This comes as a surprise considering the fact that, one will rather expect the younger house heads to be more elite and abreast with the social economic benefits of education than other older age groups. Notwithstanding, this finding is consistent with the study by Donkoh and Amikuzuno (2011) on Ghanaian households.

In terms of the effect of *household income* and *location of household* on household education expenditure, the study found that, employed household heads as well as urban household heads

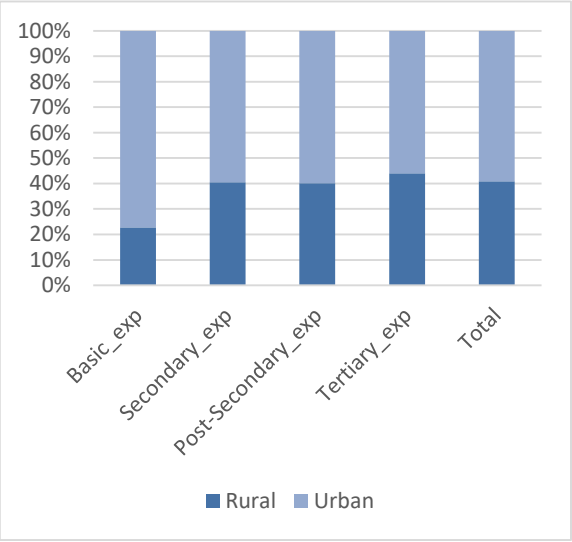
have higher probability of spending on the education of their children than their counterparts who are unemployed and those living in the rural areas. This finding is consistent with the results of Glewwe & Patrinos (1999) and Quang (2012) who found that the willingness of household to make education expenditure on their children increases with increase in household income. Glewwe & Patrinos (1999) found that there is the high tendency for households in urban areas to make higher education expenditures than rural households. This is because, urban households are financially positioned to support quality education than their rural counterparts who are unemployed and are financially constrained to support quality education of their children.

Figure 5.1: Average Total Amount Spent by Household per Member Attending School by Demographics (%), 2012-2013

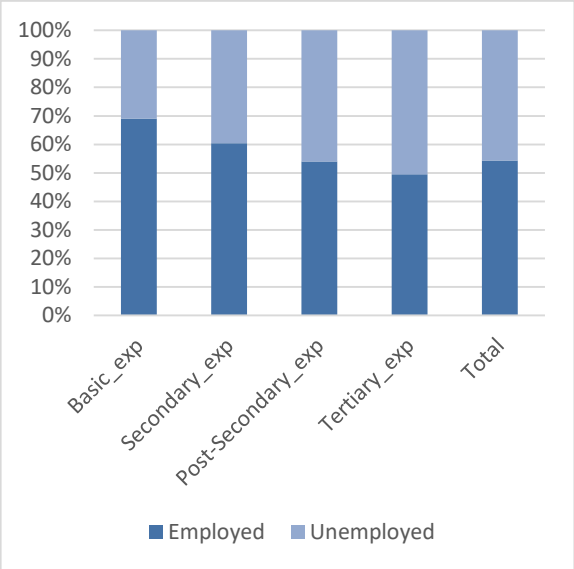
Age



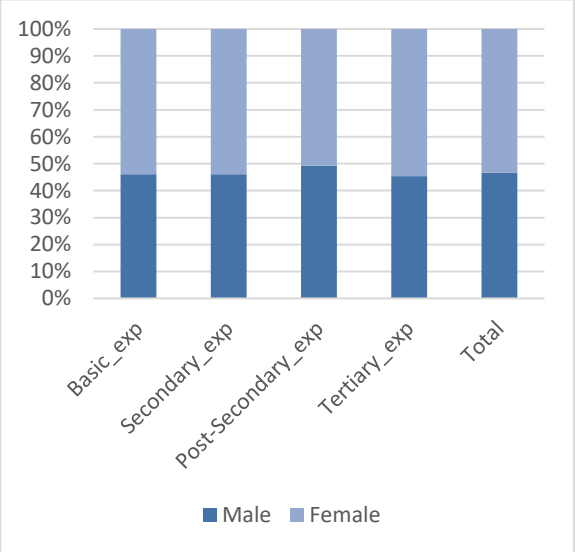
Location



Employment Status



Sex of House Head

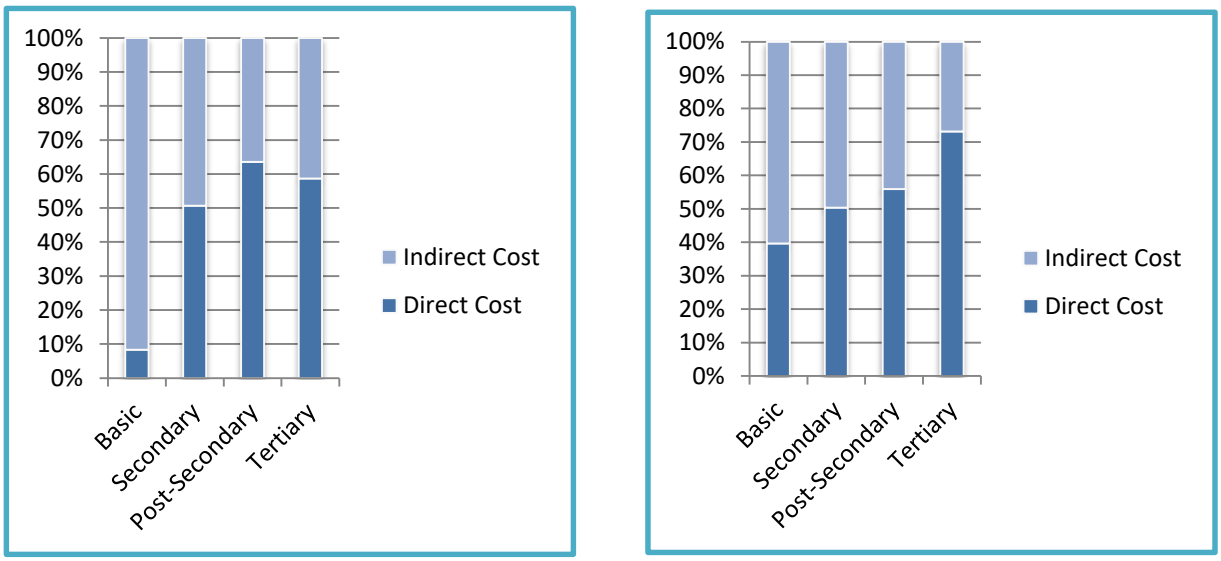


Source: GLSS 6, Author's own calculation

Figure 5.2 provides a graphical presentation of both direct and indirect education expenditures, that households in Ghana make. Basically, Ghanaian households on average spend close 40% of their total education expenditures on indirect cost. What is surprising is the high indirect expenditures incurred at the basic level of education for public school who are direct beneficiaries of government flagship programs such as free basic education, school feeding program, among other policy interventions.

Figure 5.2: Average Household Education Expenditure by Type of Cost for Private and Public Schools (%) 2012/2013

Public *Private*



Source: Authors Own Calculation Based on GLSS Survey 6

5.3 Econometric Analysis of Household Income Elasticity of Education Demand in Ghana

In demand theory, one of the most popular measures in consumer demand is the income elasticity coefficient. One added advantage of the QUAIDS model to this study is the fact that, it enables us to determine the expenditure elasticity coefficient, which shows the relative change of demand for education in response to a one percent increase in household income. With respect to this thesis, the demand for education means total household education expenditure.

Table 5.1 and Table 5.1.1 provide the two-stage average income and price elasticities of demand for education for household in Ghana. From the tables, it is clear that almost all the results are statistically significant at 5%. Adopting the two stage budgeting, the analysis found from that, considering five group of items consumed by households namely; Food, Clothing, Housing, Education and Other goods and services, on average, household demand for education which is the main focus of this study has an income elasticity of 0.439 %. This means that education general is a normal necessity good, the demand of which increases with a change in household income holding other household goods constant. The finding also suggests that, even though Ghanaian households are faced with high cost of education, they demand at least one level of education regardless of their income. This shows the importance Ghanaian households attach to education by recognizing its significant role in influencing the incomes and welfare of household members. Comparatively, the findings of this study is consistent with the findings by Gallet, Craig, (2007) who estimated that quantity demanded for education was less responsive to household income in the U.S. Glewwe & Patrinos (1999) and Quang (2012) also estimated a normal elasticity of household demand for education.

Table 5.1: Household Income Elasticity of Education Demand (First Stage)[4]

Items	Income Elasticity
Food	**0.989**
	(0.001)
Clothing	**0.934**
	(0.004)
Housing	**1.560**
	(0.036)
Education	**0.439**
	(0.130)
Other goods and services	**0.964**
	(0.002)

Source: Own calculations.

Notwithstanding, the purpose of this analyses is to estimate household income elasticity for each level of education with respect to total household income. This second stage of the two-stage budgeting process presents the elasticity for each level of education; basic, secondary, post-secondary and tertiary education with respect to first, the total household expenditure and secondly with respect to total household education expenditure.

[4] Expenditure values are elasticity coefficients whiles Standard mean errors in parenthesis

Table 5.1.1 Household Income and Price Elasticity of Education Demand (Second Stage)

	Income Elasticity			Prices(uncompensated)
	Total Household Exp	Ed Exp	Overall Effect	
Basic	**0.758**	**1.019**	**0.773**	**-0.732**
	(0.106)	*(0.005)*		*(0.014)*
Secondary	**0.514**	**1.028**	**0.528**	**-0.785**
	(0.144)	*(0.003)*		*(0.057)*
Post-Secondary	**0.411**	**0.987**	**0.406**	**-0.763**
	(0.204)	*(0.003)*		*(0.054)*
Tertiary	**-0.336**	**1.001**	**-0.336**	**-0.608**
	(0.721)	*(0.068)*		*(0.166)*

Source: Own calculations.

In terms of household demand for education with respect to total household expenditure it was found in Table 5.1.1 that for every 1% increase in household income, demand for basic, secondary and post-secondary rises by 0.758%, 0.514% and 0.411% respectively, whiles demand for tertiary education by way of education expenditure decreases by 0.336%. The negative budget elasticity estimated for tertiary education is explained by the income substitution effect which suggest that, Ghanaian households prefer private tertiary education over public tertiary education as household income rises. Where Ghanaian households perceive income as a barrier to acquiring quality education for their children, they make the choice to send their children to a school which they believe has the quality services to educate their children, as their income rises.

From the Table 5.2, it is evident that as household income rises, Ghanaian households make the preference by demanding more private tertiary education over public tertiary education. This situation is very common among urban households who choose private tertiary education over public education when their income rises.

Table 5.2 Household Income Elasticity of Education Demand Based School Type

Expenditure Elasticity		
	Public	**Private**
Basic	1.209	0.958
Secondary	0.595	0.881
Post-Secondary	0.387	0.919
Tertiary	-0.288	0.871

Source: Author's own estimation, GLSS6

Now, estimating household expenditure elasticity for each level of education with respect to total household education expenditure, it was found that, a 1% increase in household education budget raises household education expenditure for basic, secondary, post-secondary and tertiary education on average by 1.019%, 1.028%, 0.987% and 1.001% respectively. These estimated elasticities are quite high, implying that Ghanaian households spend higher percentage of their education budget in acquiring these levels of education most especially basic and secondary education. Estimating high education budget elasticities suggest that, these levels of education in Ghana are characterized

with high indirect cost of education, as such households are compelled to make extra out of pocket education expenditure to get quality education for their children. This strong association between household income and education (basic and secondary education) indicates that government commitment to free basic education among other education polices are not felt enough, as an average household in Ghana is pushed to cover some other indirect education expenditure relying on their own resources to obtain quality education for their members. It is therefore not surprising that, household education expenditure as a share of household total income has been rising over the years. According the GLSS 6 report, households in Ghana spend on average GH 1,271.00 annually on education, representing 10.6 percent of total annual household expenditure in 2013 which is an increase from 7.6 percent in 2006. As shown from Figure 5.2, households in Ghana spend almost 40% of their total educational expenditure on indirect costs such as parent –teacher association dues, books and supplies, transport, private tuition, food and boarding and school uniforms with basic education having the highest percentage of indirect expenditure cost.

Considering the two-stage budgeting process, the overall income elasticity of demand for each level of education with respect to total household expenditure is estimated at 0.773%, 0.528%, 0.406% and -0.336% for basic, secondary, post-secondary and tertiary education respectively. This result is consistent with the finding of Bayar & Yanik Ilhan (2016). Based on the estimated elasticities, it suggests that, education at each level of education is a normal necessity good, the demand of which increases as household income rises for basic, secondary and post-secondary schools in Ghana. This emphasizes the significant role of household income as a determinant of household education expenditure.

The results also confirm that, households in Ghana perceive education as a crucial investment that has full future benefits to the individual and household at large. Ghanaian perceive education as a means to come out of poverty, in the sense that, education positions the individual for the labor market and increase their chance of employment and raising income. In view of that, household are willing to increase their demand for each level of education as household income rises. Notwithstanding, even though the demand for each level of education among Ghanaian households is income inelastic, the relatively high income elasticity estimated suggests that household are burdened with inevitable high indirect education expenditure. In effect, Ghanaian households are compelled to spend a greater percentage of their income to afford this level of education. Specifically, the study found that, even though basic education enjoys government's free basic education policy, household demand for basic education was more responsive to household income (0.773%) than other levels of education. This is as a result of other forms of out of pocket education expenditure that household have to incur in acquiring basic education for their children. It therefore means that, if these indirect education cost are not well addressed, it could discourage household demand for education in Ghana by greater percentage, simply because education tend to become too expensive to afford even if the direct tuition cost is almost nil. The negative tertiary education income elasticity is explained by the income substitution effect of household demand for tertiary education. The study found that, as household income rise, they demand more private tertiary education and a net reduction in demand for public tertiary education as illustrated in Table 5.2. This is common among urban households who are able to afford quality tertiary education for their children.

In sum, the estimated income elasticity figures show that, household income play significant role in household education expenditure in Ghana and that acquiring a least one level of formal education was simply inevitable among Ghanaian households as they see education as means to get out of poverty or increase household incomes. Hence, the corresponding increase in household education expenditure as their income rises. It is thus not surprising that, Ghana's literacy rate has increased from 57.9% in 2000 to 76.6% in 2015 and Ghana has shown steady growth in achieving the UNDP Sustainable Development Goal 4 which require inclusive and quality education for all.

5.4 Price Elasticity of Household Demand Education in Ghana

The next important measure in the demand analysis is the uncompensated price elasticity coefficient. It explains the percentage change in household demand for each level of education in Ghana as a result of one percent change in the cost of education (ceteris paribus).

In estimating the uncompensated elasticity, the results found in table 5.1.1 shows that almost all the results are statistically significant at 5 % or 10%. As expected, all the results are negative confirming the demand theory which explains the negative relationship between price and quantity demanded of that good. As already stated, a good is own price elastic when price elasticity in absolute terms is greater than 1 whiles a good whose price elasticity is smaller than 1 is an inelastic good. Elastic good shows how highly sensitive that good is to its price whiles inelastic goods are less sensitive to changes in price. Consequently, a given percentage increase in the price will reduce the quantity demanded by a higher percentage for an elastic good than for an inelastic good.

From table 5.1.1, it was found that, a 1% increase in the price of basic, secondary, post-secondary and tertiary decreases their corresponding household quantity demanded by -0.732%, -0.785%, -0.763% and -0.608% respectively. This suggest that, Ghanaian households are not too responsive to the cost of education and this is because, the demand for each level of education is considered as a normal necessity good in Ghana. This findings is consistent with the study by Gaddah & Munro (2011), Lavy (1996), Noorbakhsh and Culp (2002) and Heller (1997). For instance, Lavy (1996) estimated the price elasticity of demand for education in Ghana to be -0.1. Canton and De Jon (2005) also found that demand for education was price inelastic in the Netherlands using tuition fees as proxy for cost of education. Historically, estimating low price elasticity of education was the basis for those who argued for an increase in school fees. However, this analysis estimated higher price elasticities compared to other studies such as Lavy (1996) and do not support the call for increased school fees. In fact, even though this analysis found that Ghanaian households are not highly responsive to the cost of education, the high price elasticities estimated for each level of education supports the argument that households in Ghana are burdened with some inevitable indirect education cost, such that if not well addressed could rise to discourage household demand for education by greater percentage. Specifically, the study found that Ghanaian household are more sensitive to the cost of secondary education (- 0.785%) than any other level of education. The same way the study found that, household demand for education becomes more price elastic as one progress from basic education to secondary education. It means that, whiles government is trying hard to absorb some direct cost of education associated with basic and secondary level of education especially, households in Ghana are still burdened with some other indirect cost of education, which could rise to discourage demand for these levels of education by a wider

percentage even if direct cost of education is nil. Akyeampong (2009) highlighted that, the inability of the FCUBE to reduce the indirect cost of schooling was the major challenge with the programme. Gaddah and Munro (2011) also explained that, the fact that non-enrolment is still high even after setting education prices to zero in their study, is a reflection of the negative effect of high opportunity costs on schooling demand among Ghanaian rural households. Ghanaian households spend almost 40% of their total educational expenditure on indirect costs such as parent –teacher association dues, books and supplies, transport, private tuition, food and boarding, school uniforms etc (Figure 5.2). This is the reason why government flagship policies such as free school uniform and text books distribution, construction of day secondary school, school feeding program are welcomed policies that should be more decentralized to be able to reach the actual beneficiaries who are the poor. Specifically, the high price elasticity household demand for secondary education supports the recent introduction of the Free Senior High School policy to make secondary education more affordable to the poor. Government should equally ban schools from charging students with unapproved fees. These are policies that will reduce some of these indirect cost incurred by households in Ghana.

In the nut shell, the slow responsiveness of Ghanaian households to price of education proves their commitment in sending their children to school to complete at least one level of education even though they are burdened with extra education expenditure when they send their children to school.

5.5 Econometric Analysis of Household Education Demand Based on Household Demographics in Ghana

Next we compute the price and expenditure elasticity of demand for each level of education among rural and urban households in Ghana. That is, estimating the sensitivity of demand for education among rural and urban households in Ghana. We find that almost all the results are statistically significant at 5%.

Table 5.3: Household Income Elasticity of Education Demand (Rural/Urban): First Stage[5]

Items	Income Elasticity	
	Rural	***Urban***
Food	**1.00**	**0.974**
	(0.001)	*(0.002)*
Clothing	**0.994**	**0.853**
	(0.002)	*(0.009)*
Housing	**1.906**	**1.204**
	(0.071)	*(0.007)*
Education	**-0.242**	**1.359**
	(0.224)	*(0.032)*
Other goods and services	**0.972**	**0.952**
	(0.004)	*(0.002)*

Source: Authors Own calculations using GLSS 6.

[5] Expenditure values are elasticity coefficients whiles Standard errors in parenthesis

Table 5.3.1: Household Income Elasticity of Education Demand (Rural/Urban): Second Stage[6]

	Rural Household Income Elasticity			Urban Household Income Elasticity		
	Household Total Expenditure	*Household Education Expenditure*	*Overall Effect*	*Household Total Expenditure*	*Household Education Expenditure*	*Overall Effect*
Basic	**0.713**	**1.049**	**0.748**	**0.825**	**0.975**	**0.804**
	(0.178)	*(0.008)*		*(0.025)*	*(0.002)*	
Secondary	**0.702**	**1.040**	**0.730**	**0.344**	**1.019**	**0.351**
	(0.025)	*(0.002)*		*(0.273)*	*(0.006)*	
Post-Secondary	**0.366**	**0.987**	**0.361**	**0.449**	**0.986**	**0.443**
	(0.326)	*(0.004)*		*(0.258)*	*(0.004)*	
Tertiary	**0.446**	**0.824**	**0.368**	**-0.567**	**1.053**	**-0.597**
	(0.421)	*(0.244)*		*(0.926)*	*(0.050)*	

Source: Authors Own calculations using GLSS 6.

5.5.1 Income Elasticity of Household Education Based on Location (Rural/Urban)

Table 5.3 provides the income elasticity of demand for general education in Ghana among both urban and rural households. Adopting the two-stage budgeting process, the study found that considering five group of items consumed by households namely; Food, Clothing, Housing, Education and Other goods and services, on average, household demand for education among rural has a budget expenditure elasticity of -0.242 % whiles urban households have a budget expenditure elasticity of 1.359 %. This means that, education has low opportunity cost among urban household,

[6] Expenditure values are elasticity coefficients whiles Standard errors in parenthesis

as such they spend a large portion of their income on education. On the other hand, education has high opportunity cost among rural households (ceteris paribus). Gaddah & Munro (2011) explained that, the fact that education non-enrolment is still high even after setting prices to zero is a reflection of the negative effect of high opportunity costs on schooling demand among rural households. Rural households, consider formal education to be too expensive for their low income to afford. It is thus common to see rural household switch to other forms of informal education such carpentry, tailoring, masonry works, trading and other economic activities, such as farming, fishing, trading, and other forms of labor that will yield them higher returns instead of sending their children to school. Poor household see child birth as an economic strategy to have more cheap and surplus labor to assist in their local activities and not necessarily because of education. It is thus not surprising that, rural household's record low school completion rates as well as low progressing rates for their children compared to urban households.

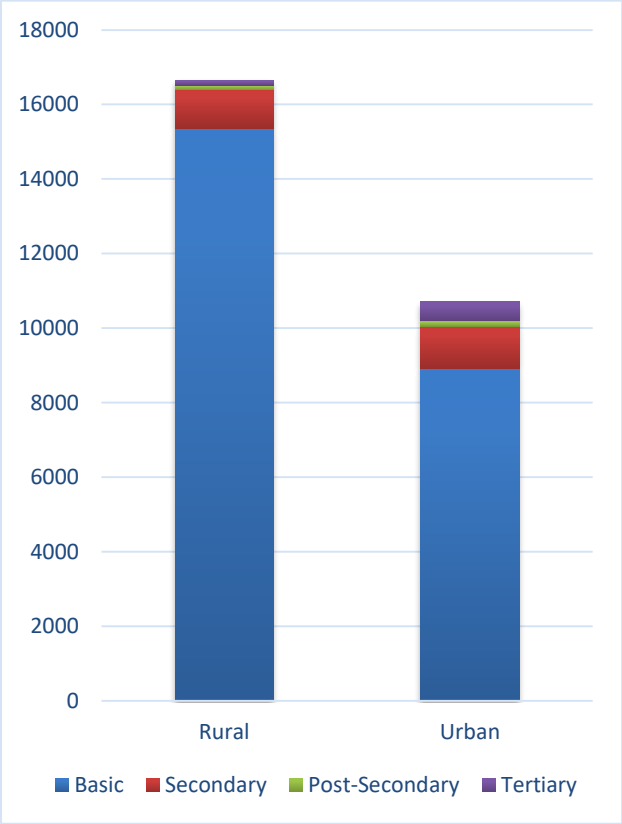
To analyze the income elasticity effect on each level of education, Table 5.3.1 shows the overall household expenditure elasticity for each level of education using the Two-Stage Budgeting process. The study found that a 1% increase in rural household income increases household demand for basic, secondary, post-secondary and tertiary education by 0.748%, 0.730%, 0.361% and 0.367% respectively and 0.804%, 0.351%, 0.443% and -0.594% respectively for urban households. The positive income elasticities estimated for each level of education explains the importance of household income as a determinant of household demand for education in Ghana. The negative budget elasticity estimated for tertiary education among urban household is explained by the income substitution effect of household demand for tertiary education. Among urban

households, as their income rises, they make the choice to increase demand for private tertiary education and a net reduction in the demand for public tertiary education. (table 5.2)

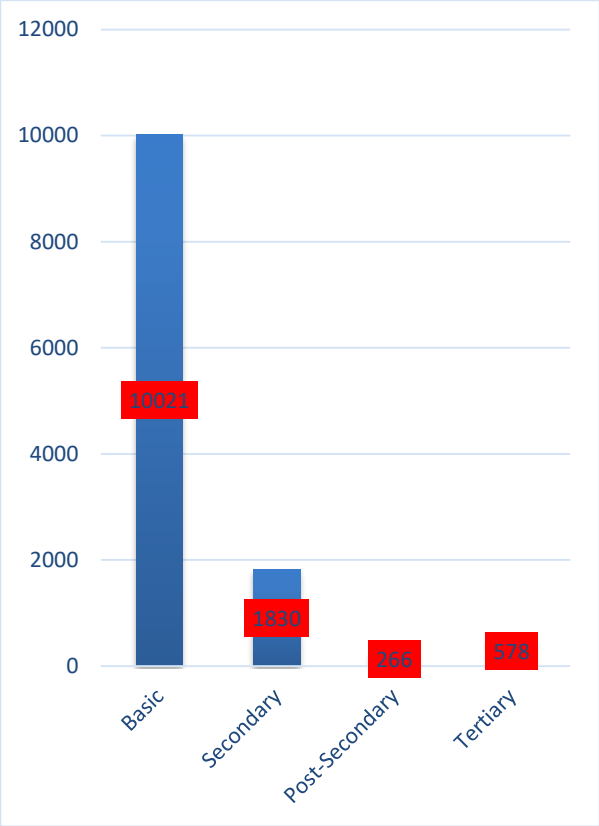
Another observation made from this analysis is the fact that, even though rural household make the lowest education expenditure at all level of education in Ghana (in absolute terms), the high income elasticities estimated suggests that, they spend a greater percentage of their income on basic and secondary education as household income rises. In fact, rural household demand for secondary education is more income elastic than that of urban households, whiles urban household are more income elastic to demand for other levels of education. This suggests that, rural households are burdened with other indirect cost of education at the basic and secondary level most especially, despite government policy interventions at the basic level. Talick (2002) argues that, if households perceive that the quality of human and physical infrastructure in the school is inadequate they feel compelled to invest in education. In view of that, for rural households who are able to break the cost barriers of education, they will still have a daunting task to make extra out-of-pocket education expenditures in acquiring quality education for their children from their little income. It is for this reason this study justifies government free senior high school policy as a commendable pro-poor policy to reduce household secondary education expenditure among rural households.

Figure 5.3: Education Enrollment by Level (2012-2013)

Location (Rural/Urban)



National



Source: Own Calculation based on GLSS 6

5.5.2 Price Elasticity of Household Education Demand Based on Location (Rural/Urban)

The next important measure in the demand analysis is the uncompensated price elasticity coefficient. It informs us about the percentage change in demand for each level of education among both rural and urban household as a result of one percent change in the cost of each level of education (ceteris paribus).

Table 5.3.2: Household Price Elasticity of Education Demand (Urban/Rural): Second Stage[7]

	Uncompensated Price Elasticity (Urban)	Uncompensated Price Elasticity (Rural)
Basic	**-0.762**	**-0.712**
	(0.010)	*(0.023)*
Secondary	**-0.705**	**-0.874**
	(0.109)	*(0.007)*
Post-Secondary	**-0.757**	**-0.769**
	(0.057)	*(0.096)*
Tertiary	**-0.665**	**-0.414**
	(0.163)	*(0.476)*

Source: Author's own estimation, GLSS6

[7] Expenditure values are elasticity coefficients whiles Standard errors in parenthesis

Table 5.3.2 provides the uncompensated own price elasticity of demand for all level of education in Ghana for both rural and urban households. From the results the coefficients are almost statistically significant at most 10 % and are all negative. This confirms the theory of economy, which illustrates that the price effect of a normal good is usually negative, so the uncompensated own-price elasticity should be non-positive. From Table 5.3.2, it was found that among rural households, a 1% increase in the cost of education for basic, secondary, post-secondary and tertiary education on average reduces their respective quantity demanded by 0.712%, 0.874%, 0.769% and 0.414%. On the other hand, a 1 % increase in the price of each level of education reduces the respective demand by 0.762%, 0.705%, 0.757% and 0.665% for basic, secondary, post-secondary and tertiary education respectively among urban households. In simple terms, it suggests that, both urban and rural households are not responsive to the cost of education. This is because each level of education in Ghana is a normal necessity good that households cannot do without, hence are slow to respond to changes in cost of each level of education. Notwithstanding, rural households are generally more responsive to education cost than urban households.

Despite the non-responsiveness of both rural and urban household education demand to the cost of education, the study found that, the price elasticities estimated are quite large and that, rural households are more price elastic to demand for secondary school (-0.874) than urban household. Specifically, the study further found that demand for education among rural households is more price elastic as one moves from basic to secondary education.

This suggests that, rural households are burdened with high cost of education at these levels of education most especially at the secondary school level, despite government free basic education policies and other policies geared towards making education cheap in Ghana. In view of that, any further increase in either the direct or indirect cost of these levels of education will cause Ghanaian rural households to decrease their corresponding demand by greater percentage. Gaddah and Munro (2011) explained that, the fact that non-enrolment in education is still high even after setting prices to zero is a reflection of the negative effect of high opportunity costs on schooling demand among rural households. A step of assistance to rural household will go a long way to help them afford education, especially secondary education at a lower cost.

In sum, the study found that, Ghanaian rural households are burdened with high cost of education emanating for other education cost aside school fees. This is evident in the high price elasticities of demand for education estimated. Secondary education was more price elastic among rural household than among urban household, as such a form of assistance to these rural households will go a long way to help reduce household education cost among Ghanaian household.

CHAPTER SIX

SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

6.1 Introduction

This chapter summarizes the study conclusions based the research findings, whiles making some recommendations for future studies. The study equally makes some critical lessons identified whiles making policy recommendation to Ghana government and other stakeholders.

6.2 Summary of Findings

The study seeks to analyze the sensitivity of household demand for education with respect to cost of education and household income in Ghana. In the study there are four goods demanded by households; Basic Education, Secondary Education, Post-Secondary Education and Tertiary Education. To achieve this objective, the study adopted the Quadratic Almost Ideal Demand System model (QUAIDS) by Banks et al (1997) and the Two- Stage Budgeting process as used by José (1997). The study concentrated on data of households who have their members currently enrolled in school for which households make education expenditures using the Ghana Living Standard Survey 6 conducted from 18th October 2012 to 17th October 2013

The study calculated the total education expenditure share and price of each of the level of education using GLSS 6 data. The study assumes there is an additive zero-mean error term associated with each of the education expenditure share equations and then estimate the coefficient

by iterated feasible generalized nonlinear least-squares estimation using the Maximum Likelihood approach. The study first estimated the stochastic version of the household demand model and then re-estimate the model but this time factored household demographic characteristics which included; the sex of household head, employment status of household head, age of household head and the location of household (rural/urban) to estimate the actual price and income elasticity of household demand for education. The Wald Test was used to test the significance of the household demographic factors incorporated into the QUAIDS model. The study then estimated income and uncompensated own price elasticities each level of education The results estimated explains the sensitivity of household demand for education at all levels in Ghana.

6.2.1 Demographic Determinants of Household Education Expenditure in Ghana

In identifying factors that influence Household education expenditure in Ghana, the study considered factors such as income of household head, the sex of household head, employment status of household head, age of household head and location of the household.

In terms of the effect of *age of household head* on household education expenditure, the study found that younger household heads tend to spend less on education than the middle and old age household head. This finding is the same as the findings of Donkoh and Amikuzuno (2011) who found that middle aged household heads spend more on household education in Ghana.

In terms of the effect of *household income* and *household location* on household education expenditure, the study found that, employed household heads as well as household heads in urban

households make the highest education expenditure than their counterparts who are unemployed and those living in the rural areas.

6.2.2 Elasticity of Demand for Education in Ghana

The original objective of this study was to estimate actual elasticities. In answering the research question one (1) of the study, it was found that, considering five groups of items consumed by households namely; food, clothing, housing, education and others, education is a normal necessity good with a positive income elasticity of 0.439. This suggest that Ghanaian households consider education as a good they cannot do without. The study further found that a 1 % increase in household income, increases household education expenditure for basic education, secondary education, post-secondary education by 0.773%, 0.528%, 0.406% except for tertiary education where the coefficient was estimated at -0.336. These estimated elasticities confirm the strong commitment of Ghanaian households towards education being fully aware of the important role education plays in improving household welfare. The positive income elasticity also shows the importance of income as a determinant of household demand for education in Ghana. The reason for the negative income elasticity for tertiary education is explained by the income substitution effect where Ghanaian household choose private tertiary school over public tertiary schools as their income rises. The study also found that even though education at each level of education was a normal good, household demand for basic education was more sensitive to household income. This explains that household are burdened with extra education expenditure at the basic level of education which compels Ghanaian households to spend a greater percentage of their income in acquiring quality basic education for their children.

In answering research question two (2), the study estimated own price elasticities for basic, secondary, post-secondary and tertiary education at -0.73, -0.78, -0.76 and -0.61 respectively. This suggest that, household demand for education is not responsive to cost of education. However, the demand for education in Ghana is more price elastic as one moves from basic to secondary education. This result is consistent with the study by Canton and De Jon (2005) who found that, demand for education was price inelastic in the Netherlands using tuition fees as proxy for cost of education. Lavy (1996) equally found that household demand for education in Ghana was price inelastic. Notwithstanding, even though education generally was estimated to be price inelastic, this thesis estimated higher price elasticities for each level of education than what was estimated by Lavy (1996). The high price elasticity estimated for each level of education confirm that, Ghanaian households are burdened with high indirect cost of education at each level of education most especially at the secondary level even if direct cost of education is nil. As such, any further increase in education cost will force Ghanaian households to decrease demand for each level of education by greater percentage.

Considering the responsiveness of household demand for education based on demographic factors, it was found that, income elasticity of demand for basic, secondary, post-secondary and tertiary education among *rural household* was 0.748, 0.730, 0.361 and 0.367 respectively, whiles a 1% increase in urban household income, increases the quantity demanded for basic, secondary and post-secondary education by 0.825%, 0.344% and 0.449%. Tertiary education however saw a negative income elasticity of -0.567%. The reason is explained by the income substitution effect, where urban households demand more private tertiary education over public tertiary education as their income rises.

With respect to cost, the study found that a 1% increase in the cost of education for basic, secondary, post-secondary and tertiary education on average, reduces rural household respective quantity demanded by 0.712%, 0.874%, 0.769% and 0.414%, whiles a 1% increase in the cost of education for basic, secondary, post-secondary and tertiary education on average, reduces urban household respective quantity demanded by 0.762%, 0.705%, 0.757% and 0.665%. These results suggest that, rural households are more income and price elastic to demand for secondary education than urban households, and demand for education among rural poor household is more price elastic as one moves from basic to secondary. The high price elasticities estimated among rural household suggest the negative impact of high indirect education cost that rural household incur to acquire quality education for their children, as such if these cost are not well addressed, it could cause rural households to reduce their demand for education by higher percentages especially at the basic and secondary levels. In effect, a form of assistance will go a long way to reduce the cost basic and secondary education among the rural poor households.

In the nutshell, it is evident that even though education is normal necessity good in Ghana, the high price and income elasticities estimated for each level of education in Ghana suggest that households are still burdened with extra out of pocket education expenditure despite government commitment in reducing the direct cost of education in Ghana. If these cost are not well addressed, it could discourage household demand for education and also render government education cost interventions ineffective as found by Akyeampong (2009)

6.3 Policy Implication and Recommendations

The debate in recent studies over the years has to do with the allocation of scarce resources to social sectorial development among developing countries given their massive budgetary constraints. This has given rise to a closer study of distribution of expenditure in developing countries. In health, the argument has to do with focusing on preventive more than the curative public health services. In the field of education or human capital development, the recommendations by international policy organizations has to do with, developing countries restructuring their education financing towards primary education by way of direct redistribution or by cost-recovery measures such as absorption of school fees and subsidies to selected education services. (Schwartz and Stevenson, 1990). Indeed, the recommendation is that, every household member should acquire at least basic education and should be free for all. What seem to be missing in the literature is the appreciation of the fact that cost of education are in two folds; direct and indirect expenditure. Most often, studies fail to assess the impact of these indirect cost of education incurred by household on their education expenditure.

The study acknowledges the significant role of government policies to abolish some direct cost of education in Ghana. However, most of these indirect education cost incurred by Ghanaian household are high and if these costs are not well addressed, could render government education cost interventions ineffective as found by Akyeampong (2009). This is because, these indirect cost of education can rise to serve as severe constraints to household demand for education even if

direct cost of education is nil. It is common to see Ghanaian students being charged for items such as; school management fees, teacher motivation fees, school generator dues, school bus fees, school uniforms, extra classes fees among other things by school authorities without seeking approval from the Ghana Education Service. In policy recommendation, government through the Supervision Department of the Ministry of Education, should strictly eliminate from the system unapproved fees charged by school managers. Government should as a matter of urgency develop and monitor a standardized school billing system for all levels of education that states clearly what students are supposed to be charged for and prosecute school heads who introduced unapproved fees in their school bills to students especially at the basic and secondary school levels. When well implemented, the actual fees charged students will be less considering the fact that, government absorbs most of the school fees paid by students. This will help reduce household education expenditure in Ghana.

From the analysis, it was also evident that rural households are more price and income elastic to demand for secondary education. In view of this, the study supports the recent introduction of the Free Senior High School in Ghana to help poor households acquire secondary school education at minimal cost. In policy recommendation, the study recommends that this policy should be revised to concentrate largely on rural households instead of the rich households. This will deliver the effectiveness of the policy and will also help sustain the policy financially in the sense that, government will not end up making education expenditure for households who genuinely can pay for secondary education. Instead, adequate resources will be available to help household who are genuinely financially constrained to afford education for their children.

The study also finds that household income is a key determinant of household demand for education. In view of that, as income of households increases, household education expenditure rises as well. Based on this finding, it means that government policies should target increasing the incomes of poorer households who cannot afford education for their children. Aside government providing scholarship to children from these homes, the Social Welfare Department, Business Development Ministry, NGOs, Microfinance and Loans Centre should collaborate effectively and educate households that are not financially stable to engage in other entrepreneurial activities that will help them make extra income, with technical and financial support from these government agencies. Government can also improve the incomes of poorer households especially in the rural households by constructing feeder roads linking villages to town market centers so that they can trade their farm produce easily to earn extra income to spend on their children's education. In this attempt, rural households will be able to acquire enough money and spend on the education of their children as well other household demands.

Another major finding is the high opportunity cost of education among rural households in Ghana. The study found that, rural households or low income households prefer to engage their children in other activities such as farming, taking care of younger siblings at home, selling in the market, among other activities than to send their children to school. They seek to reap immediate economic gains on their children in helping them engage in these activities rather than sending them to school that will put financial burden on them. In view of this, government policy interventions should focus on reducing the opportunity cost of education especially among the rural households. The opportunity cost of schooling can be reduced, for instance, by providing free meals at school, free

school uniforms, providing free text books, providing merit scholarship programs especially for girls, constructing basic and secondary day schools in each community to reduce distance to school, providing free sanitary pad to young girls who attend school, just to mention a few. Government through the Gender Ministry and Social Welfare department should also organize community services to care for young children, thus freeing girls who would otherwise be responsible for caring for their younger siblings to go to school. However, in implementing some of these interventions, if not well managed can result in deterioration of quality of services rendered at the school. This is because it can lead to overcrowding of schools making these policies financially difficult to sustain.

Similarly, it is a common practice that school items such as textbooks and supplies sold directly at the schools are government subsidized and also serve as extra source of revenue to the schools. However, studies show that most disadvantaged students are still unable to afford them, hence they go to school without these items to enhance their studies. The study recommends that government looks at alternative way of further reducing cost of education materials so that majority of the disadvantaged students can have access to them. Government should encourage domestic production and printing of textbooks. Government should encourage local publishers to produce and print more domestic academic textbooks. Government can achieve this by adopting economies of scales to increase the production capacity of domestic printing houses though cooperative textbook production. Government can also give tax subsidies and financial credit to producers of academic text books in Ghana. Adopting this strategy coupled with foreign donor supports could

make academic text books extremely cheap to acquire by households instead of importing expensive text books.

Finally, there is the need for the Ministry of Education and Department of Children under the Ministry of Gender and Social Protection to continually educate rural households on the importance of education. These community education awareness programs should emphasize on the importance of education on household welfare as against the negative effect of child marriage, child labor on the welfare of children. These awareness programs should equally highlight government free education policy interventions that rural households can take advantage of and send their children to school. Another effective way is by organizing community education forum but instead of bringing resource persons from other towns, indigenes of that community who are successful today in their field of work as a result of education should be used to motivate their fellow community members to send their children to school instead of sticking to outmoded cultural systems.

6.4 Limitation of the Study

The study relied heavily on the Ghana Living Standard Survey round 6, which provides rich information on household level demographic and economic characteristics to aid in data analysis. However, one challenge faced by this study is the inability of the GLSS to provide information on who actually bears the cost of education. The study thus assume that heads of the household bears the cost of education because the study could not could not trace it in the dataset.

Regardless of the identified limitation, the study sets the pace for more studies in household demand for education in Ghana. The study also contributes to the few studies on household education demand analysis in development economics.

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Appendix A

Note: w_i is the proportion of household demand for the i^{th} level of education, as such if a household does not demand a particular level of education (w_i=0), the expenditure elasticity will be infinite this is because uncompensated price elasticity function for the i^{th} level of education owing to changes in the price of j^{th} level of education, has w_i as a denominator as part of the function. This explains why the number of non-missing observations for each of the four education expenditure elasticities is less than the estimated sample size as shown in the tables below

Appendix A: Education Expenditure Elasticity Summary Statistics (Household demand for general education with respect to total household income)

Variable	Obs	Mean	Min	Max
Food	10786	0.989	-5.624	7.930
Clothing	10611	0.934	-26.405	9.672
Housing	9154	1.560	-4.857	199.328
Education	10681	0.439	-1060.18	106.590
Others	10783	0.964	-7.274	16.056

Appendix B: Education Expenditure Elasticity Summary Statistics (Household demand for each level of education with respect to total household expenditure)

Variable	Obs	Mean	Std. Dev.	Min	Max
Food	10786	1.059	0.130	-1.549	11.124
Clothing	10611	0.980	0.247	-12.924	15.103
Housing	9154	1.694	4.917	1.001	351.544
Others	10783	1.037	0.257	-4.616	17.578
Basic	9913	0.758	10.561	-602.42	125.441
Secondary	1821	0.514	6.134	-247.003	0.982
Post-Secondary	265	0.411	3.323	-36.539	0.981
Tertiary	574	-0.336	17.274	-381.302	0.983

Appendix C: Education Expenditure Elasticity Summary Statistics (Household demand for each level of education with respect to total household education expenditure)

Variable	Obs	Mean	Std. Dev.	Min	Max
Basic	9913	1.019	0.466	-5.424	33.513
Secondary	1821	1.028	0.135	0.424	4.989
Post-Secondary	265	0.987	0.048	0.484	1.006
Tertiary	574	1.001	1.622	-30.851	4.222