UNIVERSITY FOR DEVELOPMENT STUDIES

TAMALE

MODELLING DOMESTIC TOURISM DEMAND FOR GHANA

EBENEZER KOJO OCRAN

2020

UNIVERSITY FOR DEVELOPMENT STUDIES

MODELLING DOMESTIC TOURISM DEMAND FOR GHANA

Ebenezer Kojo Ocran (MSc., BSc)

(UDS/DAS/0009/10)

A thesis submitted to the Department of Statistics, Faculty of Mathematical Sciences, University for Development Studies, in partial fulfilment of the requirements for the award of

DOCTOR OF PHILOSOPHY in Applied Statistics

OCTOBER, 2020

DECLARATION

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature:……………………..…………Date:…………………….

Name:…………………………………………………...………………….

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of dissertation laid down by the University for Development Studies.

Principal Supervisor's Signature:…………….…………Date:……………..

Name:…………………………………...………………………………..

Co-Supervisor's Signature:……………………..…….Date:……………...

Name:……………………………………………….……………………..

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my supervisor, Professor A. O. Adebanji for her advice, constant encouragement, constructive discussions, direction, suggestions and comments, in the preparation of the thesis. Professor A. 0. Adebanji has been an excellent supervisor to have learnt a lot from to shape my future life and duties. I also owe a debt of gratitude to Dr. S. Sarpong, a Co-supervisor and Head of Statistics Department of University for Development Studies, Navrongo Campus, for his efforts in reviewing series of drafts and the direction of this thesis.

I am grateful to Professor O. A. Y. Jackson of the Methodist University College, Accra, Ghana for taking time of his tight schedules to go through the thesis in providing guidance and advice whenever necessary. My sincere thanks go to Professor Kwaku Adutwum A. Boakye, Head of the Department of Hospitality and Tourism Management, University of Cape Coast, for his suggestions and comments which assisted the shape of the thesis.

I could not have completed the work without Dr. Paul Adjei Onyina, a lecturer at the Pentecost University College, Accra, for his criticisms and advice. I cannot forget my wife and children for their support and encouragement.

ABSTRACT

Domestic tourism plays a significant role in Ghana's economy as it generates markets for a wide variety of tourism products but lags behind other countries like United Kingdom, Germany, Kenya and other countries in terms of domestic tourism expenditure. Furthermore, no expenditure was known about the general value of domestic tourism at both macro and micro levels. Being motivated by this necessity, the study had to investigate Ghana's domestic tourism demand for tourism products from 2012 to 2017. The data used for the study covered 2012 to 2017. The study used Linear Almost Ideal Demand System (LAIDS) models (static and dynamic) to estimate the effects of changes in relative prices and real total tourism expenditure. It also used quantile regression model to determine the impact of socio-demographic factors on domestic tourism expenditure. For the LAIDS models, the results show that price and income are the main economic factors affecting domestic tourism demand in Ghana. For the long-run, the demand for tourism products in Ghana is price elastic and fairly unitary income elastic, whiles for the short-run, it is price inelastic and income elastic. The quantile regression approach suggests that age of household head, educational level of household head, annual income of households and household loans are the main factors that affect domestic tourism expenditure in Ghana. The most significant outcome of the research has been an improvement to the LAIDS model by including a positivity restriction as one of the theoretical restrictions to cater for tourism products which violate the demand law. It is thus suggested that government and tourism practitioners should be careful of the pricing and taxation policies of tourism products in the country in order not to decrease domestic tourism participation.

LIST OF ACRONYMS

AIDS	Almost Ideal Demand System
DAIDS	Dynamic Almost Ideal Demand System
E. As	Enumeration Areas
ECM	Error Correction Mechanism
GDP	Gross Domestic Product
GLFS	Ghana Labour Force Survey
GLSS	Ghana Living Standards Survey
GSGDA	Ghana's Shared Growth and Development Agenda
GSS	Ghana Statistical Service
GTA	Ghana Tourism Authority
HT & ES	Household Income & Expenditure Survey
ITSUR	Iterative Seemingly Unrelated Regression
LA/AIDS	Linear Approximation of Almost Ideal Demand System
LAIDS	Linear Almost Ideal Demand System
MOTAC	Ministry of Tourism, Arts and Culture
NR	Negativity Restriction
NTDP	National Tourism Development Plan
OLS	Ordinary Least Squares
PR	Positivity Restriction
PIGLOG	Price Independent Generalized Logarithm
QR	Quantile Regression
SAIDS	Static Almost Ideal Demand System
SUR	Seemingly Unrelated Regression
UNWTO	United Nations World Tourism Organisation
VAT	Value Added Tax
VFR	Visiting Friends & Relatives

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

1.1 Background

1.1.1 An overview of the contribution of tourism to Ghana's economy

For the past few years, tourism has become the world's largest and fastest growing sector, and serves as a major earner of foreign exchange (UNWTO, 2015). Owing to this, copious attempts have been made to comprehend the main components of tourism demand, with the sole aim to formulate, discuss, develop, implement and evaluate appropriate policies and strategies to attract more visitors (Divisekera, 2007). Tourism as a source of national revenue was recognised in Ghana as far back in 1970 when the tourists' resource potentials of the country was identified by the government. Tourism Development Plan was originated in 1975 when the government of the time brought into being the first Tourism Development Plan, 1975-1990 (Asiedu, 2008). The objective of the plan was to offer better opportunities for the supply of improved tourism products. In 1996, the government's vision on tourism brought about 'National Tourism Development Plan (1996-2010) within the framework of the first Coordinated Programme of Economic and Social Development Policies under the title, ''Ghana: Vision 2020'', to make Ghana achieve a middle-income status within 25 years, while the economic impact of tourism researched and analysed and ways recommended for enhancing economic benefits at the national, regional and district levels.

In Ghana's Shared Growth and Development Agenda (GSGDA, 2010-2013), tourism was recognized as a young but expanding industry in Ghana that if harnessed would generate employment, decrease poverty and become the first foreign exchange earner to reduce pressure on the country's foreign exchange earnings. In 2013, the 15-year National Tourism Development Plan, 2013 – 2027 was brought into being. Its objective was to evaluate how tourism could offer improved contribution to national and local economic development (National Tourism Development Plan, 2013).

Tourism is one of the main foreign exchange earnings in Ghana, including merchandise exports, remittances from abroad and oil, which was found in large quantities in 2007 and continues to show its potential as the main driver of growth (Bank of Ghana, 2007). However, tourism's contribution to growth and job creation varies greatly across the nation, due to the distribution of tourism infrastructure. Yet, it is one of the main sources of income for the population both in the rural and urban communities.

Indeed, the sector has witnessed a fast growth in Ghana since 1980. This growth is supported by Table 1.1 which presents international tourist arrivals and receipts, from 1985 to 2014. The international tourist arrivals rose considerably from 85 thousand in 1985 to 1,093 thousand in 2014, an increase of 1,185.9%, while international tourist receipts grew from 20 million US Dollars in 1985 to 2,067.1million US Dollars in 2014, an increase of 10,235.5% (Table 1.1). It is a fast-evolving economic factor with a large number of small and medium sized businesses scattered across the country and showing expansion in growth in the economy. In 2005, direct and indirect employment in the tourism sector stood at 172,823, and this rose to 359,000 in 2012 (Ministry of Tourism, Arts and Culture, 2013).

Table 1.1: International tourist arrivals and receipts, 1985 - 2014

	1985	1990	1995	2000	2005	2010	2011	2012	2013	2014
Arrivals ('000)	85.0	146.0	286.0	456.3	392.5	746.6	827.5	903.3	994	1093
% Annual change	-	-	-	-	-	11.7	10.9	9.2	10.0	10.0
Int. receipts (million US$)	20.0	81.0	233.2	289.5	627.1	1406.3	1634	1704.7	1877	2067.1
% Annual change	-	-	-	-	-	16.1	16.2	4.3	10.1	10.1

Source: Ministry of Tourism, Arts and Culture and Ghana Tourism Authority

Ghana's domestic tourism sector, in terms of the major attractions, has huge potentials of poverty reduction and wealth creation for the people of Ghana, especially for those in the rural areas, where natural, historical and community-based eco-tourism sites and tourism related businesses are located (Ghana Statistical Service, 2018). Table 1.2 presents visitor arrivals and real revenue accruing to selected major tourist sites from 2005 to 2014. It is observed from Table 1.2 that total visitor numbers rose from 381.6 thousand in 2005 to 592.3 thousand in 2014. Similarly, domestic visitors' real revenue from the country's major tourist sites increased marginally from 490 thousand Ghana Cedis in 2005 to 492.2 thousand Ghana Cedis in 2014. These figures demonstrate that the domestic tourism sub-sector can grow if the relevant policies are put in place, based on evidence-based empirical data, for rapid development of domestic tourism sub-sector in particular, and the tourism sector in general.

Table 1.2: Visitor arrivals and real revenue accruing to selected major tourist sites in Ghana, 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Arrivals (‘000)	381.6	508.8	603.6	613.7	585.6	616.5	664.1	742.7	722.3	592.3
Annual change (%)	-	33.3	18.6	1.7	-4.6	5.3	7.7	11.8	-2.7	-18
Real revenue ('000 Gh¢)	490.0	663.7	756.2	708.1	626.4	561.3	664.4	571.4	575.7	492.2
Annual change (%)	-	35.45	13.94	-6.37	-11.54	-10.38	18..36	-14	0.75	-14.5

Source: Ghana Museums and Monuments Authority, Ghana Tourism Authority and Wildlife Division

Domestic tourism plays a significant role in Ghana’s economy as it generates markets for a wide variety of tourism goods and services such as accommodation, food and drinks, transport, recreation, culture and sporting activities, shopping/non-consumables and others, (Table 2.1) (Ghana Statistical Service, 2015 and Ghana Living Standards Survey, 2016/17 (GLSS, 7).

Given the importance of domestic tourism consumption to Ghana’s economy and its direct link to the performance of tourism-related businesses, research and analysis in domestic tourism demand have become a necessity. Hence, the main aim of the study is to investigate the determinants of domestic tourism demand in Ghana; i.e., economic and non-economic factors that affect domestic tourism demand in Ghana, using expenditure data from 2012 to 2017 and Almost Ideal Demand System (AIDS) and Quantile Regression models.

1.2 Problem Statement

There are four different problems associated with domestic tourism demand in Ghana. The first is that Ghana does not have estimates of volume, value and size of domestic tourism demand. The economic assessment of the contribution of tourism on the Ghanaian economy has been focused on the value of inbound tourism, with no attention paid to the domestic and outbound tourism contributions. Domestic tourism can be a major contributor to Ghana's economy, and a wide variety of tourism goods and services are marketed through it. However, no expenditure is known about the general value of domestic tourism at both macro and micro levels. There is therefore the need to fill this gap to determine the volume, value and size of domestic tourism demand in Ghana (Ghana Statistical Service, 2006).

Secondly, the impacts of economic parameters such as price and expenditure elasticities underlying the demand for tourism goods and services by domestic tourists have not been quantified nor analysed. These economic factors are critical as they enable tourists or visitors to travel to different destinations (regions) of the country. These economic parameter estimates, from the economic policy point of view, are essential for the formulation, development, discussion, implementation and evaluation of policies. They are critical to the domestic tourism industry and the tourism sector as a whole. Interestingly, however, these economic parameter estimates are not in existence at present, especially, in the case of domestic tourism.

Thirdly, there are some socio-demographic variables that influence domestic tourist/visitor expenditure. The effects of these socio-demographic factors on domestic tourism expenditure in Ghana have not been analysed. The variables include age of household head, educational level of household head, annual household income, and household loan, access to Internet, car ownership and ownership of a mobile phone.

Fourthly, positivity restriction has not been factored into the existing almost ideal demand system (AIDS) model in the literature. The existing AIDS model is based on the existing law of demand. The law of demand generally stipulates that all things being equal, as the price of a good or service increases the quantity demanded of that good or service decreases and as the price of a good or service decreases the quantity demanded of that good or service increases. In some instances, however, this generality may not be true. This is because there are some tourism goods and services which do not follow the demand law. One of the goals of this study is to offer some improvements to the AIDS model to include positivity restriction on the parameters of the AIDS model as one of the theoretical restrictions to cater for some tourism products which violate the demand law.

1.3 Research Questions

The main research questions are the following:

- How do we estimate domestic tourism demand in Ghana?

- What are the impacts of Ghana's domestic tourists' demand for tourism products to changes in relative prices and real total tourism expenditure?
- What are the effects of socio-demographic variables on domestic tourism expenditure in Ghana?
- What happens when the compensated own price elasticities turn out to be positive?

1.4 Objective of the Study

1.4.1 Main objective

The main objective of the study is to quantify the responsiveness of domestic tourists' demand for tourism goods and services to changes in price, income and prices of other tourism goods and services.

1.4.2 Specific objectives

The specific objectives of the study are:

- To determine the volume, value and size of domestic tourism demand in Ghana;
- To estimate price and expenditure elasticities of domestic tourism demand, using AIDS model;
- To determine the association between socio-demographic factors and domestic tourism expenditure in Ghana, using quantile regression model; and
- To propose a revised AIDS model with positivity restriction on own-price elasticity and evaluate its comparative performance.

1.5 The Significance of the Study

The principal contribution to knowledge of this study is to develop the AIDS model to include positivity condition or restriction (which means that all own-price elasticities could be positive) on the parameters of the AIDS model to make it more efficient, reliable and complete for easy estimation and interpretation, where currently is depending only on negativity restriction which means that all own-price elasticities should be negative.

Another principal contribution of this work is to establish long-run and short-run Ghana's domestic tourist behaviour by distinguishing it through the static and dynamic LAIDS models, while the main socio-demographic factors that affect domestic tourism expenditure could be identified to assist governments, researchers, policy makers, suppliers, marketers and the tourism sector in making informed decisions to plan strategies of tourism growth to put domestic tourism on a higher pedestal.

Other principal contribution of the study is that it will show the way in which domestic tourism market analysis, based on static and dynamic LAIDS models can be used to examine different goods and services' share of Ghana's domestic tourism market.

The study will also address methodological problem by using the concepts of "usual residence" and "usual environment" in relation to domestic tourism data collection to design a model or tool to collect domestic visitor consumption expenditure data for analysis and dissemination in Ghana.

Another contribution is that price and income/expenditure elasticities at national and regional levels will be made available for use by governments, suppliers and tourism practitioners for policy design such as for prices, indirect taxation and subsidies, which will need knowledge of these elasticities for prices and taxable tourism goods and services in the country.

The study seeks to model domestic tourism demand to be used in predicting future price and income/expenditure changes and share of different tourism goods and services of Ghana's domestic tourism market.

Understanding Ghana's domestic tourism demand is critical for analyzing domestic tourism flows, developing marketing strategies and positioning national and regional markets for the development of the domestic tourism industry and the tourism sector as a whole for national development. This will be consolidated by the fact that the nation's domestic visitors, firms and the government will depend on the reliability of these factors for decision and policy making.

1.6 Limitations of the Study

Ghana's domestic tourists' demand for goods and services had been modelled, but there were some limitations of the study that should be brought to the notice of researchers for redress in future studies. Firstly, there was lack of domestic tourism expenditure data, and hence the study covered 2012 to 2014 as primary data and 2015 and 2016/2017 as secondary data from the Ghana Statistical Service.

Secondly, the data covered some kinds of travels or trips, including funerals; leisure, recreation and holidays; visiting friends and relatives; business and professionals; health treatment; religion/pilgrimage, education/training; and shopping whose elasticity estimates would not reveal the actual preferences of domestic tourists. The reason being that the demands by professional and business tourists would distort the real price or income responsiveness of tourists, since government institutions such as Metropolitan, Municipal and District Assemblies (MMDAs), Ministries, Departments and Agencies (MDAs) and some private institutions sponsor such trips for their employees. Thus, future research should focus on more disaggregation like holiday tourists, pilgrimage tourists, Christian tourists, business tourists, professional tourists, among others.

Thirdly, the inclusion of these two segments of tourists, funeral tourists and VFR (visiting friends and relatives') tourists could influence the demand for tourist accommodation. The reason being that a large number of these two segments stay with their friends' and relatives' residences during domestic tourism rather than staying in hotels. Future research should focus on more disaggregation like funeral tourists, visiting friends, visiting relatives, and focus on narrowing the aggregation of the categories of tourism goods and services, like recreation, culture, sports, food, drinks or beverages as categories of expenditure.

Fourthly, the study focused on only the destination of domestic tourists and not on the region of origin of domestic tourists. The ideal situation to model the tourist demand was to take the two into consideration. This came about due to the stratification of the country into three zones. Owing to this, the domestic tourists were not distinguished by the region of origin, but by the region of destination/visit. For future studies by researchers, domestic tourists should be distinguished by the region of origin and destination to make the modelling of domestic tourist demand an ideal one.

Lastly, there was memory effect as the reference period of 12 months was too long for many respondents to remember the number, nature and value of tourism trips undertaken by domestic tourists.

1.7 Organization of the Study

This thesis is organized into five chapters. Chapter One comprises the introduction, which includes the background, consisting of an overview of the contribution of tourism to Ghana's economy, problem statement, research questions, objectives, significance of the study limitations of the study and organization of the study. The remaining chapters are structured as follows: Chapter Two offers the review of the literature on domestic tourism demand, theoretical concepts and framework of tourism, quantile regression framework and the almost ideal demand system model (AIDS model). It also explains how it has been used by other researchers, highlighting on its inexactness without considering the Error Correction Mechanism for the short-run behaviour of tourists. Chapter Three presents the methodology of the study, which includes research design, description of data and data source, the theory of the quantile regression framework, the theory of the almost ideal demand system (AIDS) model, other econometric models used and the software used for data collection. Chapter Four presents Ghana's domestic tourism market, price and expenditure/income elasticity estimates, socio-demographic factors that affect domestic tourism expenditure and a revised AIDS model with positivity restriction. Chapter Five discusses the findings of the research, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews tourism demand studies, quantile regression and almost ideal demand systems and thus, the econometric techniques widely used by demand analysts in the applied demand analysis. Owing to the nature of the research, this chapter is organized as follows: first, to review findings on tourism demand as a measurement of the volume, scales, impact and value of tourism at different geographical scales. Secondly, selected studies on the applications of quantile regression have been reviewed. This is because the application of quantile regression techniques has greatly increased in recent years due to several advantages it has over the traditional regression. Thirdly, the study focuses on studies on tourism demand using different versions of AIDS models since most of the studies usually compare and contrast the results. It argues that only long-run equilibrium conditions are mostly considered in different destinations (countries) while short-run conditions are rarely considered.

2.2 Findings of Studies on Tourism Demand

Akturk and Kucukozmen (1989) analysed the purchase for tourism products from Turkey for the arrivals of twenty Organization for Economic Co-operation and Development (OECD) countries commencing 1980 – 2004. The model employed to estimate was an Autoregressive Distributed Lag Model (ARDL model). Arrival figures were regarded as the explanatory variables but considered three key factors: tourism price in Turkey; level of income of the origin country; and tourism price in alternative destinations. The study revealed that apart from Denmark and the Netherlands, the remaining countries exhibited that, an increase in income of these countries resulted in more than a proportionate rise in tourism demand of Turkey. The study observed also that tourism in Turkey was insensitive to changes in price of the competing destinations in general.

UNWTO (1995) provided a set of guidelines which assisted individual nations to establish statistical programmes for the measurement of domestic tourism in their countries.

According to Gartner (1996), a person was well-thought-out to be a tourist provided he moved a stated distance away from his home.

Frechtling, 2001, had noted that "Tourism is an expenditure-driven economic activity. That is, the consumption of tourism is at the centre of the economic measurement of tourism and the foundation of the economic impacts of tourism and, therefore understanding tourism consumption is essential for understanding tourism's economic impacts."

Sampol (2002) analysed tourism expenditure in a cross–sectional dimension. The study observed that an urgent factor to influence expenditure levels was the nationality of the visitor. A reference nationals from Germany represented one of the most important sources of international tourists for the Balearic Islands, representing two-fifths of the total number of tourists. U. K. came second, accounting for more than one-third of the international tourists.

According to UNWTO (2003), the *usual environment of an individual* referred to the geographical borders within which the basic routine of life should take place (residence, work place, place of study and trade).

Forbes and Kabote (2004) sought to explore the extent to which pricing was affecting the performance of domestic tourism in Zimbabwe using a descriptive survey. The results showed that most tourism products in the country were moderately priced. The study revealed conclusively that pricing policies were affecting domestic tourism performance. The result further revealed that Zimbabwean domestic tourists were in favour of least pricing, discount pricing and price bundling.

UNWTO, 2005 considered the Household Income and Expenditure Survey (HI&ES) to be the most efficient and suitable instrument for measuring domestic tourism.

Proenca and Soukiazis (2005) used a combination of time series and cross sectional data to estimate the demand for tourism in Portugal. The study considered four main countries as the critical generators: Spain, Germany, France and the U. K; recording almost $9/10^{th}$ of the overall tourism inflows in Portugal. The dynamic panel data estimated the demand for tourism brought to light the significance of the accommodation capacity as the key determinant to explain tourism inflows in Portugal.

Dolnicar *et al.*, (2007) investigated the heterogeneous nature of household discretionary expenditures obtained from a realistic choice desk. The result highlighted the significance of tourism expenditure studies in the context of the decisions of other household expenditure.

UK Tourists (2007) revealed that UK residents alone took 76.8 million domestic holidays within the UK in 2007, spending £14 billion. England accounted for 60.9 million of these holidays and £10.9 billion of the time intervals in a year as part of the usual activities.

Namibia Central Bureau of Statistics (2007) aimed at examining the behaviour of domestic tourists in case of households and by trips. The study revealed that there were more tourist households in Zimbabwean rural households than urban households.

EUROSTAT (2008) presented an overview of tourist expenditures, arrivals, and nights spent by visitors, as well as information on the frequency of trips made abroad. As may be expected, more than 50 percent of the tourists' expenditure made by European citizens in 2006 was destined for European countries, while 9.2 percent of expenditure was made in Africa. Accommodation statistics existed for the bed-nights spent by those not residing in the European Union.

South African Tourism (2008) reported on 'Tourism Definitions Used in South Africa' that tourism could not be described as an industry in the traditional way. This was because industrial establishments were classified with regard to the goods and services being produced, whereas tourism was based on the consumption of goods and services that depended on the taste of the consumer. This brought to the fore the difficulty the measurement of tourism's contribution to the economy of any country faced. Having seen the importance of tourism globally and the increasing economic interdependence among countries, the world had got a common language to define and measure tourism statistics.

EUROSTAT (2008) provided a manual to enable it to obtain information about domestic tourism in individual countries which was comparable. The purpose of the manual was to enumerate the flows of resident travellers among the different regions of the country and beyond. To differentiate tourism trips of resident travellers, regarding destination and reason for the trip, its duration, types of accommodation used, mode of transport, overnight stays, and expenditure incurred.

UNWTO (2008) depicted the coming of age of tourism statistics, where tourism was recognized as an activity which could be measured correctly to provide accurate and reliable analysis and generate effective policies.

Allen and Yap (2009) employed panel data for a study. The study was to scrutinize if there were some indicators that would influence Australian domestic tourism in future. The response variables used domestic tourist nights that were disaggregated. The results showed that the consumer sentiment index had impacted significantly on visiting friends and relatives and not on holiday tourism. The results further found that an increase in households' debts could persuade a quite number of Australians to travel within the country. The study observed that working hours had a statistically significant effect in respect of holiday data.

New Zealand (2009) reported that the nation received about 12.4 billion US Dollars or 57% as domestic tourism expenditure, whereas 9 billion US Dollars was realised from inbound tourism. This reflected the household expenditure, commercial tourism and government expenditure in New Zealand. In New Zealand, domestic tourism same-day trips were more cherished than overnight trips. This is because 28.3 million domestic trips, representing 65%, had been recorded while overnight trips were 15.1 million, representing 35%. Holiday trips were the highest, followed by visiting friends and relatives then business. The report showed that visitors predominately used private homes (56%)

whereas average expenditure per strip was $181.00. Majority of the visitors used car travel as the common form of domestic tourism transport (92%).

U. K. Tourism Statistics (2009) reported that in 2008 and 2009, the number of trips were 117.715 and 126.006 million, respectively in U. K. For number of nights, 378.388 and 398.749 million nights were spent, while the corresponding domestic tourism expenditure was £21,109 million and £21,881 million, respectively in 2008 and 2009. For the same years, average night per trip was 3.21 and 3.16, average expenditure per trip was £178 and £174, while average expenditure per night was £56 and £55, respectively.

Similarly, Craggs and Schofield (2009) reported on the findings of a survey of day-visitor expenditure by category at the Quays in Salford, U.K. The study examined tourism expenditure recorded at the micro level, which focused on the Quays in Salford, Manchester's rejuvenated dockland area. The results revealed that tourism expenditure had great influence on the age of the visitor, visitation frequency and motivation of visit. The result further showed that heavy spenders were females and shopping was their main motivation for the visit.

Proust *et al.*, (2009) investigated tourists' attitudes, preferences and local product consumption during their holidays in Crete. The study aimed to comprehend the diverse ways that tourism had assisted Cretan agricultural demand in Crete and how it would make the management of the agriculture sector easier in future. The result showed that Crete competed with Italy, Spain or Portugal as well as other new vacation destinations which had developed recently. The key finding was that Crete had observed high degree of satisfaction for the following areas: climate, cleanliness, accommodation and natural sites. This was explained by a large inflow of tourists to the island.

Statistics South Africa (2011) presented the main findings obtained from the second edition of Domestic Tourism Survey Report. The data were collected to measure domestic tourism industry's contribution to the economy of South Africa. Besides knowing its contribution to GDP, it would help the planning, marketing, policy formulation, discussion, implementation and regulation of activities that were related to tourism. The study showed that nearly 3 million same-day trips and 3.3 million overnight trips were recorded in 2010. Visiting friends and relatives was the main reason for embarking on both domestic same-day and overnight trips in South Africa. Embarking on trips for leisure was the second most important reason for travels.

UNWTO (2011) reported in terms of the country's profiles that in Australia, tourism contributed 2.5% to the economy and about 8% of the whole export earnings and about 20% of the workers was employed in the sector. Asia and Pacific, unlike any other region in the world, was characterised by historical, geographical, economic and political context that were unique and had an enormous bearing on tourism and domestic tourism in particular. Owing to the rapid and constant economic growth of the Asian destinations in the past three decades, affluent class in the region preferred to travel abroad thereby depriving domestic tourism of a valuable market.

U. K. Tourism Statistics (2012) reported that the performance of tourism in the U. K. was the 6th largest industry in U. K. that employed about 9% of the people working in the UK. About 227 Pounds was an average spend per visit, 67 Pounds was the average expenditure per night while the average length of stay was 3 nights. Total number of bed-nights was 388.2.1million while total trips recorded were 126 million. Domestic tourism generated 24 billion Pounds in 2012 to the economy of the United Kingdom.

According to Pavel (2012), the focus of Germany's tourism industry was the investigation on estimating the impact of consumption expenditures of tourists on income and employment in Germany. The results indicated that the aggregate tourism consumption or expenditure in Germany amounted to 278.3 billion Euros, where domestic tourism contributed 241.7 billion Euros or 87%. Private trips accounted for a lion share of 79% than business trips. The outcome demonstrated the economic importance of the tourism industry in Germany, where tourism represented 4.4% of aggregate Germany's gross domestic product (GDP).

UNWTO (2013) decided to undertake domestic tourism research which had become one of its priority areas in recent time for its programme of work. The purpose of the study was to make available the picture of domestic tourism through the research of policies, strategies and resilient capacity. This would enhance an awareness creation of domestic tourism which contributed to the socio-economic development of the country.

UK Tourism Statistics (2015) also revealed that 200 Pounds was an average spend per visit, 66 Pounds was the average expenditure per night while the average length of stay was 3 nights. Total number of bed-nights was 377.1million while total trips recorded were 124 million. Domestic tourism expenditure was £25,000 million.

"Tourism has become one of the driving forces of global employment, economic security and social-wellbeing of the 21st century. The sector today represents 5% of global Gross Domestic Product (GDP), one in twelve jobs worldwide, and 30% of the world's export of services, ranking fourth after fuels, chemicals and automotive products" (UNWTO, 2015).

2.3 Measuring Domestic Tourism Demand in Ghana

The term 'tourism demand' is usually used to mean actual or observed tourism participation and activity. This type of demand is known as real or actual demand and refers to the aggregate number of tourists/visitors recorded in a given location or at a particular point in time (Page and Connell, 2006).

To plan and promote domestic tourism in Ghana, and to assess visitors' demand for various tourism goods and services, it is important to determine the answers to such questions as:

- Who visits? Why? When? To which part or destination of the country?
- Where do they stay? How long do they stay at their destinations?
- In what type of accommodation? How much do they spend?
- What are the impacts of Ghana's domestic tourist's demand for tourism products to changes in relative prices and real total tourism expenditure?
- What are the nature, magnitudes and relationship of economic parameters which underlie tourists' demand for tourism goods and services?
- What are the effects of socio-demographic variables on domestic tourism demand?

Often, much of such information is not available, and as a result, there are no well-founded bases to support decision making within the tourism sector, especially, in terms of fiscal policy (Xiaoli and Bingsong, 1997).

Economic factors largely account for the total demand for tourism products in a particular destination while non-economic factors motivate the choice of specific types of tourism goods and services. To account for the above, the researcher looks at the expenditures on visits to the country's attractions which have slowed down for the past ten years, making the demand for domestic tourism low (Ghana Statistical Service, 2018). Table 2.1 describes domestic and international inbound tourism expenditure from 2012 to 2016/17. Table 2.1 shows that in 2012, domestic tourism generated 2,711.00 million Ghana Cedis with its corresponding inbound expenditure of 1,704.70 million US Dollars. The table further illustrates that domestic tourism expenditure is smaller compared to that of inbound tourism expenditure from 2012 to 2016/17. This demonstrates that the patronage of domestic tourism in Ghana is on the low side, and the possible reasons for low patronage need to be established, and appropriate measures put in place to boost domestic tourism participation in Ghana.

Table 2.1: Domestic and inbound tourism expenditure in Ghana, 2012 – 2017

Expenditures	2012	2013	2014	2015	2016/17
Domestic tourism expenditures (million Gh¢ in nominal term)	2,711	3,855	3,005	698	2,909
Int. inbound tourism receipts (expenditures) (million US$)	1,705	1,877	2,067	2,275	2,505

Source: Study Data, 2012 – 2014, Ghana Statistical Service and Ghana Tourism Authority

Apart from income, prices, taste and preferences which are key determinants of domestic tourism participation, there are some socio-demographic variables that influence domestic tourism demand which need to be analysed to assist the management of domestic tourism in Ghana. These socio-demographic factors include age of household head, educational level of household head, annual household income, household loan, access to Internet, car ownership, and ownership of a mobile phone (Hung, Shang and Wang, 2012).

2.4 Methodological Description

The survey was designed to measure the number of trips, bed-nights and expenditure of domestic visitors resident in Ghana. These three measurements were associated and of great value and were needed from the survey for effective tourism data analysis. These were visitors' trips by Ghanaians and non-Ghanaians resident in Ghana; tourists' bed-nights by Ghanaians and non-Ghanaians resident in Ghana; and the value of expenditure on these trips.

These variables, such as destination of visitors, purpose of visit, means of transport, accommodation type used, and others, were added to the questionnaire in order to render meaningful analysis to describe the number of trips, bed-nights and expenditure of visitors or tourists.

2.4.1 The concept of usual residence

Firstly, it is at the place of usual residence that the reason to embark on a journey is made and where the journey begins. Secondly, the place of usual residence decides whether an individual arriving in a place or region is a visitor or not.

2.4.2 The concept of 'usual environment'

The phrase "usual environment" of a person refers to the locality or administrative unit in which the individual lives. For travels within Ghana, this concept is used to include in statistical observation for only those travellers who move outside their usual environment and can be considered visitors if they meet other criteria. The survey makes use of the grouping of four measures or decisive factors to define the "usual environment" of a visitor or tourist or a household are listed below:

- The geographical boundaries in which the fundamental habit of life takes place (residence, work place, place of study and place of trade): it includes places an individual regularly pays visit to (on a weekly basis) other than vacation homes.
- Displacement covered from time travelled to return.
- Period of the travel from departure to return.
- The moving away from an administrative border (UNWTO, 2006).

The "usual environment", a concept, being used for domestic tourism data collection has been operationalized. Administrative Territorial Unit (ATU) is used to determine which trips are found in individual's 'usual environment' (so as to leave them out as domestic tourism activities). ATU travels are travels made inside the District or Municipal or Metropolitan areas not for tourism purposes.

2.4.3 The concept of 'usual environment' and second homes

The survey considers the dwelling of individuals or each household as the primary home. Rented family or owned dwellings inhabited by an individual or household during tourism trips are regarded as private home or second home. Every individual or household which occupies dwellings owned by relatives or friends is considered as relative's or friend's residence.

Other countries use various means to decide the usual environment of a person. Table 2.2 shows different countries which use Administrative Territorial Units (ATUs) to delimit the usual environment while Table 2.3 describes countries which use different criteria to determine a person's usual environment.

Table 2.2: Countries that use Administrative Territorial Units (ATUs) to delimit the term 'usual environment' in domestic tourism data collection

Country	Distance	Frequency
Italy	ATU	Weekly
Spain	ATU	Weekly
Czech Rep.	ATU	Twice a week
China	ATU	Municipality
Morocco	ATU	City
Thailand	ATU	Municipality
Uruguay	ATU	Locality

Source: UNWTO, 2003

Table 2.3: Other countries which use different criteria to delimit the "usual environment" in domestic tourism data collection

Country	Distance	Frequency
Finland	Kilometres	Weekly
United Kingdom	Kilometres	All overnight trips
South Africa	Kilometres	40 kilometres in

Source: UNWTO, 2003

2.4.4 Trips, bed- nights and expenditure (spend)

Trips are movements from the usual environment to a place or region which involve at least one overnight stay or not, taken by adults aged 15 years or more, including children of age 0-14.

Bed nights are overnight(s) spent away from the usual environment on trip(s) by both adults and children aged 0 and above. Every night spent by adults aged 15 years or more, including children of age 0-14 was considered as a night. Therefore, a party of 2 adults and 3 children taking 3 overnight trips away from the usual environment (home) will count as 15 bed-nights.

Expenditure/Spending is the domestic tourism expenditure incurred by visitors for tourism trips. Three different expenditures are considered. These are pre-trip expenditure (expenditure incurred before the trip), on-trip expenditure (expenditure incurred during the trip) and post-trip expenditure (expenditure incurred after the trip). Tourism Expenditure is the expenditure incurred for purchasing tourism goods or services for the direct satisfaction of visitors. The domestic tourism expenditure is measured in purchasers' prices. (UNWTO, 1995). For the purpose of this study, the household annual income is the total income earned by the members of the household, without remittances during the preceding year, are considered to be the annual income of the household (World Bank, 2000).

2.5 A Tool for Domestic Tourism Expenditure Data Collection

The most important requirements of tourism expenditure data is a breakdown of the expenditure by item. The detailed breakdown of tourism expenditure data is critical for economic analysis and for market research data. Ghana did not have the detailed breakdown of tourism expenditure data for measuring the impacts of domestic tourism industry in particular, and tourism in general on the economy and other sectors of the economy. Therefore relevant domestic tourism expenditure data had to be collected for the study from 2012 to 2014. To be able to collect domestic tourism expenditure data, we would need a model to assist in expenditure data collection (UNWTO, 1994; 1995; 2000; 2005; 2006; 2011; 2012 and 2013) and (Xiaoli and Bingsong, 1997). The collection of tourism expenditure data for the study will address the methodological problem as to how to utilize the concepts of "usual residence" and "usual environment" in relation to domestic tourism expenditure data collection to validate the results Lelwala and Gunaratne, 2008; Allen and Yap, 2009; and Disegna and Osti (2016). The developed tool or model would be presented to the Ghana Statistical Service for the collection of domestic and outbound tourism expenditure data, from 2015.

2.5.1 Expenditure breakdown by commodity groups

The expenditure breakdown by commodity groups is made up of the following seven groups: package tours; accommodation; food and drinks; transport;

recreation, culture and sporting activities; shopping/non-consumables; and other services (UNWTO, 2008; Disegna and Osti, 2016).

Group 1**: Package tours**

Group 1 is made up of tourism goods and services which are bought by the visitor as a singular item. This package is, more often than not, a single charge for the whole for transport, accommodation, food and drinks, etc. Usually, the data which are provided by the visitors, do not have information on how much the package expenditure should be allocated to the component items. It is critical to break each tourist's package expenditure in order to be in its component items. It is after this that we aggregate such breakdowns.

Group 2**: Accommodation**

Expenditure under Group 2, "Accommodation" includes: expenditure on collective and private accommodation, such as hotels and similar establishments, health institutions, work or holiday camps, conference centres, holiday dwellings, tourists camp sites, other collective accommodation, owned dwellings, rented rooms, family homes, friends and relatives and other accommodation

A second home of a visitor being used refers to any direct expenditure relating to a visit to a second home such as expenditure on transportation, food and drinks, entertainment, heating, cooking, etc. It includes expenditure on maintenance, annual charges, repair of building, yearly charges like taxes and rates and should be attributable to each visit to the holiday home based on the number of days to spend there.

Note: If the price of a commercial accommodation includes breakfast as part of the expenses, irrespective of whether the meal is taken or not, the total cost is considered as accommodation expenditure. But, where meals are charged for separately and included in the final bill, an estimate is made of the extra cost and included in the cost of "Food and drinks" "Group 3"

Group 3**: Food and drinks**

"Food and drinks" is made up of the following expenditure on food and drinks incurred when a visitor eats at licensed and unlicensed restaurants, cafes, drinking bars, and nite clubs: expenses on food and drinks in places of entertainment are included if the main reason of visiting that place is to have a meal or drink;

- Expenses on food and drinks incurred on a means of public transport, and expenditure on food and drinks incurred in hotels and similar establishments, where the expenses incurred can be separated from the charge for collective and private tourism accommodation (e.g., hotels and similar establishments) is accepted;
- Expenses incurred on prepared and unprepared food and drinks at retail stores to be consumed during tourism trips. This is made up of food and drinks bought at kiosks, supermarkets, retail stores, grocery stores, open markets, restaurants, fast food take-away establishments, and other food outlets.
- Drinks or beverages being consumed on the premises (hotels, restaurants, theatres, stadia, etc.,) and taken away for consumption.

Group 4: **Transport**

Expenditure on Group 4, "Transport" covers all travel expenses incurred during tourism visits. This includes the following:

- Travel to and from the visitor's destination (s).
- Travel at the destination or destinations.
- Any travel embarked on from the destination(s), such as visiting tourist sites. Expenditure in this category includes:
- Transport fares and charges on public and private transport, e.g., domestic airlines, ships, trains, buses, motor bikes, and taxis;
- fuel and other running costs incurred by visitors during tourism trips;
- vehicle repairs and buying of spare parts during tourism visits;
- hiring of vehicles for tourism purposes;
- parking expenses incurred which include station taxes, airport taxes, booth tolls, and other charges not elsewhere classified; and
- expenditure on passenger lines and ferries, cruise, and other waterway transportation.

Group 5: **Recreation, culture and sporting activities**

Group 5 "recreation, culture and sporting activities" includes the expenditure of the following activities. These include:

- the payment of gate fees to entertainment centres, national museums, tourist sites, sports stadia, and other events being paid for as entrance fees;
- recreational and sports facilities and equipment fees paid during tours;
- entrance fees paid at national, regional and district theatres, such as night clubs, discotheques etc.;

- the purchase, repair and maintenance of recreational and sporting equipment or goods during tourism travels;
- expenses incurred on visitor's own recreation and sporting equipment; expenditure on excursion tours and hired guides, and
- Expenses like fuel and other running costs where a visitor's own recreation and sporting equipment have been utilised.

Group **6: Shopping**

Group 6, "shopping:' is made up of expenditure on goods only and not on services.

- Capital goods, such as land, improved land, buildings, housing, and other important goods such as cars, canoes, and second homes, even if they will be used in the future for tourist travel purposes are not to be included in Group 6.
- Expenditure on the following types of goods should be included: souvenirs, luggage, and clothing (e.g., a purchase of a pair of trousers, shirt, funeral cloth, etc.,) and footwear (e.g., a pair of shoes, sandals, etc.,); tobacco products, goods for personal care, and other goods, not elsewhere classified.
- Expenses on art works and on jewellery are included on condition that: If the intention is to buy on behalf of a business, either for resale, investment or for decoration, then exclude;
- If it is bought merely for investment then the cost of the good should not be included; and

- If the good is purchased for own use, or for someone else, then include the cost of the good.
- The following exclusions are made for shopping: (i) expenditure on food and drinks which have been added to Group 3, **"**Food and drinks"; (ii) expenditure on equipment and recreational goods which have been added to Group 5, "Recreation, culture and sporting activities"

Group 7**: Other**

"Other" includes expenditure on services only before or during the tour and not goods:

- Expenditure on telephone calls (MTN, TIGO, VODAFONE, AIRTEL, KASAPA, etc.;) and postage;
- Fees paid to travel agencies, tour operators, travel & tours, as well as development and/or printing of films;
- Personal services such as haircutting, pedicure, manicure, hair dressing, etc.
- "Other" excludes expenditure on the following: (i) accommodation services which have been added to Group 2, "accommodation" (ii) transportation services which have been added to Group 4, "transportation", (iii) recreation, culture and sporting activity services which have been added to Group 5 "recreation, culture and sporting activities"; and
- Insurance on travels within Ghana (UNWTO, 1995).

2.5.2 Expenditure before the trip, during the trip and after the trip

The following is the visitor expenditure from time perspective:

- **Expenditure before the trip**

All expenditures made on goods and services before a trip which clearly related to the trip, e.g. purchase of funeral cloth, a bag, a pair of trousers, a pair of shoes, shirt, handkerchiefs, souvenir, car repairs, recreation goods, etc.

- **During the trip**

All consumption regardless of the nature of the goods or services as far as they were considered being part of household actual final consumption. (E.g. yoghurt, papaye, a pair of trousers, a pair of shoes, souvenir, bread, tins of milk, duty-free purchases, etc.).

- **After a trip**

All tourism goods and services bought after the trip which clearly related to the trip (e.g. the repair of a vehicle used for tourism purposes, photographic processing, repair of tourism kits, etc).

2.5.3 Items excluded from domestic tourism expenditure

It is important to note that for tourism activities, certain items are excluded from the purview of expenditure. These include:

- Capital type investments, e.g. land, improvement of land, buildings, vehicles, canoes, second homes, etc.;
- Money donated to host relatives or friends on tourism trips or funerals which has not been used for the payment of tourism goods or services;
- Donations which are made to institutions; and
- Purchases of tourism goods for resale.

2.6 Purpose of Visit

An individual may embark on a trip for different reasons. Usually, there will be one reason which could be termed as the only reason for the visit, without which the visit would not be embarked on, is the purpose of visit. The purpose of visit for domestic tourism has been categorized into two main groups: personal; and business and professional.

- **Personal**

For personal, visitors travel for leisure, holidays, and recreation, visiting friends and relatives, education and training, health and medical care, religion/ pilgrimages, shopping, among others.

- **Business and professional**.

This category is made up of tourism activities of the self-employed and employees (e.g. investors and businessmen, etc.) so far as they do not engage in any gainful employment in the place visited, for example, investors, businessmen, etc.

- **Duration of stay**

The period of stay is determined in terms of bed-nights, in the case of overnight tourists. The number of nights is counted from the day of departure to the day of arrival from the tour. For a trip to be domestic tourism, the number of bed-nights has to be less than 365. For same-day visitors, the duration of a trip should be less than 24 hours.

- **Mode of transport**

The mode of transport is referred to as the means by which a visitor displaces from his/her place of residence to the place of visit outside his/her usual environment for domestic tourism.

- **Hospitality**

It is made up of two services: to provide overnight accommodation for people travelling away from home, and options for people to dine outside their home.

2.7 Tourist Accommodation

Tourist accommodation is a basic requirement for tourists travelling away from home. Tourists require a place to lodge to rest while they embark on tour. The following are some accommodation types:

- **Hotel:** is a licensed establishment that offers lodging paid for by tourists on a short-term basis.
- **Guest house:** A small house together with the main house where guests or visitors lodge and pay for.
- **Holiday resort:** is a playground or vacation spot or resort area or an area where many people go for recreation.
- **Health establishments:** refer to as health and related institutions which offer lodging services to patients/visitors.
- **Work camp or holiday camp:** is a type of camp that encourages holiday-makers to stay within the site boundary and provides entertainment for them.
- **Tourist campsite:** is an area usually divided into small pitches, where

people can camp overnight using tents.

- **Holiday dwelling:** a place made up of apartments which are considered holiday dwelling unit.
- **Budget hotels:** establishments which offer cheaper prices for visitors per room per night. These hotels are often with insufficient amenities in their rooms.
- **Hostel:** an establishment that provides low-cost food and lodging to a group of pupils, students, workers or travelers.
- **Primary home:** in Ghana, the residence of every person or a household is deemed statistically as the primary home**.**
- **Private homes or second homes:** rented or family or owned residence for occupation by persons or households on tourism trips.
- **Relatives' or friends' residence:** persons or households who reside in dwellings owned by relatives or friends during tourism trips is regarded as **relative's or friend's residence.**

Other: any accommodation not elsewhere classified (UNWTO, 1995).

2.8 Some Operational Definitions of Tourism Terms

- **Tourism:** Is the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place or country visited (UNWTO, 1995).
- **Visitor:** Any person who travels to a place other than that in which he/she has his/her usual residence but outside his/her usual

environment for a period not exceeding 12 months and whose main purpose of visit is other than the exercise of an activity remunerated from within the place or country visited (UNWTO, 1995).

- **Tourist:** a visitor who resides at least one night in a licensed or private accommodation in the place or region visited.
- **Same-day visitor:** a visitor who does not spend the night in a licensed or private accommodation in the place or region visited.
- **Traveller:** a person who makes at least one travel or trip during the study period, but the trip is not a tourism trip.
- **Arrivals:** When a person travels to the same place or region several times during the year is counted each time as a new arrival.
- **Household:** is either one person or group of persons who share from the same eating or cooking arrangements.
- **International inbound tourism**: refers to Ghanaians and non-Ghanaians resident outside Ghana who visit Ghana for not more than 365 days for tourism purposes.
- **International outbound tourism**: refers to Ghanaians and non-Ghanaians resident in Ghana who visit other countries outside Ghana for not more than one year for tourism purposes.

People not considered as Tourists or Visitors of Domestic Tourism

The following category of people are not considered as domestic tourists or visitors:

- Those who travel in between their usual environment.
- Those who embark on military duties.

- Those whose travel serves as part of a shift to a new location which is permanent.
- Sales people who travel, for the purpose of their occupation or job.
- Those whose purpose is to travel to be admitted to, or detained in a facility, for example, prison or hospital or any long stay.

2.9 Determinants of Domestic Tourism Demand

Economic factors generally account for the total demand for tourism goods and services in a given destination while non-economic factors drive the choice of specific types of tourism goods and services. In the literature, the major determinants of domestic tourism demand are income, relative prices, exchange rates, transportation costs, and these have the highest effect on demand for tourism. The economic theory suggests that quantity purchased of a good or service is a function of the relative price of the product, income of the consumer and the taste or preference of the consumer (Marcussen, 2011), and this is in line with the theory of economics. The traditional demand theory takes into consideration the price of the product, income of tourists and prices of other products and taste or preference as the main determinants of market demand. He further expounded that other factors also affect market demand like distribution of income, the complete population and its structure, accessibility of credit, government policy, wealth, past levels of demand and income (Koutsoyiannis,1991),

2.9.1 Income

For determinants of domestic tourism demand, income is the most commonly used variable to expound domestic tourism demand (Song, Li and Witt, 2010). A rise in real income per capita expenditure results in a rise in the number of tourism goods and services purchased by a tourist (DeHaan, 2009). Divisekera (2007), found out that the responsiveness of demand for domestic travel varies within a destination (Australia) and the main factors of domestic tourism are prices, income of tourists, prices of other tourism goods and services and tourist's preference or taste.

2.9.2 Price

Following the theory of demand, prices and tourism demand are related negatively. Domestic tourism involvement rises when the cost of living in Ghana is lower related to the prices of tourism products. The consumer price index (CPI) is the most frequently used variable in tourism demand analysis (Baggio, 2011). A rise in the prices of tourism products in the destination or region brings discouragement to tourists to move to this destination, while a rise in tourism products could also drive tourists to take into consideration cheaper goods and services.

2.9.3 Dynamics

In recent literature, dynamics has been more prominent in using lagged variable to take into account the inflexibilities that tourists face in the demand for tourism products in the short-run. This means that tourism demand cannot respond in full to a change in income and prices. To realise this, the behaviour pattern of tourists' lagged consumption of tourism product is included in the model as lagged dependent variable.

2.9.4 Other factors

Socio-demographic factors are used to explain domestic tourism demand since it is expected that these variables affect the total domestic tourism consumption by driving the choice of specific types of tourism goods and services. The socio-demographic factors are age of household head, educational level of household head, annual household income, household loan, access to Internet, ownership of a car and ownership of a mobile phone.

2.10 Quantile Regression Framework

In this section, selected studies on the applications of quantile regression have been reviewed. The application of quantile regression techniques has greatly increased in recent years. For instance, labour economics has been one of the most popular fields for application.

Koenker and Basset (1978) introduced and developed the quantile regression to model the relationship between explanatory and response variables for different quantiles of the response variable.

Buchinsky (1998) provided recommendations for the practical use of the semi-parametric technique of quantile regression which concentrated on cross-section applications. The study presented several alternative estimators for the covariance matrix of the quantile regression estimates, reviewed the results for a sequence of quantile regression estimates, and discussed testing procedures for homoskedasticity and symmetry of the error distribution.

According to Koenker and Hallock (2000), quantile regression provided an extension of univariate quantile-estimation to estimation of conditional quantile function via an optimization of a piece-wise linear objective function in the residual. To compute quantile regression estimators, might be expressed as a linear programming problem and competently solved by simplex or barrier method.

The dissemination of technological change all the way through statistics was closely linked to its embodiment in statistical software. This was highly true of Koenker and Hallock (2001), argued that the methods of quantile regression, as the linear programming algorithms that underpinned dependable implementations of the methods seemed rather mysterious to some users. As early as in 1950s, it had been known that median regression methods founded on minimizing sums of absolute deviations or residuals could be formulated as linear programming problems and proficiently solved with some of the simplex algorithm.

Montnegro (2001) analysed gender gap in the returns to education, the returns to experience, and gender wage gap in Chile. The study used the standard "Mincerian" wage equation and estimated it separately by gender using the quantile regression technique. Data from Chile, from 1990 to 1998 was used in the estimations. The results clearly showed that the returns to education, the returns to experience and the gender wage differential were not constant along the wage distribution. The wage distribution showed that at the lower part, women had higher returns to education than men, and similar returns to experience.

De Mello *et al*., (2002) put forward a novel approach to estimate and make inference from growth equations. The study used the quantile regression approach for the assessment of income convergence and the effects of policy variables on conditional distribution of the Gross Domestic Product growth rates. The findings showed that the earlier empirical growth studies which depended on conditional mean estimation approach rendered a misleading or deceptive or misinformed picture of growth dynamics.

Yu *et al.*, (2003) offered a review of how quantile regression is a more complete statistical model than mean regression, and which has widespread applications.

Machado (2003) studied how to estimate the conditional quantiles of counts. For the separateness of the data, some smoothness had to be non-naturally imposed on the problem. The study used standard quantile regression technique for smoothing the data.

Omar *et al*., (2004) applied the method of volume separation to casino tourists, profiled them, detected ways to mark heavy spenders and examined whether volume separation was a viable separation approach to gaming market. The study showed that a sample of visitors to two commercial casinos was divided into light, medium and heavy spenders based on spending per person per day, not including gambling. The findings indicated that a large number of heavy–spending tourists were not interested in gaming, but interested in the destination's other tourism products.

Buhai (2005) presented a short and generally easily reached overview of the method of quantile regression, with focus on initiating the method and examining two major submissions. The study showed that quantile regression provided an additional room of univariate quantile estimation to estimation of conditional quantile functions.

Fitzenberger and Kunge (2005) investigated the relation between the gender wage gap, the choice of training occupation, and occupational mobility using quantile regression technique. The study used longitudinal data for young employees having apprenticeship training in West Germany. The results showed that there was a gender wage gap regarding experience; (i) the gap had declined over time; (ii) in the lower part of the wage distribution, the gap was maximum and it rose with experience; and (iii) occupational mobility was lesser for women than for men and the wage increases due to occupational mobility were greater for men than for women.

Sergio *et al.*, (2006) put forward a new quantile regression technique for modelling unconditional quantiles of an outcome variable as a function of independent variables. The regression model being estimated could be used to conclude the effects of various independent variables on a given unconditional quantile as was like the regression coefficients being used with regard to the mean.

Takeuchi *et al.*, (2006) introduced a nonparametric type of a quantile estimator, which could be got by working out a simple quadratic programming problem and could afford the same convergence statements and bounds on the quantile property of the estimator.

Zietz *et al*., (2007) used quantile regression approach to determine the relation of a particular housing attribute on house price. The research sought to make clear some of the misunderstanding by using quantile regression to assess the impact of different housing attributes on selling price. Using the outcome of the research showed that the impact of housing attributes on house price could be expounded better by assessing quantile regressions across categories of price.

Cornell University (2007) explained how quantile regression model estimated the partial effect of explanatory variables across different sections of the population. The institution investigated the relation among infants' birth weight and explanatory variables. The university found out that the coefficient estimates for the 5^{th}, 10^{th}, 50^{th}, 90^{th} and 95^{th} quantiles provided different estimates of the covariates of the distribution.

Allen *et al*., (2009) used an application of quantile regression technique to a sample of Australian stocks over the period of the recent stock market downturn in connection with the global financial predicament. The study observed that as market losses rose, the return distributions of a financial asset was likely tilted towards the left tail.

Dolnicar *et al*., (2008) investigated heterogeneity in household discretionary expenditures. The results highlighted the significance of learning tourism expenditure in the circumstance of other household expenditure decisions. It demonstrated the importance of this knowledge for tourism destination management. Also, in addition to policies of government to be able to assess the competitiveness among categories of expenditure so as to discover market segments that would be suitable for the product category put forward.

Ng, (1999) found out that visitors who repeated their visits planned to spend more in Hawaii than first time visitors. Using quantile regression approach, different spending behaviours across the whole spectrum of the tourist population were observed through the moderate spenders to frugal spenders.

According to Fitzenberger (2012), quantile regression was progressively used in applied econometric research. This approach permitted one to estimate the effects of independent variables along the conditional distribution of the independent variables.

Citia-Nicidemo (2009) investigated the gender gap between wives and husbands for the Mediterranean countries. The study observed that wives underwent two kinds of unfairness with regard to their husbands: a lower wage for the same work done; and their main duty was to be responsible for children. The result showed that the wage gap was clearer for women who were married at the base of the wage distribution in Southern countries.

Fitzenberger *et al.*, (2010) investigated the rise in wage differential, the decrease in collective bargaining, and the development of the gender wage gap in West Germany from 2001 to 2006. The results showed that wage differential was strongly increasing; determined not only by rise in real wage increases at the top of the wage distribution but also by real wage decreases beneath the median.

Sergio *et al.*, (2011) used quantile regression technique to argue that the amendment in the returns to occupational tasks had contributed to modification in the wage distribution over the last thirty years.

Hung *et al.*, (2011) applied quantile regression technique to analyse the determinants of household domestic travel expenditure using travel expenditure as a response variable. The study used socio-demographic variables as explanatory variables. The predictors were household head's age; educational level of household head; income per year of the household; household loan; access to Internet; and car ownership. The results revealed that older and well educated household heads with higher income were prepared to spend more on domestic tourism in Taiwan. Households with light tourism expenditure were more likely to be affected by home loan expenditures. The results further showed that the use of Internet and car ownership had strong relationship with domestic tourism expenditure.

Hung *et al*., (2012) discussed household tourism spending behaviour which applied the quantile regression approach. The study used a percentage of tourism expenditure as the response variable. The results showed that Internet access and car ownership played significant roles in terms of domestic tourism expenditure. According to the study, household loan was one of the main constraints of domestic spending for light spenders.

Chernozhukov *et al*., (2012) analysed the effect of either changing the distribution of independent variables, or changing the conditional distribution of the outcome given by independent variables, on the complete marginal distribution of the outcome.

Melly (2006) put forward estimators of unconditional distribution functions in the presence of predictor variables. The conditional distribution was being estimated by the use of quantile regression technique. The study showed $\sqrt{n}$ consistency and asymptotic normality of the estimators and provided analytical estimators of their variance. The study further showed that the methods were well performed in finite samples by Monte-Carlo simulations. Using it for black-white wage gap showed its effectiveness of the estimators.

Soderbom (2013) provided that by far, the most common object of interest in econometrics was the conditional mean and its determinants. However, estimation of conditional quantiles (e.g. medians) was increasingly popular.

The reason was that such an approach enabled the researcher to estimate the partial effect of an explanatory variable across different segments of the population.

Othmen (2013) attempted to investigate for the first time the consequence of motivations, characteristics of trips and the socio-demographic features of tourists on their day to day expenditure in the estuary region of Gironde, France. The study found the effects of the contributing factors, using quantile regression and an ordinary least squares (OLS) regression. The result showed that there was a relation between the importance attached to execute a seaside tourist's tourism experience and their everyday expenditure on the recent trip. The result further showed that travel motives, though, to less significant level, when selected together with variables such as household income and type of accommodation selected by tourists, influenced tourists' everyday expenditure. This is because "econometrics" provides valuable tools for studying casual relationships between tourist characteristics, trip characteristics, motivation for the visit and consumer expenditure.

Fitzenberger (2013) discussed the linear quantile regression technique: Distance function, asymptotic distribution, properties of the estimator, and interpretation as method-of-Moments Estimator.

Martinez–Silva and Roca-Pardinas (2013) considered the probable relationships between explanatory variables and quantiles of a dependent variable by way of a regression model. Their main aim was to conduct comparative study, using simulation and application to real data, to perform a review of a number of currently used flexible quantile regression techniques being implemented in R software.

According to Machodo and Santos (2013), the results of a heteroscedasticity test were presented to guide researchers to choose the appropriate covariance matrix estimator to use.

Logan and Petscher (2013) used quantile regression to analyse the correlations for the selected sample compared to the unselected sample. According to the study, if you did not get the cut point exactly right, you might miss some significant differences. The results showed that we could study the whole distribution of the collected data instead of mean only; and no normality assumption was required.

Fitzenberger (2014) discussed that, of late, quantile regression technique was progressively used in applied econometric research. The technique allowed the estimation of the differential effects of independent variables along the conditional distribution of the response variable. For instance, the wage effect of education or training might vary between low-wage and high-wage individuals.

Thrane (2014) gave practical advice on how to improve the modelling of micro-level tourism expenditure in future. Three key issues were discussed here: the selection of explanatory variables; the selection of functional form; and the selection of estimation technique.

Ferrer-Rosell *et al.*, (2014) argued that it was important to study domestic visitors' spending behaviour to provide vital information to travel organizers, policy makers, suppliers, destination marketers and analysts in designing the appropriate marketing strategies.

Koenker (2015) stated that quantile regression was a developing body of statistical methods to estimate and draw conclusions about functions of conditional quantile. He pointed out that the traditional method of regression might turn out to be misleading and quantile regression was a useful procedure to overcome these problems.

Marrocu *et al*., (2015) evaluated the effects of the main factors of tourist expenditure by using both linear and quantile regression models to individual micro data collected in 2012. The study revealed that, in addition to income and foreign nationality, tourist expenditure was favourably driven by trip-related and psychographic features. The results further indicated that greater positive effects were found for heavy spenders while group size and the number of visited sites added to shrinking the level of expenditure for light spender tourists.

2.11 AIDS and Other Econometric Models

In this section, empirical studies on Almost Ideal Demand System (AIDS) and other econometric models are reviewed, since most of the studies used this model and others for the estimation of own-price elasticities, cross-price elasticities, and income/expenditure elasticities. Economic impact of tourism goods and services' consumption by tourists or visitors had not been given much research attention, especially in Africa in general, and Ghana in particular.

Demand analysis is referred to as the study of commodity demanded by consumers, most usually based on aggregate data but occasionally, and more so recently, on cross-sectional or even panels of households (Deaton and Muellbauer, 1980). The first approach concentrated on the demand for a particular commodity by paying particular consideration to any special features of the single market being entailed. The second approach, developed after 1950, entailed the simultaneous estimation of the entire system containing demand equations for every commodity group purchased by consumers. The AIDS model seemed to have distinction in tourism economics. Since its introduction by Deaton and Muellbauer in 1980, it had been broadly approved by tourism statisticians and economists in such a way that it is the most accepted of all the demand systems. Its usage can be attributed to two key properties: first, AIDS is flexible; it is consistent. Second, it is easy to use, estimate and interpret.

The Almost Ideal Demand System (AIDS) model was developed by Deaton and Muellbauer (1980). Since the development of this model, many researchers had been continuously using it for consumer demand analyses due to its flexible nature. Fujii, Khaled and Mak (1985) used the AIDS model for modelling tourism demand. Even though there were alternative systems modelling approaches, the Almost Ideal Demand System (AIDS) model of Deaton and Muellbauer (1980a) was considered, since it was one of the most useful frameworks to examine consumer behaviour due to its flexible nature and other longing properties. Full details of this model is well discussed in Chapter Three. The AIDS model had been applied to model household expenditures, consumption of goods and services, and trade shares. Several studies had used the AIDS model to analyse tourism demand.

Following Fujii *et al.*, (1985), earlier researches on travel demand were centred on single-equation models, where the demand for a particular type of travel was expressed as a function of its own price and income (Gray, 1966), Quandt (1970), Kwack (1972), Artus (1972) Bechdolt (1973) and Straszheim

(1978). The study commented that one key defect of the single-equation approach was that it could not model the effect of a change in a particular region or destination on the demand for a visit to a different region or destination. The research analysed expenditure by visitors to Hawaii for six different categories of goods: food and drinks; lodging; recreation and entertainment; local transport; clothing and other. The results of the model provided empirical estimates of own, cross price and income elasticities of demand from a complete dataset on expenditure by visitors to a tourist destination. The analysis showed its usefulness as it evaluated the effects of policies on the pricing of tourism goods and services at a resort. Here, only long-run elasticity estimates were calculated, leaving out the short-run elasticities.

Alston and Chalfant (1991) estimated demand elasticities with the Linear Approximation of Almost Ideal Demand System (LA/AIDS). The paper investigated how AIDS price elasticities were being estimated using the LA/AIDS by conducting Monte Carlo experiments in which data were generated by the AIDS model. The primary conclusion of the paper was that different values could be got for AIDS elasticities when the LA/AIDS parameter estimates were substituted in various elasticity expressions. The paper revealed that two of the formula that had been used in previous studies resulted in very poor estimates, more often when multi-collinearity was high among prices. The best results were obtained from either the elasticity expression that assumed that budget shares were endogenous.

For the research on outbound tourism by French in Spain, United Kingdom, Italy, Germany, and Belgium, Durbary (2002) considered AIDS model of

Deaton and Muellbauer (1980a) as an important model for modelling tourism demand across destinations, notably Spain, UK and Italy. The results indicated that U.K and Spain were substitute destinations for French tourists. Similarly, U.K and Italy were substitute destinations as well. The study further observed that the expenditure elasticities showed positive results and around one, implying that one percent increase in real income would lead to a proportionate increase in demand.

Syriopolos and Sinclair (1993) employed the Almost Ideal Demand System (AIDS) to estimate tourism expenditure allocation by US and West European countries among a range of Mediterranean destinations. The expenditure elasticities demonstrated considerable variations in tourism demand preferences between origin countries and between newly developing countries. The own and cross–price elasticity estimates indicated the significance of effective prices to determine the apportionment of expenditure among destinations.

Lim and McAleer (2001) used seasonally unadjusted quarterly data to estimate the income, price and transportation cost elasticities of inbound tourism from Singapore to Australia. This was to assess whether Australia and New Zealand as destinations, were substitutes or complimentary for Singaporean tourists. It was also to assess concerns such as non-stationary, co-integration and spurious regressions. The study showed that international tourism demand by the people of Singapore for Australia was income and price inelastic.

A lot of studies which had tried to model tourism demand had depended on single equation models as noted by Archer (1970), Sheldon (1990) Sinclair (1991) and others. It is noteworthy that single equation specifications were being subjected to an amount of disapproval as an adhoc or lack in some theory (Sinclair 1998; Sinclair and Stabler, 1997). Using AIDS to model – implies "it may be seen as the most advanced modelling of the complete demand system".

Following Chalfant (1987) and Ahmed and Shams (1994), the Marshalian and Hicksian elasticities were calculated from the estimated parameters of the Linear Approximation of AIDS model (LA/AIDS). Using the formulas reported, compensated and uncompensated elasticities were calculated.

Hung *et al*., (1991) put together a linear expenditure model to analyse domestic tourism demand in the United States of America. The model commenced with the supposition of consumer utility maximization under budget constraints and used five commodity bundles: transportation, lodging, food service, entertainment/recreation, and other goods and services. The study showed that the outcome from the resulting income elasticity estimates, price elasticity estimates and cross-price elasticity estimates could support the understanding of domestic tourism consumer behaviour. The result showed that amongst the tourism goods and services, transportation was the most price responsive product.

Sinclair and Syriopoulos (1993) investigated tourism expenditure distributions among four countries in Europe. Papatheodorou (1999) studied the international tourism demand in the region of Mediterranean.

Molina (1994) analysed the demand for food in Spain during the period 1964-1980 to estimate the dynamic version of AIDS and included habit formation to capture the behaviour of the food consumer during the period of investigation. The study showed that uncompensated own-price elasticities were inelastic, milk and eggs had the highest own-price elasticity estimates. However, majority of the elasticity estimates were almost unity and that the cross-price elasticities were low but were substitutes.

Seddighli and Shearing (1997) examined the trends of tourism in North East England. The study used the Johansen and Juselius (1990, 1992) multivariate co-integration analysis to analyse the long-run relationship between Northumbria in England.

De Mello *et al.*, (2002) used a system of equations model to examine tourism demand. The AIDS model was applied to the UK demand for tourism in the neighbouring destinations, France, Spain and Portugal. The results showed that the expenditure elasticities were greater for Spain than France during the initial period. The cross-price elasticity estimates indicated substitutability between the immediate neighbours, Portugal and Spain, and France and Spain. The cross-price elasticity estimates for France and Spain showed that the French share was more sensitive to price changes in Spain than Spain was to price changes in France. If Spanish prices increased by 1%, the French share increased by 1.38%.

Tourism industry survey in advance of the Canadian Tourism marketing summit in 2004 reported that an increasing dependence on domestic travel i.e. the percentage of domestic travelling and expenditure was an ever growing proportion of the whole tourism industry and entertainment.

Turkish Statistical Institute (2003) conducted a survey on household income and consumption expenditure. Price elasticities under 12 commodity classes were analysed with the AIDS model. The results showed that communication had the lowest price demand elasticity while housing and rent had the highest price demand elasticity.

Turkish Statistical Institute (2003) conducted a survey on household income and consumption expenditure. Price elasticities under 12 commodity classes were analysed with the AIDS model. The results showed that communication had the lowest price demand elasticity while housing and rent had the highest price demand elasticity.

Katafono and Gounder (2004) modelled the demand for tourism in Fiji. The study used co-integration and error correction methods to build a tourism demand model for Fiji. The results showed that both long–run and short-run indicated that income of the major trading partners were positively related with tourism demand. This could be explained by the fact that increases in the long–term prices could not deter tourists.

Li *et al.*, (2004) examined the linear almost ideal demand system ((LAID), in both static and dynamic forms in the circumstance of international tourism demand. The result showed the dominance of the dynamic error correction LAIDS over the static counterpart, both suitable for theoretical restrictions and forecasting accuracy. The result calculated both long-run and short-run demand elasticity estimates. According to the results, income elasticity estimates showed that travelling to most main destinations in Western Europe seemed to be a luxury for UK tourists in the long-run. UK tourists seemed to be more responsive to price changes in the destinations in the long run than in the short run.

De Mello (2005) used a general form of the Dynamic AIDS (DAIDS) to analyse UK tourism demand for the destination of Portugal, Spain and France.

Obtaining consistent information on how tourists apportioned expenditure and how they adjusted to equilibrium was of great interest for tourism analysis and policy formulation and implementation in the area of tourism demand. The main objective of the study had been to show that carefully built models did matter for the progress of research in the tourism demand analysis.

Athanasopoulos and Hyndman (2006) used regression to estimate important economic relationships for domestic tourism demand. They recognized as well the effect of world events such as the 2000 Sydney Olympics and the 2002 Bali Bombings on Australia's domestic tourism.

Han *et al.*, (2006) modelled U.S. tourism demand for three main European destinations. Other empirical static models included De Mello *et al.*, (2002) and Divisekera (2003). Of these static analyses, these two, White (1985) and Divisekera (2003, 2007) modelled travel and tourism demand simultaneously.

Sadeghi and Shearing (2007) estimated price and expenditure elasticities for Hamedan Province in Iran using AIDS model. The results showed that expenditure elasticities for the commodity groups were income/expenditure elastic but demand for commodity groups was price inelastic.

For example, Divisekera (2007) used AIDS model to estimate demand elasticities for Australian tourists. The system of demand equations used which expressed demands as a function of relative prices and real expenditure was non-linear. Two systems of demand equations were estimated: combined or aggregate of demand of domestic tourism (national); and demands differentiated by region of destination (states/territories). The study showed that tourists' demand for different tourism products purchased by domestic tourists was less responsive to prices but more income elastic. Here, only long-run elasticity estimates were calculated, leaving out the short-run elasticities. New South Wales was the key tourist destination. Static AIDS specifications focused on the selection of nonlinear and linear models as well as a variety of estimation methods.

Some research activities which were considered to be pioneers that modelled the U.S. tourism demand for tourism in European countries included White (1982) and Harrison and Hagan (1984). The study analysed the development of the shares of market of U. S. tourism expenditure in Europe from the year 1960-1981.

Lelwala and Gunaratne (2008) modelled the tourism demand from United Kingdom (UK) to Sri Lanka using error connection modelling approach. The study showed a unique co-integrating relation that was noticed in the long-run model and indicated that income of United Kingdom and exchange rate were positively related. The results revealed that United Kingdom's income was the most vital demand factor in the long-run. The error correction model indicated that the departure of response variable from its equilibrium would be corrected at a rate of 30.71%. The results concluded that tourists from UK were highly price responsive to Sri Lanka as a destination.

Different studies on estimates of demand elasticities had been done using the AIDS model: Rijo, 2008; Nzuma and Sarker, 2008; and Mikolasek & Netuka (2010).

Allen *et al*., (2009) employed a co-integration approach to study the casual analysis employing the quarterly data of Australia on the number of bed-nights spent away from their usual environment by interstate visitors from 1998 to 2006. The study concluded that the short-run coefficients for income, cost of accommodation, costs of recreation, restaurants and domestic airfares were statistically significant. This showed that any changes in income and prices in tourism goods and services in Australia affected the demand for intestate domestic tourism in the short-run.

Allen and Yap (2009) researched for the existence of other indicators that could have influence on future Australian domestic tourism demand. The research used panel data consisting of 252 observations to develop variables. The study used domestic visitor nights. The results showed that the estimated elasticities for holiday and visiting friends and relatives (VFR) were respectively 2.39 and 2.90.

Ozcelit (2009) used data from Turkish Statistical Institute in 2003 on the Household Income and Expenditure surveys to model consumer goods and services in Turkey. The findings were that elasticities for transportation were inelastic while furniture, house appliances and home care services were elastic. Communication had the lowest price elasticity while housing and rent had the highest price elasticity. Consumers in housing and rent were more sensitive than consumers in communication.

Song *et al.*, (2010) discussed measurement of tourism demand. According to the study, arrival of tourists and expenditure of tourists were commonly used measures for tourism demand in empirical research in the form of both, aggregate and per capita. The study used the general-to-specific modelling technique to recognize the key factors of tourism demand dependent on various demand measures. The research revealed also that tourists' income and word-of-mouth influenced tourists into Hong Kong. Meanwhile, Hong Kong's tourism price with respect to the one in the origin country served as the key factor of expenditure of tourists. Both long-run and short-run elasticities were calculated.

Tafere (2010) used data on household on prices, expenditures and characteristics of households to estimate demand factors for various agricultural produce. The research used the Quadratic Almost Ideal Demand Model (QU-AIDM) for the estimation. The results showed that the negative income elasticities of “other cereals” and barley indicated that the two were inferior. However, wheat, maize and sorghum were income-inelastic.

Coenen and Eekeren (2010) discussed the econometric analysis of domestic tourism demand of households in Sweden. The category of expenditure estimated included accommodation, groceries, restaurants, shopping and transportation. The AIDS model calculated price and expenditure elasticities with regards to different characteristics of households.

Mehrara and Ahmdi (2011) analysed the demand for fuels in Iran motorized sector. The two used the Almost Ideal Demand System model to estimate price and income elasticities for fuels in the automotive sector. These included gasoline, automotive gas oil and liquefied petroleum gas (LPG). The results of the study were respectively, the own-price elasticity estimate for gas oil was -0.22, gasoline -1.01 and LPG being -3.58. The results further demonstrated that gasoline and gas oil were normal commodities while LPG was an inferior commodity. This study presented a dynamic form of the Almost Ideal Demand System (AIDS).

Wu *et al*., (2011) made an observation on the studies of Divisekera (2007) and Jiumpanyarach (2011) used the AIDS model to assess demand for Thailand agricultural products. The model estimated demand for palm, cassava, rubber, rice and sugar. The finding was that the AIDS model estimates for palm, cassava and sugar were highly responsive to the new price.

Mehrara and Ahmdi (2011) analysed the demand for fuels in Iran motorized sector. The two used the Almost Ideal Demand System model to estimate price and income elasticities for fuels in the automotive sector. These included gasoline, automotive gas oil and liquefied petroleum gas (LPG). The results of the study were respectively, the own-price elasticity estimate for gas oil was -0.22, gasoline -1.01 and LPG being -3.58. The results further demonstrated that gasoline and gas oil were normal commodities while LPG was an inferior commodity.

Song *et al.*, (2011) used structural time series model (STSM) and the time – varying parameter TVP regression method to forecast future demand of tourism precisely. This new model, the TVP – STSM, was used to model and forecast tourist arrivals on quarterly basis to Hong Kong from key source markets: China, South Korea, and the United Kingdom (UK). The empirical results showed that the TVP–STSM was the best.

Yap (2011) examined the economic determinants of Australian domestic tourism. The study measured the number of nights by domestic holiday visitors, business travellers and visitors of friends and relatives (VFR) spend from first quarter of 1999 to fourth quarter of 2010. The study showed that the decisions to travel within Australia by holiday makers could be influenced by the exchange rates.

Redriguez and Rivadulla (2012) analysed the key factors that induced international demand for tourism in Spain and quantified their occurrences. The study generated five models of tourism demand. To estimate, the study used dynamic models and a data panel of 15 countries from 2001–2009. The analysis showed the significance of habit persistence to expound tourism demand of foreigners, for example, Spain, where 64% of the total bed nights of foreign tourists resulted from habit persistence and month-to-month effect.

Kaninda and Fonsah (2012) analysed U.S. demand for imported melons using a Dynamic Almost Ideal Demand System (AIDS). The study served as an exporting countries' reference and U.S. retailers as pricing strategies for the various melons. It was also for U.S. decision makers responsible for tax and trade policies.

Botha (2012) modelled tourism demand for South Africa with tourists coming from the UK and the USA who used an almost ideal demand system (AIDS). The study used an error correction almost ideal demand system to compute the responsiveness of UK and USA tourism demand to South Africa regarding changes in tourism prices and income. The study showed that tourists from the UK and USA were not responsive to price changes in South Africa in short-term. It continued that if tourism in South Africa increased by 1%, it would result in a 1.05 % rise in demand in Spain.

Chang-Jui and Tian- Shyug (2012) estimated price effects in an Almost Ideal Demand Model of Outbound Thai Tourism to East Asia. The results from the nonlinear and linear AIDS models indicated that tourism demand for destinations in East Asia was responsive to effective relative price changes.

Song and Li (2012) discussed tourism demand modelling and forecasting, and how tourism demand could be assessed. The study evaluated two measures in the circumstance of econometric modelling and the forecasting of tourism demand. The empirical research emphasised on demand for Hong Kong tourism by Australian residents, the UK and the USA using general-to-specific modelling approach. The results demonstrated that tourists' arrivals in Hong Kong were determined mainly by income of tourists and the tourism price in Hong Kong as compared to that of the tourist origin country.

Atsushi and Yoshino (2013) examined the use of Almost Ideal Demand System (AIDS) model to estimate Japanese international tourism demand. The study revealed that Asia's tourism demand to that of Japan was resilient for relative price change in Oceania (-1.333). This value was higher than Asian own–price elasticity value (-0.980) and there was gross–complementary relationship. For own–price elasticity, Asia's demand for tourism was price inelastic in short-run, but transformed to price elastic in long–run for inbound tourism.

Chang-Jui and Tian- Shyug (2013) built up tourism demand econometric models which depended on the monthly data of tourists who visited Taiwan. They adopted Multivariate Adaptive Regression Spines and Artificial Neural Network and Support Vector Regression to build up models for forecasting in order to compare the forecast outcomes. The study showed that the optimal model is Support Vector Regression model while the worst model is Multivariate Adaptive Regression Spines.

Paud and Som (2013) discussed the potentials and challenges of developing the domestic tourism industry in the Asir region. This was because Saudi Arabia was one of the biggest exporters of tourists going out of the Kingdom. The analysis was based on secondary data with support of interviews with twelve tourism operators and hoteliers in the region. The results showed that Asir region was a unique tourist destination.

Motallebi *et al*., (2013) employed the static AIDS model to assess the long-run equilibrium model and being represented by the short-run dynamics by an error correction mechanism. The two used this procedure to estimate three kinds of popular meat demand functions in Iran. The meat were: red meat, chicken and fish. The study revealed that the elasticity estimates of red meat and chicken were price elastic in the long-run whereas fish was price inelastic.

Ziramba and Moyo (2013) employed co-integration approach to make inferences about the long run and short run relationships. The results of the study showed that outbound tourism demand was being influenced by the real domestic income and relative prices in the long-run. For short run, only relative prices had an effect on the demand for outbound tourism in South Africa. Finally, it was clear that outbound tourism demand was price inelastic in both periods.

For the Australian tourism expenditure, Song *et al.*, (2013) used a system-of-equations approach to model the substitution relationship between Australian domestic and outbound tourism. The empirical results showed that own-price elasticities were negative and significant which followed the demand theory. Really, the demand for Australian domestic tourism was the least price responsive (-0.29). With respect to cross-price elasticities, it was found out that the cross price elasticity estimates were positive and significant. The findings of the study showed that domestic tourism was considered as a necessity in Australia, and the demand for outbound tourism was more price elastic than the demand for domestic tourism.

Statistics Norway (2013) estimated the demand systems which depended on quarterly and yearly macroeconomic data from the National Accounts of

Norway. The report analysed and compared various forms of the Almost Ideal Demand System (AIDS): long-run; the AIDS linear approximation and short-run. The study showed, in part, that food, beverages and vehicle running costs were necessities while clothing and shoes, other products and consumption abroad were luxuries.

Sousa (2014) assessed own-price and cross-price elasticity estimates for five major groups of alcohol, i.e. beverages: beer, wine, cider, spirits and "ready-to-drink" goods being in the on-and the off-trade. The study used data from 2007 to 2012 to estimate a Heckman correction model. The results showed that the own-price elasticity estimates were negative and highly significant, while a number of cross-price elasticity estimates were significant in line with the demand theory.

Gatt and Falzon (2014) utilized AIDS, a model which depended on economic theory, to estimate the own-price and cross-price elasticity estimates in the Mediterranean countries. This is because the study determined the market share estimation amongst the seven Mediterranean countries. Greece-Spain, Greece-Portugal, Spain-Portugal and Italy-Turkey were substitute destinations, whereas Greece-Italy, Spain-Turkey, Portugal-Italy and Spain-Italy were complementary holiday destinations.

Sotiriadis and Varvaressos (2014) analysed the understanding of developing leisure tourism in Greece so as to have some important lessons for other tourism destinations. The study used the technique of strategic analysis. This technique demonstrated the importance of tourism as an important economic activity and assessed the recent situation and structural problems of Greece as a destination. The result showed that Greek tourism could do better if there was a suitable tourism planning and reliable policy. Its main focus might be the sustainable development of destination.

Prasanna-PereraLalith (2015) developed an econometric model which depended on the Cobb- Douglas function to analyse the relationship between foreign exchange earnings, tourist arrivals, tourist prices, tourist expenditure and direct employment in tourism activities. The study indicated that a one percent rise in tourist prices would drop the foreign exchange by 0.2 percent. A rise in one percent international receipt per tourist per day will make the share of foreign exchange rise by one percent while a rise in one percentage of the employment in the tourism sector would increase foreign exchange earnings by 0.19 percent.

The AIDS model was developed initially in static procedure to imitate the long-run equilibrium of the economic system. But the AIDS model, in reality, inclines to depart from the equilibrium form and it is incapable to capture the dynamics.

According to the literature, ‘‘the static AIDS model, also known as long-run AIDS model pays attention to long-run solutions of the model, and hence disregards the short-run dynamics of the demand system; i.e., it presumes that tourists’ behaviour is all the time in equilibrium and there is no change between long-run and short-run behaviour of tourists. In fact, consumers’ behaviour could be influenced by many factors like consumption habits, short-run dynamics, government policy intervention, lack of information, improper or false expectations, more often than not inhibit consumers or tourists from adjusting their expenditure promptly to price and income changes. Consumers are likely to develop habits for certain commodities. As a result, they are less likely to opt for new types of goods and services even if there is a relative price increase of their preferred type of goods and services''.

Hence, a dynamic form of the Almost Ideal Demand System (AIDS) was introduced to cater for the dynamic behaviour of consumers or tourists.

But Pollak and Wales (1969) established a way to account for such behaviour by introducing linear habit scheme: : $\alpha_i = \tilde{\alpha_i} + k_i q_{it-1}$,

where α_i is the original intercept in equation, and q_{it-1} denoted demand for commodity i at time t-1. Due to this weakness, the analysis is to estimate the dynamic version of the static LAIDS model which takes into consideration habit formation and persistence with respect to patterns in consumption. The dynamic LAIDS model builds on the static LAIDS model by including a dynamic data generating process, which is estimated by the use of disequilibrium term from the static LAIDS model.

The use of the Hicksian negativity restriction alone as one of the parameters of AIDS model makes the estimation of the AIDS model deficient in situations where the law of demand is violated. According to Hicksian, every negative semi-definite matrix must have non-positive numbers on the diagonal ($e_{ii} \leq 0$, for every good i). The Law of Demand states that: "As the price of a good increases the compensated quantity demanded of that good cannot increase" (Fall, 2018). When compensated own-price elasticity turns out to be positive, there is no interpretation as positivity condition on the parameters of AIDS model has not been made part of the restrictions of the conventional AIDS model in the literature.

Fall (2018) reported on the law of demand to illustrate that the compensated (Hicksian) demand for any good was a non-increasing function of the good's own price. But, there were some studies where compensated own-price elasticities had turned out to be positive instead of being negative, and thus violating the Law of Demand, (Divisekera, 2007; Wu *et al*., 2011; Deaton and Muellbauer, 1980). However, there is little literature on positivity which means that all compensated own-price elasticity numbers should be positive on the diagonal of the Slutsky matrix, ($e_{ii} \geq 0$, for every good or service i).

My contribution to knowledge is to offer some improvements to the AIDS model by including a positivity restriction on the parameters of the AIDS model as one of the theoretical restrictions. Positivity means that every positive semi-definite matrix must have non-negative numbers on the diagonal of the Slutsky matrix, ($e_{ii} \geq 0$, for every good or service i).

Lorenzo and Sergio (2000) gave the definitions and conditions of positivity as follows: ‘‘a matrix A is strictly greater than a matrix B (if it has the same number of rows and columns) and denote this by $A \gg B$, if and only if all the elements aij of A are greater than the corresponding elements of b_{ij} of B, if all the elements of A are greater than or equal to the corresponding elements of B, but at least one of the $a_{ij}$is greater than b_{ij}, we will say that A is greater than B and denote this by $A > B$. Obviously, both $A \gg B$ and $A > B$ imply that $A \neq B$. The notation $A \geq B$ which should be read as A greater than or equal to B will mean that all the elements of A are greater than or equal to the corresponding elements B. Thus $A \geq B$ is satisfied also, when $A = B$. These definitions justify the use of the following notations and terminology:

strictly positive matrix A: $A \gg 0$ $(aij > 0\ \forall (i, j)$

positive matrix A: $A > 0(aij \geq 0, \forall (i, j),\ \ni (i, j){:}\ aij > 0\ )$

non negative matrix A: $A \geq 0$ $(aij \geq 0, \forall(i,j))$

strictly positive diagonal matrix. A: $A \geq 0$ $(aij = 0\ \forall_i \neq j, aij > 0\ \forall_i)$''.

The last notation, though not rigorous, will be used in the consequence for the sake of simplicity. Analogue definition and notations can be given also for n-dimensional vectors with $n \geq 2$. When dealing with scalars, however strict positivity $(a \gg 0)$.

Warner (1965), an American mathematician, reported on the properties of positivity as follows:

Let (R, +, ∘) be a ring whose zero is 0_R

Let $Q \subseteq$ R such that:

(Q1): $Q + Q \subseteq$ R

(Q2): $Q \cap (-Q) = 0_R$

(Q3): $Q \circ Q \subseteq$ R

Let Q: R → {T, F} be the propositional function defined as:

$\forall x \in D$: Q(x) ⇔ x ∈ Q

Then Q is the positivity property on (R, +, ∘). The name positivity property is also defined to be comparable to propositional function, more often defined on an integral domain (D, +, x) which does not include zero in its fibre of truth.

CHAPTER THREE

METHODOLOGY

3.1 Research Design

The data for this study was obtained by probability sampling of domestic tourism household panel surveys from 2012 to 2014 and secondary data from 2015 to 2017 from the Ghana Statistical Service (GLFS, 2015; GLSS 7, 2016/17). The household panel surveys from 2012 to 2014 became necessary due to the fact that there was no reliable and relevant domestic visitor consumption expenditure data in Ghana. The data covered the ten (10) regions of Ghana.

3.1.1 Stratification

For the survey estimates to be precise and reliable, the country was stratified into three ecological zones: Coastal Zone; Forest Zone and Savannah Zone. Regarding proportional stratified sample, the size of each stratum in the sample is proportional to the size of the stratum in the population. Each of the stratum is homogeneous with regards to the given characteristic feature. In other words, each zone has similar characteristics. Within each zone, Enumeration Areas (EAs) were selected. These EAs were classified with respect to ecological zones for the results of the survey (Zelin and Stubbs, 2005).

The breakdown of the stratification of the three ecological zones into EAs is as follows:

Stratum 1: Coastal Zone, constitutes Western, Central and Greater Accra regions;

Stratum 2: Forest Zone, is made up of Volta, Eastern, Ashanti and Brong Ahafo regions; and

Stratum 3: Northern Zone, constitutes Northern, Upper East and Upper West regions.

3.1.2 Sample size and allocation

The study adopted a two-stage stratified random sampling design for choosing the sample. For the first stage, a sample of 20 EAs was selected using systematic sampling with probabilities proportional to size (Cochran, 2007). The second level of selection used systematic sampling of households from the original list of the households. Owing to the smallness of the sample size and to cover more households, twenty households were selected from each EA (United Nations, 2005). A sample of 80 households was selected from the savannah zone, 180 households from the forest ecological zone and 140 from the coastal zone. In all, a sample of 400 households with 1,586 (Table 3.1) respondents aged 15 years and above with demographic characteristics such as sex, age, marital status, economic status, educational attainment among others were selected.

Table 3.1: Sample design for the survey

Zone	2010 Pop. &Housing Census Distribution	Proportionate Allocation of EAs	Number of Households	Number of Persons Interviewed	Number of Persons involved in tourism activities
Coastal	8,587,938	7	140	555	364
Forest	11,842,769	9	180	714	468
Savannah	4,228,116	4	80	317	208
Total	24,658,823	20	400	1,586	1,040

Source: Study data, 2012 – 2014

3.1.3 Preferred calculated sample size

3.1.3.1 Yamane Tara formula

(a) Yamane (1967) brought about a simplified formula for the calculation of a sample size. There are several approaches for determining the sample size but Yamane's method has been used for over 40 years (University of Florida, 1992). Using Yamane method at 10% level (α = 0.10) of significance, and from 2010 Ghana's population of 24,658,823 of the three ecological zones, the preferred calculated sample size is stated below:

n = Sample size

e = Estimated error between ratio of population size and ratio of sampling size, and it is estimated as 0.10.

N = Population size of the three ecological zones

$$n = \frac{N}{(1+Ne^2)} \tag{3.1}$$

$$n = \frac{24{,}658{,}823}{[\ 1 + (24{,}658{,}823 * 0.102\ )]}$$

$$n = \frac{24,658,823}{[\ 1 + [\ 1 + (246,588.23)]}$$

≥ 100 (meaning, 100 respondents were being used to calculate the sample size per each zone).

3.1.3.2 Krejcie and Morgan's formula

Krejcie and Morgan (1970) made available a formula to use to calculate a reliable sample size suitable for the household domestic survey.

The viable sample for the survey is:

$$s = \frac{x^2 MQ(1-Q)}{f^2(M-1) + x^2(1-Q)} \tag{3.2}$$

where S = required sample size:

$\chi^2 =$ the table value of chi-square for one degree of freedom at the preferred confidence interval (3.841);

M = size of Ghana's population;

Q = Ghana's population proportion (being assumed to be 0.5, it is expected to give the desired sample size);

f = is the degree of accuracy being expressed as a proportion (0.05).

(Craggs and Schofield, 2009)

$$x^2 = 3.841$$

$$M = 24,658,823$$

$Q = 0.5$

$f = 0.05$

$$n = \frac{(3.841)(24,658,823)(0.5)^2}{(0.5)^2(24,658,823) + (3.841)(0.5)^2}$$

$$= \frac{25599135}{66648.02} = 384.0945.$$

Hence, a sample size of 384 for a population of 24,658,823 (2010PHC) with 5% margin of error; and a coverage of 95% puts the sample size at 404. Hence, a sample size of 1040 visitors having participated in domestic tourism in 2012, 2013 and 2014 was ideal.

3.2 Description of Data and Data Source

3.2.1 Method of data collection

The three surveys were conducted separately and continuously throughout each year, using a questionnaire. The face-to-face method of interview was used for the sampled households. The three yearly surveys were conducted with a representative sample of about 1,586 adults aged 15 years and over within Ghana. The surveys were for adults but the study collected information on all adults and children who were part of the trip. The surveys were designed to be representative of all the people in Ghana. They provided information on domestic tourism as households as well as individuals.

Respondents were asked whether they had taken tourism trips in Ghana that involved at least one night away from home or a same-day trip away from home. When such trips were identified, further questions were asked about a maximum of six trips - the most recent six trips - with a core set of questions for all six trips. Apart from the most recent six trips on which questions were asked, any additional trips were considered and recorded as such.

A wave was set at yearly interval, with Wave 1 corresponding to domestic tourism by households and individuals from January to December, 2012. Wave 2 involved domestic tourism from January to December, 2013. Wave 3 involved domestic tourism from January to December, 2014. In order to maintain representativeness of the survey, all original respondents at Wave 1 remained sample members at Waves 2 & 3 (panel survey). The original sample members were followed as they moved between households. The questionnaire was designed to maximise accuracy of recall and minimise the task for those who would undertake more than one trip.

The primary data gathered on tourism goods and services included package tours, accommodation, food and drinks, transport, recreation, cultural and sporting activities, shopping/non-consumables and other services. Data on households' annual income and some socio-demographic data were collected. Data on households with respect to owning a car, owning a mobile phone, having access to Internet and contracting a loan were also collected.

Three teams were involved in the data collection. A team worked in each zone during the period of the data collection. The teams administered questionnaires in every household in the sample. An individual diary was used to record information on individual or household tourism activities; the duration and the location of these activities within the first survey as well as the subsequent surveys were recorded (Raj, 1968). In all, three supervisors and five interviewers were recruited for the data collection, Table 3.2.

Table 3.2: Distribution of supervisors and interviewers

Zone	Supervisor	Interviewer
Coastal	1	2
Forest	1	2
Northern	1	1
Total	3	5

Source: Study data, 2012 – 2014

3.2.2 Tourism expenditure

During the surveys, respondents were asked to consider different tourism products they might have spent their money on or demanded during their trips, such as accommodation, food and drinks, transportation, recreation, culture and sporting activities, shopping/non-consumables, and other services, and then to estimate how much they spent for each group of tourism goods and services separately. The summation of the expenditure on these different tourism goods and services added up to their total expenditure on the trips. Inquiring from the respondents this information, the national and regional estimate of domestic tourism expenditure or values were generated. The basis for asking respondents to consider about each trip separately was to make it easier for them to think through and to provide how they expended their money when they were on their travel. This piece of information was used to provide how these different tourism goods and services together contributed in totality to the value of domestic tourism in Ghana (Baggio,2018).

Demand is the quantity of a good or service which visitors/tourists are willing and able to purchase under a given set of conditions for a given time period

(Song and Witt, 2000). In this context, domestic tourism demand is the measurement of the volume, scale, impact and value of domestic tourism at different geographical scales from national and regional levels (Page and Connell, 2006). Tourism demand is the measurement of visitors' use of a good or service (Fletchling, 2001). Although, economic factors are critical as they enable people to travel, they cannot fully explain tourist expenditure. Asgare, Santos and Venn (1997), found out that by including socio-demographic variables to the model together with economic variables, the explanatory power of the model rises significantly.

Domestic tourists can be disaggregated into five categories: namely, funeral visitors (FUN); leisure, recreation and holiday makers (LRH); visitors visiting friends and relatives (VFR); business visitors (BUS); and others (OTH) (which includes professionals, health treatment, religion/pilgrimage, education/training and shopping) (Rossello-Nadal and Jianan (2019).

3.2.3 Data analysis

In order to check for the completeness and accuracy of the data, manual editing was performed on all the questionnaires received from the field by the data editors. Consistency checks of the data were carried out to further reduce errors after which it was captured. The Census and Survey Processing System (CSPro) was used for the data capture while Stata Statistical Programme was used for processing the data. Software R was employed to estimate static and dynamic linear AIDS models. To obtain ranges, frequencies and measures of central tendency, such as mean, median and mode, minimum and maximum values and others, descriptive statistics was performed on each of the variables used.

To discover the most influential variables among the variables being selected which affect tourism expenditures, multiple regression analysis (MRA) was employed to determine statistical significance and the relative contribution of each explanatory variable (age, education, income, access to internet, ownership of mobile phone, household loan and car ownership). In addition, MRA was used to investigate the relationship between the selected variables (Gordor and Howard, 2000).

Quantile regression approach was used to explore or understand the determinants of domestic travel consumption expenditure using Stata software. Own-price elasticities, cross-price elasticities and expenditure/income elasticities of tourism products purchased by domestic tourists (accommodation, food and drinks, transport, recreation, culture and sporting activities, shopping and others) by primary and secondary sources were calculated using static and dynamic Linear Almost Ideal Demand System (LAIDS) models for Ghana as a whole and each of the ten destinations (regions) using R software.

3.3 The Theory of Quantile Regression Framework

The quantiles are denoted by θ, where, $\theta \in (0, 1)$. The conditional quantiles denoted by $q(\theta/Z)$ are the inverse of the conditional cumulative distribution function (CDF) of the dependent variable, $F^{-1}(\theta/Z)$. For example, for $\theta = 0.80$, $q(0.80/Z)$ is the 80th percentile of the distribution of *F* conditional on the values of Z, i.e. 80% of the values of F are less than or equal to the specified function of Z.

3.3.1 Definition

The θ- quantile of a random variable Z per cumulative distribution function (CDF), $F(z) = P(Z \leq z)$ is the minimum ($\equiv$ infinum) value $q\theta$ for which $q\theta = F^{-1}(\theta) = inf\{z: F(z) \geq \theta\}$, where $\theta\epsilon(0,1)$. (3.7)

Thus, the quantile regression estimator, $\theta - quantile$, of a sample $\{Z_1, \ldots, Z_n\}$, could be found as the solution to the following minimization problem:

$$\hat{q}_\theta = \arg\min(z)\sum_{i=1}^{n}\rho_\theta(Z_i - M) = \sum_{i=1}^{n}[\theta.I(Z_i > M) + (1-\theta).I(Z_i < M]|Z_i - M| \quad (3.8)$$

The "check function, $\rho_{\theta,}$" is dependent on the absolute deviation of residual $|Z_i - M|$ which is weighted by θ if positive and by $(1 - \theta)$ if negative. When $\theta = 0.5$ (median), we weight positive and negative residuals equally, which means that the sum of absolute deviations is minimized (Least Absolute Deviation - LAD) (Fitzenberger, 2014). This minimization is formulated by a linear programming which means that the computation is straightforward (Fitzenberger, 2014 and Barnes and Hughes, 2002).

3.3.2 The Linear quantile regression

A linear quantile regression denotes the

conditional $\theta - quantile\ q_\theta(Y_i|Z_i,\ldots,Z_{ki})$ of Y_i as a linear function of

$regressor\ Z_{2i},\ldots,Z_{ki}$

The model:

$$Y_i = \beta_{0,1} + \beta_{0,2} + Z_{2i} + \ldots + \beta_{0,k} Z_{ki} + \varepsilon_i^{\theta} = z_i^{'} \beta_0 + \varepsilon_i^{\theta} \tag{3.9}$$

where Z_{ji} observation i for regressor $j = 2,\ldots,k$; $i = 1\ldots,n$ $q_{\theta}(\varepsilon_i^{\theta} | Z_i) = 0$

, that is, the conditional quantile of the error term is equal to zero, and $\varepsilon_i^{\theta} = Y_i - z_i^{'}\beta_0$, continuously (i.i.d) random variable (conditional on z_i). β_0 is the vector of parameters to be estimated for a given value of the distribution's quantile θ, and refers to the marginal change in the θ^{th} quantile owing to marginal change in Z.

ε_i^{θ} is the error term which is assumed to be independently and identically distributed with symmetric distribution around zero.

Estimator for $\beta_0 = (\beta_{0,1},\ldots,\beta_{0,k})^{'}$:

$$\widehat{\beta}_0 = \arg\min(\beta_i,\ldots,\beta_k)\sum_{i=1}^{n}\rho_{\theta}(Y_i - z_i^{'}\beta_{\theta}) = \sum_{i=1}^{n}[\theta.1(Y_i > z_i^{'}\beta_0) +$$
$$(1-\theta)I(Y_i < z_i^{'}\beta_0)].|Y_i - z_i^{'}\beta_{\theta}| \text{ with } z_i = (Z_{2i},\ldots,Z_{ki})^{'} \tag{3.10}$$

3.3.3 Data and variables

In this study, regression analyses are performed at seven different quantiles of domestic tourism expenditure distribution (i.e. 5th, 10th, 25th, 50th, 75th, 90th and 95th percentiles), in other words, analysing the data set via quantile regression, using the θ^{th} quantiles:

$\theta \in$ (0.05, 0.1, 0.25, 0.5, 0.75, 0.90 and 0.95)

The model is characterised as follows:

$$Q_H[\theta | AGE_i, EDU_i, INC_i, LOAN_i, NET_i, CAR_i, MOB_i] = \beta_0 + \beta_{1\theta}AGE_i +$$
$$\beta_{2\theta}EDU_i + \beta_{3\theta}INC_i + \beta_{4\theta}LOAN_i + \beta_{5\theta}NET_i + \beta_{6\theta}CAR_i +$$
$$\beta_{7\theta}MOB_i + \varepsilon_i \tag{3.11}$$

There is a difference in the level of spending in the quantiles, from 5th quantile to 95th quantile. In the light of this, and in order to identify the differences between visitors that are light, medium and heavy spenders, the study focused on the 5th, 10th, 25th, 50th, 75th, 90th and 95th quantiles (Omar, Singh and Holecek (2004)).

The equation below is the fundamental model of the empirical study. The quantitative variables are EXPENDITURE, AGE and INCOME which are transformed in natural logarithm.

$$lnEXP_i = \beta_0 + \beta_1 lnAGE_i, + \beta_2 EDU_i + \beta_3 lnINCOME_i + \beta_4 LOAN_i + \beta_5 NET_i + \beta_6 CAR_i + \beta_7 MOBILE\ PHONE_i + \varepsilon_i \quad (3.12)$$

where, β_0 is a constant, *EXP* = domestic tourism expenditure, *AGE* = household head's age, *EDU* = household head's educational level, *INCOME* = income of domestic tourism households for a year, *LOAN* = domestic tourism household loan (yes = 1, no = 2), *NET* = access of Internet of the entire household (yes = 1, no = 2), *CAR* = household ownership of a car (yes = 1, no =2), *MOBILE PHONE* = mobile phone ownership of the household head or any member of the household (yes = 1, no = 2).

The response variable is domestic tourism expenditure (Proenca and Soukiazis, 2005) and the explanatory variables are age of a household head, educational level of household head, household income for a year, household loan, access to Internet, ownership of a car and ownership of a mobile phone (Sampol and Perez, 2000)

In doing so, the study tries to explore the determinants of domestic tourism, mainly for domestic-same day visitors, domestic tourists and total domestic visitors.

Note: Total domestic visitors = (same-day visitors + overnight visitors).

3.4 The Theory of the Almost Ideal Demand System Model

The AIDS model was developed initially in static procedure to imitate the long-run equilibrium of the economic system. But the AIDS model, in reality, inclines to depart from the equilibrium form and it is incapable to capture the dynamics. To estimate demand equations requires the use of statistical and econometric techniques on tourism data. Demand analysis depends on many approaches. But there are two approaches which are often used by researchers. These are single-equation approach and system-of-equations approach. Single-equations are either linear functions or power models or log linear functions which depend on the demand for a particular good or service which uses special features of the single market involved (Tunaer-Vural, 2012). A specific single equation model of a static tourism demand function is stated as follows: $D_{ij} = f(P_i, Y_i, E_i, T_i, Z_i)$ where D_{ij} is the tourism demand, P_i are the prices, Y_i is income, E_i is the exchange rate, T_i is the transport costs and Z is the set of qualitative variables affecting tourism demand. The log-linear form is popular due to its convenience of giving direct estimates of the relevant elasticities and its good empirical performance relative to the linear form.

The system-of-equations approach is where a group of equations is included in a system and are estimated simultaneously, and the approach allows you to examine how consumers select a group of tourism goods and services in order to maximize preference or utility given the constraints of budget. This makes it possible to obtain reliable estimates of each equation in the system than the single approach. For this reason, this approach allows you to derive theoretically consistent demand elasticity parameters, such as own price elasticities, income elasticities and more critically, elasticity estimates of cross–price which associate with the different tourism products consumed by tourists. Using these elasticities (own-price, cross-price and expenditure/income) the impacts of a price change or expenditure change on the quantity of each good or service demanded in the system will be estimated. The satisfaction a consumer derives from consuming a good or service is called utility. The consequence of the definition of utility is that utility is a function of the amount of the good or service consumed. To obtain equations of demand, the first assumption is to have a utility function as follows:

$$U = u(q_i, \ldots, q_n) \qquad (3.13)$$

where, q_i are the quantities of goods and services i to be consumed, u is utility, which refers to the satisfaction obtained from all the units of a good or service consumed. We assume further that this utility function could be differentiated and thus for each marginal utility is positive. That is: $\frac{\partial u}{\partial q_i} > 0,\ i = 1\ldots, n$. Marginal utility is the additional satisfaction one derives in consuming one more unit of the good or service i.

The AIDS model relies on a particular class of preference, the price independent generalised logarithmic class (PIGLOG class) which is represented by a cost or expenditure function which informs the least budget needed for a consumer to achieve a target level of utility, u, at given prices, p_i.

The PIGLOG class allows an exact aggregation over consumers without identical preferences being imposed.

Let x represent the budget or total expenditure to be spent for a specified period on some of tourism goods and services or of n tourism goods and services. It is expected that these tourism goods and services can be purchased in non-negative quantities, q_i at given prices p_i, $i = 1, 2, ..., n$

Let $q = (q_1, q_2, ..., q_n)$ represent the quantities vector of tourism goods and services (n) purchased, while $p = (p_1, p_2, ..., p_n)$ represents the prices vector.

Let the budget constraint of the representative tourist be: $\sum_{i=1}^{n} p_i q_i = x$ and define utility function as $u(q)$ as stated above. However, the intention of the tourist is to maximize the utility subject to the budget constraint. That is:

maximize u(q) subject to $\sum_{i=1}^{n} P_i \; q_i = x$ (3.14)

To solve for the maximisation problem brings to the fore the uncompensated demand functions (Marshallian): $q_i = m(x, p)$ (3.15)

On the other hand, the tourist's problem could be expressed as the minimum total expenditure necessary to attain a specific level of utility u^1, at given prices.

That is: minimize $\sum_{i=1}^{n} P_i \; q_i = x$ subject to $u(q) = u^1$ (3.16)

To solve for the minimisation problem brings to the fore the compensated demand functions (Hicksian): $q_t = h_i(u, p)$. (3.17)

For the above reasons, a cost or expenditure function could be defined as:

$c(u, p) = \sum_{i=1}^{n} P_i \; h_i(u, p) = x$ (De Mello, 2001). (3.18)

For the total expenditure x and prices p_i, the utility u^1 is obtained from

equation $\sum_{i=1}^{n} P_i \; h_i(u,p) = x$ (3.19)

To solve for u using equation (3.18), you obtain an indirect utility function:

$$u = s(x,p) \tag{3.20}$$

A cost function is specified by the AIDS models and is used to obtain the demand functions for the commodities to be analysed.

The tourists' utility function, which represents preferences for the consumption of different tourism products, is given by an expenditure function, $c(u,p)$ which informs the minimum budget needed for a consumer to achieve a target level of utility, u, at given prices, p (Wainwright, 2013).

Following the above, we define the tourism expenditure function as:

$$c(u,p) = a(p) + ub(p) \tag{3.21}$$

$$c(u,p) = (1-u)a(p) + ub(p) \tag{3.22}$$

where, u is the utility and $a(p)$ and $b(p)$ are the expenditure costs on subsistence (poverty) and bliss (affluence) respectively, and defined as:

$$a(p) = a_0 + \sum_{i=1}^{N} a_i \log p_i + \frac{1}{2}\sum_{i=1}^{N}\sum_{j=1}^{N} \gamma_{ij}^{*} \log p_i \log p_j \,. \tag{3.23}$$

$$b(p) = \beta_0 \prod_i p_i^{\beta_i}, \; (i, j = 1,\ldots,n), \tag{3.24}$$

where a_i, β_i, $and\ \gamma_{ij}^{*}$ are parameters to be estimated, thus, α_i measures the average share of product i, β_i measures the effect on the budget share of a good or service i given an increase in the real expenditure per capita, γ_{ij}^{*} measures the effect on the budget share of product i, (due to a 1% change in the price of commodity *j*) due to an increase in the relative price of product *j*, at constant expenditure.

The Almost Ideal Demand System (AIDS) is based on a particular class of preferences known as the price-independent generalized logarithmic (PIGLOG) class. The PIGLOG cost function can be defined as: $\log c(u,p) = (1-u)\log\{a(p)\} + u\log\{b(p)\}$ (Deaton and Muellbauer, 1980a) (3.25)

where, u is the level of utility, the satisfaction the consumer derives from consuming a commodity (Adei and Addo, 2007) and p is a price vector. Examples of utility include beautiful scenery, pleasant climate, etc. (Divisekera (2007)). The expenditure function (3.25) therefore provides a weighted average of $\log\{a(p)\}$ and $\log\{b(p)\}$, respectively, where $1-u$ and u are the given weights, respectively.

From the above, $a(p)$ and $b(p)$ could represent poverty and affluence expenditure, respectively. The AID system could further express $\log\{a(p)\}$ and $\log\{b(p)\}$ as:

$$\log\{a(p)\} = a_0 + \sum_i^n a_i \log p_i + \frac{1}{2}\sum_i\sum_j \gamma_{ij} \log p_i \log p_j \qquad (3.26)$$

$$\log\{b(p)\} = \log\{a(p)\} + \beta_0 \prod_i p_i^{\beta_i} \qquad (3.27)$$

$$\log c(u,p) = (1-u)\left\{a_0 + \sum_i a_i \log p_i + \frac{1}{2}\sum_i\sum_j \gamma_{ij}^* \log p_i \log p_j\right\}$$

$$+u\left\{a_0 + \sum_i a_i \log p_i + \frac{1}{2}\sum_i\sum_j \gamma_{ij}^* \log p_i \log p_j \prod_i p_i^{\beta_i}\right\}$$

$$= a_0 + \sum_i a_i \log p_i + \frac{1}{2}\sum_i\sum_j \gamma_{ij}^* \log p_i \log p_j + u\beta_0 \prod_i p_i^{\beta_i} \qquad 3.28$$

From the above equation, we can achieve the Hicksian (or compensated) demand for goods and services $i \in (1,\ldots,n)$, q_i, by differentiating partially the expenditure function with respect to p_i. But the demand functions can be obtained directly from equation (3.28), since its price derivatives are the quantities demanded: $\frac{\partial c(u,p)}{\partial p_i} = q_i$, To multiply both sides by $\frac{p_i}{c(u,p)}$, we find: $\frac{\partial \log c(u,p)}{\partial \log p_i} . \frac{p_i}{c(u,p)} = \frac{q_i p_i}{c(u,p)} = w_i$ (Pogany,1996) (3.29)

where, w_i is a budget or expenditure share, p_i is the price and q_i the quantity of the tourism good or service i.

Therefore, to partially differentiate equation (3.28) with respect to $\log p_i$ yields the following:

$$\equiv a_i + \sum_j \gamma_{ij} \log p_j + \beta_i u \beta_0 \prod\nolimits_i p_i^{\beta_i} \qquad (3.30)$$

where, $\gamma_{ij} = \frac{1}{2}\left(\gamma_{ij}^* + \gamma_{ji}^*\right) = \gamma_{ji}$ (3.31)

Equation (3.30) poses a number of challenges econometrically. It is a non-linear equation, and also contains the utility, u, a variable which naturally cannot be measured. For a utility-maximizing consumer, total expenditure x = c (u, p), and this equality can be inverted to give u as a function of p and x, the indirect utility function, hence, we can rewrite equation (3.28) in terms of prices and total expenditure, x, i.e. $x = c(u, p)$. Hence, we can get the indirect utility function by inverting $c(.)$ i.e $x = c(u, p) \rightarrow \phi(x, p)$.

From equation (3.28), we have $\log x = \log c(u, p)$ (Morey, 2002) which yields:

$$\log x = a_0 + \sum_i a_i \log p_i + \frac{1}{2}\sum_i \sum_j \gamma_{ij}^* \log p_i \log p_j + u\beta_0 \Pi_i p_i^{\beta_i} \quad (3.32)$$

$$\equiv \log p + u\beta_0 \Pi_{i=1} p_i^{\beta_i}, \quad (3.33)$$

where, P is a price index defined by:

$$\log p = a_0 + \sum_i a_i \log p_i + \frac{1}{2}\sum_i \sum_j \gamma_{ij}^* \log p_i \log p_j, \quad (3.34)$$

Where α_i , β_i and γ_{ij}^* are parameters that define preferences (i, j=1,…, n), n is the number of tourism products.

By re-arranging equation (3.32) to obtain equation (3.33) and substituting it into equation (3.30), we obtain the non-linear AID system's demand function on budget or expenditure share form:

$$w_i = a_i + \sum_i \gamma_{ij} \log p_j + \beta_i \log\left(\frac{x}{p}\right) + \varepsilon_i \text{ (Deaton and Muellbauer, 1980)} \quad (3.35)$$

where w_i is a budget or expenditure share, p_j is the price of j^{th} commodity, n is the number of items, $\boldsymbol{x}$ is the overall expenditure on tourism products, and a_i measures the average share of product i, γ_{ij} measures the effect on the share of product i, (due to a 1% change in the price of commodity j) due to an increase in the relative price of product j, at constant expenditure.

β_i measures the effect on the budget share of a good or service i given an increase in the real expenditure per capita. *X/P* is real expenditure, *P* is the price index defined as in equation (3.34) and ε_i is the disturbance term, $\varepsilon_i \sim \mathrm{N}(0,\sigma_i^2)$.

3.4.1 Linear approximation of almost ideal demand system

A geometric price index which has been widely used is the Stone's price index, and is stated below:

$$p^* = \prod_i^{w_i} p_i \qquad (3.36)$$

Taking logarithms of both sides gives:

$$\log p^* = +\sum_i w_i \log p_i \quad \text{(Statistics Norway, 2013)} \qquad (3.37)$$

For the static model to be linear, Deaton and Muellbauer (1980), suggested that the price index P is replaced with Stone's price index P^* which takes the form, $InP^* = \sum_i^n w_i^B Inp_i$, where w_i^B is the budget share, W_i, of goods or services in the base year.

When prices are highly collinear, *P* and P^* will be approximately proportional, i.e., $P \approx kP^*$, where *k* is the degree of proportionality. By replacing *P* with kP^* in (3.35), we have $w_i = a_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log\left(\frac{x}{kp}\right) + \varepsilon_i$ (3.38)

We thus obtain an approximation to the AID system's demand functions

budget share form $a_i^* + \sum \gamma_{ij} \log p_j + \beta_i \log\left(\frac{x}{p^*}\right)$ (3.39)

where $a_i^* = a_i - \beta_i \log k$ (Statistics Norway, 2013) (3.40)

The estimation of the static LAIDS given in (3.38), can be represented in matrix form as follows:

$$\underset{(w)}{\begin{pmatrix} w_1 \\ w_2 \\ . \\ . \\ . \\ w_k \end{pmatrix}} = \underset{(a)}{\begin{pmatrix} a_1 \\ a_2 \\ . \\ . \\ . \\ a_k \end{pmatrix}} + \underset{(s)}{\begin{pmatrix} \gamma_{1,1}\gamma_{1,2} & \cdots & \gamma_{ik} & \beta_1 \\ \gamma_{2,1}\gamma_{2,2} & \cdots & \gamma_{2k} & \beta_2 \\ \cdots & & . & \cdots \\ \cdots & & . & \cdots \\ \cdots & & . & \cdots \\ \gamma_{k,1}\gamma_{k,2} & & \gamma_{kk} & \beta_k \end{pmatrix}} \underset{(M)}{\begin{pmatrix} \log p_1 \\ . \\ . \\ . \\ \log p_k \\ \log\left(X/P^* \right) \end{pmatrix}} + \varepsilon$$

Thus, W = a + SM + ε (3.41)

where, ***W*** is a column vector of expenditure/budget shares, ***α*** is an intercept, ***S*** is a matrix of coefficients, ***M*** is a vector of predictor variables and $\in_i$ are error terms which take into consideration all other factors which affect the expenditure shares and not prices and total expenditure.

The assumption is that the error term should satisfy the following three conditions in the above model:

1. $E\left[\varepsilon_a\right] = 0$; (3.42)

2. $E\left[\varepsilon_a \varepsilon_a^{'}\right] = \begin{cases} 0_k & \text{if } a \neq b \\ \sum_{kk}^{n} & \text{if } a = b \end{cases}$ (3.43)

where, ***0*** is a *0*-matrix of dimension *k* and $\sum$ is the variance-covariance matrix.

3. $\varepsilon_1 \ldots \varepsilon_a$ are independently identically error terms (Statistics Norway, 2013).

3.4.2 Dynamic linear almost ideal demand system model

The static LAIDS model, also known as long-run LAIDS model pays attention to long-run solutions of the model, and hence disregards the short-run dynamics of the demand system; i.e., it presumes that tourists' behaviour is all the time in equilibrium and there is no change between long-run and short-run behaviour. In fact, consumers' behaviour could be influenced by many factors like consumption habits, short-run dynamics, government policy intervention, lack of information, improper or false expectations, more often than not inhibit consumers or tourists from adjusting their expenditure promptly to price and income changes (Song and Li, 2008). Consumers are likely to develop habits for certain commodities. As a result, they are less likely to opt for new types of goods and services even if there is a relative price increase of their preferred type of goods and services.

Pollak and Wales (1969) established a way to account for such behaviour by means of the following linear habit scheme: $a_i = a_i + k_i q_{it-1}$, (3.44)

where a_i is the original intercept in equation (3.38), and q_{it-1} denotes demand for commodity *i* at time *t-1*. By substituting (3.44) into (3.38) we obtain a dynamic almost ideal demand system incorporating habits:

$$w_{it} = a_i + k_i q_{it-1} + \sum \gamma_{ij} \log t + \beta_i \log\left(\frac{x_t}{p_t^*}\right) \qquad t = 2,3,\ldots,T \qquad (3.45)$$

The equivalent equation for the LAID system is $a_i = a_i^* + k^* q_{it-1}$ (3.46)

Putting equation (3.46) into equation (3.38**)** yields the dynamic linear approximate almost ideal demand system incorporating habits:

$$w_{it} = a_i^* + k^*{}_i q_{it-1} + \sum_j^n \sum_j \gamma_{ij} \log p_{jt} + \beta_i \log\left(\frac{x_t}{p_t^*}\right) \tag{3.47}$$

(Statistics Norway, 2013).

The lagged estimated residuals gotten from the static model represent consumption adjustment speed or the degree of consumers' habituation. This differentiates the two models, hence, the dynamic model takes the following form (Blanciforti and Green, 1983): if all variables in equation (3.35) are co-integrated, the error correction term linear AIDS is given as follows:

$$\Delta w_i = \psi_i \Delta w_{it-1} + \sum_j \gamma_{ij} \Delta lnp_j + \beta_i \Delta ln\left(\frac{x}{p^*}\right) + \lambda_i u_{it-1} + \varepsilon_i \tag{3.48}$$

where $\triangle$ is the first-difference operator, and $u_{it-1}$are the lagged estimated residuals obtained from the long-run static model in equation (3.38) and w_{it-1} is the lagged budget share to capture consumption habit and inventory adjustments. The coefficient, λ, captures the speed of adjustment towards the long-run equilibrium at time *t-1*, and it should be significant and negative, and ε_i is the disturbance term, ψ is introduced to measure the effect of consumption habit, including habit persistence and inventory adjustments (Yang *et al*., 2010). $\gamma,\ \beta,\ \lambda, and\ \psi\ are$ parameters to be estimated and $i = 1, 2, ..., n$; $j = 1, 2, .. n$, $t = 1, 2, .., n$, and $n = 6$. Habit means that utility functions of consumers are influenced by past purchases, which results in influencing present purchases. The analysis is to estimate the dynamic version of the static LAIDS model which takes into consideration habit formation and persistence with respect to patterns in consumption. The dynamic LAIDS model builds on the static LAIDS model by including a dynamic data generating process, which is estimated by the use of disequilibrium term from the static LAIDS model. The lagged estimated residuals obtained from the static LAIDS model represent the adjustment speed of consumption, and this is the difference between the two models. The elasticities obtained from this model are calculated using the same formulae as in the static model, but as they are obtained from the dynamic model, they are regarded as short-run rather than long-run elasticities.

Habits are not observed regularly, therefore changes associated with functions of demand are usually represented by lagged variables, such as, ψ ((Wu, Li and Song, 2011). '*ln*' means that the variable is transformed in natural logarithms.

3.4.3 Restrictions on the parameters of AIDS

To comply with economic theory, the following restrictions should apply on the parameters of the static and dynamic AIDS models: adding up; homogeneity; symmetry; and negativity.

a. Adding-up restrictions:

- $$\sum_{i=1}^{n} a_i = 1; \quad \sum_{i=1}^{n} \beta_i = 0 \quad \sum_{i=1}^{n} Y_{ij} = 0 \qquad (3.49)$$

  for all j

b. Homogeneity implies $\sum_{j=1}^{n} \gamma_{ij} = 0$ *, for all i,* which is based on the assumption that a proportional increase in all prices and expenditure does not affect demand; this means, decisions to consume are made on the basis of relative prices and income alone. (3.50)

c. Symmetry implies $\gamma_{ij} = \gamma_{ji}$, for all *j*; that takes consistency of consumer selection or choices into account. (3.51)

d. Negativity is based on the laws of demand which means that all compensated own-price elasticities must be negative, where the adding-up restriction is satisfied by leaving out one equation from the estimation.

3.4.4 Elasticities

Simply, elasticity measures responsiveness. Elasticity is the measure of the degree of responsiveness of one response variable to changes in one or more explanatory variables. It is often measured in percentages and is a unit-free measure, which makes it easier to compare two or more goods or services.

Mathematically:

$$\text{Elasticity} = \frac{\text{percentage change in the response variabl}}{\text{percentage change in the explanatory variable}}$$

(3.52)

Elasticity of Demand: is the measure of responsiveness of quantity demanded to changes in the explanatory variables.

Types of elasticity

There are various types of elasticity, with different meanings. These are own-price elasticity, income elasticity and cross-price elasticity. The 'own-price elasticity' measures the responsiveness of demand to a given change in its price alone, 'income elasticity' of demand measures the sensitivity of demand for a good or service to a change in the income of the tourist who demands the good or service, while 'cross-price elasticity' measures how the quantity demanded of a good or service changes as the price of another good or service changes.

3.4.5 Calculation of elasticity and its interpretation

Having known the elasticities of demand, let us be precise about how they are measured.

Price Elasticity of Demand

$$\eta_{ij} = \frac{\text{proportianate change in quantity demanded of the tourism product}}{\text{proportionate change in price of the tourism product}} \tag{3.53}$$

Income or Expenditure Elasticity of Demand:

$$\varepsilon_{ij} = \frac{\text{percentage change in quantity demanded of the commodity}}{\text{percentage change in income of the tourist}} \tag{3.54}$$

Own-price Elasticity of Demand:

$$\varepsilon_{ij} = \frac{\text{percentage change in quantity demanded of the commodity } i}{\text{percentage change in price of the commodity } i} \tag{3.55}$$

Cross-price Elasticity of Demand:

$$\varepsilon_{ab} = \frac{\text{proportionate change in quantity demanded of the commodity } a}{\text{proportionate change in price of the commodity } b} \tag{3.56}$$

(Agyire-Tettey, 2008)

3.4.5.1 Calculation of demand elasticities

- The expenditure or income elasticity (ε_{ij}) measures the responsiveness that responds to changes in expenditure or income.
- The uncompensated own-price elasticities (ε_{ii}) and cross-price elasticities (ε_{ij}) measure how a change in the price of one good or service affects the demand for this good or service and other goods and services with the total expenditure and other prices held constant.
- The compensated own-price elasticities (ε_{ii}^{*}) and cross-price elasticities (ε_{ij}^{*}) measure the effect of price on the demand with the assumption that the real expenditure (*x/p*) is constant (Sung *et al*., 1991).

The elasticity values are worked out or calculated using the static and dynamic models' parameter estimates as follows:

Expenditure or income elasticities:

$$\varepsilon_i = \frac{\beta_i}{w_i} + 1 \tag{3.57}$$

Uncompensated own-price elasticities:

$$\varepsilon_{ii} = \frac{\gamma_{ii}}{w_i} + \beta_i - 1 \tag{3.58}$$

Uncompensated cross-price elasticities:

$$\varepsilon_{ij} = \frac{\gamma_{ij}}{w_i} - \beta_i \frac{w_j}{w_i} \tag{3.59}$$

Compensated own-price elasticities:

$$\dot{\varepsilon}_{ii} = \frac{\gamma_{ii}}{w_i} + w_i - w_j \tag{3.60}$$

Compensated cross-price elasticities

$$\dot{\varepsilon}_{ij} = \frac{\gamma_{ii}}{w_i} + w_j \tag{3.61}$$

For the Marshallian elasticities, $\varepsilon_{ij}^{M} = -\delta_{ij} + \frac{\gamma_{ij}}{w_i} - \beta_i \frac{w_j}{w_i}$.

For the Hicksian elasticity, $\varepsilon_{ij}^{H} = -\delta_{ij} + \frac{\gamma_{ij}}{w_i} - w_t \beta_i \frac{w_j}{w_i}$, where δ is the Kronecker delta, δ_{ij} = 1 for $i = j$ and δ_{ij} = 0 if $i \neq j$. (Kaninda and Fonsah, 2012), where, w_i represents the share of commodity i, $(i = 1,\ldots,6)$, w_j represents the share of commodity j, $(j = 1,\ldots,6)$ or commodity j, w_i and w_j being replaced by the averages of $\bar{w}_i$ and $\bar{w}_j$, respectively (Li, Song and Witt, 2004).

As stated above, equation $w_i = a_i^* + \sum_{i=1}^{n} \gamma_{ij} Inp_j + \beta_i In\left(\frac{x}{p}\right)$, where $(i, j = 1,\ldots,n)$ indicates that a model in the linear-log form does not allow direct explanation of its coefficients as elasticities. The explanation of the signs and values of the model's coefficient indicates how the dependent variable acts in response to changes in its determinants. The coefficient of the price variables (γ_{ij}) stands for the absolute change in the expenditure share allocated to commodity i due to a 1% change in the price of commodity j, all things being equal. For $i = j$, the sign of the coefficient of the own-price variable is expected to be negative in accordance with the theory of negativity which quantifies i as a normal good in accordance with economic terminology. A situation where $i \neq j$, the sign of the coefficient is supposed to be positive if $i\ and\ j$are substitutes (these are two alternative goods or services that could be generally utilized for the same purpose) and negative if $i\ and\ j$ are complements (are goods or services which are used together or in conjunction with another goods or services). The β_i coefficients represent the absolute change in the ith expenditure share due to 1% change in real per capita expenditure, price being held constant, positive if i and j are substitutes and negative if i and j are complements (De Mello *et al.*, 2002).

For the AIDS model framework, a coefficient $\beta_i > 0$ gives rise to expenditure elasticity above unity, while a coefficient $\beta_i < 0$ gives rise to expenditure elasticity in the interval (0, 1).

3.4.5.2 Interpretation of the AIDS model

The AIDS model is simply interpreted, where there is no changes in the relative prices and ''real'' expenditure (*x/p*), then the budget shares are constant. Changes in relative prices function through the terms γ_{ij}: each γ_{ij} represents 100 times the absolute effect on the *ith* budget share of a 1% increase in the *jth* price with real expenditure (*x/p*) being constant. Changes in real expenditure work through β_i coefficients; they sum to zero and are positive for luxury goods and services, and negative for necessities (Deaton and Muellbauer, 1980; Tash *et al*., 2012)).

3.4.5.3 Elasticity coefficients

Table 3.3 explains the coefficient of elasticity which refers to percentage change in variable *A* being divided by percentage change in variable *B*.

Table 3.3: Explanation of elasticity coefficients

Elasticity value	Description of terms
$\varepsilon_{ij} = 0$	Perfectly inelastic demand
$-1 < \varepsilon_{ij} < 0$	Relatively inelastic demand or inelastic demand
$\varepsilon_{ij} = -1$	Unit elastic demand or unitary elasticity or unit elasticity
$-\infty < \varepsilon_{ij} < -1$	Relatively elastic demand or elastic demand
$\varepsilon_{ij} = -\infty$	Perfectly elastic demand

Source: Study Data, 2012 - 2017

3.4.6 Interpretation of the AIDS model

The AIDS model is simply interpreted, where there is no changes in the relative prices and ''real'' expenditure (*x/p*), then the budget shares are constant. Changes in relative prices function through the terms γ_{ij}: each γ_{ij} represents 100 times the absolute effect on the *ith* budget share of a 1% increase in the *jth* price with real expenditure (*x/p*) being constant. Changes in real expenditure work through β_i coefficients; they sum to zero and are positive for luxury goods and services, and negative for necessities (Deaton and Muellbauer, 1980).

3.4.7 Price elasticity of demand and total revenue

For change in price should prompt you to know the effect the change in price will have on total revenue. Generally, there will be two effects on a change in price: the price effect and the quantity effect. For the price effect, a rise in unit price will tend to increase revenue since each unit is sold at a higher price, while a decrease in unit price will tend to decrease revenue since each unit is sold at a lower price. For the quantity effect, a rise in unit price will have lesser units sold, while a decrease in unit price will have more units sold as the demand law states.

3.4.8 National and regional estimates

3.4.8.1 National estimates

The aggregate demand for domestic tourism by Ghanaians and non-Ghanaians resident in Ghana is estimated as follows:

$$X^{na} = ln\left(\frac{\text{total national expenditure}\left(\sum X_i^n\right)\Big/\text{Ghana's population}}{p^*}\right) \qquad (3.62)$$

X^{na} = real per capita expenditure for the country.

P_i = the price of good or service *i*, hence

$P_i = ln(CPI)$ $i = (1, 2, ..., 6)$. Prices of the six commodity groups: accommodation; food & drinks; transportation; recreation, culture & sporting activities; shopping; and others.

$CPI_{i}{}_{i}$ = is the Consumer Price Index of each of the 6 commodity groups, $i = (1, 2, ..., 6)$ P^* = is the Stone Price Index = $\sum_{i=1}^{n} w_i^B lnP_i$, where w_i^B is the base year budget share for commodity *i* and w_i is the budget share of tourism goods and services.

3.4.8.2 Regional estimates

The demand for domestic tourism is distinguished by each region of visit (residents in Ghana) is estimated as follows:

$$X^{re} = ln\left(\frac{\text{total regional expenditure}\left(\sum X_i^r\right) \Big/ \text{Ghana's population}}{p^*}\right) \quad (3.63)$$

X^{re} real per capita expenditure for each region.

P_i = the price of tourism goods and services i in each region.

Regional Consumer Price Indices (Regional CPI)

$P_i = ln(CPI)$, $i = (1, 2, ..., 6)$ of the six commodity groups: accommodation; food & beverages; transportation; recreation, culture & sporting activities; shopping; and others.

CPI_i = is the Regional Consumer Price Index of each of the 6 commodity groups, $i = (1, 2, ..., 6)$.

p^* = is the Stone Price Index = $\sum w_i^B lnP_i$, where w_i^B is the base year budget share for commodity i in each region, and w_i is the budget share of tourism goods and services (Che, 2004).

3.4.9 Model specification

The AIDS model has solely static functional form, indicating that long-run consumer behaviour is always in equilibrium and there is no difference between long-run and short-run behaviour. The long-run AIDS can be seen as the expenditure share for commodity *i* which relates the logarithms of prices and total real expenditure as stated earlier as follows:

$$w_i = a_i + \sum_{i=1}^{n} \gamma_{ij} \log P_j + \beta_i \log\left(\frac{x}{p^*}\right) \tag{3.64}$$

Tourists' budget allocation among different product categories are to be analysed. The following are the six equations of tourism-oriented product categories to be analysed. They are: Accommodation = 1; Food and drinks = 2; Transportation = 3; Recreation, culture and sporting activities = 4; Shopping = 5; and Others = 6 (Divisekera, 2007).

w_i is the budget share of tourism goods and services; P_i is the price of a good or service, which is replaced by CPI as proxy of tourism goods and services, P^* is the Stone's price index, and V_i is the error term. The equations are defined as follows:

$$w_1 = a_1 + \gamma_{11} lnp_1 + \gamma_{12} lnp_2 + \gamma_{13} lnp_3 + \gamma_{14} lnp_4 + \gamma_{15} lnp_5 + \gamma_{16} lnp_6 + \beta_1 ln\left(\frac{x}{p^*}\right) + V_1 \tag{3.65}$$

$$w_2 = a_2 + \gamma_{21} lnp_1 + \gamma_{22} lnp_2 + \gamma_{23} lnp_3 + \gamma_{24} lnp_4 + \gamma_{25} lnp_5 + \gamma_{26} lnp_6 + \beta_2 ln\left(\frac{x}{p^*}\right) + V_2 \tag{3.66}$$

$$w_3 = a_3 + \gamma_{31} lnp_1 + \gamma_{32} lnp_2 + \gamma_{33} lnp_3 + \gamma_{34} lnp_4 + \gamma_{35} lnp_5 + \gamma_{36} lnp_6 + \beta_3 ln\left(\frac{x}{p^*}\right) + V_3 \tag{3.67}$$

$$w_4 = a_4 + \gamma_{41} lnp_1 + \gamma_{42} lnp_2 + \gamma_{43} lnp_3 + \gamma_{44} lnp_4 + \gamma_{45} lnp_5 + \gamma_{46} lnp_6 + \beta_4 ln\left(\frac{x}{p^*}\right) + V_4 \tag{3.68}$$

$$w_5 = a_5 + \gamma_{51} lnp_1 + \gamma_{52} lnp_2 + \gamma_{53} lnp_3 + \gamma_{54} lnp_4 + \gamma_{55} lnp_5 + \gamma_{56} lnp_6 + \beta_5 ln\left(\frac{x}{p^*}\right) + V_5 \tag{3.69}$$

$$w_6 = a_6 + \gamma_{61} lnp_1 + \gamma_{62} lnp_2 + \gamma_{63} lnp_3 + \gamma_{64} lnp_4 + \gamma_{65} lnp_5 + \gamma_{56} lnp_6 + \beta_6 ln\left(\frac{x}{p^*}\right) + V_6 \tag{3.70}$$

3.4.9.1 Some data variable specification

Since data on the prices for each category of expenditure were not available, the prices were proxied by the consumer price indices of the Ghana Statistical Service. The appropriate price for each category of expenditure was obtained from the consumer price index (CPI) sub-category database of the Ghana Statistical Service. The proxy used for prices of accommodation was the CPI subcategory for accommodation. Food and drinks was the CPI subcategory for food and non-alcoholic beverages. Transport prices was the CPI subcategory for transport. Recreation, culture and sporting activities prices was the CPI subcategory for recreation, sport and culture. Shopping prices was the CPI subcategory for clothing and footwear and others prices was the CPI subcategory for miscellaneous services (Crouch, 1992; 1994a; 1994b; 1995; and 1996).

3.4.9.2 Consumer expenditure categories

Table 3.4 explains the visitor expenditure category, variable symbol, category name and household income and expenditure categories of tourists.

Table 3.4: Consumer expenditure groups used

Visitor Expenditure Category	Variable Symbol	Category Name	Household Income and Expenditure Categories
Accommodation	ACC	Accommodation	Cost of accommodation used by tourists outside private home
Food and drinks	FAD	Food and drinks	Food purchased for off-premise consumption and purchased meals and beverages
Transport	TRA	Transportation	Transportation costs of taxis, buses, aircraft, train, etc.
Recreation, culture, and sporting activities	RCS	Recreation, culture and sporting activities	Cost for recreation, culture and sporting activities
Shopping	SHO	Shopping	Shopping/non-consumables for personal use and for relations.
Others	OTH	Other services	Cost for personal care, insurance, utility services, postage, haircut, hair do, Sim card, etc.

Source: Study Data, 2012 – 2014

3.4.10 Econometric methods

Iterative method for seemingly unrelated regressions (SUR) is used for the analysis (Zellner, 1962). The sum of all expenditure shares in the LAIDS model is equal to 1, hence, the residuals variance-covariance matrix will be singular, because the adding up constraint $\sum_{i}^{n} W_i$ implies a singular variance-covariance matrix. To avoid this situation, we delete one of the equations (others) from the system and estimate the remaining five equations. We recover the omitted equation by using the adding-up restrictions to recover the values. Homogeneity and symmetry conditions $(\gamma_{ij} = \gamma_{ji})$ are strictly adhered to before the system is being estimated, and negativity, that is, the values of own-price elasticities are observed to be negative following the Slutsky's matrix sign (Divisekera, 2009).

3.4.11 Results from model fit and diagnostic tests on the static and dynamic LAIDS models

The static and dynamic AIDS models are estimated by the use of the seemingly unrelated regression method or procedure. To estimate the dynamic models, the properties of the data are examined to ascertain whether the variables are integrated of the same order (Enns et al., 2014).

Using the data, the Augmented Dickey Fuller (ADF) unit root tests suggest that all the variables are integrated of order 0, I(0). Those of order 1, I(1) were differenced to assume the order 0, I(0) integration (Batchelor, 2000). Secondly, the long-run equilibrium relationship among the variables was examined by using the Engle-Granger (1987) co-integration tests on the residuals from the static AIDS model. The co-integration relationship could not be rejected using the Engle-Granger (1987) approach at the 5% significance. The results showed that the residual variables were stationary and therefore were co-integrated and thus there was a long-run relationship for each tourism good or service. The results indicated that the dynamic AIDS model had been established to examine the short-run adjustments or dynamics. Hence both the long-run and short-run models could be estimated. The restrictions of homogeneity and symmetry are imposed on the static and dynamic models during estimation (Song, Witt and Li, 2009).

The capability of the model specification in both static and dynamic models has been assessed by a number of diagnostic tests. Five of these tests are briefly discussed below. The first is on Durbin-Watson test, the second is the Breusch-Godfrey test, up to the Jarque-Bera test to assess the assumption of normally distributed error term. The tests are as follows:

- The Durbin-Watson (**DW)** test for autocorrelation between the error term and the expenditure variable.

  Durbin-Watson Test:

$$H_0 : \rho = 0$$
$$H_1 : \rho > 0$$
$$\alpha = 0.05$$

  The Breusch-Godfrey **(BG)** test which can be used to assess the hypothesis of no serial correlation of the variables.

- Breusch-Godfrey **(BG)** test:

$$H_0 : \rho = 0$$
$$H_1 : \rho \neq 0$$
$$\alpha = 0.05$$

- The Breusch-Pagan **(BP)** test which can be used to detect the existence of heteroscedasticity.

$$H_0\!:a_1 = a_2 = \ldots = a_p$$
$$H_1\!:\rho \neq 0$$
$$\alpha = 0.05$$

- The Ramsey's Regression Specification Error Test **(RESET)** is accepted or adopted to test the functional misspecification of the variables:

$$H_0\!:\delta_1 = \delta_2 = 0$$
$$H_1\!:\delta_1 = \delta_2 \neq 0$$
$$\alpha = 0.05$$

- The Jarque-Bera **(JB)** test to assess the assumption of normally distributed error term.

JB (P value > 0.05) = Accept H_0 (Normal Distribution)

JB (P value < 0.05) = Reject H_1 (Non-Normal Distribution)

$$\alpha = 0.05$$

The results are reported in Table 3.5.

For the five equations in the static LAIDS model, three of them passed the BG test of no serial correlation, all the five passed the BP test of no heteroscedasticity, five passed the RESET test of no functional misspecification, and three passed the JB test of normality. In contrast, the corresponding values for the dynamic LAIDS model are improved with 4 for the BG test, and five for the BP test, five for the RESET test, and four passed the JB test of normality. In totality, the dynamic AIDS model has a better fit according to Table 3.5 (Yang *et al*, 2010). The results confirm that the two models, static and dynamic, are capable of the estimation.

Table 3.5: Results from diagnostic tests on the static and dynamic AIDS models

	BG		BP		RESET		JB	
Equation	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-valu
Static								
ACC	7.967	0.00	10.524	0.16	1.006	0.37	9.414	0.01
FAD	8.848	0.17	2.602	0.92	0.602	0.55	0.177	0.92
TRA	0.213	0.64	3.815	0.80	0.663	0.52	1.885	0.39
RCS	9.487	0.00	12.096	0.10	0.552	0.58	1.029	0.60
SHO	0.519	0.47	3.438	0.84	1.618	0.21	43.384	0.00
Dynamic								
ACC	0.002	0.96	8.620	0.38	0.415	0.66	0.514	0.77
FAD	3.630	0.06	4.088	0.85	0.002	1.00	0.314	0.85
TRA	2.057	0.15	11.053	0.20	0.347	0.71	1.724	0.42
RCS	4.218	0.04	13.251	0.10	0.078	0.93	2.513	0.28
SHO	1.445	0.23	1.190	1.00	1.011	0.37	80.672	0.00

Source: Author's computation, 2017

3.4.13 Modelling domestic tourism demand when data violates the demand law

3.4.13.1 Justification for positivity restriction

The use of the Hicksian negativity restriction alone as one of the parameters of AIDS model makes the estimation of the AIDS model deficient in situations where the law of demand is violated. According to Hicksian, every negative semi-definite matrix must have non-positive numbers on the diagonal ($e_{ii} \leq 0$, for every good i). The Law of Demand states that: "As the price of a good increases the compensated quantity demanded of that good cannot increase" (Fall, 2018). When compensated own-price elasticity turns out to be positive, there is no interpretation as positivity condition on the parameters of AIDS model has not been made part of the restrictions of the conventional AIDS model. Here are exceptions of the demand law: future price changes, ignorance, taste and preference, habit formation, changes in fashion, incorrect information, imperfect expectation, and government intervention, among others (Lipsey and Chrystal, 2007). These could cause the quantities of goods and services purchased increase when their prices increase.

3.4.13.2 Some instances where compensated negative own-price elasticities turn out to be positive.

There are studies where compensated negative own-price elasticities have turned out to be positive. Some of the studies indicate that the compensated own-price elasticities of shopping of Malaysian and Japanese demand for Australian tourism turned out to be positive. Own-price elasticities of transport of Canadian and Indonesian demand for Australian tourism turned out to be positive, while own-price elasticities of food of Indonesian demand for Australian tourism turned out to be positive (Divisekera, 2007). The compensated own-price elasticities of meals of Mainland Chinese, Australian, Singaporean and Japanese demand for non-Asian market for Hong Kong tourism turned out to be positive (Wu *et al*., 2011).

LAIDS assumes that tourists' behaviour is always in equilibrium until full adjustment takes place, the assumption of the static LAIDS is unrealistic (Li, Song and Witt, 2004). It is assumed a rise in price results in a fall in demand (Fall, 2018).

"Although food has a positive price elasticity, these numbers appear both credible and in line with other studies" (Deaton & Muellbauer, 1980). I therefore quote the authors, "Hotel accommodation and meals outside hotels are regarded as necessities, with only one inconclusive case (meals outside hotels consumed by Singaporeans)''. The above shows that when own-price elasticities turn out to be positive, there is inconclusive case. Should that be the case, then positivity restriction on parameters of the AIDS model should be considered to be part of the conditions of the theoretical restrictions of the conventional model for easy estimation and interpretation.

3.4.13.3 Monte Carlo simulation

The parameters from the empirical results were used to do the simulation for the proposed revised model. R software was used for the simulation after estimating the parameters from the empirical results using the AIDS model. Based on the empirical results, we took a mean value and standard deviation value of the parameters of each group of tourism goods and services. The system was queried to generate a number of observations or random samples for each of the parameters. Several samples of 1,000 replications of random samples with n = 100, n = 200, n = 300, n = 400 and n = 500 were used until obtaining the required distributions. The observations obtained from the simulation were tested using the Shapiro-Wilk's normality tests for normality. After testing for non-normality, all the parameters of the tourism goods and services were estimated using the conventional models, static and dynamic linear almost ideal demand system models (Bowman and O' Connell, 2012).

3.4.13.4 The proposed revised static LAIDS model

$$w_i = a_i + \sum_{i=1}^{n} \gamma_{ii} \log P_i + \beta_i \log\left(\frac{x}{p^*}\right) + \in_i \qquad \text{(Single product)} \qquad (3.71)$$

$$w_i = a_i + \sum_{k=1}^{n} \gamma_{ik} \log P_k + \beta_i \log\left(\frac{x}{p^*}\right) + \in_i \qquad \text{(Double products)} \qquad (3.72)$$

where,

w_i is the budget share

γ_{ik} is the price coefficient or slope

P_i is the price of the commodity i,

P_k is the price of the commodity k,

β_i is the expenditure coefficient of commodity i

X is the total expenditure on tourism product;

α_i is the average share of product i

X/P^* is the real expenditure, P^* is the Stone's price index and $\in_i$ are the error terms, and a_i, β_i and γ_{ik} are parameters to be estimated, thus, α_i measures the average share of product i, β_i measures the change in budget share of a good or service i due to change in the real expenditure per capita, γ_{ik} measures the effect on the budget share of product i, (due to a 1% change in the price of commodity k).

3.4.13.5 The assumptions of the proposed revised lAIDS model (static and dynamic models)

The following assumptions should apply on the parameters of the Static and Dynamic Proposed Positivity AIDS models: adding up; homogeneity; symmetry; and positivity.

- Adding-up restrictions:

- $\sum_{i=1}^{n} a_i = 1$; (3.73)

- $\sum_{i=1}^{n} \beta_i = 0$; (3.74)

  $\sum_{i=1}^{n} \gamma_{ik} = 0$, for all *k*; (3.75)

- Homogeneity, as a restriction implies $\sum_{k=1}^{n} \gamma_{ik} = 0$, for all *i*, which is based on the assumption that a proportional increase in all prices and expenditure does not affect demand; this means, decisions to consume are made on the basis of relative prices and income alone. (3.76)

- Symmetry implies $\gamma_{ik} = \gamma_{ki}$, for all *k*; that takes consistency of consumer selection or choices into account; (3.77)

- The Slutsky matrix is positive semi-definite, ${\partial h_i}/{\partial p_i} \geq 0$, where *h* is utility and *p* is price (Fall, 2018). (3.78)

  - The first term is always positive while the second term can have either sign;
  - The substitution effect always pushes the consumer or tourist to purchase more of the tourism good or service when its price increases.
  - (If a matrix A is positive semi-definite then every diagonal entry of A must be non-negative).

- Positivity is not based on the laws of demand, but all compensated own-price elasticities must be positive, i.e. it follows Slutsky's symmetric matrix which is positive semi-definite if and only if its eigen values are non-negative. Positivity means that every positive semi-definite matrix must have non-negative numbers on the diagonal, ($e_{ii} \geq 0$, for every good or service i).

3.4.13.6 The proposed revised dynamic LAIDS model

$$\Delta w_i = \phi \Delta w_{it-1} + \sum_{i=1}^{n} \gamma_{ii} \Delta \ln + \beta_i \Delta \ln\left(\frac{x}{p^*}\right) + \lambda_i \mu_{it-1} + \varepsilon$$

(Single product) (3.79)

$$\Delta w_i = \phi_i \Delta w_{it-1} + \sum_{k=1}^{n} \gamma_{ik} \Delta ln P_k + \beta_i \Delta ln\left(\frac{x}{p^*}\right) + \lambda_i u_{it-1} + \varepsilon_i$$

(Double products**)** (3.80)

Where $\triangle$ is the first-difference operator, and u_{it-1} are the lagged estimated residuals, and w_{it-1} is the lagged budget share to capture consumption habit. The coefficient, λ, captures the speed of adjustment towards the long-run equilibrium at time *t-1*, and it should be significant and negative, and ε_i is the disturbance term, ϕ measures the effect of consumption habit. (Yang *et al.*, 2010). γ, β, λ and ϕ are parameters to be estimated and $i = 1, 2, ..., n$; $k = 1, 2, ..., n$ and $t = 2, ..., T$.

3.4.13.7 Definitions and conditions of positivity

According to Lorenzo, *et al.*, (2000), a matrix A is strictly greater than a matrix B (if it has the same number of rows and columns) and denote this by $A \gg B$, if and only if all the elements aij of A are greater than the corresponding elements of b_{ij} of B, if all the elements of A are greater than or equal to the corresponding elements of B, but at least one of the $a_{ij}$is greater than b_{ij}, we will say that A is greater than B and denote this by $A > B$. Obviously, both $A \gg B$ and $A > B$ imply that $A \neq B$. The notation $A \geq B$ which should be read as A greater than or equal to B will mean that all the elements of A are greater than or equal to the corresponding elements B. Thus $A \geq B$ is satisfied also, when $A = B$. These definitions justify the use of the following notations and terminology:

strictly positive matrix A: $A \gg 0$ $(aij > 0\ \forall(i,j)$ (3.81)

positive matrix A: $A > 0(aij \geq 0, \forall(i,j),\ \ni (i,j){:}\ aij > 0\ )$ (3.82)

non negative matrix A: $A \geq 0$ $(aij \geq 0, \forall(i,j))$ (3.83)

strictly positive diagonal matrix. A: $A \geq 0$ $(aij = 0\ \forall_i \neq j, aij > 0\ \forall_i)$ (3.84)

3.4.13.8 Positivity property

Let (R, +, $\circ$) be a ring whose zero is 0_R

Let $Q \subseteq$ R such that:

(Q1): $Q + Q \subseteq$ R (3.85)

(Q2): $Q \cap (-Q) = 0_R$ (3.86)

(Q3): $Q \circ Q \subseteq$ R (3.87)

Let Q: R $\rightarrow$ {T, F} be the propositional function defined as:

$\forall x \in D$: Q(x) $\Leftrightarrow$ x $\in$ Q (3.88)

Then Q is the positivity property on (R, +, $\circ$). (Warner, 1965).

3.5 Other Econometric Models

3.5.1 Using seemingly unrelated regression (SUR) model

The structure of the equation is written as follows:

$$\begin{aligned}
Y_1 &= Z_1 a_1 + \in_1 \\
Y_2 &= Z_2 a_2 + \in_2 \\
&\;\;. \\
&\;\;. \qquad\qquad\qquad\qquad (3.89) \\
&\;\;. \\
Y_N &= Z_N a_N + \in_N \\
Y_i &= Z_i a_i + \in_i \qquad i = 1, 2, \ldots, N
\end{aligned}$$

(Zellner, 1962)

$$y=\begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_N \end{pmatrix}, Z=\begin{pmatrix} Z_1 & 0\ldots & 0 \\ 0 & Z_2\cdots & 0 \\ \vdots & \vdots\ \ddots & \vdots \\ 0 & 0\cdots & Z_N \end{pmatrix}, a=\begin{pmatrix} a_1 \\ a_2 \\ \vdots \\ a_N \end{pmatrix}, and\ \in=\begin{pmatrix} \in_1 \\ \in_2 \\ \vdots \\ \in_N \end{pmatrix} \tag{3.90}$$

and with $E(\in/Z_1, Z_2, \ldots, Z_N) = 0, \quad E(\in\in'/Z_1, Z_2, \ldots, Z_N) = \Omega$.

The vectors and matrices are put together into one equation as follows:

$$y=\begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_N \end{pmatrix} Z=\begin{pmatrix} Z_1 & 0\ldots & 0 \\ 0 & Z_2\cdots & 0 \\ \vdots & \vdots\ \ddots & \vdots \\ 0 & 0\cdots & Z_N \end{pmatrix}\begin{pmatrix} a_1 \\ a_2 \\ \vdots \\ a_N \end{pmatrix}+\begin{pmatrix} \in_1 \\ \in_2 \\ \vdots \\ \in_N \end{pmatrix} \tag{3.91}$$

$(y = Za + \in)$

(3.92)

Each of these equations above is a system. There are N of such equation systems in the model. All are 'seemingly unrelated', but all are potentially related, because the error terms between the different equations may be correlated.

3.5.1.1 Errors of variance – covariance matrix

The SUR model assumes that the variance–covariance matrix of residuals for equation (3.91) has the structure of the following:

$w = \sum \otimes I$ (Zellner, 1962). (3.93)

The $\sum$ is an $N \times N$ matrix of variance-covariance for the N individual equations.

Putting these variances and co-variances together, we have:

$$\sum = \begin{pmatrix} \sigma_{11} & \cdots & \sigma_{1n} \\ \vdots & \ddots & \vdots \\ \sigma_{n1} & \cdots & \sigma_{nn} \end{pmatrix} \tag{3.94}$$

where σ_{11} is the variance of the residuals in equation 1, σ_{22} is the variance of the residuals in equation 2, σ_{33} is the variance of the residuals in equation 3, etc.; σ_{12} is the covariance of the residuals in equation 1 and equation 2, σ_{13} is the covariance of the residuals in equation 1 and equation 3, etc. The identity matrix I is a $S \times S$ matrix with ones on the diagonal and zeros being off the diagonal is shown below:

$$I = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}_{s\times s} \tag{3.95}$$

The variance matrix for the vector $\in$ of equation (3.91) may now be written as: $Var\ (\in) = V = \Sigma \otimes \mathrm{I}$

where $\otimes$ represents the Kronecker multiplication which gives the following:

$$V = \begin{pmatrix} \sigma_{11I} & \cdots & \sigma_{1nI} \\ \vdots & \ddots & \vdots \\ \sigma_{n1I} & \cdots & \sigma_{nnI} \end{pmatrix} \tag{3.96}$$

Hence, Zellner (1962) suggested the following:

- We should use the application of OLS to each equation in the system to obtain the vectors of the sample residuals, $\in_1, \in_2, \ldots, \in_N$.

- Diagonal elements (variances,σ_{ii}) of Σ in (3.91) are estimated while the off-diagonal elements σ_{ij} are estimated.

3.5.1.2 Estimation of SUR

Choosing an estimator

To obtain the estimates of the parameters of the SUR model, we need to choose an estimator. Four (4) estimators have been considered for this work:

- Ordinary least squares (OLS) estimator;
- Generalized least squares (GLS) estimator;
- Feasible generalized least squares (FGLS) estimator; and
- Iterated feasible generalised least squares (IFGLS) estimator.

Ordinary Least Squares (OLS) estimator

The linear relationship between x (independent variable) and y (dependent variable) is stated below:

$$y_i = a + \beta * x_i + \varepsilon_i \tag{3.97}$$

$$\sum_{i=0}^{n}\left(Y_i - \widehat{Y}_i\right)^2 = \sum_{i=0}^{n}(\hat{\varepsilon})^2 = \text{minimum} \tag{3.98}$$

$$\rightarrow \hat{a} = \sum_{i=0}^{n}\left(y_i - \hat{\beta} * x_i\right)$$

$$\rightarrow \hat{a} = \overline{y} - \hat{\beta} * \overline{x} \tag{3.99}$$

$$\hat{\beta} = \frac{\sum_{i}^{n}(y_i - \overline{y})}{\sum_{i}^{n}(x_i - \overline{x})} \tag{3.100}$$

$$\hat{\beta} = \frac{\sum_{i}^{n}(y_i - \bar{y})(x_i - \bar{x})}{\sum_{i}^{n}(x_i - \bar{x})} = \frac{\text{cov}(x, y)}{\text{var}(x)} = (X^{'}X)^{-1}X^{'}y \qquad (3.101$$

Hence, OLS estimator is given by: $\widehat{\beta}_{OLS} = (X^{'}X)^{-1}X^{'}y$ (3.102)

Generalized least squares (GLS) estimator

This is given as:

$$\widehat{\beta}_{GLS} = (X^{'}W^{-1}X)^{-1}X^{'}W^{-1}y \quad \text{or} \qquad (3.103)$$

$$\widehat{\beta}_{GLS} = \left[X^{'}(\sum{}^{-1}\otimes I)X\right]^{-1}X^{'}(\sum_{i=1}^{n}{}^{|}\otimes I)y \qquad (3.104)$$

Now, we have a system where $E(\in\in^{'}) \neq \sigma_{\varepsilon}^{2}$ we need to use the generalized least squares (GLS) estimator of β with V defined in equation (3.91)**:**

$$b_{GLS} = (X^{'}V^{-1}X)^{-1}X^{'}V^{-1}y \qquad (3.105)$$

The associated variance-covariance matrix for the coefficient estimators is as follows:

$$Var(b_{GLS}) = (X^{'}V^{-1}X)^{-1} \qquad (3.106)$$

The obvious difficulty with estimating these is that Σ is not known.

Feasible generalized least squares (FGLS) estimator

Making the GLS estimator a feasible estimator, we can use the sample of data to obtain an estimate of W; replacing W with its estimate $\widehat{\mathrm{W}}$ you get the FGLS estimator. The FGLS estimator is given by the rule:

$$\widehat{\beta}b_{FGLS} = (X^{'}\widehat{W}^{-1}X)^{-1}X^{'}W^{-1}y \qquad \text{or} \tag{3.107}$$

$$\widehat{\beta}_{FGLS} = \left[(X^{'}(\sum{}^{-1}\otimes I)X\right]^{-1}X^{'}(\sum{}^{-1}\otimes I)y \tag{3.108}$$

To estimate *W*, we consider the following conditions: an estimate of *W* using Zeller's method is obtained by applying the following procedure (Zellner, 1962):

- To estimate each of the *N* number of equations independently using OLS.
- To obtain estimates of the variances and co-variances of the residuals for the *N* number of equations, we use the residuals from the OLS regressions equations. Now, $\hat{\sigma}_{ii}$ is the estimate of the residual variance for the *ith* equation; $\hat{\sigma}_{ij}$ is the estimate of the covariance of residuals for the *ith* and *jth* equations; $\hat{\varepsilon}_i$ is the vector of residuals for the *ith* equation; $\widehat{\varepsilon}_j$ is the vector of residuals for the *jth* equation; and S is the sample size.
- The $N \times N$ matrix, $\sum$ is formed by utilising the estimates obtained.
- $S \times S$ Identity matrix **I** is built.
- By $\widehat{W} = \sum \otimes I$ we obtain an estimate of the variance-covariance matrix of residuals for the equation. (3.109)
- Having obtained the estimate of W, we can now use the sample data and the rule $\widehat{\beta}_{FGLS} = (X^{'}\widehat{W}^{-1}X)^{-1}X^{'}\widehat{W}^{-1}y$ to obtain estimates of the parameters. (3.110)

3.5.2 Validation of the quantile regression model

3.5.2.1 XY – pair method Bootstrapping

Let $q_0(\hat{y}|x) = z_i^{'}\beta\theta$, be a heterogeneous quantile regression model, and $i = 1, 2, ..., n$ observations.

The system was queried to generate a number of observations or random samples for each of the parameters of each group of tourism goods and services. Several samples of 1,000 replications of random samples with n = 100, n = 200, n = 300, n = 400, n = 500, n = 600 and n = 700 were used until obtaining the required bootstrap parameter estimates to compare with the corresponding statistic obtained on the original sample. It is to compare the estimates obtained from both $xy-\text{pair}$ method bootstrap and quantile regression models. When the estimates are the same or almost the same then the phenomenon under study is complete. With respect to each quantile regression parameter, confidence intervals could be constructed, making use of bootstrap standard errors. A greater number of bootstrap replications will result in accurate estimates of the heterogeneous quantile regression, as approximation to the normal distribution improves as the number of replications rises.

The bootstrap parameter average value is estimated as follows:

$$\bar{\hat{\beta}}(\theta) = \frac{1}{c}\sum_{c=1}^{C}\hat{\beta}_0(\theta). \qquad (3.111)$$

In the same way, the standard errors of bootstrap estimates represent an estimate of the quantile regression error. Bootstrap variance can be estimated as follows:

$$\hat{V}_{qr} = \frac{1}{c}\sum_{c=1}^{C}\left(\hat{\beta}_{cr}(\theta)_q - \bar{\bar{\beta}}_r(\theta_q)\right)\left(\hat{\beta}_{cr}(\theta)_q - \bar{\bar{\beta}}_r(\theta_q)\right)^T \qquad (3.112)$$

where k quantiles are considered; p independent variables; r is each independent variable and for each quantile, q. $r = 1,\ldots,p$;

$$q = 1,\ldots,k \text{ and } \bar{\bar{\beta}}_r(\theta_q) = \frac{1}{c}\sum_{i=1}^{n}\bar{\hat{\beta}}_{cr}(\theta_q) \qquad (3.113)$$

Confidence interval: $\bar{\bar{\beta}}_r(\theta_q) \pm z_{\alpha/2} SD\left(\hat{\beta}_r(\theta_q)\right)$, where $\bar{\bar{\beta}}_r(\theta_q)$ (3.114)

represents the average value of the C bootstrap estimates and $SD\hat{\beta}_r(\theta_q)$ represents the square root of the variance. (SD is standard deviation) (Davino *et al*., 2014).

3.5.2.2 Computation of PseudoR^2

RASω_o is residual absolute sum of weighted differences is the corresponding minimizer.

TASω_o is for each considered quantile (θ), the total absolute sum of weighted differences between the observed dependent variable and the estimated quantile.

PseudoR^2 is an index comparing the residual absolute sum of weighted differences using the selected model with the residual sum of weighted differences using a model with only the intercept.

$$PseudoR^2 = 1 - \frac{RAS\omega_0}{TAS\omega_0} \qquad (3.115)$$

The model percentile with the highest PseudoR^2 value has the best fit.

RASω_o and **TAS**ω_o represent the residual absolute sum of weighted differences between observed dependent variable and the estimated quantile conditional distribution (Davino *et al*., 2014).

3.6 Software Used for Data Analysis

The Census and Survey Processing System (CSPro) was used for the data capture while Stata Statistical Programme was used for processing the data. Software R was employed to estimate static and dynamic linear AIDS models. In other words, own-price, cross-price and expenditure/income elasticities of tourism products purchased by domestic tourists were estimated using static and dynamic Linear Almost Ideal Demand System (LAIDS) models for Ghana as a whole and each of the ten destinations (regions) using R software.

CHAPTER FOUR

ANALYSIS

4.1 Preliminary Analysis of Ghana's Domestic Tourism Market

4.1.1 Key demand characteristics of domestic visitors in Ghana

Table 4.1 reports the key characteristics of same-day visitors', overnight visitors' and domestic visitors' demand distinguished by region of destination in Ghana. In 2013, Ashanti region recorded the highest proportion of total tourist expenditures by same-day visitors, accounting for almost two-fifth, while for overnight tourists, the proportion was almost one-third of the total expenditure. This was followed by Brong Ahafo, Northern, Volta, Central, Greater Accra and Eastern regions. The consumption of tourism products by the remaining three regions, Western, Upper East and Upper West was quite low, accounting for a little over one-tenth of the total tourist expenditure. For domestic visitor expenditure, Ashanti region topped with one-third, followed by Brong Ahafo, a little below one-fifth then Greater Accra, one-tenth of the total expenditure. Upper West region recorded the least amount (Table 4.1).

The results of the study showed that the estimated size of domestic tourism and hence domestic tourism expenditure in real term was about Gh¢3.454.3 million, representing 3.7% of aggregate Ghana's 2013 GDP. For 2012, the estimated size of domestic tourism and hence domestic tourism expenditure in real term was about Gh¢ 2.711.0 million, representing 3.6% of aggregate Ghana's 2012 GDP (Appendix R, Table R9 and (Table 4.6). In 2013, the domestic same-day and overnight visitors contributed respectively, Gh¢1.5billion and Gh¢2.3billion in nominal terms to the economy of Ghana (Table 4.1), while in 2012, the same-day and overnight visitors contributed Gh¢1.2billion and Gh¢1.6 billion in nominal terms, respectively are reported in Appendix R, Table R9 and (Table 4.1).

Table 4.1: Regional expenditure of same-day visitors, overnight visitors and domestic visitors, 2013 (Ghana Cedis)

Region of destination	Same-day exp.(Gh¢)	%	Overnight tourists exp.(Gh¢)	%	Domestic visitors exp.	%
Western	41.73	2.78	127.50	5.46	169.23	4.41
Central	127.70	8.52	186.58	7.99	314.28	8.20
Greater Accra	207.99	13.87	180.96	7.75	388.95	10.14
Volta	32.14	2.14	207.50	8.88	239.64	6.25
Eastern	92.28	6.16	143.36	6.14	235.64	6.14
Ashanti	583.47	38.92	655.66	28.07	1,239.13	32.31
Brong Ahafo	292.89	19.54	394.20	16.88	687.09	17.92
Northern	67.90	4.53	215.00	9.21	282.90	7.38
Upper East	41.97	2.80	136.66	5.85	178.63	4.66
Upper West	11.08	0.74	88.26	3.78	99.34	2.59
National	1,499.14	100.00	2,335.68	100.00	3,834.82	100.00

Source: Author's computation, 2017

Table 4.2 reports the key demand characteristics of domestic tourists being differentiated by the region of destination of tourists. The region that received the highest number of trips was Ashanti, recording more than one-third of the trips, followed by Brong Ahafo, receiving a little below 20 percent then Greater Accra, about one-tenth. The least was Upper West, a little over 2 percent.

Two regions, Ashanti and Brong Ahafo, accounted for almost 60 percent of the total domestic tourist nights, followed by Greater Accra region, recording a figure below 10 percent, which could mean that the large crowd of visitors who travel to the Greater Accra region could be same-day visitors. Upper West region accounted for the least.

The national average length of stay for 2013 was estimated at 10.8 nights. This means that a tourist stays at a destination for an average of 11 nights in the country. The average length of stay was similar for four regions. The regions are Ashanti, Central, Volta and Brong Ahafo. The least average length of stay was recorded by domestic tourists who visited Eastern region.

The estimated average expenditure per night, nationally, by domestic tourists for 2013 was estimated to be Gh¢20.12. Tourists to the Northern region recorded the highest average expenditure per night, followed by Upper East and then Upper West regions. The least average expenditure per night by domestic tourists was recorded in the Ashanti region.

Similarly, the estimated average expenditure per trip, nationally, by domestic tourists for 2013 was pegged at Gh¢138.52. The highest average expenditure per trip was registered by tourists to the Northern, Upper East and Upper West regions. The least average expenditure per trip was by domestic tourists to the Eastern region. The high average expenditure per trip by tourists to the three northern regions could be attributed to the distance from the south of the country to the north (Table 4.2).

Table 4.2: Regional key demand characteristics of domestic tourists, 2013 (Ghana cedis)

Region of destination	Overnight trips(M)[1]	%	Bed-nights(M)	%	Average length of stay(nights)[2]	Av. expenditure per night(Gh¢)[3]	Av. expenditure per trip(Gh¢)[4]
Western	0.81	4.81	5.70	3.14	7.0	34.96	157.34
Central	1.06	6.31	13.23	7.29	12.4	22.01	175.48
Greater Accra	1.73	10.25	16.53	9.11	9.6	17.10	104.69
Volta	1.24	7.37	15.29	8.42	12.3	21.23	166.87
Eastern	1.73	10.25	10.12	5.57	5.9	22.14	82.97
Ashanti	5.84	34.62	72.17	39.76	12.4	14.20	112.30
Brong Ahafo	2.96	17.57	35.62	19.62	12.0	17.33	133.06
Northern	0.68	4.01	5.36	2.95	7.9	62.78	317.59
Upper East	0.43	2.55	3.83	2.11	8.9	55.78	317.54
Upper West	0.38	2.25	3.67	2.02	9.7	37.66	232.12
National	16.86	100	181.52	100	10.8	20.12	138.52

Source: Author's computation, 2017

4.1.2 Domestic tourist bed-nights in Ghana

According to 'Key Figures on Europe, 2009 Edition', a night spent is defined as each night that a guest is registered to stay in a hotel or similar establishment. Bed-nights are the number of overnights away from home taken by adults and accompanying children on tourism trips. Each night away

[1] M = (Million)
[2] Average length of stay = total trips divided by total bed-nights.
[3] Average expenditure per night = total spending divided by total number of bed-nights.
[4] Average expenditure per trip = total trip costs divided by total number of trips.

spent by an adult or a child present on the trip counts as a night (UK Tourists, 2009). Table 4.3 summarizes the profile of domestic tourists by visitor bed-nights and month of visit. In total, domestic overnight visitors stayed approximately 181.2 million bed-nights in the country. In 2013, the data demonstrated that, October, November and December were the most popular months for domestic overnight travel, registering 10.2%, 12.5% and 16.9% respectively of total bed-nights. Visiting friends and relatives' and funerals' tourists recorded approximately 60 percent of the total bed-nights, 30.5 percent of bed-nights were for visiting friends and relatives segment as the major tourism market while 30.1 percent bed-nights for funeral tourists for being second major tourism market. February to April were the less popular months for the five market segments.

Third in significance was business tourism market, which registered 23.0 percent, however, it registered the lowest bed-nights in February, March and May but highest in December. Other visitors' (which include professionals, health treatment, religion/pilgrimage, education/training and shopping) market recorded only 6 percent of the bed-nights as the lowest of the total.

Table 4.3: Domestic visitor bed-nights by purpose of visit and month, 2013 (Million bed-nights)

Month	FUN	LRH	VFR	BUS	OTH	TOTAL
January	4.5	0.2	5.8	4.8	1.0	16.3
February	2.2	1.2	1.2	4.0	0.6	9.2
March	1.4	1.2	1.2	1.9	0.7	6.4
April	1.5	0.5	4.2	3.2	0.4	9.8
May	3.9	1.3	1.3	2.4	0.5	9.4
June	4.5	1.6	2.9	2.6	0.3	11.9
July	4.2	0.9	4.0	3.4	0.4	12.9
August	5.2	1.4	5.8	3.9	0.3	16.6
September	4.5	0.7	6.2	4.3	1.3	17.0
October	5.3	2.2	5.3	4.5	1.2	18.5
November	8.7	2.1	7.2	3.1	1.5	22.6
December	8.6	4.2	10.1	5.0	2.7	30.6
National	54.5	17.5	55.2	43.1	10.9	181.2

Source: Author's computation, 2017

FUN = Funeral tourists; LRH = Leisure, recreation and holidays tourists; VFR = Visiting friends and relatives segment; BUS = Business tourists; OTH = Other tourists (include Professionals, Health treatment, Religion/pilgrimage, Education/Training and Shopping).

Table 4.4 reports on the visitor bed-nights by region and purpose of visit in 2013. Among the ten regions in the country, Ashanti and Brong Ahafo regions were the most popular destinations, recording nearly 60 percent of the total bed-nights, Ashanti region recorded the highest number of bed-nights, nearly two-fifth (39.8%), followed by Brong Ahafo region (19.7%).

Third in significance was the Greater Accra region, accounting for a little below one-tenth (9.1%). The three northern regions, Northern, Upper East and Upper West together registered the least bed-nights (7%): 3%, 2.1% and 1.9% respectively.

Greater Accra region had visiting friends and relatives (VFR) bed-night segment as the major market, while leisure, recreation and holiday makers' segment was the second highest. In Ashanti, Brong Ahafo and Volta regions, funeral bed-nights were the major markets, followed by those visiting friends and relatives' segment. Northern region had VFR as its major market, followed by leisure, recreation and holiday makers' segment. Upper East and Upper West regions had tourists travelling for business as their major markets, however, Upper East region had leisure, recreation and holiday makers' segment as the second major market while Upper West had VFR segment as the second major market.

Table 4.4: Domestic visitor bed-nights by region and purpose of visit, 2013 (‘000)

Region of destination	FUN	LRH	VFR	BUS	OTH	TOTAL
	('000)	('000)	('000)	('000)	('000)	('000)
Western	951	209	2,652	1,083	803	5,698
Central	3,225	1,851	3,449	2,867	1,835	13,227
Greater Accra	3,903	4,298	4,551	2,599	1,182	16,533
Volta	5,068	3,071	6,227	438	488	15,291
Eastern	4,344	837	2,387	2,288	263	10,118
Ashanti	27,026	438	25,215	15,576	3,917	72,171
Brong Ahafo	8,315	4,280	7,273	14,398	1,352	35,617
Northern	857	1,139	2,404	768	192	5,361
Upper East	654	822	419	1,516	419	3,829
Upper West	330	419	670	1,556	380	3,355
National	54,672	17,363	55,246	43,088	11,148	181,200

Source: Author’s computation, 2017

4.1.3 Domestic overnight visitors’ trips

Trips are movements from the usual environment to a place or region which involves at least one overnight stay, taken by adults aged 15 years or more, including children of age 0-14. For domestic overnight tourists, trips are movements from the usual environment to a place or region which involves at least one overnight stay. Table 4.5 reveals that 16.9 million overnight trips were made in the country in 2013. The data shows that most of the overnight trips are for funeral trips (33.7%), followed by visiting friends and relatives (VFR) segment, 32.6 percent. However, compared with the two main markets, funeral trips and VFR segments, business trips were highly significant, registering 17.3% trips in the country. In terms of region, Ashanti region recorded the highest number of overnight trips, over one-third (34.6%). This was followed by Brong Ahafo (17.6%), Greater Accra (10.3%) then Eastern regions (10.2%)). The least number of overnight trips was recorded in the Upper West region (2.3%) GSS(2018).

Table 4.5: Domestic overnight trips by region and purpose of travel, 2013 (‘000)

Region of destination	FUN	LRH	VFR	BUS	OTH	TOTAL
Western	129.5	71.4	366.0	129.5	114.0	810.4
Central	317.0	272.2	312.8	116.2	45.0	1,063.3
Greater Accra	386.4	142.8	532.2	498.9	168.2	1,728.5
Volta	634.1	71.4	366.0	151.9	20.1	1,243.4
Eastern	705.4	464.0	361.8	138.6	58.1	1,727.9
Ashanti	2,110.8	243.1	2,154.9	1,091.6	238.0	5,838.3
Brong Ahafo	945.5	350.1	890.9	615.1	161.0	2,962.6
Northern	226.9	121.1	115.1	107.8	106.0	677.0
Upper East	198.0	58.1	86.2	58.1	30.0	430.4
Upper West	22.4	1.2	306.9	14.1	35.7	380.2
National	5,675.9	1,795.4	5,492.8	2,921.7	976.1	16,862.0

Source: Author’s computation, 2017

4.1.4 Expenditure of overnight domestic visitors

Expenditure is the spending which is incurred by visitors during tourism trips. It includes costs made in advance of the trip, costs which is incurred during the trip itself, and any bills which related to the trip received after returning home (UNWTO, 1995). The expenditure covers money paid by adults on the trip for themselves and on behalf of others on the trip, including children. It also includes money paid on behalf of the visitor taking the trip, for an example, an employer paying the cost of a business trip. Table 4.6 represents domestic tourists' expenditure by category for 2013 and 2012. In 2013, the highest expenditure was incurred on transportation, representing more than half of the total expenditure, followed by expenditure on food and drinks, registering nearly one-third (28.7%), while accommodation expenditure represented less than 4 percent. In 2012, less than half (45.3%) of the expenditure was spent on transportation, followed by food and drinks, a little above one-third (35.4%), and accommodation, less than four percent.

Table 4.6: Overnight tourists' expenditure by category for 2013 and 2012

Category of expenditure	Overnight (2013)(Million Ghana cedis)	%	Overnight (2012)(Million Ghana cedis)	%
Accommodation	92.53	3.96	60.45	3.83
Food & drinks	670.46	28.7	557.21	35.35
Transportation	1,204.63	51.57	714.25	45.31
Recreation, cultural & sporting activities	80.99	3.47	71.32	4.52
Shopping	228.42	9.78	128.5	8.15
Others	58.72	2.51	44.65	2.83
National	2,335.75	100	1,576.38	100.00

Source: Author's computation, 2017

Exchange rate in 2013; 1$ = ¢2.89

Table 4.7 reveals that domestic tourists who visited Ashanti region recorded the highest expenditure (28.1%), followed by Brong Ahafo region (16.9%) then the northern region (9.2%). Tourists to the Upper West region recorded the least expenditure (3.8%) in 2013. From Table 4.7, tourists who attended funerals emerged as the major tourism market, accounting for 29.7 percent of the total expenditure in 2013, followed by tourists who visited friends and relatives (VFR) (29.6%) as the second domestic tourism market in Ghana. The third market segment was the business tourists, spending 23.6 percent. Expenditure by other tourists recorded the least (6.9%).

Table 4.7: Expenditure of overnight tourists in Ghana by region and purpose of visit, 2013 (Million Ghana cedis).

Region of destination	FUN	LRH	VFR	BUS	OTH	TOTAL
Western	34.64	13.24	41.17	28.16	10.21	127.42
Central	58.56	33.50	42.56	35.27	16.33	186.22
Greater Accra	39.52	10.71	46.65	65.45	18.46	180.79
Volta	51.22	14.85	67.03	54.71	19.82	207.63
Eastern	41.15	20.34	36.13	27.99	17.64	143.25
Ashanti	216.79	29.66	234.28	133.44	41.32	655.49
Brong Ahafo	109.11	54.69	110.43	93.86	26.57	394.66
Northern	72.73	24.95	58.53	53.91	5.14	215.26
Upper East	42.27	28.44	34.15	29.42	2.31	136.59
Upper West	27.21	10.22	19.43	28.30	3.27	88.43
National	693.20	240.60	690.36	550.51	161.07	2335.74

Source: Author's computation, 2017

Exchange rate in 2013; 1$ =¢2.89

Table 4.8 demonstrates the expenditure of overnight tourists by region and category of expenditure. In terms of category, expenditure on transportation was the highest, recording more than half of the total (51.6%), followed by expenditure on food and drinks, nearly one-third (28.7%) and shopping nearly ten percent. About four percent of the expenditure was spent on accommodation and other services was the least (2.5%).

In terms of region, for accommodation expenditure, Ashanti region recorded the highest, followed by Brong Ahafo region, while Upper West region accounted for the least. For recreation, culture and sporting activities, tourists' expenditure in the Northern region was the highest, followed by the Ashanti region tourists then Brong Ahafo tourists.

Table 4.8: Expenditure of overnight tourists in Ghana by region and expenditure category, 2013 (Million Ghana cedis).

Region of destination	ACC	FOD	TRA	RCS	SHO	OTH	TOTAL
Western	13.46	33.46	67.58	2.54	5.67	1.29	124.00
Central	12.73	50.62	97.56	2.66	10.19	8.25	182.02
Greater Accra	6.81	25.30	82.56	3.96	34.13	8.38	161.13
Volta	5.41	73.78	133.31	4.19	13.28	1.90	231.88
Eastern	4.53	48.91	51.85	5.80	20.33	4.10	135.53
Ashanti	26.90	169.37	377.53	9.98	62.69	20.69	667.16
Brong Ahafo	13.19	144.05	175.75	7.05	45.54	10.63	396.21
Northern	5.61	56.11	88.36	33.28	14.27	2.07	199.69
Upper East	2.86	43.46	89.22	5.02	10.24	0.57	151.38
Upper West	1.10	25.68	41.04	6.68	12.01	0.88	87.40
National	92.60	670.73	1204.77	80.98	228.35	58.77	2336.20

Source: Author's computation, 2017
Exchange rate in 2013; 1$ =¢2.89

ACC = Accommodation; FAD = Food and drinks; TRA = Transport; RCS = Recreation, culture and sporting activities; SHO = Shopping; and OTH = Other services not specified above.

Table 4.9 demonstrates the average expenditure of domestic tourists by region and purpose of visit. The average expenditure per domestic tourist in Ghana was Gh¢ 12.87. Other services market accounted for the highest average expenditure per tourist (Gh¢14.40), followed by leisure, recreation and holiday market (Gh¢13.86) then business market (Gh¢ 12.78). On regional basis, tourists to the Northern region accounted for the highest average expenditure, followed by tourists to Upper East region (Gh¢35.67), then Upper West (Gh¢24.08) and Western regions (Gh¢22.36). The least average expenditure per domestic tourist in Ghana was recorded in the Ashanti region (Gh¢ 9.08).

Regarding expenditure for funeral tourism, Northern region recorded the highest average expenditure (Gh¢84.87), followed by Upper West region (Gh¢82.45) then Upper East region (Gh¢64.63). For tourists visiting friends and relatives, Upper East region accounted for the highest average expenditure (Gh¢81.50) followed by Upper West region (Gh¢29.00) then Northern region (Gh¢24.35). Ashanti region recorded the least (Gh¢8.57).

Table 4.9: Average expenditure (Ghana cedis) per domestic overnight tourist in Ghana, 2013.

Region of destination	FUN	LRH	VFR	BUS	OTH	TOTAL
Western	36.42	63.35	15.52	26.00	12.71	22.36
Central	18.16	18.10	12.34	12.30	8.90	14.08
Greater Accra	10.13	2.49	10.25	25.18	15.62	10.94
Volta	10.11	4.84	10.76	124.90	40.61	13.58
Eastern	9.47	24.30	15.14	12.23	67.07	14.16
Ashanti	8.02	67.72	9.29	8.57	10.55	9.08
Brong Ahafo	13.12	12.78	15.18	6.52	19.65	11.08
Northern	84.87	21.91	24.35	70.20	26.77	40.15
Upper East	64.63	34.60	81.50	19.41	5.51	35.67
Upper West	82.45	24.39	29.00	18.19	4.68	24.08
National	12.68	13.86	12.50	12.78	14.45	12.87

Source: Author's computation, 2017
Exchange rate in 2013; 1$ =¢2.89

4.2 Analysis of Price and Expenditure Elasticities in Ghana

The efficiency or the validity of the AIDS models were tested. Bootstrap estimates and standard errors were run to compare with the estimates and standard errors of AIDS Models (static and dynamic). The results showed that the estimates of both bootstrap and AIDS models were the same. This indicated that the phenomenon under study was complete (Appendix R, Table R16).

4.2.1 Parameter estimates of aggregate national demand (static and dynamic)

This is to discuss the parameter estimates of both static and dynamic LAIDS models in Tables 4.10 and 4.11, respectively. These parameter estimates were used to estimate the price and expenditure elasticities.

4.2.2 Parameter estimates of aggregate national demand (static)

Table 4.10 reports on the static model for the estimates of the parameters α, γ, β for the country's (national) domestic tourists' consumption of tourism products. The first column lists the estimates of the intercept terms of the six consumption categories. However, $\alpha_i's$ are practically of little interest. $\beta_i's$ determine whether the good or service in question is a luxury or necessity (Statistics Norway, 2013). The overall statistical fit of the model is satisfactory. From Table 4.10, there are five luxuries (accommodation, food and drinks, transportation, shopping and other services) and one necessity, recreation, culture and sporting activities.

Table 4.10: Parameter estimates from static LAIDS Model: national demand

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.193	-0.013	0.021	-0.316	0.121	0.013	0.174	0.013
FAD	0.196	0.021	-0.040	0.343	-0.126	-0.081	-0.177	0.114
TRA	0.184	-0.316	0.343	-0.008	0.056	0.259	-0.334	0.032
RCS	0.185	0.121	-0.126	0.056	0.090	-0.271	0.120	-0.175
SHO	0.183	0.013	-0.081	0.259	-0.271	0.184	-0.104	0.003
OTH	0.059	0.174	-0.117	-0.334	0.120	-0.104	0.261	0.013

Source: Author's computation, 2017

4.2.3 Parameter estimates of aggregate national demand (dynamic)

The results of the final model estimations are reported in Table 4.11 for the dynamic LAIDS model. There are some similarities among the estimated parameter values. From Table 4.11, there are two luxuries (other services and food and drinks) and four necessities; accommodation, transportation, recreation, culture and sporting activities and shopping

Table 4.11 shows that the estimated parameters of the error corrections term, λ_i, possess the correct signs, and that the coefficients of the error correction terms λ_i, indicate short-run adjustments. All the estimates are significant and negative. The shopping and transportation error correction terms,-1.116 and -1.104 respectively, indicate that domestic tourists are able to adjust shopping and transportation consumption to long-run equilibrium considerably quicker than the remaining four products (Utami, Hartono and Awirya., 2016; Motallebi and Pendel, 2013). Table 4.11 further shows that the speed of adjustments is the same for the six commodities. For accommodation, it takes one month (1/1.002 = 0.998) to get back to equilibrium. Similarly, the time for equilibrium adjustment is one month for food and drinks, transportation, recreation, culture and sporting activities, shopping and other services (Yang, Changyou and Donald, 2010).

The coefficients of the lagged share variable in the short-run (dynamic) AIDS model show a pattern of consumption habit. Habit means that the utility functions of the consumers are influenced by past purchases, which results in influencing present purchases, (Wu *et al*., 2011). Five of the coefficients are positive and one being negative for all the six commodities. The positive coefficients for food and drinks (0.105), transport (0.223), recreation, culture and reporting activities (0.129), shopping (0.198) and other (0.095) indicate that domestic tourists have habit persistence for these commodities. The negative sign for accommodation (-0.022) indicates less tourists' habit persistence for tourist accommodation.

Table 4.11: Estimated parameters from dynamic LAIDS (EC LAIDS) Model: national demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	0.003	-0.003	0.011	-0.003	-0.020	0.012	-0.009	-1.002	-0.022	0.521	1.959
FAD	-0.003	0.007	-0.002	-0.005	-0.004	0.007	0.015	-1.050	0.105	0.427	1.982
TRA	0.011	-0.002	0.003	-0.003	0.009	-0.019	-0.013	-1.104	0.223	0.518	1.926
RCS	-0.003	-0.005	-0.003	-0.002	0.001	0.013	-0.005	-1.047	0.129	0.492	1.945
SHO	-0.020	-0.004	0.009	0.001	0.019	-0.006	-0.012	-1.116	0.198	0.629	1.931
OTH	0.012	0.007	-0.019	0.013	-0.006	-0.007	0.024	-1.048	0.095	0.468	1.952

Source: Author's computation, 2017

DW refers to the Durbin-Watson statistic.

4.2.4 National estimates of long-run and short-run uncompensated own price and cross-price elasticities

Table 4.12 presents the long-run and short-run elasticities which are obtained through the model estimated parameters. The procedure used permits the own price and cross-price calculation of long-run and short-run elasticities. The obtained estimated elasticity coefficients differ significantly from zero as they have been shown by the‘*t*’ statistics. As observed from Table 4.12, they have the expected theoretical signs which show that all uncompensated long-run and short-run own-price elasticities are negative, meaning that all the Slutsky matrix is negative semi-definite showing the reliability of the models. Both the long-run and short-run own-price elasticities are negative, however, some are less than unity, while others are more than unity, in absolute value.

Nationally, regarding long-run, for the overall ranking, it is observed that the demand for food and drinks is relatively the most price elastic (-1.126), followed by other services (-1.075), then shopping (-1.067), accommodation (-1.038) and transportation (-1.004), hence a 1% increase in their prices would result in a more than 1% decrease in the their respective budget shares and hence decrease their consumption to decrease revenue, while the demand for recreation, culture and sporting activities (-0.917) is price inelastic, suggesting, a 1% increase in its price would result in 0.917% decrease in the budget shares for recreation, culture and sporting activities and hence increase revenue. For the long-run, of the six commodities, nationally, food and drinks is the most expensive, followed by other services, shopping, accommodation, transportation and recreation, culture and sporting activities. The estimates show that these five commodities have price elastic demand, suggesting that the government of Ghana and the tourism practitioners should be careful about their pricing policies and taxation. However, recreation, culture and sporting activities, with elasticity less than unity implies that tourists' demand for recreation, culture and sporting activities is price inelastic and hence an increase in its price will result in less than proportionate decrease in the quantity demanded and hence increase their consumption rapidly to increase revenue. Thus, to maximize profit by suppliers, the price of recreation, culture and sporting activities in the country could be increased.

The food and drinks group is made up of expenditure on food and drinks incurred when a visitor eats at licensed and unlicensed restaurants, open markets, cafes, drinking bars, and nite clubs. Others are expenses on food and drinks in places of entertainment, hotels and similar establishments, prepared and unprepared food and drinks at retail stores to be consumed during tourism trips. In other words, this is made up of food and drinks bought at kiosks, supermarkets, retail stores, grocery stores, open markets, restaurants, fast food take-away establishments, and other food outlets.

The other services' group is made up of expenditure on telephone calls (MTN, Tigo, Vodafon, Airtel, Kasapa, etc.) and postage; fees paid to tour operators for package tours, insurance, as well as development and/or printing of films; and personal services such as hair-cutting, pedi-cure, medi-cure, hair dressing, etc.

The uncompensated cross-price elasticities show that there exists substitutability and complementarity, hence, the results show that the cross-price effects are relatively moderate in magnitude. However, a price rise in one good generally has some effects on all other goods and services. Out of 15 pairs of the uncompensated cross-price elasticities at the upper triangle of the panel, five of them are significant, two are substitutes and three are complements. The substitutes are food and drinks versus transportation and shopping versus other services. The complementary tourism products are: accommodation versus food and drinks/transportation; food and drinks versus shopping.

Nationally, using uncompensated cross-price elasticities, when the price of accommodation increases by 10% the quantity demanded of food and drinks decreases by 0.72% and vice versa, and hence would result in a loss in revenue to suppliers and government. Again, when the price of food and drinks increases by 10%, the quantity demanded of shopping decreases by 4.13% and vice versa, meaning revenue from food and drinks will decrease while that of shopping will decrease.

Nationally, regarding short-run, for the overall ranking, it is observed that the demand for food and drinks (-1.039) is relatively the most price elastic, followed by other services (-1.014), meaning they behave as normal luxury products, indicating that the consumption of these goods and services is sensitive to prices. This suggests that a rise in prices of these commodities would result in more than proportionate decrease in their quantities demanded and reduce revenue to suppliers and the nation. The demand for recreation, culture and sporting activities (-0.978), accommodation (-0.957), shopping (-0.871) and transportation (-0.728) is price inelastic, indicating that a rise in prices of these commodities would result in less than proportionate decrease in their quantities demanded and hence increase revenue. For the short-run, of the four commodities, nationally, food and drinks is relatively the most expensive, followed by other services then recreation, culture and sporting activities, accommodation and shopping. To complement the static model by the dynamic model, the elasticity estimates show that these four commodities, food and drinks, other services, recreation, culture and sporting activities, and accommodation have their elasticity around unity, and hence have fairly elastic demand, suggesting that the government of Ghana and the tourism practitioners should be careful about their pricing and taxation policies. If care is not taken about their pricing by tourism and tourism related industries, the prices of these four tourism goods and services will increase, and domestic tourists will decrease their consumption which will affect the domestic tourism industry. However, the demand for shopping and transportation is price inelastic and hence an increase in their prices will result in less than proportionate decrease in their quantities demanded and hence increase their consumption rapidly to increase revenue. For the four tourism goods and services whose price elasticities are relatively unitary suggest that they could need government subsidy.

The short-run uncompensated cross-price elasticities show substitutability and complementarity. Out of 15 pairs of the uncompensated cross-price elasticities at the upper triangle of the panel, six of them are significant, four are complements and two are substitutes. In contrast, the short-run elasticities show that the cross-price effects are relatively low. However, a price rise in one good generally has some effects on all other goods and services.

Nationally, for the short-run, using uncompensated cross-price elasticities, when the price of accommodation increases by 10%, the quantity demanded of transport decreases by 0.97% and vice versa. Similarly, when the price of recreation, culture and sporting activities increases by 10%, the quantity demanded of other services increases by 0.99% and vice versa to increase revenue, but the demand for shopping will decrease by 0.09% (Table 4.12).

Table 4.12: National estimates of long-run and short-run uncompensated own and cross-price elasticities of Ghanaian tourism goods and services.

Quantity/Price	ACC	FAD	TRA	RCS	SHO	OTH
Long-run						
ACC	-1.038***	-0.072*	-0.133**	0.116	0.019	0.185
FAD	-0.003*	-1.126***	0.356**	-0.165	-0.413***	0.117
TRA	-0.030**	0.426**	-1.028***	0.010	0.300	-0.389
RCS	0.160	-0.129	0.046	-0.917***	-0.257	0.213
SHO	0.023	-0.406***	0.286*	-0.262*	-1.067***	0.094*
OTH	0.193	0.157	-0.361	0.172	0.097*	-1.075**
Short-run						
ACC	-0.957*	-0.041*	-0.097**	-0.031	-0.160	0.104*
FAD	-0.034*	-1.039***	-0.024***	-0.037	-0.020***	0.060
TRA	-0.066*	-0.024***	-0.728***	-0.016	-0.072	-0.124
RCS	-0.028	-0.042	-0.019	-0.978***	-0.009*	0.099*
SHO	-0.110*	-0.009***	0.071	0.003*	-0.871***	-0.028
OTH	0.103*	0.055	-0.110	0.087*	-0.053	-1.014***

Source: Author's computation, 2017

Note: ***, ** and * indicate 1%, 5% and 10% significant levels respectively

4.2.5 National estimates of long-run and short-run compensated own-price and cross-price elasticities

To have a comprehensive understanding of the competition relationship among tourism goods and services, the compensated cross-price elasticities are calculated and reported in Table 4.13. From Table 4.13, a positive price elasticity between two tourism goods and services denotes substitutability and a negative value denotes complementarity. In all, there are 15 pairs of cross-price elasticities among tourism goods and services. In the long-run, five of the 15 pairs of compensated cross-price elasticities at the upper triangle of the panel are significant. All of them are positive, indicating the presence of substitution relationships between the six consumption categories. The extent of substitutability is highest between food and drinks and transportation, followed by between transportation and shopping, accommodation and other services, accommodation and recreation, culture and sporting activities, and between accommodation and transportation. For instance, when the price of accommodation is increased by 10% the quantity of other services demanded increases by 3.78% and vice versa. When the price of food and drinks increases by 10%, the quantity demanded of transport services increases by 5.61%.

In the short-run, six of the 15 pairs of the compensated cross-price elasticities at the upper triangle of the panel are significant. Three (3) are positive and three are negative. The positive pairs indicate substitutability and the negatives indicate complementarity, meaning, these three complements are bought together. The substitutes are accommodation versus transportation; food and drinks versus transportation; and recreation, culture and sporting activities versus shopping. The complements are accommodation versus recreation, culture and sporting activities; food and drinks versus shopping; and recreation, culture and sporting activities versus others (Kaninda and Fonsah, 2012).

For compensated cross-price elasticities, for example, in the short-run, the tourists' demand for accommodation in the country is more responsive to price changes in transportation than is for their demand for transportation in response to price changes in accommodation, related with cross-price elasticities of 0.212 and 0.065, respectively. This indicates that if the average transport fare increases by 10%, then domestic tourists in Ghana are likely to spend 2.12% more on accommodation, but if the average price of accommodation increases by 10%, the domestic tourists in Ghana will spend only 0.65% on transportation.

Table 4.13: National estimates of long-run and short-run compensated own and **cross-price elasticities of Ghanaian tourism goods and services**

Quantity/Price	ACC	FAD	TRA	RCS	SHO	OTH
Long-run						
ACC	-0.825***	0.231	0.250*	0.296**	0.216	0.378*
FAD	0.216	-0.810***	0.561***	0.037	-0.192	0.333
TRA	0.161*	0.639***	-0.836***	0.194	0.502***	-0.193
RCS	0.321**	0.043	0.197	-0.693***	-0.094	0.371
SHO	0.214	-0.202	0.464***	-0.086	-0.627***	0.282
OTH	0.384*	0.36	-0.183	0.348	0.29	-1.054**
Short-run						
ACC	-0.815*	0.097	0.212*	-0.097*	-0.014	-0.260
FAD	0.094	-0.515***	0.144***	-0.086	-0.146***	0.209
TRA	0.065*	0.109***	-0.748***	-0.107	0.240	-0.027
RCS	-0.102*	0.093	0.122	-0.792**	0.160*	-0.251*
SHO	-0.010	-0.116***	0.200	0.117*	-0.611***	-0.112
OTH	0.230	0.186	0.027	-0.208*	-0.113	-0.931***

Source: Author's computation, 2017

Notes: ***, ** and * indicate 1%, 5% and 10% significant levels respectively

4.2.6 National estimates of uncompensated own-price and expenditure elasticities

For the long-run, only recreation, culture and sporting activities is price inelastic, with a coefficient of -0.917, while the remaining products reveal price elastic demand, with elasticities ranging from -1.028 to -1.126. For the short-run, food and drinks and other services reveal price elastic demand, while accommodation, transport, recreation, culture and sporting activities and shopping reveal price inelastic demand, with elasticities ranging from -0.728 to -0.978.

As usual, all the expenditure/budget elasticities for both long-run and short-run are positive, indicating that they are normal goods. Regardless of time horizon, and in terms of long-run, the groups of accommodation, food and drinks, transportation, shopping/non-consumables and others are luxury tourism products, while the group of recreation, culture and sporting activities is a necessity. The results showed that all the short-run expenditure elasticities are smaller than that of long-run elasticities (Table 4.14).

A comparison of income elasticities derived from long-run and short-run show substantial differences in the sizes of elasticities of demand. For the long-run, income elasticities show considerable differences, ranging from 0.918 (shopping) to 1.039 (recreation, culture and sporting activities). Income elasticities for accommodation (1.001), food and drinks (1.038) and other (1.039) are greater than unity, indicating that a rise in tourists' expenditure could result in a rise in the demand for these goods and services. While income elasticities for transportation (0.991), shopping (0.918) recreation, culture and sporting activities (0.977) are below unity which indicate that an increase in the income of domestic tourists will result in increase in the demand for these products, but at lower proportions.

For the short-run, income elasticities show variations, and range from 0.897 to 1.061. Recreation, culture and sporting activities, shopping and other services and transportation are above unity and hence they are normal luxury goods. This suggests that if the domestic tourists' income allocated to tourism trips in Ghana rises by a certain proportion, a larger proportion of their income would be spent on these goods and services. However, income/expenditure elasticities for accommodation and food and drinks are below unity, indicating that a rise in tourists' expenditure could result in an increase in the demand for these goods and services in the country, but at a lower proportion.

The expenditure elasticities are all positive, from 0.897 to 1.061, indicating that these tourism goods and services are normal and demand for them is fairly income elastic which is in line with studies by Divisekera, 2007 and Sadeghi (2007). However, the demand for Ghana's goods and services is less sensitive to changes in the total expenditure budget of Ghanaian tourists, taking into account the income levels of Ghanaians and non-Ghanaians resident in the country.

Table 4.14: National estimates of uncompensated own-price and expenditure/ income elasticities of Ghanaian tourism goods and services

	Uncompensated own-price		Expenditure elasticities	
Commodity	Long-run	Short-run	Long-run	Short-run
ACC	-1.038***	-0.957***	1.001***	0.897***
FAD	-1.126***	-1.039***	1.038***	0.945***
TRA	-1.028***	-0.728***	0.991***	1.061***
RCS	-0.917***	-0.978***	0.977***	1.018***
SHO	-1.067***	-0.871***	0.918***	1.026***
OTH	-1.075***	-1.014***	1.039***	1.028***

Source: Author's computation, 2017
Note: *** denotes significance at the 1% respectively

4.2.7 Regional comparison of domestic tourism demand elasticities in Ghana

This section discusses the comparison of own-price, income/expenditure, cross-price elasticities, and consumers' speed-of-adjustments towards long-run equilibrium in the ten regions of Ghana for tourism goods and services purchased by domestic tourists.

4.2.7.1 Regional comparison of own-price elasticities (short-run)

The price elasticity estimates of demands from each region in Ghana by dynamic model are reported in Table 4.15. Also summarised and included in the table are the appropriate national price elasticity estimates for easy comparison with the regions' elasticities. In the short-run, the price elasticity estimates for accommodation from the regions are considerably different from the national estimate of -0.957. The price elasticities range from 0.724 to 1.398 and hence similar in magnitude to the national average. For the short-run, in terms of price elasticity estimates for accommodation, Greater Accra region is the least price elastic (-0.724) in relative terms, followed by Ashanti (-0.788) and Central (-0.831) regions, then Upper West and Volta regions. This implies that a 1% increase in the price of accommodation in the Greater Accra region will result in a decrease in quantity demanded by 0.724%, all things being fixed, and to increase revenue, prices of accommodation in the Greater Accra, Ashanti and Central regions and those regions whose price elasticities are below unity could be increased.

However, the price elasticities for accommodation in the Brong Ahafo, Western and Upper East regions are above unity which indicate that an increase in prices of accommodation in these regions will result in more than proportionate decrease in their quantities demanded, thus results in a decrease in revenue. Domestic tourists to the Brong Ahafo region are comparatively the most responsive to changes in prices of accommodation in Ghana, with a coefficient of -1.398, followed by Upper East region compared with the national average of -0.957.

Similarly, the demands for food and drinks show close similarities across the regional markets, with elasticities of demand for food and drinks being significantly different in size compared to the national average of -1.039. The price elasticities of food and drinks range from 0.590 to 1.764. With respect to food and drinks, the elasticity of demand in the Volta region is the least price elastic in relative terms, followed by Greater Accra, Western and Upper East regions. The results imply that a 1% increase in the price of food and drinks in the Volta region will result in a less than proportionate decrease in quantity demanded by 0.590%, all things being equal, and as a result total tourism revenue will rise. To maximize profit, prices of food and drinks in the Volta region together with the regions whose price elasticities are below unity could be increased. On other hand, the price elasticities of food and drinks for the remaining six regions are above unity which indicate that an increase in the prices of food and drinks in these regions will cause their quantities demanded to decrease significantly, resulting in decrease in revenue. Tourists to Brong Ahafo region, followed by Upper West, Ashanti and Northern regions are the most sensitive to changes in prices of food and drinks in the country, whose coefficient of elasticity estimates are above unity.

The regional demands for transportation are similar in magnitude to the national estimate of -0.728, with the exception of Volta and Greater Accra regions whose price elasticities are higher than the national average of -0.728. The price elasticities range from 0.465 to 1.051. With regard to transportation elasticities in the country, Upper West region is the least price elastic (-0.465) in relative terms, followed by Upper East and Ashanti regions. This indicates that a 1% increase in the price of transportation in the Upper West region will result in a less than proportionate decrease in the quantity demanded by 0.465%, all things being equal, and to increase tourism revenue, prices of transportation in the Upper West, Upper East and Ashanti, and those regions whose price elasticities are below unity could be increased to increase revenue. However, the price elasticities of transportation in the remaining two regions are above unity, and indicate that an increase in prices of transportation in these regions will result in more than proportionate decrease in their quantities demanded, thus resulting in a decrease in revenue. Domestic tourists to the Volta region are the most sensitive to prices in transportation, followed by Greater Accra region, with elasticity coefficients of -1.051 and -1.035, respectively, which are higher than the national average of -0.728.

Regional demands for recreation, culture and sporting activities are not different. The own-price elasticities for recreation, culture and sporting activities are largely similar in magnitude across the regional markets, which range from 0.650 to 1.593. Tourists to the Volta and Upper West regions are comparatively the most responsive to changes in the prices of recreation, culture and sporting activities, with elasticity coefficients of -1.593 and -1.225 respectively, as compared with the national estimate of -0.978. For short-run elasticities for recreation, culture and sporting activities, in relative terms, Western region is the least price elastic, followed by Ashanti and Central regions. The results show that a 1% increase in the price of recreation, culture and sporting activities in the Western region could result in a decrease in quantity demanded by 0.650%, all things being equal, and to increase revenue, prices of recreation, culture and sporting activities in the Western region could be increased alongside with Ashanti and Central regions. In contrast, the price elasticities for recreation, culture and sporting activities for the five remaining regions whose price elasticities are above unity indicate that an increase in prices of these goods and services will decrease in the quantities demanded, resulting in a decrease in revenue. Tourists to the Volta region are the most sensitive to prices of recreation, culture and sporting activities, whose elasticity estimate is higher than the national average.

The price elasticities of demand for shopping in the short-run from the ten regions vary in magnitude, ranging from 0.454 (Upper East region) to 1.216 (Ashanti region). Domestic tourists to Ashanti region are the most sensitive to price changes in shopping, with elasticity coefficient of -1.216, compared with the national estimate of -0.871. Regarding elasticities for shopping, Upper West region is the least price elastic (-0.454) in relative terms, followed by Greater Accra, Brong Ahafo and Volta regions. This means that a 1% increase in the price of shopping in the Upper West region will result in a decrease in the quantity demanded by 0.454%, all things being equal, and to maximize revenue, prices of shopping in the Upper West region could be increased together with Greater Accra, Brong Ahafo and Volta regions. But as observed from Table 4.15, the price elasticities of shopping in the remaining four regions are above unity which means that an increase in prices of shopping in these regions will result in more than proportionate decrease in their quantities demanded, thus resulting in a decrease in revenue.

Similarly, Upper East region tourists are relatively the most sensitive to the price of other services, with a coefficient of -1.554, followed by tourists to Central region, with a coefficient of -1.518, compared with the national estimate of -1.014. With regard to demand for other services, Brong Ahafo region is the least price elastic (-0.108), in relative terms, followed by Volta and Upper East regions. This implies that a 1% increase in the price of other services in the Brong Ahafo region will result in a decrease in the quantity demanded by 0.108%, all things being equal, and to increase revenue, prices of other services in the Brong Ahafo region could be increased together with Volta and Upper East regions. But as shown in Table 4.15, the price elasticities of the other services in the remaining seven regions are above unity which means that an increase in the price of other services in these regions will result in more than proportionate decrease in their quantities demanded, thus resulting in a decrease in revenue.

It is evident from Table 4.15 that significant differences exist in price elasticities of all tourism goods and services consumed by tourists by region. The general inference stemming from the comparisons made is that, in totality, demands for different tourism products consumed by domestic tourists in Ghana exhibit inelastic price elasticity in the short-run.

Table 4.15: Regional comparison of uncompensated own-price elasticities of demand of domestic tourists (dynamic model)

Region	ACC	FAD	TRA	RCS	SHO	OTH
Western	-1.090***	-0.741***	-0.758***	-0.650***	-1.227***	-1.053***
Central	-0.831***	-1.004***	-0.688***	-0.978***	-1.185***	-1.518***
Greater Accra	-0.724***	-0.736***	-1.035***	-1.254***	-0.553***	-1.066***
Volta	-0.939***	-0.590***	-1.051***	-1.593***	-0.734***	-0.531***
Eastern	-0.973**	-1.058***	-0.718***	-0.995***	-1.052***	-1.148***
Ashanti	-0.788***	-1.140***	-0.553***	-0.959***	-1.216***	-1.151***
Brong Ahafo	-1.398***	-1.764***	-0.859***	-1.221***	-0.682***	-0.108***
Northern	-0.967***	-1.098***	-0.712***	-1.224***	-0.921***	-1.342***
Upper East	-1.009***	-0.926***	-0.540***	-1.042***	-0.815***	-0.684*
Upper West	-0.903***	-1.416***	-0.465***	-1.225***	-0.454***	-1.554***
National	-0.957***	-1.039***	-0.728***	-0.978***	-0.871***	-1.014***

Source: Author's computation, 2017
Notes: ***, ** and * indicate 1%, 5% and 10% significant levels respectively.

4.2.7.2 Regional comparison of income/expenditure elasticities (short-run)

Table 4.16 presents the regional comparison of income/expenditure elasticities obtained from the dynamic model estimates for the regional destinations. Summarised in Table 4.16 are the relevant national income/expenditure elasticity estimates to facilitate comparison. These summarise the key elasticity parameters of income derived from the regional dynamic model. The income elasticities demonstrate some differences in the pattern of consumption and preferences for Ghana's tourism products amongst the regions.

Nationally, as we compare tourism goods and services groups in Table 4.16, recreation, culture and sporting activities, shopping, other services and transport behave as luxury products, with their expenditure elasticities larger than one, that is 1.018, 1.026, 1.028 and 1.061 respectively, while accommodation and food and drinks which are necessities have their elasticities less than one, that is 0.897 and 0.945, respectively. The results show that transportation, recreation, culture and sporting activities, shopping and other services are relatively luxury goods and services. The implication is that if the domestic tourists' income allocated to tourism trips in Ghana rises by a certain proportion, a larger proportion of their income would be spent on these commodities. On the other hand, accommodation and food and drinks are necessities, and thus, a smaller proportion of their income would be expended if the allocated income to tourism trips rose by a certain proportion.

The short-run income elasticity estimates of accommodation by domestic tourists from different regions of Ghana exhibit differences, ranging from 0.661 (Upper East region) to 1.107 (Brong Ahafo region). However, income elasticity of demand for accommodation is around unity across the regions. Tourists' demands from these ten regions exhibit relatively income inelastic for accommodation. Domestic tourists' demands for accommodation in the Brong Ahafo region (1.107) are the most income elastic, followed by tourists demand from Eastern, Greater Accra, and Western regions, while the demand by tourists from the Upper East region is the least income elastic for accommodation (0.661). Four (Brong Ahafo, Eastern, Greater Accra, and Western) regions' income elasticities of demand for accommodation are larger than the national estimate of 0.897, five regions' income elasticities are smaller than the national average while Upper West's income elasticity for accommodation is the same as the national average. Tourists to Brong Ahafo region have very high preferences for accommodation. The results show that the demand for accommodation in the country is fairly income inelastic and hence a normal necessity good as said before, implying that an increase in the income of domestic tourists would result in an increase in the demand for accommodation, but at a smaller proportion. For instance, in contrary, an income elasticity of demand of 1.107 means that a 10% increase in incomes of domestic tourists to the Brong Ahafo region would lead to a 11.07% increase in the demand for accommodation in the region, at a higher proportion.

Elasticity of demand for food and drinks exhibits considerable differences across the regions and are closer to the national estimate of 0.945; their income elasticities range from 0.700 (Greater Accra region) to 1.014 (Northern region). Tourists' demands from these ten regions exhibit relatively income elastic for food and drinks. The most income elastic region is Central, followed by Brong Ahafo and Northern regions. Domestic tourist's demand from the Greater Accra region reveals relatively the least income elastic, followed by tourist's demand from Eastern and Volta regions. The analysis shows that the demand for food and drinks in the country is relatively income elastic and hence a normal luxury good, implying that an increase in the income of domestic tourists would result in an increase in the demand for food and drinks in the country. For example, an income elasticity of demand for food and drinks in the Central region of 1.098 means that a 10% increase in incomes of tourists would result in a 10.98% rise in the demand for food and drinks in the Central region. Domestic tourists to Central and Brong Ahafo regions have relatively higher preferences for food and drinks, with income elasticity coefficients of 1.098 and 1.070, respectively.

The demand elasticities of transportation by tourists from the regions of the country show considerable variations among regions and are closer to the national average of 1.061, and their income elasticities range from 0.773 (Upper East region) to 1.117 (Ashanti region). Tourists' demands from these ten regions show relatively income elastic for transportation. The most income elastic region is Ashanti, followed by Upper West, Eastern and Brong Ahafo regions. Domestic tourist's demand from the Northern region reveals relatively the least income elastic (0.773), followed by tourists' demand from Upper East and Greater Accra regions. From the dynamic AIDS model results, the demand for transportation in the country is fairly income elastic, which means that a rise in the income of domestic tourists would result in an increase in the demand for transportation in the country, at a higher proportion. For example, an income elasticity of demand for transportation of 1.117 means that a 10% increase in incomes of tourists would lead to an 11.17 increase in the demand for transportation in the Ashanti region.

Elasticities for recreation, culture and sporting activities demonstrate similar differences across the regional markets, ranging from 0.903 (Brong Ahafo region) to 1.217 (Eastern region), and three regions' (Western, Upper East and Eastern regions) elasticity estimates are larger than the national estimate, while the remaining regions' estimates are below the national average of 1.018. Tourists' demand from these ten regions shows relatively income elastic for recreation, culture and sporting activities. The results suggest that tourists from the Eastern region have high preferences for recreation, culture and sporting activities, exhibiting the highest income elasticity of 1.217, followed by Upper East region (1.149). However, the least income elastic region is Brong Ahafo. According to the results, tourists demand from Western, Upper East and Eastern regions reveal relatively income elastic demand.

The income elasticities of demand for shopping also show some differences across the regional markets, and they range from 0.902 (Eastern region) to 1.283 (Upper East region), and four regions' elasticities are above the national estimate of 1.026 and six are below. This reveals that tourists to the Upper East region have high preferences for shopping, and the most income elastic region is Upper East region, indicating that tourists to Upper East, Northern and Volta regions perceive shopping as a luxury, while tourists to the Eastern region and the remaining regions whose elasticities are below unity perceive shopping as a necessity, with their elasticity coefficients ranging from 0.902 to 0.971.

Finally, the preferences for other services are exhibited from the estimated elasticities and demonstrate considerable variations across the regional markets, and range from 0.816 (Brong Ahafo region) to 1.251 (Upper East region). Six regions' elasticities are above the national estimate of 1.028 and four are below the national average (1.028). Demands for other services by tourists from Upper East region are the most income elastic (1.251), and the least income elastic is observed in the Brong Ahafo region, with a coefficient of 0.816. This means that a 10% increase or decrease in the tourism budgets in Ghana would lead to 12.51% and 8.16% increase or decrease in their expenditure on other services in Upper East and Brong Ahafo regions, respectively. This shows that domestic tourists to the Upper East region have preferences for other services than the remaining regions. Generally, the demand for other services in the country is income/expenditure elastic and a normal luxury service.

Table 4.16: Regional comparison of uncompensated income/expenditure elasticities of demand of domestic tourists (dynamic model)

Region	ACC	FAD	TRA	RCS	SHO	OTH
Western	0.953***	0.999***	0.966***	1.141***	0.967***	0.955***
Central	0.882***	1.098***	0.934***	0.985***	1.014***	1.091***
Greater Accra	1.018***	0.700***	0.889***	1.078***	0.958***	1.139***
Volta	0.843***	0.921***	1.014***	0.926***	1.081***	1.216***
Eastern	1.059***	0.863***	1.033***	1.217***	0.902***	0.904***
Ashanti	0.821***	0.940***	1.117***	0.904***	0.935***	1.012***
Brong Ahafo	1.107***	1.070***	1.013***	0.903***	1.079***	0.816***
Northern	0.760***	1.014***	0.773***	0.954***	1.155***	1.042***
Upper East	0.661***	0.976***	0.818***	1.149***	1.283***	1.251***
Upper West	0.897***	0.933***	1.112***	0.961***	0.971***	1.134***
National	0.897***	0.945***	1.061***	1.018***	1.026***	1.028***

Source: Author's computation, 2017
Note: *** indicates 1% significant level.

4.2.7.3 Regional comparison of cross-price elasticities (short-run)

The cross-price elasticity estimates of demand measure how the quantity demanded of one good or service changes as the price of another good or service changes. There is substitution relation between a pair of category of goods and services. But the level of the substitution effect varies between each pair of the tourism goods and services category. This section examines the cross-price elasticities of the ten regions in Ghana. The report of the research findings are focused more on compensated price elasticities because they reflect the effects of price changes better than uncompensated price elasticities. To provide demanding findings, the focus is only on statistically significant results.

In the Western region, for the uncompensated cross-price elasticities, there is only one substitute and four complements of the tourism products purchased by domestic tourists. The substitute is accommodation versus recreation, culture and sporting activities. The complements are accommodation versus transportation/shopping; transportation versus shopping; and, recreation, culture and sporting activities versus other services. For compensated cross-price elasticities, for example, in the short-run, the demand for accommodation among domestic tourists in the Western region is more responsive to price changes in transportation than is their demand for transportation in response to price changes in accommodation, related with cross-price elasticities of 0.276 and 0.004, respectively. This indicates that if the average transport fare increases by 10%, then Western region domestic tourists are likely to spend 2.76% more on accommodation. But if the average price of accommodation increases by 10%, the domestic tourists will spend only 0.04% on transportation are reported in Appendix C, Table C4.

For the Central region tourism goods and services demand, substitute commodities are accommodation versus recreation, culture and sporting activities and shopping. The complementary tourism products are accommodation versus transportation and recreation, culture and sporting activities versus shopping. For compensated cross-price elasticities, for example, in the short-run, the demand for accommodation among domestic tourists in the Central region is more responsive to price changes in transportation than is their demand for transportation in response to price changes in accommodation, with their cross-price elasticities 0.143 and 0.023, respectively. This means that if the average transport fare increases by 10%, Central region domestic tourists are expected to spend 1.43% more on accommodation. But if the average price of accommodation increases by 10%, the domestic tourists will spend only 0.23% on transportation are reported in Appendix D, Table D4.

In the Greater Accra region, with regards to demand for tourism goods and services, for the uncompensated cross-price elasticities, the substitute is accommodation versus food and drinks while the complements are accommodation versus transportation/shopping and food and drinks versus recreation, culture and sporting activities. This means that these commodities are demanded together. However, for the substitute, the level of substitution effect varies between each pair of tourism goods and services category. For the compensated cross-price elasticities, for instance, in the short-run, the demand for accommodation among domestic tourists in the Greater Accra region is much more responsive to price changes in transportation than is their demand for transportation in response to price changes in accommodation, with related cross-price elasticities of 0.186 and 0.083, respectively. This means that if the average transport fare rises by 10%, then in the Greater Accra region, domestic tourists are likely to expend 1.86% more on accommodation. But if the average price of accommodation rises by 10%, the domestic tourists will spend only 0.83% on transportation are reported in Appendix E, Table E4.

In the Volta region, with respect to uncompensated cross-price elasticities, the substitute tourism goods and services are transportation versus shopping while the complementary products are accommodation versus transportation/ shopping, and recreation, culture and sporting activities versus shopping. However, the level of substitution effect varies between each pair of tourism goods and services category. For compensated cross-price elasticities, for example, in the short-run, the demand for accommodation among domestic tourists in the Volta region is much more sensitive to price changes in transportation than is their demand for transportation in response to price changes in accommodation, with related cross-price elasticities of 0.231 and 0.037, respectively. This indicates that if the average transportation price rises by 10%, then Volta region domestic tourists are expected to spend 2.31% more on accommodation. However, if the average price of accommodation increases by 10%, the domestic tourists will spend only 0.37% on transportation are reported in Appendix F, Table F4.

With respect to tourism demand in the Eastern region, for uncompensated cross-price elasticities, the substitute tourism goods and services are: accommodation versus shopping. The complements are accommodation versus food and drinks/transportation, and shopping versus other services. However, the level of substitution effect varies between a pair of tourism goods and services category. For compensated cross-price elasticities, for example, in the short-run, the demand for accommodation among domestic tourists in the Eastern region is more responsive to price changes in transportation than is their demand for transportation in response to price changes in accommodation, with their cross-price elasticities 0.299 and 0.011, respectively. This shows that should the average price of transportation increase by 10%, then Eastern region domestic tourists are expected to spend

2.99% more on accommodation. But if the average price of accommodation rises by 10%, the domestic tourists will spend just 0.11% on transportation are reported in Appendix H, Table H4.

Regarding tourism demand in the Ashanti region, the substitute tourism products are: accommodation versus shopping and recreation, culture and sporting activities versus other services. The complements are: accommodation versus transport/recreation, culture and sporting activities; transportation versus recreation, culture and sporting activities/shopping and recreation, culture and sporting activities versus shopping. Here too, the level of substitution effect varies between each pair of the tourism goods and services category. For compensated cross-price elasticities, for example, in the short-run, the demand for accommodation amongst domestic tourists in the Ashanti region is more sensitive to price changes in transportation than is their demand for transportation in response to price changes in accommodation, having cross-price elasticities 0.124 and 0.021, respectively. This indicates that if the average transport fare increases by 10%, then Ashanti region domestic tourists are likely to spend 1.24% more on accommodation. But if the average price of accommodation increases by 10%, the domestic tourists in Ashanti region will expend only 0.21% on transportation are reported in Appendix K, Table K4.

For Brong Ahafo region, with regard to tourism demand, substitute tourism goods and services are food and drinks versus recreation, culture and sporting activities. The complements are: accommodation versus transport/recreation, culture and sporting activities; transport versus other services; and shopping versus other services. For compensated cross-price elasticities, for example, in the short-run, the demand for accommodation among domestic tourists in the Brong Ahafo region is much more responsive to price changes in transportation than is their demand for transportation in response to price changes in accommodation, with related cross-price elasticities of 1.105 and 0.497, respectively. This indicates that should the average transport fare rise by 10%, then Brong Ahafo region domestic tourists are expected to spend 11.05% more on accommodation. However, if the average price of accommodation rises by 10%, the domestic tourists in Brong Ahafo will spend 4.97% on transportation. These figures show the highest among the ten regional markets and are reported in Appendix M, Table M4.

With regards to Northern region, the complementary commodities are: accommodation versus transport/recreation, culture and sporting activities and shopping versus other services, while the substitutes are transportation versus shopping; and recreation, culture and sporting activities versus others. For the compensated cross-price elasticities, for example, in the short-run, the demand for accommodation amongst domestic tourists in the Northern region is much more sensitive to price changes in transportation than is their demand for transportation in response to price changes in accommodation, with related cross-price elasticities of 0.288 and 0.049, respectively. This means that should the average transport fare increase by 10%, then Northern region domestic tourists are expected to spend 2.88% more on accommodation. All the same, if the average price of accommodation rises by 10%, the domestic tourists will spend only 0.49% on transportation are reported in Appendix N, Table N4.

For Upper East region, with respect to uncompensated cross-price elasticities, the substitute commodities are accommodation versus food and drinks.

The complementary commodities are accommodation versus transportation and recreation, culture and sporting activities versus shopping. Regarding compensated cross-price elasticities, for example, in the short-run, the demand for accommodation among domestic tourists in the Upper East region is more responsive to price changes in transportation than is their demand for transportation in response to price changes in accommodation, with their cross-price elasticities 0.120 and 0.058, respectively. This indicates that should the average transport fare rise by 10%, then Upper East region domestic tourists are likely to spend 1.20% more on accommodation. However if the average price of accommodation rises by 10%, the domestic tourists will spend only 0.58% on transportation are reported in Appendix P, Table P4.

In Upper West region, with respect to domestic tourism demand, the complementary tourism goods and services are accommodation versus transportation/shopping, transportation versus shopping and recreation, culture and sporting activities versus other services. The substitute commodities are accommodation versus recreation, culture and sporting activities. For compensated cross-price elasticities, for example, in the short-run, the demand for accommodation among domestic tourists in the Upper West region is much more sensitive to price changes in transportation than is their demand for transportation in response to price changes in accommodation, with their cross-price elasticities 0.193 and 0.009, respectively. This indicates that should the average transport fare increase by 10%, then Upper West region domestic tourists are likely to spend 1.93% more on accommodation. But if the average price of accommodation increases by 10%, the domestic tourists will spend only 0.09% on transportation are reported in Appendix Q, Table Q4.

From the analysis above, it can be observed that in all cases the demand for accommodation among domestic tourists is more responsive to price changes in transportation among domestic tourists than the demand for transportation in response to price changes in accommodation across the country, in terms of compensated cross-price elasticities.

4.2.7.4 Regional comparison of tourists' speed-of-adjustment towards long-run equilibrium of tourism products consumed in Ghana (short-run)

Table R15 (Appendix 15) presents national and regional error correction terms obtained from the Error Correction Mechanism for easy comparison of tourism goods and services consumed by Ghanaian tourists in Ghana. The dynamic AIDS model assists us to understand the speed of consumption of tourism products to their long-run equilibrium behaviour at national and regional levels. Generally, both the national and regional tourism goods and services error correction term coefficients indicate that domestic tourists are able to adjust the consumption of tourism products to long-run equilibrium considerably quicker.

Nationally, the shopping error correction term (-1.116) indicates that domestic tourists in Ghana are able to adjust the consumption of shopping to long-run equilibrium considerably quicker than the remaining tourism products. This is followed by transportation (-1.104), recreation, culture and sporting activities (-1.047), other services (-1.018), accommodation (-1.002) and food and drinks

(-0.945). This indicates that domestic tourists in Ghana are able to adjust the consumption of tourism products to long-run equilibrium considerably faster, and any increase in prices of these tourism products will result in tourists adjusting their behaviour to decrease their consumption and thus reduce revenue to marketers, suppliers and government.

On the regional level, in the Western region, the accommodation error correction term (-1.372) indicates that tourists to this region are able to adjust the consumption of accommodation to long-run equilibrium considerably quicker than the remaining regions. This is followed by tourists to Central and Ashanti regions. However, accommodation error correction term of -0.719 in the Greater Accra region indicates that tourists are able to adjust accommodation consumption to long-run equilibrium a bit slower than the remaining regions.

For regional food and drinks demand, the error correction terms show that domestic tourists to Ashanti (-1.182) and Greater Accra (-1.168) regions are able to adjust food and drinks consumption to long-run equilibrium faster than tourists to the other regions. However, tourists to the Volta region are able to adjust food and drinks consumption to long-run equilibrium considerably slower than the remaining regions.

Regarding regional transportation error correction terms, it is evident that domestic tourists to Eastern and Western regions are able to adjust transport consumption to long-run equilibrium faster than tourists to the remaining regions. These are followed by tourists to Northern and Upper West regions.

In terms of recreation, culture and sporting activities error correction terms, the analysis shows that domestic tourists to Upper East, Greater Accra and

Brong Ahafo regions are able to adjust the consumption of recreation, culture and sporting activities to long-run equilibrium faster than tourists to the remaining regions.

For regional shopping error correction terms, tourists to Volta (-1.241), Brong Ahafo (-1.126), and Upper West (-1.112) regions are able to adjust the consumption of shopping to long-run equilibrium quicker than tourists to the remaining regions. However, tourists to the Northern region are able to adjust the consumption of shopping to long-run equilibrium considerably slower (-0.849).

With regards to regional other services error correction terms, tourists to Upper West, Greater Accra and Upper East regions are able to adjust other services consumption to long-run equilibrium faster than tourists to the remaining regions are reported in Appendix R, Table R15.

In terms of consumption of tourism products in the regions, the analysis shows that, in the Western region, accommodation error correction term coefficient (-1.372) indicates that domestic tourists in the region are able to adjust consumption of accommodation to long-run equilibrium considerably quicker than the remaining tourism products. This is followed by transportation. In the Greater Accra region, recreation, culture and sporting activities error correction term (-1.207) shows that domestic tourists in the region are able to adjust their consumption to long-run equilibrium considerably quicker than the remaining tourism products, followed by other services then food and drinks. Tourists to the Ashanti region are able to adjust the consumption of accommodation (-1.183) to long-run equilibrium considerably faster than the rest of the products, while tourists to the Upper East and West regions are able to adjust the consumption of other services (- 1.139 and -1.247) respectively, to long-run equilibrium considerably faster than the rest of the tourism products are reported in Appendix R, Table R15 (Motallebi and Pendell, 2013).

4.3 Analysis of Socio-Demographic Factors Affecting Domestic Tourism Expenditure in Ghana

Domestic visitors are heterogeneous and hence heterogeneous quantile regression models were used for the analysis for same-day visitors, overnight tourists and domestic visitors. According to pseudoR^2 indices, validation of the models with the best fits are the10th quantiles, followed by the 25th quantiles and the 75th quantiles, respectively of Tables 417, 418 and 419 (Appendix R, Table R17).

To test for the efficiency or validity of the quantile regression model, bootstrap estimates and standard errors were run to compare with the quantile regression model estimates and standard errors. The estimates of both models were the same and hence the phenomenon under study was complete (Appendix T, Tables T1 & T2; T3 & T4 and T5 & T6).

4.3.1 Empirical results for domestic same-day visitor travel expenditure

Table 4.17 reports on the empirical results for same-day visitor travel expenditure in Ghana. The quantile regression results reveal some interesting facts. At 5th, 10th and 25th quantiles, a 1-year increase in age variable will increase domestic same-day expenditure by 0.053, 0.239 and 0.214, respectively. At 75th, 90th and 95th quantiles, a 1-year increase in age variable will decrease domestic same-day expenditure by 0.096, 0.298 and 0.162, respectively. At the 50th quantile, the coefficient of the age variable is not statistically different from zero, signalling at that expenditure, age is not really a relevant explanatory variable.

For post graduate holders, at 75th, 90th and 95th quantiles are significantly positive, demonstrating that a 1 level increase in variable will result in an increase in domestic tourism expenditure by 0.206, 0.181 and 0.290, respectively. This shows that education has positive effects on travel consumption for heavy same-day visitors.

At 75th, 90th and 95th quantiles, for the income variable, as it is characterised as elasticity, as both the dependent and independent variables are measured in natural logarithm, an increase in income by 1% results in an increase in domestic same-day tourism expenditure by 0.017%, 0.087% and 0.0175%, respectively. This suggests that domestic same-day travel is a normal good, and thus a rise in the income of same-day visitors will result in rise in same-day domestic tourism expenditure in Ghana.

With regard to household loan expense effect, at 5th, 10th and 25th quantiles, a 1 unit increase in the loan variable will result in a rise in domestic tourism expenditure by 0.208, 0.364 and 0.389 respectively. At the 90th and 95th quantiles, a 1 unit increase in the loan variable will result in a decrease in domestic same-day tourism expenditure by 0.410 and 0.233. This demonstrates that domestic same-day visitors with low loan payment spend more on domestic tourism, while other visitors with high loan payment spend less on domestic tourism.

Table 4.17 shows that Internet and mobile phone variables have no relationship with the domestic tourism expenditure, but car usage has positive effect on domestic tourism expenditure for heavy spenders (95^{th} quantile).

Table 4.17: Empirical results for same-day visitor travel expenditure in Ghana

	Quantiles						
Variable	5th	10th	25th	50th	75th	90th	95th
Constant	0.192	0.154	0.638**	1.774**	2.785**	3.213**	3.284**
	(0.137)	(0.101)	(0.051)	(0.020)	(0.051)	(0.178)	(0.203)
Age	0.053**	0.239**	0.214**	0.001	-0.096**	-0.298**	-0.162*
	(0.035)	(0.028)	(0.016)	(0.006)	(0.016)	(0.048)	(0.047)
JHS/MSLC	*-0.522**	*-0.045**	*-0.001*	*0.903***	*0.369*	*-0.202*	*-0.632*
	(1.24)	*(1.083)*	*(0.839)*	*(0.419)*	*(0.899)*	*(1.360)*	*(1.809)*
SHS/'O'/'A'	*-0.103*	*-0.073*	*-0.069***	*-0.021*	*0.013**	*0.038*	*-0.298*
	(0.168)	*(0.147)*	*(0.114)*	*(0.057)*	*(0.122)*	*(0.185)*	*(0.246)*
Dip/Trg A & B	*-0.406*	*0.405***	*-0.115*	*-0.009*	*0.098**	*0.314*	*0.141*
	(0.150)	*(0.131)*	*(0.102)*	*(0.051)*	*(0.109)*	*(0.165)*	*(0.219)*
1st Degree	*0.452*	*0.394***	*-0.227*	*-0.009*	*0.284**	*0.360***	*0.125*
	(0.163)	*(0.143)*	*(0.110)*	*(0.055)*	*(0.118)*	*(0.179)*	*(0.238)*
Post graduate	*0.367*	*0.039*	*0.026***	*0.018*	*0.206***	*0.181***	*0.290***
	(0.432)	*(0.377)*	*(0.292)*	*(0.146)*	*(0.313)*	*(0.473)*	*(0.630)*
Income	0.032**	0.047**	-0.002	0.006**	0.017**	0.087**	0.088*
	(0.016)	(0.013)	(0.007)	(0.003)	(0.007)	(0.023)	(0.026)
Loan	0.208**	0.364**	0.389***	-0.018	-0.409	-0.410**	-0.233*
	(0.109)	(0.083)	(0.037)	(0.013)	(0.036)	(0.124)	(0.137)
Internet	-0.023	-0.061	-0.018	0.002	0.014	-0.102	-0.071
	(0.086)	(0.065)	(0.031)	(0.011)	(0.030)	(0.099)	(0.109)
Car	-0.077	-0.006	-0.007	0.008	0.023	0.031	0.188*
	(0.086)	(0.064)	(0.031)	(0.011)	(0.030)	(0.099)	(0.110)
M phone	0.028	-0.042	-0.004	0.01	0.02	-0.012	-0.051
	(0.087)	(0.066)	(0.031)	(0.001)	(0.030)	(0.099)	(0.111)

Source: Author's computation, 2017
*Notes: ***, ** and * are 1%, 5% and 10% are significant levels, and values in parenthesis are standard errors*
(JHS = Junior High School; SHS = Senior High School; 'O' & 'A' = Ordinary & Advance Levels; Dip = Diploma and Trg A & B = Teacher Training Certificate A & B)

4.3.2 Empirical results for domestic tourists' travel expenditure

Table 4.18 discusses the empirical results for domestic tourists' travel expenditure determinants in Ghana.. At 5th, 10th and 25th quantiles, a 1-year increase in age variable will increase domestic tourist expenditure by 0.079, 0.173 and 0.033, respectively. At 75th, 90th and 95th quantiles, a 1-year increase in age variable will decrease domestic tourist expenditure by 0.044, 0.053 and 0.031, respectively.

For post graduate degree holders, at 25th, 75th, 90th and 95th quantiles, a 1 level increase in variable will increase domestic tourist expenditure by 0.027, 0.196, 0.375 and 0.102, respectively. This shows that education has positive effects on travel consumption for light, medium and heavy domestic tourists.

Table 4.18: Empirical results for domestic tourists' travel expenditure in Ghana

	Quantiles						
Variable	5th	10th	25th	50th	75th	90th	95th
Constant	-0.225	0.096	1.099**	2.119**	2.916**	3.783**	4.130**
	(0.104)	(0.089)	(0.079)	(0.036)	(0.096)	(0.138)	(0.191)
Age	0.079**	0.173**	0.033**	-0.004	-0.044**	-0.053**	-0.031
	(0.030)	(0.026)	(0.023)	(0.011)	(0.028)	(0.040)	(0.056)
JHS/MSLC	*-0.522*	*-0.045**	*-0.001*	*0.903***	*0.369*	*-0.202*	*-0.632*
	(0.744)	*(0.983)*	*(0.362)*	*(0.473)*	*(0.840)*	*(1.366)*	*(0.877)*
SHS/'O'/'A'	*-0.041*	*-0.062**	*-0.001*	*-0.008*	*0.059**	*0.188*	*-0.059*
	(0.168)	*(0.147)*	*(0.114)*	*(0.057)*	*(0.122)*	*(0.185)*	*(0.246)*
Dip/Trg A & B	*-0.419*	*0.311*	*-0.077*	*-0.004*	*0.511***	*0.463*	*0.164*
	(0.135)	*(0.179)*	*(0.066)*	*(0.086)*	*(0.153)*	*(0.249)*	*(0.160)*
1st Degree	*-0.288*	*0.177*	*0.043***	*0.006**	*0.334**	*0.302**	*0.120*
	(0.175)	*(0.232)*	*(0.085)*	*(0.111)*	*(0.198)*	*(0.322)*	*(0.207)*
Post graduate	*-0.036*	*0.078*	*0.027**	*0.018*	*0.196***	*0.375**	*0.102***
	(0.137)	*(0.145)*	*(0.164)*	*(0.114)*	*(0.280)*	*(0.218)*	*(0.197)*
Income	0.133**	0.052**	0.007**	0.013**	0.210**	0.132**	0.104*
	(0.013)	(0.011)	(0.010)	(0.005)	(0.012)	(0.017)	(0.024)
Loan	0.499**	0.640**	0.566***	-0.317**	-0.219	-0.028**	-0.225*
	(0.070)	(0.060)	(0.054)	(0.025)	(0.065)	(0.093)	(0.129)
Internet	0.068	0.042	-0.007	-0.017*	0.02	0.164	-0.065*
	(0.059)	(0.051)	(0.046)	(0.021)	(0.055)	(0.079)	(0.109)
Car	-0.081	-0.102	-0.01	-0.011	-0.049	-0.059	-0.027*
	(0.059)	(0.051)	(0.046)	(0.021)	(0.055)	(0.079)	(0.109)
M phone	-0.046	-0.062	-0.016	-0.016*	-0.160**	-0.267**	-0.215*
	(0.059)	(0.051)	(0.046)	(0.021)	(0.055)	(0.079)	(0.110)

Source: Author's computation, 2017

*Notes: ***, ** and * are 1%, 5% and 10% are significant levels, and values in parenthesis are standard errors.*

(JHS = Junior High School; SHS = Senior High School; 'O' & 'A' = Ordinary & Advance Levels; Dip = Diploma and Trg A & B = Teacher Training Certificate A & B)

The household income coefficients on domestic tourism expenditure for different quantiles are positive from the lower (0.05th) to the upper quantiles, showing that income level significantly influences domestic visitor travel expenditures. At 5th, 75th, 90th and 95th quantiles, for the income variable, as it is characterised as elasticity, as both the dependent and independent variables are measured in natural logarithm, an increase in income by 1% results in an increase in expenditure by 0.133%, 0.210%, 0.132% and 0.104%, respectively. The results are in line with the previous studies (Hung, Shang and Wang, 2011) which confirm that domestic tourism is a normal good. It follows also the studies by Marrocu *et al*., (2015), which explains that tourist expenditure is income driven.

With respect to household loan, at 5th, 10th and 25th quantiles, a 1 unit increase in loan variable will result in a rise in domestic tourism expenditure by 0.499, 0.640 and 0.566 respectively. However, at the 50th, 90th and 95th quantiles, a unit increase in the loan variable will result in a decrease in domestic tourism expenditure by 0.317, 0.028 and 0.0.225 respectively..

This indicates that domestic tourists with high loan payments spend less on tourism expenditure. This is in contrast with a study by (Hung, Shang and Wang, 2012) in Taiwan, where home loans are one of the major constraints of tourism spending for light spenders.

The study indicates that access to Internet relates tourism expenditure negatively at *q*50 and *q*95 respectively. This implies that usage of Internet is not an information source for heavy spenders for travel decisions and planning. Ownership of a car was estimated to be negatively related to domestic expenditures at the highest quantile (q95), suggesting that the use of a car is not transport accessibility for domestic tourist spenders. Mobile phone usage is not an information source for medium and heavy spenders.

4.3.3 Empirical results for domestic visitors' travel expenditure

Table 4.19 discusses the empirical results for domestic visitors' (domestic same-day and overnight visitors) travel expenditure determinants in Ghana.

At 5th, 10th and 25th quantiles, a 1-year increase in age variable will increase domestic visitors' expenditure by 0.141, 0.218 and 0.119, respectively. At 75th quantiles, a 1-year increase in age variable will decrease domestic visitors' expenditure by 0.091 in Ghana.

For post graduate holders, at 75th, 90th and 95th quantiles are positively significant, demonstrating that an increase in 1- level of the variable will increase domestic tourism expenditure by 0.209, 0.176 and 0.099, respectively. This shows that education has positive effects on travel consumption for heavy domestic visitors.

Table 4.19: Empirical results for domestic visitors' travel expenditure in Ghana

	Quantiles						
Variable	5th	10th	25th	50th	75th	90th	95th
Constant	0.020	0.135	0.784**	1.850**	2.718**	3.218**	3.530**
	(0.087)	(0.094)	(0.059)	(0.027)	(0.086)	(0.158)	(0.121)
Age	0.141**	0.218**	0.119**	-0.001	-0.091**	0.056	-0.071
	(0.024)	(0.026)	(0.016)	(0.007)	(0.023)	(0.043)	(0.033)
JHS/MSLC	*-0.356**	*-0.047**	*-0.005*	*0.777***	*0.365*	*-0.401*	*-0.632*
	(0.124)	*(0.183)*	*(0.139)*	*(0.129)*	*(0.159)*	*(0.160)*	*(0.188)*
SHS/'O'/'A'	*-0.081*	*-0.076**	*-0.054**	*0.031**	*0.013**	*0.046*	*-0.297*
	(0.154)	*(0.148)*	*(0.084)*	*(0.067)*	*(0.112)*	*(0.185)*	*(0.188)*
Dip/Trg A & B	*-0.325*	*0.304***	*-0.215*	*-0.005*	*0.107**	*0.314*	*0.147*
	(0.151)	*(0.121)*	*(0.102)*	*(0.061)*	*(0.099)*	*(0.135)*	*(0.180)*
1st Degree	*-0.512**	*-0.268***	*-0.225*	*-0.007*	*0.282**	*0.360***	*0.125*
	(0.143)	*(0.122)*	*(0.100)*	*(0.065)*	*(0.108)*	*(0.158)*	*(0.170)*
Post graduate	*0.367*	*0.04*	*-0.027***	*0.018*	*0.209***	*0.176***	*0.274***
	(0.132)	*(0.177)*	*(0.185)*	*(0.136)*	*(0.217)*	*(0.136)*	*(0.111)*
Income	0.100**	0.066**	0.001*	0.006**	0.118**	0.144**	0.099**
	(0.010)	(0.011)	(0.007)	(0.003)	(0.010)	(0.018)	(0.O14)
Loan	0.323**	0.466**	0.589***	-0.067**	-0.822	-0.517**	-0.239
	(0.057)	(0.062)	(0.039)	(0.018)	(0.058)	(0.104)	(0.08)
Internet	-0.029	-0.004	-0.004	-0.005	0.012	0.121	-0.080
	(0.048)	(0.052)	(0.033)	(0.015)	(0.048)	(0.088)	(0.067)
Car	-0.115	-0.055	-0.009	0.002	-0.009	-0.065	0.025
	(0.048)	(0.052)	(0.033)	(0.015)	(0.048)	(0.087)	(0.066)
M phone	-0.088	-0.046	-0.001	-0.001	-0.056	-0.121	-0.147
	(0.048)	(0.052)	(0.033)	(0.015)	(0.048)	(0.088)	(0.067)

Source: Author's computation, 2017

*Notes: ***, ** and * are 1%, 5% and 10% are significant levels, and values in parenthesis are standard errors*

(JHS = Junior High School; SHS = Senior High School; 'O' & 'A' = Ordinary & Advance Levels; Dip = Diploma and Trg A & B = Teacher Training Certificate A & B)

At 75^{th}, 90^{th} and 95^{th} quantiles, for the income variable, as it is characterised as elasticity, as both the dependent and independent variables are measured in natural logarithm, an increase in income by 1% results in an increase in expenditure by 0.118%, 0.144% and 0.099%, respectively by domestic visitors. This is in line with the study as the demand for the country's tourism goods and services is income elastic, it follows that an increase in income of domestic visitors would result in an increase in the demand for tourism goods and services.

With respect to household loan, the quantile regression estimated coefficients are positive at the lower quantiles, (0.05), (0.10), and (0.25) suggesting that at these quantiles, a 1 unit increase in the loan variable will increase domestic tourism expenditure by 0.323, 0.466 and 0.589, respectively. This suggests that domestic visitors with low loan payment spend more on domestic tourism. However, at 50^{th} and 75^{th} quantiles, a 1 unit increase in the loan variable will result in a decrease in domestic tourism expenditure by 0.067 and 0.517, respectively. This indicates that domestic tourism expenditure is constrained by household loans for medium and heavy domestic tourism spenders in Ghana, suggesting that domestic visitors with high loan payment spend less on domestic tourism.

There were some important variables which the study thought would affect domestic visitors' consumption expenditure, including access to Internet, ownership of a car and ownership of a mobile phone by households, but they proved otherwise. The results demonstrate that these variables have no relationships with the domestic tourism consumption expenditure distribution. This indicates that access to Internet and ownership of a mobile phone are not information source for travel decisions and planning, while usage of a car for domestic tourism purposes is not popular by domestic visitors in Ghana.

Hence, unlike advanced countries where there is a rise in car ownership, mobile phone and Internet accessibility, and that Internet access is the main information source for travel decisions and planning. In Ghana these devices are not used for information source for travel decisions and planning in terms of domestic tourism, because the country's tourist sites, accommodation establishments, restaurants, transport operations, and others are not visible online.

4.4 Modeling Domestic Tourism Demand When Data Violates the Demand Law

4.4.1 Shapiro–Wilk's test of normality for data

The researcher observed much variability in the data. Hence, there was the need to test for the normality before the analysis was done on the data. The Shapiro–Wilk's test of normality was used to test the normality of the data. Table 4.20 shows that the *p*-values of the data on all the variables are less than 0.05 level of significance, hence, the data are not normally distributed.

Table 4.20: Shapiro-Wilk's test for normality

Shapiro-Wilk's Normality Test				
Variable	W	V	z	Prob>z
Total expenditure	0.95317	3.834	2.980	0.00144
Price of accommodation	0.96530	2.841	2.315	0.01030
Price of food and drinks	0.88543	9.380	4.963	0.00000
Price of transport	0.86447	11.097	5.336	0.00000
Price of rec, culture & sports	0.96801	2.619	2.135	0.01640
Price of shopping	0.98876	9.110	4.863	0.00000
Price of other services	0.92608	6.052	3.992	0.00003
Share of accommodation	0.96201	3.110	2.516	0.00594
Share of food and drinks	0.94142	4.796	3.476	0.00025
Share of transport	0.94680	4.356	3.262	0.00055
Share of rec. culture & sports	0.94221	4.731	3.446	0.00028
Share of shopping	0.97251	2.251	1.799	0.03601
Share of other	0.95682	3.536	2.800	0.00255

Source: Author's computation, 2017

4.4.2 The proposed revised static LAIDS model

It can be observed from Table 4.21 that where the data are not normally distributed, five of the uncompensated own-price elasticities are positive and only one being negative, while all the six compensated own-price elasticities are positive.

Table 4.21: The uncompensated and compensated own and cross-price elasticities when data are not normally distributed (proposed revised static LAIDS model)

	ACC	FAD	TRA	RCS	SHOP	OTH
Uncompensated own and cross-price elasticities						
ACC	-0.922***	-0.652*	-0.238*	-0.132	-0.146	0.096
FAD	-0.761**	0.283***	0.014*	-0.163	-0.044*	0.038
TRA	0.030*	0.237*	0.739***	0.074	0.156	0.113
RCS	0.341*	0.046	-0.022	0.719***	0.043*	-0.203*
SHO	-0.347**	-0.113	0.136	-0.035*	1.115***	0.298
OTH	0.444	0.296*	0.520	-0.517*	0.413	1.044***
Compensated own and cross-price elasticities						
ACC	0.303**	-0.253	0.030	0.577	0.003*	0.225
FAD	-0.389	0.043**	0.175	0.263	0.046	0.116
TRA	0.070*	0.263**	0.721***	0.120	0.165	0.122
RCS	0.501*	0.149	0.047	0.537**	0.081*	-0.169*
SHO	0.018	0.123*	0.294	0.383*	1.027*	0.374
OTH	0.409	0.274*	0.505	-0.557	0.405	1.052***

Source: Author's computation, 2017
*Notes: ***, ** and * are 1%, 5% and 10% are significant levels, and values in parenthesis are standard errors.*

4.4.3: The proposed revised dynamic LAIDS model

From Table 4.22, six of the uncompensated and the compensated own-price elasticities are positive, and hence, satisfy the positivity restriction, which states that all own-price diagonal elasticities must be positive.

Table 4.22: Uncompensated and compensated own and cross-price elasticities when data are not normally distributed (proposed revised dynamic LAIDS model)

Uncompensated own and cross-price elasticities

	ACC	FAD	TRA	RCS	SHO	OTH
ACC	0.207***	0.104*	-0.758**	-0.038	0.825	-0.784
FAD	0.632*	0.122***	-1.484**	-0.450	1.677**	-1.587
TRA	-0.422*	-0.091**	0.418***	-0.053	-0.449	0.511
RCS	-0.225	-0.125	-0.449	0.164**	-0.287*	-0.131*
SHO	0.298*	0.125*	-0.779	-0.094*	0.219***	-1.241
OTH	-0.123*	-0.051	0.358	-0.012*	-0.543	0.438**

Compensated own and cross-price price elasticities

	ACC	FAD	TRA	RCS	SHO	OTH
ACC	0.038**	0.137	-0.298*	0.083	1.252	0.204
FAD	1.012	0.871***	-0.769**	-0.263	2.341*	-0.051
TRA	-0.159**	-0.055*	0.777***	0.077	0.009	1.574
RCS	0.169**	-0.072	0.292	0.603*	0.401**	1.462**
SHO	0.718	0.182*	0.009	0.112*	0.952***	0.455
OTH	0.108	-0.020**	0.792	0.101	-0.141	0.494***

Source: Author's computation, 2017
*Notes: ***, ** and * are 1%, 5% and 10% are significant levels, and values in parenthesis are standard errors.*

4.4.4: The LAIDS model compared with the proposed revised model

Table 4.23 compares linear almost ideal demand system (LAIDS) model using normal data and proposed revised model using data that are not normally distributed. From Table 4.23, all the six compensated own-price elasticities from normal data are negative, satisfying the negativity restriction. On the other hand, the six compensated own-price elasticities from non-normal data are positive, satisfying the positivity restriction. Positive own-price elasticities show that some tourism goods and services violate the demand law. This indicates that when both positive and negative own price elasticities are combined it provides better results. This makes the restrictions on the parameters of the AIDS model complete to provide a better way of estimating and interpreting results from the AIDS model, which hitherto, was depending only on negativity restriction which meant that all own-price elasticities should be negative but often some turned out to be positive own-price elasticity numbers on the diagonal of the matrix. The positivity restriction has been established to improve the efficiency of the AIDS model to cater for positive own-price elasticities as a complement to the negativity restriction. For the LAIDS model, as observed from Table 4.23, they have the expected theoretical signs which show that all compensated own-price elasticities are negative, that is, all diagonal elements of the elasticity matrix are negative, meaning that the Slutsky matrix is negative semi- definite, showing the reliability of the model. From Table 4.23, and LAIDS model, when the price or rate of accommodation increases by 1%, the demand for accommodation decreases by 0.815%; when the price of food and drinks increases by 1%, the demand for food and drinks decreases by 0.515%, while when the price of other services increases by 1%, the demand for other services decreases by 0.112%.

On the other hand, for the proposed positivity model, as observed from Table 4.23, they have the expected theoretical signs which show that all compensated own-price elasticities are positive, that is, all diagonal elements of the elasticity matrix are positive, meaning that the Slutsky matrix is positive semi-definite, showing the reliability of the model. When the price of accommodation increases by 1%, the demand for accommodation increases by 0.038%; when the price of food and drinks increases by 1%, the demand for food and drinks increases by 0.871%, while when the price of other services increases by 1%, the demand for other services increases by 0.494%. This is the difference between the two models.

Table 4.23 further shows that for the positivity model, accommodation versus transport are complementary goods and services and vice versa; accommodation versus recreation, culture and sporting activities are substitutes and vice versa. Food and drinks versus transport are complementary and vice versa, while food and drinks versus shopping are substitutes and vice versa. Recreation, culture and sporting activities versus accommodation/shopping/other services are substitutes and vice versa, while other services versus food and drinks are complementary.

Table 4.23: Comparing the LAIDS Model with the Proposed Revised Model

		LAIDS Model (Dynamic)				
Compensated	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.815*	0.097	0.212*	-0.097*	-0.014	-0.26
FAD	0.094	-0.515***	0.144***	-0.086	-0.146***	0.209
TRA	0.065*	0.109***	-0.748***	-0.107	0.240	-0.027
RCS	-0.102*	0.093	0.122	-0.792**	0.160*	-0.251*
SHO	-0.010	-0.116***	0.200	0.117*	-0.611***	-0.112
OTH	0.230	0.186	0.027	-0.208*	-0.113	-0.931***
		Proposed Revised Model (Dynamic)				
Compensated						
ACC	0.038**	0.137	-0.298*	0.083*	1.252	0.204
FAD	1.012	0.871***	-0.769**	-0.263	2.341*	-0.051
TRA	-0.159**	-0.055*	0.777***	0.077	0.009	1.574
RCS	0.169**	-0.072	0.292	0.603*	0.401**	1.462**
SHO	0.718	0.182*	0.009	0.112*	0.952***	0.455
OTH	0.108	-0.020**	0.792	0.101	-0.141	0.494***

Source: Author's computation, 2017

*Notes: ***, ** and * are 1%, 5% and 10% are significant levels, and values in parenthesis are standard errors*

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussions

The section discusses Ghana's domestic tourism market, price and expenditure elasticities of national and ten regional markets in Ghana, socio-demographic factors that affect domestic tourism participation and expenditure, as well as positivity restriction of the conventional AIDS model as one of the theoretical restrictions.

5.1.1 Discussions of Ghana's Domestic Tourism Market

Ghana did not have the detailed breakdown of tourism expenditure data for measuring the impacts of the domestic tourism industry in particular, and the tourism sector in general on the economy, and to compare with the other sectors of the economy. Therefore, relevant primary domestic tourism expenditure data was collected for the study from 2012 to 2014, including secondary data from 2015 to 2016/2017 from the Ghana Statistical Service (Ghana Labour Force Survey, 2015 and Ghana Living Standards Survey 7, GLSS 7, 2016/17). To be able to collect relevant domestic tourism expenditure data, the study needed a model or a tool. Hence, the developed tool or model used for domestic tourism expenditure data collection for the study was presented to the Ghana Statistical Service for the collection of domestic and outbound tourism expenditure data from 2015.

For domestic tourism demand, the analysis shows that domestic visitors with age group 25 to 44 years constitute the bulk of the domestic visitors in Ghana. This is because this segment forms the main productive group of the tourism population. The elderly people aged 65 and over constitute the least travelled group. This is largely the pensioners or the aged. The study shows that those married constitute more than half (55.0%) of the domestic visitors who are more responsible and hence travel quite often. The study indicates further that the highest proportion of domestic visitors falls in the Middle/ Junior High School graduates group, representing 34.2 percent while those who are non-literate constitute more than one-fifth (22.4%) of the domestic visitors. This shows that the non-literate population has more interest in domestic tourism participation than the literate population.

With reference to economic status, the self-employed visitors constitute the largest proportion of domestic visitors (53.0%). This is attributable to a situation in Ghana in which the bulk of the economically active population is self-employed. Almost all the domestic visitors travel by road, a small percentage travel by air, sea/lake and insignificant number travel by rail.

The national average length of stay for 2013 was estimated at 10.8 nights. This means that domestic tourists in the country spend not less than eleven nights per trip. Comparing across the regions, the highest average length of stay is recorded by two regions: Ashanti and Central (12.4 nights each). The average length of stay by tourists to these key tourist regions is higher than the national figure, and this could be due to the fact that Ashanti region has a rich culture and multiplicity of tourist sites for the indigenous people and for visitors to witness. Hence, visitors who travel to the region for these activities quite often stay longer. In the same way, Central region, is the hub of attractions and has most of the country's historic buildings, schools and attractions for visitors and the indigenous people. The least average length of stay is recorded by domestic tourists to Eastern region, and this could be due to few attractions and businesses situated in the region.

The results of the study show that the estimated value of domestic tourism expenditures, in real terms were respectively, Gh¢ 2,711.0 million in 2012, Gh¢ 3,454.3 million in 2013, Gh¢ 2,331.3 million in 2014, and Gh¢ 1.459.6 million in 2017. Also the size of the industry is represented by 3.6% of Ghana's 2012 GDP, 3.7% of 2013 GDP, 2.1% of 2014 GDP and 0.7% of 2017 GDP, respectively. These figures are low compared to domestic tourism contributions to Australia, 73,000 million US Dollars, (Divisekera, 2007); U.K., 21,027 million Pounds (U.K. Tourism Statistics, 2014), New Zealand, 12.4 billion Dollars (New Zealand, 2009), in Germany, 241.7billion Euros, representing 87% of aggregate tourism consumption (Pavel, 2012), etc.

The estimated average expenditure per night, nationally, by domestic tourists for 2013 was around Gh¢20.12. Northern region recorded the highest average expenditure per night (Gh¢62.78) by domestic tourists. The least average expenditure per night by domestic tourists was recorded in the Ashanti region (Gh¢14.20). These figures could be considered to be low simply because majority of the tourists stay in friends'/relatives' residences and, or own residences. However, these findings are in line with findings by UK Tourist, 2009, where the average expenditure per night was £56.00. The estimated average expenditure per trip, nationally, by domestic tourists for 2013 was estimated at Gh¢138.52. This amount is deemed to be reasonable since incomes of Ghanaians are relatively low. The study is line with U.K. Tourist, 2009, where the average expenditure per trip was £174.00 and average length of stay per trip was 3.21 nights.

In total, domestic overnight trips were 16.86million in the country in 2013, where the number is about 7 times compared to that of domestic overnight trips reported in UK Tourist, 2009 (117.8million). The data demonstrates that December, November and October are the most popular months for domestic overnight travel. This period could be true since this is the period for Christmas festivities and people travel a lot for businesses, visiting friends and relatives (VFR), funerals, among others. The data revealed that the domestic overnight visitors who travel for the purposes of visiting friends and relatives and funerals constitute about three-fifth (60.5 %) of the total bed-nights. This figure of 181.2 million bed-nights reported in Ghana is less than half of the figure reported by UK Tourist, (2009) 398.749 million bed-nights.

The study has revealed that more than three-quarters (77.7%) of domestic tourists in Ghana stay in friends'/relatives' homes at some point during their trips, while about one-tenth (10.7%) of them stay in private/second homes. This is because domestic tourists in Ghana prefer to stay in these places due to financial constraints and presumably high cost of hotel rates. Hence, only 3.7 percent of domestic tourists stay in hotels. This is in contrast with the situation in U.K., where patronage of hotels was about 61%, guest house was 2% and friends' and relatives' homes was 35%.

For expenditure on tourism goods and services, a little above half of the tourist consumption expenditure is incurred on transportation, food and drinks and records nearly one-third of the expenditure, while accommodation registers only 4 percent. This suggests that domestic tourists spend the greatest part of their income on transportation and food and drinks, leaving a small fraction on accommodation.

The average expenditure per night by a domestic tourist in Ghana was Gh¢12.87 in 2013, and in 2017 (Ghana Statistical Service, 2018), it was Gh¢18.25. These figures are small owing to the fact that majority of the tourists stay in friends'/relatives' residence. This reduces their expenditure on domestic tourism. Regarding expenditure for funeral tourism and visiting friends and relatives, the three Northern regions recorded the highest average expenditure, while Ashanti region recorded the least. This phenomenon could be attributable to the distance from the south to the north being covered by domestic tourists to these three regions of the north, and the Ashanti region recording the least could be due to the geographical location of the region and multiplicity of cultures for domestic tourists to travel a few distances to consume tourism products.

5.1.2 Discussions of Price and Expenditure Elasticities in Ghana

Nationally, for the static model (long-run), the estimates of the uncompensated own-price elasticities show that for the overall ranking, the demand for food and drinks is the most price elastic (-1.126), followed by other services (-1.075), shopping (-1.067), accommodation (-1.038), transportation (1.028) and recreation, culture and sporting activities (-0.917). This is in line with a study conducted in Hawaii, Honolulu by Fujii, *et al.*, (1985), where the own-price elasticity of demand for lodging (-0.950) and the cross-price elasticities between lodging and other tourism expenditure categories are reasonably high. But this is in contrast with a study by Divisekera, (2007) in Australia, where the demand for domestic tourism goods and services was price inelastic.

The food and drinks group is made up of expenditure on food and drinks incurred when a visitor eats at licensed and unlicensed restaurants, open markets, cafes, drinking bars, and nite clubs. Others are expenses on food and drinks in places of entertainment, hotels and similar establishments, prepared and unprepared food and drinks at retail stores to be consumed during tourism trips. In other words, this is made up of food and drinks bought at kiosks, supermarkets, retail stores, grocery stores, open markets, restaurants, fast food take-away establishments, and other food outlets.

The other services' group is made up of expenditure on telephone calls (MTN, Tigo, Vodafone, Airtel, Kasapa, etc.) and postage; fees paid to tour operators for package tours, insurance, as well as development and/or printing of films; and personal services such as hair-cutting, pedi-cure, medi-cure, hair dressing, etc.

The analysis shows that food and drinks group is relatively the most price elastic (-1.126), and the most expensive group in Ghana. The second most expensive group is other services (-1.075), shopping (-1.067) accommodation (-1.038) then transportation (-1.028). This suggests that a 1% increase in their prices of these goods and services would result in a more than 1% decrease in their respective budget shares, resulting in the reduction of revenue to the state. However, the price elasticities of demand for recreation, culture and sporting activities (-0.917) is price inelastic, indicating that a 1% increase in the price of this group would result in 0.917% decrease in the budget share for recreation, culture and sporting activities, thus, resulting in increase in revenue.

Nationally, the results regarding dynamic model (short-run), also show that for the overall ranking, however, the demand for food and drinks (-1.039) is relatively the most price elastic, followed by other services (-1.014) recreation, culture and sporting activities (-0.978) accommodation (-0.957), shopping (-0.871) and transportation (-0.728). The results show that, over all, the demand for tourism goods and services in Ghana is price inelastic, and their elasticities range from 0.728 (transportation) to 1.039 (food and drinks) in absolute value. This is in line with studies on Australia by Divisekera (2007), where domestic tourists demand for tourism goods and services was price inelastic, even though static AIDS model was used. It is also in line with a study by Sadeghi and Shearing (2007) in Iran on 'Demand of Domestic Tourism' where the demand for tourism goods and services was price inelastic.

Transportation, shopping, accommodation and recreation, culture and sporting activities have lower price elasticities which are less than one (-0.728, -0.8.71, -0.957 and -0.978), respectively, and they are price inelastic in relative terms. The implication is that the sale of each of the individual commodity groups would rise, if the prices rise. That is a 10% increase in price in transportation will result in less than proportionate decrease in quantity demanded by 7.28% and hence increase revenue, all things being fixed. To maximize profit, prices of transportation in the country could be increased, alongside shopping, accommodation and recreation, culture and sporting activities. Should government or private investors put up industries in the country, then the construction of transport enterprises, shopping centres, accommodation facilities and recreation, culture and sporting facilities should be given priority attention among the variables.

In general, the results of the estimation demonstrate that tourism price is the main determinant affecting domestic tourists' spending allocation in Ghana.

For the long-run, nationally, income elasticities for other services, food and drinks and accommodation are relatively income elastic, which means that a rise in tourist budgets would result in increase in the demand for these three groups of products. These commodity groups, other services, food and drinks and accommodation behave as luxury goods, meaning, their expenditure elasticities are 1.039, 1.038 and 1.001, respectively. This means that a 10% increase or decrease in the tourism budgets of Ghanaian tourists would lead to 10.39%, 10.38% and 10.10% increase or decrease in their expenditure on other services, food and drinks and accommodation, respectively. When comparing the commodities, the income elasticity estimates of shopping (0.918), recreation, culture and sporting activities (0.977) and transportation (0.911) are below unity, this means that an increase in tourist budgets could lead to an increase in the demand for these goods and services, but in smaller proportions.

For the long-run, the results show that, over all, the demand for tourism goods and services by domestic tourists in Ghana are fairly unitary income elastic, with their demand elasticities which range from 0.918 (shopping) to 1.039 (other services).

A comparison of income elasticities derived from long-run and short-run show substantial differences in the sizes of the elasticities of demand. For the long-run, income elasticities demonstrate differences which range from 0.918 (shopping) to 1.039 (other services). Income elasticities for other services (1.039), food and drinks (1.038) and accommodation (1.001) are greater than unity, indicating, a rise in tourist budgets would cause an increase in demand for these goods and services.

For the short-run, the results show that, overall, the demands for tourism goods and services by tourists in Ghana are fairly income elastic, with their elasticities ranging from 0.897 (accommodation) to 1.061 (transport). Income elasticities for recreation, culture and sporting activities (1.018) shopping (1.026), other services (1.028) and transport (1.061) are above unity and hence they behave as normal luxury goods. This means that a 10% increase or decrease in the tourism budgets of Ghanaian tourists would lead to 10.18%, 10.26%, 10.28% and 10.61% increase or decrease in their expenditure on recreation, culture and sporting activities, shopping, other services and transport respectively. However, income elasticities for accommodation and food and drinks are relatively income inelastic. This implies that these goods and services are normal necessity goods. An increase in tourist budgets in Ghana will result in an increase in the demand for these commodities in Ghana, but in smaller proportion of money would be expended on them. The implication of the findings is that policy makers and tourism practitioners should pay more attention to the expansion of these six commodities. . The results are in line with studies conducted by Deaton, (1988), where the income elasticity for education and transport was 1.94, luxury, food and health services were necessities while the rest had income elasticities greater than unity. However, the demand for Ghana's goods and services is less sensitive to changes in the total expenditure budget of Ghanaian tourists, taking into account the income levels of Ghanaians and non-Ghanaians resident in the country.

The coefficients of the lagged share variable in the short-run show a pattern of consumption habit of domestic tourists. The positive coefficients for food and drinks (0.105), transport (0.223), recreation, culture and reporting activities (0.129), shopping (0.198) and other (0.095) indicate that consumers have habit persistence for these commodities, which influence past purchases, which in turn influence present purchases. The negative sign observed for accommodation (-0.022) indicates less habit persistence/effect exists for consumers.

The dynamic LAIDS model assists us to comprehend the speed of consumers' adjustment to their long-run behaviour. All the estimates are negative and significant. The shopping and transportation error correction terms,-1.116 and -1.104 respectively, indicate that domestic tourists are able to adjust shopping and transportation consumption to long-run equilibrium quicker than the remaining four products. The speed of adjustment is the same for the six commodities. For accommodation, it takes one month (1/1.002 = 0.998) to get back to equilibrium. Similarly, the corresponding time for equilibrium adjustment is one month for food and drinks (1/0.945 = 1.0582), transportation, recreation, culture and sporting activities, shopping and other services (Yang *et al*, 2010) and (Motallebi and Pendell, 2013).

The cross-price elasticities provide valuable information about the interrelationship between tourism goods and services for long-run and short-run. Hence, the uncompensated long-run cross-price elasticities show that accommodation versus food and drinks/transportation and food and drinks versus shopping are complementary while food and drinks versus transport and shopping versus other services are substitutes. The short-run cross-price elasticities show that accommodation versus food and drinks/transportation, food and drinks versus transportation/shopping and recreation, culture and sporting activities versus shopping are complementary, implying that these are demanded together, while recreation, culture and sporting activities versus other services are substitutes and hence consider the six commodities as competitors. Hence, the study addresses the gap regarding tourism price competitiveness in Ghana.

Comparing regional price elasticities of accommodation, Greater Accra region is least price elastic in relative terms, followed by Ashanti and Central regions. This indicates that a 1% increase in the price of accommodation in the Greater Accra region would result in a less than proportionate decrease in quantity demanded of the commodity, all things being equal. To maximize profit, prices of accommodation in the Greater Accra region could be increased together with prices of accommodation in Ashanti and Central regions. Domestic tourists to the Brong Ahafo region are relatively the most sensitive to changes in prices of accommodation in Ghana, with a coefficient of -1.398, compared with the national average of -0.957.

Regarding food and drinks elasticities, Volta region is least price elastic in relative terms, followed by Greater Accra and Western regions. The results follow that a 1% increase in the price of food and drinks in the Volta region will result in a less than proportionate decrease in quantity demanded, all things being equal. To maximize profit, prices of food and drinks in the Volta, Greater Accra and Western regions could be increased to generate revenue. Tourists to Brong Ahafo region are relatively the most sensitive to prices of food and drinks, whose elasticity estimate is higher than the national average of -1.039.

With respect to transport elasticities, Upper West region is the least price elastic in relative terms, followed by Upper East and Ashanti regions. It follows that a 1% increase in price of transportation in the Upper West region would result in a less than proportionate reduction in the quantity demanded, all things being fixed. To increase revenue, prices of transportation in the Upper West region could be increased together with Upper East, Ashanti and Northern regions. Tourists to the Volta region are relatively the most sensitive to transportation, with a coefficient of -1.051, which is higher than the national average of -0.728. This means that a price increase in transportation in Volta region would result in more than proportionate decrease in the quantity demanded, and this would result in a decrease in revenue in the country.

For elasticities for recreation, culture and sporting activities, in relative terms, Western region is fairly the least price elastic, followed by Ashanti and Central regions. Tourists to Northern and Upper East regions are the most sensitive to prices of recreation, culture and sporting activities, whose elasticity estimates are higher than the national average of -0.978.

With regards to price elasticities for shopping, demands from the Upper West region is the least price elastic in relative terms. It indicates that a 1% increase in price of shopping in the Upper West region would result in less than proportionate decrease in the quantity demanded, all things being equal, and to maximize revenue, prices of shopping in the Upper West region together with Greater Accra and Brong Ahafo regions, whose price elasticities appear to be less sensitive, could be increased for a rise in revenue. Domestic tourists to the Ashanti region are the most sensitive to shopping, with a coefficient of -1.216, compared with the national estimate of -0.871. This indicates that if the price of shopping is increased in Ashanti region, it would result in more than proportionate decrease in the quantity demanded by tourists to the region and total revenue is unlikely to be boosted.

Similarly, for other services, demand of domestic tourists to the Volta region is considerably the least price elastic (-0.531), followed by Upper East region. It indicates that a 1% increase in price of other services in the Volta region would result in a less than proportionate decrease in the quantity demanded, all things being equal, and to maximize revenue, prices of other services in Volta region could be increased. Tourists to Central region are relatively the most sensitive to price rise for other services, with a coefficient of -1.518, compared with the national estimate of -1.014.

The income elasticity estimates of demand by region of visit for accommodation range from 0.661 (Upper East region) to 1.107 (Brong Ahafo) and are around unity across the regional markets, and five regions' elasticities are larger than the national estimate of 0.897 while four are below. Domestic tourists who visit Brong Ahafo have very high preferences for accommodation, with elasticity of 1.017, together with tourists to Greater Accra (1.018) and Eastern (1.059) regions. And their demands behave as luxury goods, with their elasticities greater than one. The results show that the demand for accommodation in the country is fairly income elastic and hence a normal luxury good, implying that an increase in the income of domestic tourists would result in an increase in the demand for accommodation.

The income elasticities of demand with respect to food and drinks across the regions range from 0.700 (Greater Accra region) to 1.098 (Central region). Domestic tourists to Central region have high preferences for food and drinks, followed by Brong Ahafo and Northern regions with their elasticity coefficients above unity. Greater Accra region is the least income inelastic, followed by Eastern region. This implies that an increase in the income of domestic tourists would result in an increase in the demand for food and drinks. The fairly income elastic region is Central region, followed by Northern and Brong Ahafo regions with 1.098, 1.070 and 1.014 elasticities, respectively. This means that a 10% increase or decrease in the tourism budgets in these regions would result in a 10.98%, 10.70% and 10.14%, respectively, in their spending on food and drinks in these regions.

With respect to demand for transportation across the regions, the elasticities range from 0.618 (Upper East) to 1.117 (Ashanti region). Thus, income elasticities of demand for transportation among domestic tourists differ considerably across the regional markets. Domestic tourists to Ashanti region have high preferences for transportation, followed by Upper West and Brong Ahafo regions with their elasticity coefficients above unity. Hence, demand for transport in Ashanti, Upper West and Brong Ahafo regions behave as luxury goods. The implication is that an increase in the income of domestic tourists would result in an increase in the demand for transportation in these regions. The most income elastic region is Ashanti region, followed by Eastern and Brong Ahafo regions with their elasticities 1.117, 1.112 and 1.013 respectively. This means that a 10% increase or decrease in the tourism budgets in these regions would result in a 11.17%, 11.12% and 10.13%, respectively, in their spending on transport in these regions.

For recreation, culture and sporting activities, Upper East region is fairly the most income elastic, followed by Greater Accra, Eastern and Western regions.

This suggests that tourists to UER have high preferences for recreation, culture and sporting activities. This could be due to a multiplicity of community-based eco-tourism sites in the region. From the results, the demand for recreation, culture and sporting activities in the country is fairly income elastic and hence a normal luxury good, implying that an increase in the income of domestic tourists would result in an increase in the demand for recreation, culture and sporting activities, all things being equal.

Domestic tourists' demands for shopping from Upper East, Northern, Volta, Brong Ahafo, and Central regions are the most income elastic and hence behave as luxury goods while tourists demands from Eastern, Ashanti, Upper East and Western exhibit income inelastic for shopping and hence are necessity commodities. Table 4.7 reveals that tourists to the Upper East region have high preferences for shopping than the rest of the tourists to the remaining regions. From the results, the demand for shopping in the country is fairly income elastic and hence a normal luxury good, implying that an increase in the income of domestic tourists would result in an increase in the demand for shopping, all things being fixed.

The income elasticities of demand with respect to other services across the regions range from 0.816 (Brong Ahafo) to 1.251 (Upper East region). Regarding income elasticities for other services, Upper East region is the most income elastic region. This demonstrates that tourists to the Upper East region have high preferences for other services. The results show further that the demand for other services in the country is fairly unitary income elastic and hence a normal good, implying that an increase in the income of domestic tourists would result in an increase in the demand for other services, all things being equal. It is therefore appropriate for using the AIDS model to capture changes in domestic tourists' spending allocation, which could provide a signal to the performance of the Ghanaian economy.

5.1.3 Discussions of Socio-demographic Factors Affecting Domestic Tourism Expenditure in Ghana

To study the determinants of domestic tourism expenditure, we can analyse the impact of domestic visitors' spending behaviour from a microeconomic point of view. This permits identification of patterns in expenditure behaviours.

The quantile regression estimates show that the household head's age has positive effects on the domestic visitors' travel expenditure for light spenders and negatively affects heavy spenders for the two categories of domestic visitors, same-day visitors and overnight tourists. The observed negative sign of quantiles 75th and 90th of both same-day visitors and overnight tourists suggest that domestic tourism expenditure decreases as household head's age increases. The results show that visitors with low education level spend less on domestic tourism while those who are well educated are prepared to spend more.

It further indicates that the household income level significantly influences domestic travel expenditure. This is because the quantiles are positive from lowest to the highest. This suggests that the household income level significantly affects light, medium and heavy household spenders. This indicates that higher tourism expenditure households have higher income elasticity of demand. The higher the income the more Ghana's visitors will spend on domestic tourism.

The household loans positively and significantly affect light spenders, however, by the study, it is interesting to note that domestic tourism expenditure is constrained by household loans for medium and heavy spenders. The result is in contrast with Hung *et al*., (2012), where according to the paper, home loans are major constraints of tourism spending for light spenders. In Ghana, household loans are major constraints of domestic tourism spending for medium and heavy spenders.

The results demonstrate that access to Internet and ownership of mobile phones in Ghana are not determinants of domestic overnight travel expenditure and are not information sources. This is because these variables have no relationship with the domestic tourism expenditure. This could be due to the fact that majority of domestic visitors are illiterates, and some are not conversant with information communication technology (ICT). This illustrates that they cannot use computer as the main source for travel decisions and planning for domestic tourism activities. With respect to car ownership, the results demonstrate that it does not relate domestic tourism expenditure. This indicates that independent domestic tourism travel by car is not popular in Ghana, but uses other means of transport, for example, buses, mini buses, etc. Finally, the results show that Internet access, ownership of a car and ownership of a mobile phone do not affect domestic visitors' consumption expenditure in Ghana which is in contrast with Hung *et al*., (2011). In their case, there was a rise in Internet accessibility and advertisement as well as an increase in car ownership which are key determinants of travel industry operations in Taiwan.

5.1.4 Discussions of Modelling Domestic Tourism Demand when Data Violates the Demand Law

The use of the Hicksian negativity restriction alone, as one of the parameters of AIDS model makes the estimation of the AIDS model deficient in situations where the law of demand is violated. The reason being that some tourism goods and services violate the demand law on which the negativity restriction is based. In the literature, when the supposed negative own-price elasticity numbers turned out to be positive, there was no interpretation as positivity condition had not been made part of the conventional AIDS model. But including positivity condition to the AIDS model has made it more efficient, reliable and complete for estimation and interpretation. This makes the restrictions on the parameters of the AIDS model complete to provide a better way of estimating and interpreting results from the AIDS model, which hitherto, was depending only on negativity restriction which meant that all own-price elasticities should be negative. Similarly, six of the uncompensated and the compensated own-price elasticities are positive, using the proposed dynamic LAIDS model and hence, satisfies the positivity restriction. The positivity restriction has been established to improve the efficiency of the AIDS model to cater for positive own-price elasticities as a complement to the negativity restriction. Table 4.23 compares LAID model using normal data and proposed positivity model using non-normal data. From Table 4.23, all the six compensated own-price elasticities from normal data are negative, satisfying the negativity restriction. On the other hand, the six compensated own-price elasticities from non-normal data are positive, satisfying the positivity restriction. Positive own-price elasticities show that some tourism goods and services violate the demand law. This indicates that when both positivity and negativity restrictions are combined will provide better results. This makes the restrictions on the parameters of the AIDS model complete to provide a better way of estimating and interpreting results from the AIDS model, which hitherto, was depending only on negativity restriction which meant that all own-price elasticities should be negative but often some turned out to be positive own-price elasticities.

5.2 Conclusions

This section provides conclusions on Ghana's domestic tourism market, price and expenditure elasticities in Ghana, socio-demographic factors that affect domestic tourism expenditure and the inclusion of positivity restriction to the parameters of almost ideal demand system (AIDS) model as one of the theoretical restrictions.

5.2.1 Conclusions of Ghana's Domestic Tourism Market

Ghana did not have the detailed breakdown of tourism expenditure data for measuring the impacts of domestic tourism industry in particular, and tourism in general on the economy, and also to compare with the other sectors of the economy. The developed tool or model used to collect the domestic tourism expenditure data for the study was presented to the Ghana Statistical Service for the collection of domestic and outbound tourism expenditure data from 2015.

The study measured the volume, value and size of domestic tourism by residents in Ghana. In 2013, nearly 17 million domestic tourism trips were undertaken, resulting in 2.33 billion Ghana Cedis with average direct spending of GH¢138.52 per trip. Expenditure per night was GH¢20.12. About 181.22 million bed nights were recorded with the national average length of stay of 10.8 nights. The phenomenon of visiting friends and relatives had influenced the growth in domestic tourism in Ghana in terms of huge arrivals for funerals (5.6 million arrivals) and VFR (5.5 million arrivals) visitors.

The months of December, November and October are the most popular months for domestic overnight travel. More than three-quarters of domestic tourists in Ghana stay in friends'/relatives' homes at some point during their trips, while about one-tenth of them stay in private/second homes. However, a chunk of the tourists stay in friends'/relatives' and private/second homes, while less than 4 percent stay in hotels.

A chunk of the domestic tourist's income is spent on transportation and food and drinks, with a little on accommodation. The size of the domestic tourism industry in the Ghanaian economy reveals that in 2012, it was 3.6%, 3.7% in 2013, 2.1% in 2014 and 0.7% in 2017. This figures demonstrate that the size of domestic tourism expenditure is relatively shrinking.

5.2.2 Conclusions of Price and Expenditure Elasticities in Ghana

An estimation has been made of Ghana's domestic tourism market as well as estimates of price and income/expenditure elasticities of demand for Ghanaian tourism products using both static and dynamic Linear Almost Ideal Demand System (LAIDS) models for residents in Ghana.

Domestic tourists' expenditure patterns in Ghana as a whole and the ten regions of Ghana were examined. The regions of destination in Ghana include Western, Central, Greater Accra, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East and Upper West regions. This was achieved by estimating four demand systems. Nationally, first, static and dynamic LAIDS models examined the total tourist demand for tourism products in Ghana as a whole (national); and second, static and dynamic LAIDS models examined demand for tourism goods and services by region of visit of the tourist. The systems of equations provided parameters of demand regarding Ghana as a whole and the ten regional markets of Ghana. In each case, demand parameters were estimated for the six categories of tourism goods and services: accommodation; food and drinks; transportation; recreation, culture and sporting activities; shopping/non-consumables and others. The expenditure data used for the study covers a period of 2012 to 2017, where primary expenditure data (panel data) covers 2012 to 2014 and secondary expenditure data covers 2015 and 2016/2017 from the Ghana Statistical Service.

The dynamic LAIDS model reflects the economic system more accurately than the static LAIDS model (Song *et al*., 2011; Gujarati and Porter, 2009). The findings indicate that domestic tourism demands for tourism products in Ghana are sensitive to changes in relative prices and real total tourism expenditure. The demand for tourism products in Ghana is relatively price elastic and unitary income elastic in case of long-run, while it is relatively price inelastic and income elastic for the short-run. However, the demand for tourism products in Ghana is less sensitive to changes in total expenditure budget due to low incomes of households

Due to the fact that there were different consumption patterns of consumers or tourists, and different economic situations in the country, price and expenditure elasticities calculated in the regions were not be same across the country It would be desirable to use elasticity estimates obtained from the regional models as well as the national models for pricing and taxation policies to bring about the desired results.

Generally, with respect to own-price elasticities, Ghanaian domestic tourists are more responsive to price changes in the long-run than in the short-run For the relatively price-elastic regions, a careful control in terms of prices in Ghana as a whole and the ten regions would benefit the growth of domestic tourism industry. Regarding the tourism supply establishments, reducing prices of tourism goods and services is not the panacea to gain the competitiveness against each region in the country. Different elasticity estimates have been calculated for Ghana as a whole, and for the 10 regions, and the results indicate a basis for domestic tourism policy-making in Ghana as a whole and in these regions.

The positive coefficients for tourism products demonstrate that domestic tourists have habit persistence for these products, but less tourists' habit persistence for tourist accommodation with negative coefficient. Thus, Ghana's domestic tourists prefer to stay in private or friends'/relatives' residences to staying in hotels. Hence, less than 4% of domestic tourists stay in hotels.

Domestic tourists are able to adjust the consumption of tourism products to long-run equilibrium considerably quicker, resulting in revenue reduction. Thus, during pricing and taxation policies, subsidy introduction and removal in Ghana, government, tourism practitioners and suppliers should be more careful for these tourism products which tourists consume. In general, the results show that price and income are the major determinants affecting domestic tourists' spending allocation in Ghana.

5.2.3 Conclusions of Socio-demographic Factors Affecting Domestic Tourism Expenditure in Ghana

To the best of my knowledge, the study is the first of its kind to examine the determinants of domestic tourism consumption using quantile regression approach in Ghana. The study identifies the main determinants as income of households, household loan, age of household head and educational level of household head, and their impacts on individual spending for domestic visitors. The research finds that relatively older and well educated households with higher income levels are prepared to spend more on domestic tourism in Ghana.

The study offers in-depth knowledge on the spending behaviour of domestic tourism visitors in Ghana. The information provided offers tourism operators, suppliers, policy makers and governments to plan event strategies which focus on definite market segments of domestic visitors with respect to how they spend. The study shows that an increase in income of domestic visitors would result in an increase in the demand for tourism goods and services.

Household loans are one of the major constraints of domestic tourism spending, for medium and heavy spenders. But positively affect light domestic tourism expenditure households.

Independent domestic tourism travel is not popular by cars in Ghana. Thus, domestic visitors patronise public transport and other means of transport for domestic tourism activities. Internet access and mobile phones are not information sources as compared to advanced countries.

5.2.4 Conclusions of Modelling Domestic Tourism Demand when Data Violates the Demand Law

Including positivity condition to the AIDS model has made it more efficient, reliable and complete for estimation and interpretation. The need for the inclusion of the positivity condition to cater for data that violates the demand law has been established to replace the situation where negative own-price elasticity turns out to be positive own-price elasticity, making interpretation difficult. This makes the restrictions on the parameters of the AIDS model complete to provide a better way of estimating and interpreting results from the AIDS model, which hitherto, was depending only on negativity restriction which meant that tourism demand depended solely on demand law, making own-price elasticities on the diagonal of the elasticity matrix negative. By this study, own-price elasticities on the diagonal of the elasticity matrix are expected to be positive, when tourism price increases as demand increases.

The existence of positive own-price elasticities shows that some products violate the demand law, hence, when both positivity and negativity restrictions are combined, they provide better results.

5.3 Contribution of the Study to Body of Knowledge

The principal contribution to knowledge of this study is the development or revision of the AIDS model to include positivity condition or restriction on the parameters of the AIDS model to make it more efficient, reliable and complete for estimation and interpretation, where hitherto, was depending only on negativity restriction which made estimation and interpretation uneasy or difficult.

Of special interest of the findings is that a rise in price of tourism products in the country may probably do a significant damage to tourism products and the domestic tourism industry as a whole.

The other principal contribution is that it has established long-run and short-run Ghana's domestic tourist behaviour by distinguishing it through the static and dynamic LAIDS models, while the main socio-demographic factors that affect domestic tourism expenditure have been identified as age of the household head, educational level of the household head, annual income of households and loans of households to assist government, researchers, policy makers, suppliers, marketers and the tourism sector in making informed decisions to plan strategies of tourism growth to put domestic tourism on a higher pedestal.

Other contributions of the study is that it has shown the way in which domestic tourism market analysis, based on static and dynamic LAIDS models have been used to examine different tourism goods and services' share of Ghana's domestic tourism market.

Further contribution is that it has addressed methodological problem by using the concepts of "usual residence" and "usual environment" in relation to domestic tourism data collection to design a tool or model to collect visitor consumption expenditure data for analysis and dissemination in Ghana.

The study has made available price and income/expenditure elasticities at national and regional levels for use by governments, suppliers and tourism practitioners to design many different policies; for instance, important policy design for prices, indirect taxation and subsidies, needs knowledge of these elasticities for prices and taxable tourism goods and services in the country.

Ghana did not have the detailed breakdown of tourism expenditure data for measuring the impacts of domestic tourism industry in particular, and tourism in general on the economy, and to compare with the other sectors of the economy. To be able to collect relevant domestic tourism expenditure data, the study needed a model or a tool. Hence, the developed tool or model used for domestic tourism expenditure data collection for the study was presented to the Ghana Statistical Service for the collection of domestic and outbound tourism expenditure data from 2015.

5.4 Recommendations

The following policy implications have been outlined for use by governments, tourism practitioners, firms, marketers and researchers.

5.4.1 Policy implications

The government of Ghana and the tourism practitioners should be careful about the bundle of tourism products of their pricing and taxation policies, while more attention should be paid to the expansion of goods such as transport and other services which behave as luxury products.

It will be desirable to use elasticity estimates obtained from the regional models as well as the national models as a basis for policy simulation to evaluate policy options to increase achievements or reduce mishaps.

To maximize the benefits of the domestic tourism industry, greater attention should be paid to all year round domestic tourism promotion by government, researchers, media, industry practitioners, etc. to reduce the seasonality of purchase of tourism products.

Uninterrupted goods and services innovation, coupled with strategic pricing may lower substitutability of tourism goods and services demanded by domestic tourists in Ghana and thus increase revenue.

Regarding the demand for food and drinks, Volta, Greater Accra and Western regions are the least price elastic in relative terms. This makes it profitable for the establishment of food and beverage facilities in these regions.

According to DeHaan (2007), the higher the tourists' income the more they will spend on tourism, hence households' income be improved to spur them on to increase their participation in domestic tourism activities.

Tourism price is a key determinant of domestic tourism demand, therefore Government, tourism practitioners, analysts and destination marketers should aim at making the tourism price competitive in the regions of Ghana.

The study can be used as a reference for Ghanaian retailers/marketers in pricing strategies for different tourism goods and services and for policy makers in charge of tax and trade policies.

For transport business, the results show that the demands for transportation in Upper West, Upper East and Ashanti regions are the least price elastic and hence doing transport business in these three regions will maximize profit.

Domestic tourists to the Ashanti and Brong Ahafo regions out-number tourists to the remaining regions of the country, the demand for accommodation by tourists in the Greater Accra, Ashanti and Central regions is price inelastic, and tourists to Brong Ahafo are the most income elastic, and have preference for accommodation, thus to maximize the benefits of the domestic tourism industry, it is therefore economical to site a greater number of the country's accommodation facilities and attractions in these regions.

Metropolitan, Municipality and District Assemblies (MMDAs) should be encouraged to use greater proportions of their budgets for the development of tourism facilities in their respective districts.

Government board meetings, workshops, seminars, etc. could be held outside government institutions to boost domestic tourism participation.

The media have a major role to sensitise the public in terms of education and awareness about the existence of the country's tourist sites and how to patronise them.

Internet facility centres should be dotted across the country for use by the citizenry, since, the country's tourist sites, accommodation facilities, transport operations, restaurants and others are not visible online.

Well-developed and comprehensive loan packages should be made available to potential light domestic visitor consumers.

Ghana Private Road Transport Union (GPRTU) and other transport unions should encourage the influx of affordable means of transport into the country for domestic tourism.

Telecommunication companies should be encouraged to provide multiplicity of telecommunication equipment and improve communication networks in every part of the country to assist the rural and urban inhabitants to have access to information on domestic tourism.

5.4.2 Recommendation for future/further studies

The following are the recommendations for future or further studies:

- They should focus on the disaggregation of purpose of visit and tourism goods and services;
- They must aim at collecting tourism data from both the region of destination and region of origin of domestic visitors for proper modelling; and
- They should plan for four time's quarterly domestic tourism data collection in a year to reduce memory effect.

REFERENCES

Adei, S. and Addo, S. (2007). *Introduction to economic science.* Accra, Ghana.

Agyire-Tettey, K. F. (2008). *Elements of microeconomics*. University of Ghana, Legon, Ghana

Ahmed, U. A. and Shams, A. (1994). Demand elasticities for different food items in Bangledesh. *Journal of econometrics*, 15, 1-22.

Akturk, T. and Kucukozmen, C. C. (1989). Tourism demand for Turkey: models, analysis and results. *International journal of tourism.*

Allen, D. E., Gerrans, P., Singh, A. K. and Powell, R. (2009). Quantile regression: its application in investment analysis. *The Finsia, journal of applied finance, issue 4*

Allen, D. E. and Yap, C. (2009). Modelling Australian domestic tourism demand: a panel data approach. Australia: Edith Cowan University.

Allen, D. E. and Yap, G. (2009). Investigating other leading indicators influencing Australian domestic tourism demand. Mathematics and computer in simulation, 81(7), 1365-1374. *Journal article*

Alson, J. M. and Chalfant, J. A. (1994). The silence of the lambdas: a test of the almost ideal and Rotterdam models, *American Journal of Agricultural Economics*, 75(2), 304-313

Anderson, G. and Blundell, R. (1983). Testing restrictions in a flexible demand system: an application to consumer's expenditure in Canada. *Review of Economic Studies*, 50(3), 397-410

Artus, J. (1972). An economic analysis of international travel, *International Monetary Fund Staff Papers*, 19, 579-613

Asgary N, Santos, G. and Vern, V. (1997). The determinants of expenditures by Mexican visitors to the border cities of Texas. *Journal of tourism*.

Asiedu, A. B. (2008). Tourism planning in Ghana, *Journal of tourism*, pp 69 - 90

Athanapoloulos, G., Deng, M,. Li, G. and Song, H. (2013). Domestic and outbound tourism demand in Australia: a system-of-equations approach. Department of Econometrics & Business Statistics. *Journal*

Athanasopoulos, G. and Hyndman, R. J. (2006). Modelling and forecasting Australian domestic tourism. *Tourism Management*, 29, 19-31

Atsushi, K. and Yoshino, D. (2013). Short-run and long-run international tourism demand modelling based on dynamic AIDS model - *An Empirical Research in Japan*

Ayodele, E. F. and Omobowale A. O. (2013). Heterogeneity in rural household food demand and its determinants in Ondo State, Nigeria: an application of Quadratic Almost Ideal Demand System. *Journal of tourism*.

Badwin, M.A., Hadid, M. and. Phillips, C. D. A. (1983). The estimation and testier of a system of demand equations for the UK. *Applied Economics* 15(1): pp 81-180

Baggio, R. (2011). Collaboration and cooperation in tourism destination: a network science approach. Current Issues in Tourism, 14(2), pp 183-189. *Journal of tourism*

Baggio, R. (2018). Measuring tourism: methods, indicators, and needs. *Journal of the Future of Tourism.*

Bank of Ghana (2007). *The tourism industry and the Ghanaian economy*, Accra, Ghana

Barnes, M. L. and Hughes, A. W. (2002). A quantile regression analysis of the cross section of stock market returns. *Journal of econometrics*

Barten, A. (1967). Evidence on the Slutsky conditions for demand equations. *The Review of Economics and Statistics*, 49(1), 233-242

Bechdolt, B. V. (1978). Gross-sectional travel demand functions: U. S. visitors to Hawaii, 1961-1970, *Quarterly Review of Economics and Business*, 13, 37-47

Bierens, H. J. (1982). Integrated conditional moment testing of quantile regression models. *Journal of tourism*.

Bigano, A., Goria, A., Hamilton, J. M. and Tol, R. S. J. (2005). The effects of climate change and extreme weather events on tourism. *FEEM Working Paper* No. 30.05 CMCC Research Paper No. 01

Blanciforti, L. and Green, R. (1983). An almost ideal demand system incorporating habits: analysis of expenditures on food and aggregate commodity groups. *The Review of Economics and Statistics,* Vol. 65, No. 3, pp511-515

Blaise, M. (2006*). Applied Quantile Regression (Dissertation)*

Boakye, K. A. A. and Owusu-Mintah, S. B. (2008). *Domestic tourism in Ghana*. Cape Coast, Accra, Ghana.

Botha, A. (2012). Modelling tourism demand for South Africa using a system-of-equations approach: the almost ideal demand system. *Journal of tourism.*

Bowman, A. and O' Connell, R. (1997). *Applied Statistics*. The McGraw-Hill companies, USA.

Buchinsky, M. (1998). Recent advances in quantile regression models: a practical guideline for empirical research. *The Journal of Human Resources*, Vol. 33 No. 1, pp 88-126

Buhai, S. (2005). Quantile Regression: Overview and Selected Applications. *Journal of quantile regression.*

Butchelor, R. (2000). Eviews tutorial: cointegration and error correction. *Journal of econometrics.*

Cai, L. A., Hu, B. and Feng, R. (2002). Domestic tourism demand in China's urban centers; Empirical Analyses and Marketing Implications. *Journal of Vacation Meetings* 8(1), 64 – 71.

Catia-Nicodemo (2009). Gender pay gap and quantile regression. *Journal for econometrics.*

Chalfant, J. A.(1987). A globally flexible, almost ideal demand system. *Journal of business and economic statistics*

Chang-Jui, L. and Tian-Shyug, L. (2012). Estimating price effects in AIDS model of outbound Thai tourism to East Asia. *Journal of tourism research and hospitality*, Vol. 1, Issue 3.

Chang-Jui, L. and Tian-Shyug, L. (2013). Tourism demand forecasting: economic model based on multivariate adaptive regression splines, artificial neural network and support vector regression.Vol.3 No. 6 pp1-18, ISSN 1792-7544 *Journal of Advances in Management and Applied Economics*

Che, Y. B. (2004). An approach to modelling regional tourist attraction, resource development and market, 20(3), 163 – 165. *Journal of tourism*.

Chernozhukov, V., Chen, D., Belloni, A. and Hansen, C. (2012). Sparse models and methods for optional instruments with an application to eminent domain. *Journal for quantile regression.*

Cobb, D. (2013). Tourism economics in Sri Lanka: an economic analysis. *Journal for tourism economics*.

Cochran, W. G. (2007). *Sampling techniques*. John Wiley and Sons, Hoboken

Coenen, M. and Van Eekeren, L. (2003). Demand for domestic tourism by Swedish households, Department of Economics, Umea University, Sweden, *Umea Economic Studies*, 578, 39pp.

Cornell University (2007). Quantile regression. *Journal of quantile regression*

Cortes-Jimenez, I., Pulina, M. and Durbary, R. J. (2009). Estimation of outbound Italian tourism demand: a monthly dynamic EC-LAIDS model. *Tourism Economics* 15(3): 547-565

Craggs, R. and Schofield, P. (2009). Expenditure-based segmentation and visitor profiling at the Quays in Salford, UK. *Journal of tourism*.

Crouch, G. I. (1992). Effect of income and price on international tourism, *Annals of Tourism Research*, Vol.19, Issue 4, pp 643 – 664.

Crouch, G.I. (1994a). Demand elasticities for short-run verses long-run tourism, *Journal of Travel Research*, 33, 2-7.

Crouch, G.I. (1994b). Price elasticities in international tourism, *Hospital Research Journal*, 17, 27 – 39.

Crouch, G. I. (1995). A meta-analysis of tourism demand. *Annals of Tourism Research*, 22, 10 – 18

Crouch, G. I. (1996). Demand elasticities in international marketing: a meta-analytical application to tourism, *Journal of Business Research, Elsevier*, 36(2), pp 117 – 136.

Davino, C., Furno, M. and Vistocco, D. (2014). *Quantile regression: theory and applications*. John Wiley and Sons Ltd; U. K.

De Mello, M. M. (2005). Testing alternative dynamic systems for modelling tourism demand. CEF. UP. Working Papers 0501. *Journal of tourism*

De Mello, M. (2001). *Theoretical and empirical issues in tourism demand analysis*. (PhD thesis). University of Nottingham, Nottingham

De Mello, M. and Alvaro, N. (2002). The new empirics of economic growth: quantile regression estimation of growth equations. Department of Economics, University of Illinois at Urbana-Champaign, 1206 S. 6th St., 484 Wohlers Hall, Champaign, IL 61820. *Journal of econometrics*

De Mello, M., Pack, A. and Sinclair, M. T. (2002). A system of equations model of U. K. tourism demand in neighbouring countries. *Journal of tourism*

Deaton, A. (1988). Quality, quantity, and spatial variation of price,. *Discussion Paper*.

Deaton, A. and Muellbauer, J. (1980a). An almost ideal demand system, *American Economic Review,* Vol 70, No. 3, pp 312-326

DeHaan, C. (2007). The drivers of tourism demand in the U. K. Tourism and Travel Research Institute. *Journal of tourism*.

Delurgio, S. A. (1998). *Forecasting principles and applications*, McGraw-Hill Co., Inc. USA

Disegna, M. and Osti, L. (2016). Tourists' expenditure behaviour: the influence of satisfaction and the dependence of spending categories. *Tourism Economics*, 22(1).

Divisekera, S. (2003). A model of demand for international tourism. *Annals of Tourism Research* 30(1), 31- 49.

Divisekera, S. (2007). Modelling and estimation of tourism demand elasticities: a study of tourist expenditure allocation in Australia. *CRC* for Sustainable Tourism Pty Ltd, Queensland, 2007, pp 6-14 (6) *Journal of tourism*.

Divisekera, S. (2009). Ex-post demand for Australian tourism goods and services. *Tourism Economics* 15(1), pp 153 – 180

Dolnicar, S., Crouch, G. I., Oppewal, H. and Huybes, T. (2007). Discretionary expenditure and tourism consumption: insights from a choice experiment. *Journal for tourism*

Durbary, R. (2002). Long run structural tourism demand modelling: An application to France. Chinese Dettaan Tourism and Travel Research Institute. *Journal of tourism*.

Dybedal, P. (2009). Data collection on tourism flows – from fragmentation to harmonization. First international conference on measurement and economic analysis of regional tourism, Donostia- San Sebastian, Spain. *Journal of tourism.*

Engle, R. F. and Granger, C. W. J. (1987). Co integration and error correction: representation, estimation and testing. *Econmetrica,* Vol. 55, No. 2, pp 251-276

Enns, P. K,. Takaaki, M. and Kelly, N. J. (2014). Time series analysis and spurious regression. *Journal of econometrics*.

EUROSTAT (2008). *Domestic tourism manual.* European Commission. Working Paper.

EUROSTAT (2008). *Statistical portrait of the European Union – European year of intellectual dialogue*, London, U.K.

Fall (2018). Hicksian demand and expenditure function duality, Slutsky equation. Study Programme. *Journal of econometrics*

Ferrer-Rosell, B., Coenders, G. and Martinez-Garcia, E. (2014). Determinants in tourist expenditure composition – the role of airline types. *Journal of tourism*

Fitzenberger, B. (2013). Quantile regression. Discussion paper. No.05-65.

Fitzenberger, B. (2014). Quantile regression. *Discussion Paper*.

Fitzenberger, B. Dirk, A., and Katrin, S. (2010). Rising wage inequality, the decline of collective bargaining, and the gender wage gap. *Discussion Paper* No. 4911, Bonn Germany.

Fitzenberger, B. and Kunge, A. (2005). Vocational training and gender: wages and occupational mobility among young workers *Journal of labour economics*

Forbes and Kabote (2004). Pricing and domestic tourism performance in Zimbabwe. *Journal of domestic tourism*

Foster, D. (1996). Measuring customer satisfaction in the tourism industry. Third International and Sixth National Research Conference on Quality Management. *Journal of tourism*.

Frechtling, D. C. (2001). *Forecasting tourism demand: methods and strategies*. Oxford, U.K

Frechtling, D. C. (2006). An assessment of visitor expenditure methods and models. *Journal of travel research,* volume XX pp 1-10

Fujii, E. T., Khaled, M. and Mak, J. (1985). An almost ideal demand system for visitor expenditures. *Journal of transport economics and policy*, Vol. xix No. 2 161-171

Gatt, W. and Falzon, J. (2014). French and German tourism in the Mediterranean – *A market share analysis*.

Gartner, W. C. (1996). *Tourism development: principles, processes and policies*, John Wiley & Sons, INC.

Ghana Statistical Service (2006). *Tourism Market Trends in Ghana*, Accra, Ghana

Ghana Statistical Service (2015). *Ghana labour force survey report.* Accra, Ghana

Ghana Statistical Service (2017). *Ghana living standards survey report, round 7.*Accra, Ghana

Ghana Statistical Service (2018). *Domestic and outbound tourism statistics in Ghana*, Accra, Ghana

Ghana Statistical Service (2018). *Trends in the Tourism Market in Ghana*, Accra, Ghana

Gordor, B. K. and Howard, N. K. (2000). *Elements of Statistical Analysis*. Ghana Mathematics Group, Cape Coast, Ghana

Green, R. and Alston, J. M. (1990). Elasticities in AIDS models, *American Journal of Agricultural Economics*, 72(2), 442-445

Gujarati, D. N. and Porter, D. C. (2009). *Basic econometrics.* The Mcgraw-Hill/Irwin, New York, USA

Hamal, K. (1996). Tourism and the economy: understanding the economics of tourism, Posted December 1, 2004 Categories: Hawaii's economy, *UHERO Working Papers*

Hamal, K. (1998). Australian outbound travel demand: long – haul versus short-haul. *Bureau of Tourism Research, Conference Paper*

Han, Z., Durbary, M. and Sinclair, M. T. (2006). Modelling US tourism demand for European destinations. *Tourism management.*

Harrison, M. J. and O'Hagan, J. W. (1984) Market shares of U.S. tourist expenditure in Europe: An econometric analysis. *Journal of econometrics* pp 919 – 931.

Hung, W. T., Shang, J. K. and Wang, F. C. (2011). Understanding determinants of domestic travel consumption. *International Journal of Advances in Management Sciences*, Volume: 1-1.

Hung, W. T., Shang, J. K. and Wang, F. C. (2012). 'Another look at the determinants of tourism expenditure'. *Annals of Tourism Research* 2012, Vol 39, No. 1, pp495 – 498

Ichiro, T., Nomura, K. and Takafumi, K. (2006). Non-parametric quantile estimation. *Journal of Machine Learning*

Janda, K., Mikolaset, J. and Netuka, M. (2009). The estimation of complete almost ideal demand system from Czezh household survey budget data. *Journal of econometrics*.

Jiumpanyarach (2011). Estimation of demand system in an AIDS model: the opportunity for exporting Thai agricultural products. *Journal for business and economics*, Vol. 5.

Jurius, K. and Johansen, S. (1992). Testing structural hypothesis in a multivariate co-integration analysis of the PPP and the UIP for U. K. *Economic literature.*

Kabote, F., Vengesayi, S. and Mashiri, B. (2014). Pricing and domestic tourism performance in Zimbabwe. *African Journal of Hospitality, Tourism and Leisure* Vol. 3(2)

Katafono, R. and Aruna, G. (2004). Modelling tourism demand in Fiji. *Journal of tourism*

Kaninda, S.T. and Fonsah, E. G. (2012). Analysis of US demand for imported melons using dynamic AIDS. *Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting*

Katafono, R and Gounder, A. (2004). Modelling tourism demand in Fiji. *Journal of tourism*

Koenker and Basset (1978). Quantile Regression. *Econometrica*, Vol. 46, No. 1, 33-50.

Koenker, R. and Basset (2000). Quantile Regression: An introduction. *Journal of economic perspectives*. 15(4)

Koenker, R. and Hallock, K. F. (2001). Quantile Regression: *Journal of economic perspectives.* Volume 5 No. 4 pp 143 - 156

Koenker, R. (2015). Quantile Regression in R: a vignette. *Journal of quantile regression.*

Koutsoyiannis, A. (1991). *Modern microeconomics*. Second Edition. Macmillan Press, London.

Krejcie, R. and Morgan, D. W. (1970). Determining sample for research activities. *Journal for educational and psychological measurement*, 30, 607-610

Kwack, S. Y. (1972). Effects of income and prices on travel spending abroad, 1960III-1967IV. *International Economic Review*, 13, 245-256

Lelwala, E. I. and Gunaratne, L. H. P. (2008). Modelling tourism demand using co-integration analysis: a case study for tourist arriving from United Kingdom to Sri- Lanka. Tropical Agricultural Research, Vol. 20, 50-59. *Journal of tourism*

Li, G. Song, H. and Witt, S. F. (2004.) Modelling tourism demand: a dynamic linear AIDS approach. *Journal of Travel Research*, 43, 141-150

Li, G., Song, H. and Witt, S. F. (1993). Modelling tourism demand: a dynamic linear AIDS Approach. *Journal of econometrics.*

Li, G., Song, H. and Witt, S. F. (2005). Recent development in econometric modelling and forecasting, *Journal of Travel Research*, 43, 141-150

Li, M. (2005). Tourism demand forecasting by improved SVR model. Department of Social Science, Zhengzhou Tourism College, Henan, *P.R.* China. *International Journal*, Vol.8, No. 5, 403-412.

Lim, C. and McAleer, M. (2001). Modelling the determinants of international tourism demand to Australia. pp 23-43, *Journal of tourism*

Lipsey, R. G. and Chrystal, K. A. (2007). *Economics*, New York, USA

Logan, J. A. R. and Yaacov, P. (2013). An introduction to quantile regression. Presentation for Modern Modelling Methods. *Journal of quantile regression*

Lorenzo, F. and Sergio, R. (2000). *Positive linear systems: theory and applications.* John Wiley and Sons, Hoboken

MacFeely, S. (2008). Developing tourism statistics at the sub-national level: a response-issues and insights. *Journal of tourism*

Machado, J. A. F. (2003). Quantiles for Counts. *Facudade de Economia.*

Machado, J. A. F. and Santos, S. J. M. C. (2013). Quantile regression and heteroscedasticity. *Journal of economics*

Marcussen, C. H. (2011). Determinant of tourist spending in cross-section studies and at Danish destinations. *Journal of tourism*

Marrocu, E., Paci, R. and Zara, A. (2015). Micro-economic determinants of tourist expenditure: a quantile regression approach. *Tourism Management Journal*.

Martinez-Silva, I. Roca-Pardinas, J. and Lustres-Perez, V. (2013). Flexible quantile regression models: application to the study of the purple sea urchin. *Journal of quantile regression.*

Mehrara, M. and Ahmedi, S. (2011). The estimation of the automotive fuel demand in Iran: almost ideal demand system approach. *Australian Journal of Business and Management Research*, Vol. 1, No. 7, 72-77

Melly (2006). Estimation of counterfactual distributions using quantile regression. *Journal of quantile regression*.

Mike J., Stabler, M. J., Papatheodorou, A. and Sinclair, M. T. (2010). The economics of tourism (1st Edition). *Journal of econometrics.*

Ministry of Tourism (1996). *Integrated tourism development plan for Ghana*, Accra, Ghana

Ministry of Employment and Labour Relations (2010-2013). Ghana's Shared Growth and Development Agenda (GSGDA), Accra Ghana.

Ministry of Tourism, Arts and Culture (2013). *National tourism development plan for Ghana* (2013 – 2027), Accra, Ghana

Molina, J. A. (1994). Food demand in Spain: an application of the almost demand system. A. *Journal of Agricultural Economics*.

Montnegro, C. E. (2001). Wage distribution in Chile: does gender matter? A Quantile Regression Approach. *Working Paper Series*, No 20.

Morey, E. R. (2002). Hicksian demand functions, expenditure functions and Shepard's Lemma. *Journal of econometrics.*

Morley, D. (1992). *Television, audiences and cultural studies,* London and New York.

Motallebi, M. and Pendell, D. L. (2013). Estimating an almost ideal demand system model for meats in Iran. Selected Paper Prepared for presentation at the Agricultural and Applied Economics Associations AAEA & CAES Joint Annual Meeting, Washington, DC, August 4-6, 2013. *Journal of Agricultural Economics.*

Namibia Central Bureau of Statistics (2007). *Domestic tourism in Namibia*, Windhoek, Namibia.

New Zealand Tourism Ministry (2009). *Domestic travel by New Zealand residents*, Wellington, New Zealand.

Ng, S. (1999). Testing for homogeneity in demand systems when regressors are non-stationary. *Journal of applied econometrics*, Vol. 10, 147-163

Nicodemo, C. (2009). Gender pay gap and quantile regression in European families. IZA DP No. 3978. *Journal of labour statistics*

Nsuma and Sarker (2008). Time series econometrics in estimating an error corrected AIDS in Kenya. Journal of econometrics

Omar, M., Singh, A. J. and Holecek, D. F. (2004). Impact of light, medium and heavy spenders on casino destinations: segmenting gaming visitors based on amount of non-gaming expenditure, *UNLV Gaming Research & Review Journal*, Volume 8, Issue 1

Othmen, A. B. (2013). Nature-based tourists in the Gironde estuary: examining and identifying the relationship between their expenditure and the motivations for their visit. *Journal of tourism*

Ozcelit (2009). Household income and expenditure surveys to model consumer goods and services in Turkey. *Economic journal*

Page, S. J. and Connell, J. (2006). *Tourism: a modern synthesis.* London, U. K.

Papatheodorou, A. (1999). The demand for international tourism in the Mediterranean region. *Journal for international tourism*, 619 – 630.

Paud, M and Som, M. (2013). Domestic tourism development in Asir region, Saudi Arabia. *Environmental science.*

Pavel, F. (2012). *The economic impact of Germany's tourism industry*, Germany

Pogany, P. (1996). The almost ideal demand system and its application in general equilibrium calculations. Office of Economics Working Paper, *Journal of tourism* No 96-05.

Pollak, R. A. and Wales, T. J. (1969). Estimation of the linear expenditure system. *Journal of economics.*

Prasonna-PereraLalith, W. (2015). Tourism economics in Sri Lanka: AU Econometric Analysis. *Journal of tourism*

Proenca, S. A. and Soukiazis, E. (2005). Demand for tourism in Portugal: a panel data approach. A Discussion Paper, No. 29. *Journal of tourism*

Proust, R., Angelakis, G. and Drakos, P. (2009). A study of tourist's attitude and preference for local products in Crete and changes induced by the current economic crisis. 113th Seminar, Chania, Crete, Greece, European Association of Agricultural Economists. *Journal for tourism management.*

Raj, D. (1968). *Sampling theory*. McGraw- Hill, New York

Ridderstaat, J., Croes, R. and Nijkamp, P. (2013). Modelling tourism development and long-run economic growth in Aruba. Faculty of Economics and Business Administration, VU University of Amsterdam, and Tinbergin Institute. The Netherlands. *Discussion paper.*

Rijo, M. J. and Hana, R. (2008). Economic value of disability-adjusted life years lost to cancers. *Journal of clinical oncology.*

Rodriguez, X. A. and Rivadulla, R. (2012). Tourism in Spain: Disaggregated analysis of international demand. *Economic literature.*

Rossello-Nadal, J. and Jianan, H. E. (2019). Tourist arrivals versus tourist expenditures in modelling tourism demand. *Journal of tourism.*

Sadeghi, J. M., Tayebi, S. K. and Jamshidi, M. (2007). Price and expenditure elasticities of demand for domestic tourism in Iran: the case of Hamedan Province. *Journal of Iranian Economic Review*, Vol. 12, No. 18.

Sampol, C. J. and Perez, E. A. (2000). Tourist expenditure determinants in a cross-section data model. University of Balearic Islands, Spain. *Journal of tourism*

Sara, D. (2008). Tourism and discretionary income allocation: heterogeneity among households. *Journal of tourism*

Seddighi, H. R. and Shearing, D. F. (1997). The Demand for tourism in North East England with special reference to Northumbria, Economics Department, Business School, University of Sunderland, Sunderland, SR60DD *Journal of tourism*

Sergio, F., Nicole, M. F. and Lemieux, T. (2009). Unconditional quantile regressions. *Journal of quantile regression*

Sergio, F., Nicole, M. F. and Lemieux, T. (2011). Occupational tasks and changes in the wage structure, IZA Discussion Paper *No*. 5542. *Journal of Economics*

Sinclair, M.T. (1998). Tourism and economic development: a survey. *Journal tourism and economic development.*

Sinclair, M.T. and Stabler, M. (1997). *The economics of tourism*, London; Rout ledge.

Sinclair, M.T. and Syriopoulos, T. (1997). Effective compensated own-price elasticities of tourism. *Journal of tourism*

Song, H. and Li, G. (2008). Tourism demand modelling and forecasting: a review of recent research, Tourism *Management*, 29 (2), pp 203 – 220.doi: 10. 1016/j.tourman.2007. *Journal of tourism*

Song, H., Li, G., Witt, S. F. and Alhassansopolos, G. (2011). Forecasting tourist arrivals using time-varying parameter structural time series models, *International Journal of tourism*

Song, H., Li, G., Witt, S. F. and Fei, B. (2010). Tourism demand modelling and forecasting: how should demand be measured*? Journal of school of hotel and tourism*

Song, H. and Li, G. (2012). Modelling and forecasting: how should demand be measured*? Journal of tourism*

Song, H., Romilly, P. and Liu, X. (2010). An empirical study of outbound tourism demand in the UK, 611 – 624. *Journal of tourism*

Song, H., Witt, S. F. and Li, G. (2009). The *advanced econometrics of tourism demand*, London, United Kingdom

Song, H. and Witt, S. F. (2000). Tourism demand modelling and forecasting: modern econometric approaches. Pergamon, Oxford (*Research Monograph) Journal of tourism*

Song, H. and Wong, K. K. F. (2003). Modelling and forecasting the demand for Hong Kong tourism, *International Journal of Hospitality Management*, 22 (4), 435 – 451.

Song, H. and Wong, K. K. F. (2003). Tourism demand modelling. a time-varying parameter approach, *Journal of Travel Research* 42 (1), 57-64.

Soteriades, M. D. and Arvanitis, S. E. (2006). Expenditure patterns by travel party size: British and German Tourists on Crete, Greece. *International Journal of Tourism and Hospitality Research*

Sotiriadis, M. and Varvaressos, S (2014). A strategic analysis of Greek Tourism: competitive position, Issues and Lessons. *International Journal of Tourism Hospitality and Leisure*, Vol 4(2)

Sousa, J. (2014). Estimation of price elasticities of demand for alcohol in the United Kingdom. *HMRC Working Paper 16.*

South African Tourism (2008). *Tourism definitions used in South Africa*. Johannesburg, South Africa

Statistics Norway (2013). *An almost ideal demand system analysis of non-durable consumption categories*, Norway.

Statistics South Africa (2009). *Concepts & definitions for Statistics South* Africa (Version 2), Johannesburg, South Africa

Statistics South Africa (2011).*Domestic Tourism Survey Report*, Johannesburg South Africa

Stone, J. R. N. (1954). Linear expenditure systems and demand analysis: an application to the pattern of British demand, *Economic Journal*, 64(255), 511-612

Stone, R. (1954). The economic journal, Vol. 64, 255, 511-527

Sraszheim, M. R. (1978). Airline demand functions in the North Atlantic and the pricing implications, *Journal of transport and policy*, 12, 179-195

Sung, S. P. Uysal, M. and McLellan (1991). A linear expenditure model for tourism demand. *International journal of tourism*

Syriopoulos, T. C. and Sinclair, M. T. (1993). An econometric study of tourism demand: the AIDS model of U.S. and European tourism in Mediterranean countries. *Applied Economics* 25(12) 1541 - 1552

Taljaard, P. R. (2010). The demand for meat in South Africa: an almost ideal estimation. Vol. 43. Issue 4, 430 – 443. *Journal of agriculture*

Takeuchi, I., Quoc, V. L., Sears, T. D. and Smoda, A. J. (2006). Non parametric quantile estimation. *Journal of machine learning*, research, 7, 1231 – 1264

Tash, N. S., Shahraki, J. and Jangi, S. N. (2012). Estimating the almost ideal demand system model for rural households in Iran. *International Journal of Academic Research in Business and Social Sciences*, Vol. 2, No 8, pp 344-355

Tefere, K. (2010). Food demand elasticities in Ethiopia. *Journal of econometrics*

Thrane, C. (2014). Modelling micro-level tourism expenditure recommendations on the choice of independent variables, functional form and estimated technique. *Journal of tourism*

TNS- RI Travel and Tourism (2007). UK *tourist*, UK

TNS- RI Travel and Tourism (2009). UK *tourist*, UK

TNS- RI Travel and Tourism (2012). UK *tourist*, UK

Tunaer-Vural, B. M. (2012). Price and income elasticity of demand for tourism sector in Turkey. *International journal of tourism.*

Turkish Statistical Institute (2003). *Household income and consumption expenditure survey*, Turkey.

United Nations (2005). Household sample surveys in developing and transition countries. ST/ESA/STAT/SER, F/96

United Nations World Tourism Organization (1994). *Recommendations on tourism statistics*, Madrid, Spain

United Nations World Tourism Organization (1995). *Collection of tourism expenditure statistics*, Madrid, Spain

United Nations World Tourism Organization (2000). *Data collection and analysis for tourism management, marketing and planning*, Madrid, Spain

United Nations World Tourism Organization (2000). *Measuring total tourism demand*, Madrid, Spain

United Nations World Tourism Organization (2000). *Tourism satellite account. Technical document no 4: measuring tourism Gross Domestic Product*, Madrid, Spain.

United Nations World Tourism Organization (2000).*Tourism satellite account. Technical document no 1: measuring visitor final consumption expenditure in cash*, Madrid, Spain

United Nations World Tourism Organization (2003). Enzo Paci papers on measuring the economic significance of tourism, Volume 3, Madrid, Spain

United Nations World Tourism Organization (2005). *Measuring domestic tourism and the use of household surveys*, Madrid, Spain

United Nations World Tourism Organization (2006). *Tourism Market Trends*, Madrid, Spain

United Nations World Tourism Organization (2008). *International recommendations on tourism statistics*, Madrid, Spain

United Nations World Tourism Organization (2013). *Domestic Tourism in Asia and the Pacific*, Madrid, Spain

University of Florida (1992). Determining sample size. One of a series of the Agricultural Education and Communication Department. *Journal of agriculture.*

Utami, R. C., Hartono, D. and Awirya, A. A. (2016). Analysis of the competitiveness of Indonesia tourism price compared to the competitors. *Jurnal Ekonomi Pembangunan*, 17(1), 108-124

Uysal, M., and Crompton, J. L. (2011). Determinants of demand for international tourist flows to Turkey. *International journal on tourism.*

Wainwright, K. J. (2013). Understanding the ordinary and compensated demand. *Journal of tourism*

Warner, S. (1965). *Modern algebra*. A Hand book, USA

White, K. J. (1982). The demand for international travel, a system-wide analysis for U. S. travel to Western Europe. Discussion Paper, No. 82-28. *Journal of tourism.*

World Bank (2000 – 2001). World development report.

World Tourism Organization (1995). *Collection and compilation of tourism statistics*, Madrid, Spain

World Tourism Organization (2015).*Tourism Market Trends in Africa*, Madrid, Spain

Wu, D. C., Li, G. and Song, H. (2011). Analysing tourist consumption: a dynamic system-of-equations. *Journal of Travel Research*, 50 (1), 46-56.

Xiaoli, H. and Bingsong, F. (1997). Measuring the size of tourism and its impact in an economy. *A Statistical Journal of the UN Economic Commission for Europe*, Vol. 14 Issue 4

Yamane, T. (1967). *Statistics: an introductory analysis*, 2nd edition, New York: Harper and Row.

Yang, W., Changyou, S. and Donald, L. G. (2010). Analysis of import demand for wooden beds in the U.S; *Journal of Agricultural and Applied Economics*, 42,4 : 643-658

Yap, G. C. (2010). An economic analysis of Australian domestic tourism demand. *Journal for tourism.*

Yu, K. and Gannoun (2003) Quantile regression, University of Plymouth. *Journal for quantile regression*

Zahedi, D. (2006). Estimating an ECM-AIDS model for urban area's household expenditure: The Case of Iran. *Iranian Economic Review,* Vol. 10, No. 7, Fall 2006

Zelin, A. and Stubbs, R. (2005). Cluster sampling: a false economy? *International Journal of Market Research* Vol.47 No. 5, 2005 p.501-522

Zellner, A. (1962). An efficient method of estimating seemingly unrelated regressions and test for aggregation bias. *Journal of the American Statistical Association*, 57: 348-368

Zietz, J., Zietz, E. N. and Sirmans, G. S. (2007). Determinants of house prices: a quantile regression approach. Department of Economics and Finance Working Paper Series.

Ziramba, E. and Busani, M. (2013). Aggregate outbound tourism demand in South Africa: An Econometric Analysis. *Journal of economics and behavioural studies 5(5), 260*

Ziramba and Moyo (2013). Aggregate outbound tourism demand in South Africa: an econometric analysis. *Journal of econometric analysis.*

APPENDICES

Appendix A: Domestic Tourism Elasticity Estimates for Ghanaian Tourism

Table A1: Estimates of long-run and short-run uncompensated own and cross-price elasticities of Ghanaian tourism goods and services

Quantity/Price	ACC	FAD	TRA	RCS	SHO	OTH
	Long-run					
ACC	-1.038***	-0.072*	-0.133**	0.116	0.019	0.185
	(-0.206)	(-0.406)	(-1.156)	(-1.067)	(0.373)	(0.422)
FAD	-0.003*	-1.126***	0.356**	-0.165	-0.413***	0.117
	(-0.404)	(-0.044)	(2.485)	(-1.010)	(-2.776)	(1.034)
TRA	-0.030*	0.426**	-1.028***	0.010	0.003	-0.389
	(-1.155)	(2.489)	(-0.381)	(1.068)	(1.459)	(-1.029)
RCS	0.160	-0.129	0.046	-0.917***	-0.257	0.213
	(1.066)	(-1.008)	(1.064)	(-0.353)	(-1.921)	(1.904)
SHO	0.023	-0.406***	0.286*	-0.262*	-1.067***	0.094*
	(0.372)	(-2.776)	(1.461)	(-1.921)	(-0.561)	(1.296)
OTH	0.193	0.157	-0.361	0.172	0.097*	-1.07***
	(0.422)	(1.034)	(-1.029)	(1.905)	(1.296)	(-1.570)
	Short-run					
ACC	-0.957*	-0.041*	-0.097***	-0.031	-0.160	0.104*
	(-1.130)	(-1.005)	(-0.743)	(-1.125)	(-0.384)	(1.060)
FAD	-0.034*	-1.039***	-0.024***	-0.037	-0.020***	0.060
	(-0.120)	(-0.137)	(-0.571)	(-1.012)	(-1.133)	(1.415)
TRA	-0.066*	-0.024***	-0.728***	-0.016	-0.072	-0.124
	(-1.051)	(-1.282)	(-0.333)	(-1.005)	(-0.646	(-1.242)
RCS	-0.028	-0.042	-0.019	-0.978***	-0.009	0.099*
	(-1.010)	(-1.097)	(-1.342)	(-1.122)	(-0.279)	(0.234)
SHO	-0.110	-0.009***	0.071	0.003*	-0.871***	-0.028
	(-0.423)	(-1.204)	(1.365)	(-1.075)	(-1.301)	(-0.112)
OTH	0.103*	0.055	-0.110	0.087*	-0.053	-1.014***
	(1.623)	(1.661)	(-0.371)	(0.235)	(-0.106)	(-1.432)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*

Source: Author's computation, 2017

Table A2: Estimates of long-run and short-run compensated own and cross-price elasticities of Ghanaian tourism goods and services

Quantity/Price	ACC	FAD	TRA	RCS	SHO	OTH
	Long-run					
ACC	-0.825***	0.231	0.250*	0.296**	0.216	0.378*
	(-1.338)	(0.811)	(1.212)	(1.018)	(0.344)	(1.025)
FAD	0.216	-0.810***	0.561***	0.037	-0.192	0.333
	(0.377)	(-1.601)	(0.011)	(1.321)	(-1.055)	(1.711)
TRA	0.161*	0.639***	-0.836***	0.194	0.502***	-0.193
	(-1.233)	(-0.087)	(-0.099)	(1.621)	(1.133)	(-1.305)
RCS	0.321**	0.043	0.197	-0.693***	-0.094	0.371
	(-1.140)	(1.021)	(1.236)	(-1.011)	(-0.134)	(1.588)
SHO	0.214	-0.202	0.464***	-0.086	-0.627***	0.282
	(0.342)	(-1.313)	(1.151)	(-0.179)	(-1.364)	(0.022)
OTH	0.384*	0.360	-0.183	0.348	0.290	-1.054***
	(0.211)	(1.222)	(-1.167)	(1.321)	(0.226)	(-1.019)
	Short-run					
ACC	-0.815***	0.097	0.212*	-0.097*	-0.014	-0.260
	(-1.505)	(1.033)	(1.662)	(-1.319)	(-1.217)	(-1.132)
FAD	0.094	-0.515***	0.144***	-0.086	-0.146***	0.209
	(1.122)	(-1.976)	(1.233)	(-0.027)	(-1.313)	(0.193)
TRA	0.065*	0.109***	-0.748***	-0.107	0.240	-0.027
	(1.243)	(1.123)	(-1.276)	(-0.734)	(0.332)	(-1.781)
RCS	-0.102*	0.093	0.122	-0.792**	0.160*	-0.251*
	(-0.461)	(1.027)	(0.334)	(-0.283)	(0.145)	(-0.911)
SHO	-0.010	-0.116***	0.200	0.117*	-0.611***	-0.112
	(-1.631)	(-1.239)	(0.062)	(0.541)	(-1.780)	(-1.102)
OTH	0.230	0.186	0.027	-0.208*	-0.113	-0.931***
	(0.252)	(0.633)	(1.738)	(-0.443)	(-1.702)	(-1.112)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*

Source: Author's computation, 2017

Appendix B: Domestic Tourism Elasticity Estimates for the Regions

Table B1: Price elasticities (Marshallian) of demand by region of destination (static model)

Region	ACC	FAD	TRA	RCS	SHO	OTH
Western	-1.074***	-1.282***	-1.094***	-0.794***	-0.732***	-0.983***
Central	-0.976***	-1.077***	-0.707***	-1.048***	-0.882***	-0.868***
Greater Accra	-0.987***	-1.337***	-0.878***	-0.894***	-1.226***	-0.722***
Volta	-0.843***	-0.923***	-1.179***	-1.229***	-0.583***	-0.717***
Eastern	-1.228***	-1.266**	-0.998***	-0.544***	-1.353***	-0.952***
Ashanti	-1.046***	-1.148***	-1.037***	-1.107***	-1.250***	-0.834***
Brong Ahafo	-1.442***	-0.584***	-1.218***	-0.971***	-1.139***	-1.978***
Northern	-1.250***	-0.963***	-1.302***	-0.799***	-1.188***	-1.412***
Upper East	-1.119***	-1.201***	-0.680***	-0.953***	-0.851***	-1.470*
Upper West	-0.622***	-1.527***	-1.228***	-0.881***	-1.526***	-0.850***
National	-1.038***	-1.126***	-1.028***	-0.917***	-1.067***	-1.075***

*Notes: ***, ** and * indicate 1%, 5% and 10% significant levels respectively.*
Source: Author's computation, 2017

Table B2: Expenditure/income elasticities of demand by region of destination (static model)

Region	ACC	FAD	TRA	RCS	SHO	OTH
Western	0.948***	0.853***	0.883***	0.920***	0.911***	1.502***
Central	1.096***	0.936***	1.107***	0.904***	1.022***	0.944***
Greater Accra	1.070***	1.486***	0.960***	0.821***	0.941***	0.774***
Volta	1.171***	0.987***	1.028***	0.944***	1.033***	0.825***
Eastern	0.741***	1.251***	1.110***	1.158***	1.001***	0.758***
Ashanti	1.119***	0.872***	1.055***	1.033***	0.988***	0.899***
Brong Ahafo	0.861***	1.177***	0.891***	0.920***	0.991***	1.160***
Northern	1.127***	0.900***	1.054***	1.043***	0.874***	0.976***
Upper East	0.855***	0.941***	0.842***	1.035***	0.644***	1.595***
Upper West	1.012***	1.013***	1.004***	1.022***	0.861***	0.985***
National	1.001***	1.038***	0.991***	0.977***	0.918***	1.039***

*Notes: ***indicates 1%, significant level.*
Source: Author's computation, 2017

Appendix C: Domestic Tourism Demand in Western Region - Elasticity Estimates

Table C1: Parameter estimates from static AIDS model: Western regional demand model

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.196	-0.077	-0.083	0.000	0.216	-0.094	0.037	-0.009
FAD	0.216		-0.367	0.314	0.118	-0.089	0.109	-0.016
TRA	0.162			-0.069	-0.105	-0.168	0.029	0.008
RCS	0.187				0.199	-0.196	-0.229	0.004
SHO	0.200					0.196	0.350	-0.019
OTH	0.039						-0.296	0.032

Source: Author's computation, 2017

Table C2: Elasticity estimates from static model: Western regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-1.074***	-0.067	-0.013	0.249*	-0.091	0.029	0.948***	-0.895***	0.121	0.174	0.432***	0.081	0.200
	(-5.308)	(-0.441)	(-0.100)	(1.702)	(-0.615)	(0.132)	(15.318)	(-4.441)	(0.803)	(1.364)	(2.980)	(0.555)	(0.907)
FAD	-0.046	-1.282**	0.359***	0.172	-0.022	-0.018	0.853***	0.115	-1.112***	0.504***	0.337**	0.132	0.136
	(-0.318)	(-6.193)	(2.893)	(1.170)	(-0.151)	(-0.080)	(13.210)	(0.803)	(-5.428)	(4.044)	(2.312)	(0.919)	(0.610)
TRA	-0.026	0.414***	-1.094***	-0.087	-0.126	-0.004	0.883***	0.194	0.590***	-0.944***	0.084	0.034	0.155
	(-0.185)	(2.809)	(-6.247)	(-0.594)	(-0.847)	(-0.022)	(14.848)	(1.364)	(4.044)	(-5.357)	(0.581)	(0.231)	(0.757)
RCS	0.248*	0.163	-0.082	-0.794***	-0.176	-0.270	0.920***	0.422***	0.346**	0.074	-0.616***	-0.010	-0.104
	(1.741)	(1.077)	(-0.651)	(-3.864)	(-1.197)	(-1.234)	(14.007)	(2.980)	(2.312)	(0.581)	(-3.017)	(-0.069)	(-0.471)
SHO	-0.088	-0.036	-0.123	-0.187	-0.732***	0.265	0.911***	0.084	0.145	0.032	-0.011	-0.568***	0.429*
	(-0.577)	(-0.224)	(-0.906)	(-1.203)	(-3.380)	(1.183)	(13.423)	(0.555)	(0.919)	(0.231)	(-0.069)	(-2.669)	(1.890)
OTH	-0.074	-0.148	-0.109	-0.402*	0.159	-0.983*	1.502***	0.210	0.150	0.146	-0.112	0.431*	-0.712**
	(-0.320)	(-0.600)	(-0.563)	(-1.681)	(0.694)	(-1.767)	(10.007)	(0.907)	(0.610)	(0.757)	(-0.471)	(1.890)	(-1.282)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*

Source: Author's computation, 2017

Table C3: Estimated parameters of dynamic AIDS model: Western regional demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	0.000	0.000	-0.005	0.005	-0.005	0.005	0.004	-1.372	0.277	0.608	2.869
FAD		0.011	0.005	-0.001	0.005	-0.021	0.005	-1.028	0.036	0.488	2.001
TRA			0.013	0.004	-0.006	-0.010	0.004	-1.131	0.065	0.561	1.974
RCS				0.009	0.002	-0.020	0.017	-1.071	0.019	0.517	1.994
SHO					-0.006	0.011	0.002	-0.959	-0.088	0.499	1.996
OTH						0.035	-0.032	-0.901	-0.076	0.526	1.969

Note: DW refers to Durbin-Watson statistic.

Source: Author's computation, 2017

Table C4: Elasticity estimates from dynamic model: Western regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-1.090***	-0.134	-0.016*	0.080*	-0.011*	0.186	0.953***	-0.958***	0.002	0.276*	0.222	0.136	0.312
	(-3.983)	(-0.645)	(-0.078)	(0.429)	(0.051)	(0.651)	(14.513)	(-3.516)	(0.008)	(0.473)	(1.180)	(0.623)	(1.095)
FAD	-0.137	-0.741**	0.128	-0.063	0.331	-0.517	0.999***	0.002	-0.599*	0.245	0.086	0.462**	-0.385
	(-0.672)	(-2.378)	(0.646)	(-0.315)	(1.419)	(-1.662)	(14.306)	(0.008)	(-1.921)	(1.237)	(0.427)	(1.980)	(-1.243)
TRA	-0.007*	0.159	-0.758**	-0.006	-0.503**	0.156	0.966***	0.004*	0.296	-0.645**	0.138	-0.377	0.283
	(-0.085)	(0.664)	(-2.402)	(-0.026)	(-1.979)	(0.483)	(13.708)	(0.473)	(1.237)	(-2.037)	(0.638)	(-1.483)	(0.882)
RCS	0.049*	-0.080	-0.025	-0.650***	-0.190	-0.217*	1.141***	0.207	0.082	0.109	-0.481**	-0.041	-0.067
	(0.276)	(-0.418)	(-0.146)	(-2.742)	(-0.948)	(-0.842)	(19.316)	(1.180)	(0.427)	(0.638)	(-2.012)	(-0.203)	(-0.260)
SHO	-0.010*	0.363	-0.452**	-0.190	-1.227***	0.523	0.967***	0.144	0.501**	-0.338	-0.046	-1.101***	0.651**
	(0.043)	(1.438)	(-1.985)	(-0.841)	(-3.449)	(1.566)	(12.746)	(0.623)	(1.980)	(-1.483)	(-0.203)	(-3.093)	(1.956)
OTH	0.196	-0.550	0.140	-0.217*	0.520	-1.053**	0.955***	0.329	-0.414	0.252	-0.075	0.645**	-0.927*
	(0.651)	(-1.646)	(0.489)	(-0.748)	(1.574)	(-1.481)	(6.383)	(1.095)	(-1.243)	(0.882)	(-0.260)	(1.956)	(-1.304)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*
Source: Author's computation, 2017

Appendix D: Domestic Tourism Demand in Central Region - Elasticity Estimates

Table D1: Parameter estimates from static AIDS model: Central regional demand model

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.121	0.003	0.000	-0.001	-0.002	-0.010	0.010	-0.109
FAD	0.137		-0.003	-0.001	0.007	0.006	-0.009	0.108
TRA	0.120			0.008	0.000	-0.003	-0.003	0.003
RCS	0.124				-0.002	0.004	-0.007	0.102
SHO	0.126					0.004	-0.001	0.001
OTH	0.372						0.011	-0.105

Source: Author's computation, 2017

Table D2: Elasticity estimates from static model: Central regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.976***	-0.036	-0.214*	0.045	-0.182	0.078	1.096***	-0.840***	0.113	0.130*	0.183	-0.043	0.209
	(-4.058)	(-0.187)	(-0.006)	(0.258)	(-1.025)	(0.315)	(13.076)	(-3.472)	(0.592)	(0.712)	(1.048)	(-0.242)	(0.849)
FAD	-0.013	-1.077***	-0.193	0.093	0.149	0.090	0.936***	0.103	-0.950***	-0.081	0.211	0.268	0.202
	(-0.075)	(-4.164)	(-1.087)	(0.531)	(0.844)	(0.348)	(10.755)	(0.592)	(-3.682)	(-0.459)	(1.206)	(1.526)	(0.784)
TRA	-0.042*	-0.241	-0.707***	0.109	-0.186	-0.052	1.107***	0.125*	-0.092	-0.575**	0.248	-0.045	0.081
	(-0.013)	(-1.206)	(-2.528)	(0.576)	(-0.953)	(-0.212)	(13.575)	(0.712)	(-0.459)	(-2.063)	(1.317)	(-0.231)	(0.327)
RCS	0.068	0.105	0.128	-1.048***	0.068	-0.249	0.904***	0.180	0.227	0.236	-0.935***	0.183	-0.141
	(0.400)	(0.555)	(0.711)	(-4.380)	(0.394)	(-1.067)	(11.581)	(1.048)	(1.206)	(1.317)	(-3.925)	(1.062)	(-0.602)
SHO	-0.168	0.147	-0.165	0.053	-0.882**	0.000	1.022***	-0.042	0.285	-0.042	0.181	-0.752***	0.122
	(-0.982)	(0.783)	(-0.895)	(0.307)	(-3.561)	(-0.002)	(12.390)	(-0.242)	(1.526)	(-0.231)	(1.062)	(-3.046)	(0.495)
OTH	0.099	0.100	-0.033	-0.266	0.009	-0.868**	0.944***	0.216	0.228	0.080	-0.147	0.129	-0.755*
	(0.387)	**(0.342)**	**(-0.131)**	**(-1.078)**	**(0.036)**	**(-1.274)**	(4.318)	(0.849)	(0.784)	(0.327)	(-0.602)	(0.495)	(-1.108)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are't' values*

Source: Author's computation, 2017

Table D3: Estimated parameters of dynamic AIDS model: Central regional demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	0.227	-0.181	-0.093	-0.044	0.011	0.068	0.025	-1.360	0.277	0.581	2.008
FND		-0.004	0.067	-0.046	0.065	0.099	0.006	-1.089	0.001	0.589	2.032
TRA			0.265	-0.131	0.001	-0.110	0.017	-1.046	-0.070	0.544	1.915
RCS				0.047	-0.155	0.274	0.012	-0.969	-0.035	0.509	1.975
SHO					-0.154	0.174	-0003	-1.035	-0.009	0.523	1.955
OTH						-0.405	-0.056	-1.027	0.009	0.544	1.961

Note: DW refers to Durbin-Watson statistic
Source: Author's computation, 2017

Table D4: Elasticity estimates from dynamic model: Central regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.831***	-0.168	-0.115*	0.103*	0.130	0.005	0.882***	-0.672***	-0.014*	0.143*	0.242**	0.290**	0.160
	(-4.991)	(-1.239)	(-0.915)	(0.819)	(0.968)	(0.028)	(13.432)	(-3.995)	(-0.105)	(0.344)	(1.931)	(2.175)	(0.847)
FAD	-0.213	-1.004***	0.027	-0.090	0.075	0.102	1.098***	-0.015*	-0.813***	0.224	0.083	-0.274*	0.295
	(-1.536)	(-4.654)	(0.189)	(-0.608)	(0.487)	(0.466)	(14.704)	(-0.105)	(-3.773)	(1.568)	(0.565)	(1.794)	(1.354)
TRA	-0.026**	0.055	-0.688***	-0.099	0.035	-0.108	0.934***	0.023*	0.218	-0.520***	0.047	0.205	0.056
	(-1.007)	(0.396)	(-3.820)	(-0.784)	(0.261)	(-0.573)	(14.896)	(0.344)	(1.568)	(-2.909)	(0.376)	(1.515)	(0.296)
RCS	0.101*	-0.080	-0.123	-0.978***	-0.265*	0.361	0.985***	0.279**	0.092	0.054	-0.824***	-0.086	0.534**
	(0.702)	(-0.490)	(-0.845)	(-4.648)	(-1.687)	(1.579)	(12.783)	(1.931)	(0.565)	(0.376)	(-3.933)	(-0.550)	(2.343)
SHO	0.105	0.086	0.021	-0.234*	-1.185***	0.192	1.014***	0.288**	-0.263*	0.203	-0.075	-1.001***	0.370*
	(0.797)	(0.586)	(0.153)	(-1.711)	(-5.939)	(0.942)	(14.632)	(2.175)	(1.794)	(1.515)	(-0.550)	(-5.014)	(1.823)
OTH	-0.032	0.102	-0.139	0.306	0.185	-1.518***	1.091***	0.165	0.292	0.057	0.477**	0.383*	-1.326***
	(-0.164)	(0.470)	(-0.713)	(1.491)	(0.871)	(-2.899)	(6.461)	(0.847)	(1.354)	(0.296)	(2.343)	(1.823)	(-2.537)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*
Source: Author's computation, 2017

Appendix E: Domestic Tourism Demand in Greater Accra Region - Elasticity Estimates

Table E1: Parameter estimates from static AIDS model: Greater Accra regional demand model

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.120	-0.006	-0.002	0.013	0.007	-0.002	-0.010	0.015
FAD	0.123		-0.004	0.000	0.004	0.000	0.002	0.126
TRA	0.126			0.003	-0.004	-0.005	-0.007	-0.122
RCS	0.140				0.000	0.003	-0.010	-0.011
SHO	0.141					0.000	0.004	0.033
OTH	0.350						0.020	-0.041

Source: Author's computation, 2017

Table E2: Elasticity estimates from static model: Greater Accra regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.987***	-0.274	-0.409**	0.376*	0.001	-0.325	1.070***	-1.108***	-0.137	0.544***	0.524**	0.151	-0.170
	(-4.300)	(-1.391)	(-2.080)	(1.704)	(0.007)	(-1.019)	(9.774)	(-3.858)	(-0.694)	(2.756)	(2.390)	(0.702)	(-0.535)
FAD	-0.321	-1.337***	-0.138	-0.087	0.094	0.398	1.486***	-0.134	-1.146***	0.051	0.120	0.301	0.614**
	(-1.647)	(-5.541)	(-0.771)	(-0.431)	(0.484)	(1.396)	(14.847)	(-0.694)	(-4.744)	(0.282)	(0.598)	(1.543)	(2.170)
TRA	-0.419**	-0.072	-0.878***	-0.061	-0.105	-0.270	0.960***	0.540***	0.051	-0.757***	0.072	0.029	-0.131
	(-2.124)	(-0.396)	(-3.345)	(-0.291)	(-0.508)	(-0.95)	(9.838)	(2.756)	(0.282)	(-2.865)	(0.345)	(0.139)	(-0.464)
RCS	0.371*	0.005	-0.038	-0.894***	0.014	-0.314	0.821***	0.474**	0.110	0.066	-0.780***	0.129	-0.195
	(1.858)	(0.028)	(-0.202)	(-3.009)	(0.069)	(-0.979)	(7.583)	(2.390)	(0.598)	(0.345)	(-2.637)	(0.617)	(-0.611)
SHO	0.018	0.156	-0.093	-0.002	-1.226***	0.196	0.941***	0.136	0.276	0.026	0.128	-1.095***	0.332
	(0.090)	(0.870)	(-0.493)	(-0.011)	(-4.404)	(0.621)	(8.258)	(0.702)	(1.543)	(0.139)	(0.617)	(-3.893)	(1.065)
OTH	-0.244	0.442*	-0.212	-0.294	0.211	-0.722**	0.774***	-0.147	0.541**	-0.114	-0.186	0.319	-0.609*
	(-0.885)	(1.760)	(-0.856)	(-0.958)	(0.700)	(-1.023)	(3.361)	(-0.535)	(2.170)	(-0.464)	(-0.611)	(1.065)	(-0.864)

Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are ‘t’ values.
Source: Author’s computation, 2017

Table E3: Estimated parameters of dynamic AIDS model: Greater Accra regional demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	0.217	0.017	-0.204	0.144	-0.066	-0.108	-0.031	-0.719	-1.207	0.577	2.318
FAD		0.032	0.097	-0.164	-0.093	0.012	-0.003	-1.168	-0.004	0.608	2.609
TRA			-0.071	0.198	-0.107	0.087	0.018	-0.946	-0.012	0.493	1.973
RCS				-0.263	0.039	0.046	0.044	-1.207	0.184	0.528	2.062
SHO					0.401	-0.173	0.004	-0.939	-0.077	0.495	1.935
OTH						0.136	-0.032	-1.179	-0.033	0.603	1.957

Note: DW refers to the Durbin-Watson statistic
Source: Author's computation, 2017

Table E4: Elasticity estimates from dynamic model: Greater Accra regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.724***	0.007*	-0.268*	0.187	-0.098*	-0.125	1.018***	-0.549***	0.201	0.186*	0.375**	0.093	0.065
	(-3.377)	(0.050)	(-1.757)	(1.150)	(-0.611)	(-0.532)	(10.245)	(-2.568)	(1.404)	(0.568)	(2.294)	(0.583)	(0.281)
FAD	0.061*	-0.736***	0.173	-0.232*	-0.094	0.158	0.700***	0.181	-0.603***	0.298**	-0.103	0.037	0.289
	(0.473)	(-4.276)	(1.294)	(-1.711)	(-0.721)	(0.859)	(9.185)	(1.404)	(-3.551)	(2.225)	(-0.756)	(0.279)	(1.588)
TRA	-0.036	0.149	-1.035***	0.224	-0.125	0.145	0.889***	0.083*	0.318**	-0.876***	0.388**	0.041	0.311
	(-1.601)	(1.022)	(-4.867)	(1.395)	(-0.813)	(0.664)	(9.975)	(0.568)	(2.225)	(-4.116)	(2.403)	(0.268)	(1.444)
RCS	0.164	-0.312**	0.183	-1.254***	0.091	0.041	1.078***	0.349**	-0.107	0.376**	-1.056***	0.294*	0.243
	(1.070)	(-2.169)	(1.169)	(-5.657)	(0.585)	(0.176)	(11.108)	(2.294)	(-0.756)	(2.403)	(-4.726)	(1.880)	(1.053)
SHO	-0.079*	-0.145	-0.131	0.112	-0.553***	-0.158	0.958***	0.085	0.037	0.039	0.289*	-0.373*	0.022
	(-0.535)	(-1.064)	(-0.891)	(0.732)	(-2.630)	(-0.703)	(10.102)	(0.583)	(0.279)	(0.268)	(1.880)	(-1.765)	(0.098)
OTH	-0.173	0.035	0.054	-0.011	-0.233	-1.066**	1.139***	0.060	0.294	0.297	0.239	0.022	-0.812*
	(-0.801)	(0.187)	(0.260)	(-0.048)	(-1.036)	(-2.062)	(6.689)	(0.281)	(1.588)	(1.444)	(1.053)	(0.098)	(-1.575)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*
Source: Author's computation, 2017

Appendix F: Domestic Tourism Demand in Volta Region - Elasticity Estimates

Table F1: Parameter estimates from static AIDS Model: Volta regional demand model

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.295	0.637	-0.484	0.023	0.489	-0.300	-0.365	-0.007
FAD	0.258		0.030	0.092	-0.261	0.059	0.563	0.031
TRA	0.307			-0.207	0.030	-0.333	0.394	0.029
RCS	0.310				-0.319	0.473	-0.412	0.041
SHO	0.335					0.732	-0.632	0.043
OTH	-0.505						0.452	-0.137

Source: Author's computation, 2017

Table F2: Elasticity estimates from static model: Volta regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.843**	-0.338*	-0.042	0.325	-0.226	-0.466*	1.171***	-0.295**	-0.026	0.405**	0.683***	0.156	-0.132
	(-2.159)	(-1.735)	(-0.218)	(1.595)	(-1.064)	(-1.676)	(12.851)	(-0.994)	(-0.134)	(2.100)	(3.364)	(0.738)	(-0.481)
FAD	-0.323	-0.923***	0.040	-0.202	0.032	0.399	0.987***	-0.029	-0.660***	0.346*	0.100	0.354*	0.680***
	(-1.478)	(-3.420)	(0.209)	(-0.961)	(0.157)	(1.533)	(11.948)	(-0.134)	(-2.445)	(1.819)	(0.475)	(1.755)	(2.653)
TRA	-0.083	0.023	-1.179***	-0.022	-0.261	0.307	1.028***	0.389**	0.297*	-0.860***	0.292	0.074	0.600***
	(-0.444)	(0.141)	(-5.073)	(-0.126)	(-1.457)	(1.242)	(12.690)	(2.100)	(1.819)	(-3.683)	(1.653)	(0.417)	(2.467)
RCS	0.384**	-0.165	0.003	-1.229***	0.309	-0.203	0.944***	0.665***	0.087	0.296	-0.940***	0.617***	0.067
	(1.925)	(-0.898)	(0.018)	(-4.637)	(1.594)	(-0.743)	(10.830)	(3.364)	(0.475)	(1.653)	(-3.548)	(3.219)	(0.248)
SHO	-0.165	0.014	-0.250	0.262	-0.583**	-0.336	1.033***	0.142	0.289*	0.070	0.577***	-0.246**	-0.041
	(-0.854)	(0.084)	(-1.483)	(1.455)	(-2.332)	(-1.319)	(12.649)	(0.738)	(1.755)	(0.417)	(3.219)	(-0.990)	(-0.165)
OTH	-0.383	0.415*	0.396	-0.181	-0.317	-0.618**	0.825***	-0.137	0.635***	0.652***	0.071	-0.047	0.383**
	(-1.309)	**(1.689)**	**(1.455)**	**(-0.612)**	**(-1.071)**	**(-0.910)**	(3.911)	(-0.481)	(2.653)	(2.467)	(0.248)	(-0.165)	(-0.565)

Source: Author's computation, 2017

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*

Table F3: Estimated parameters of dynamic AIDS model: Volta regional demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	0.007	0.007	-0.001	0.012	-0.015	-0.010	-0.033	-0.896	-0.064	0.482	2.006
FAD		0.016	0.000	0.006	0.000	-0.015	-0.014	-0.808	-0.195	0.526	1.915
TRA			0.009	0.015	0.012	-0.035	0.000	-1.024	0.027	0.491	2000
RCS				-0.008	-0.015	0.000	0.004	-0.904	-0.079	0.485	2.038
SHO					0.008	0.010	0.027	-1.241	0.042	0.600	1.993
OTH						0.051	0.016	-1.096	0.109	0.539	2.050

Source: Author's computation, 2017

Note: DW refers to Durbin-Watson statistic

Table F4: Elasticity estimates from dynamic model: Volta regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.939**	-0.035	-0.068*	0.666**	-0.412*	0.015	0.843***	-0.731*	0.133	0.231*	0.886***	-0.191	0.209
	(-2.322)	(-0.136)	(-0.266)	(2.368)	(-1.441)	(0.046)	(9.533)	(-1.813)	(0.513)	(0.514)	(3.180)	(-0.670)	(0.630)
FAD	-0.063	-0.590*	0.061	0.186	-0.075	-0.406	0.921***	0.164	-0.406*	0.279	0.428	0.167	-0.194
	(-0.197)	(-1.468)	(0.221)	(0.604)	(-0.243)	(-1.091)	(9.395)	(0.513)	(-1.014)	(1.010)	(1.397)	(0.541)	(-0.519)
TRA	0.014*	0.033	-1.051***	0.227	0.466*	-0.583*	1.014***	0.037*	0.236	-0.812***	0.493**	0.733***	-0.349
	(-0.424)	(0.141)	(-3.338)	(0.907)	(1.866)	(-1.782)	(11.495)	(0.514)	(1.010)	(-2.584)	(1.988)	(2.950)	(-1.063)
RCS	0.608**	0.141	0.226	-1.593***	-0.446*	0.172	0.926***	0.837***	0.326	0.444**	-1.351***	-0.203	0.384
	(2.301)	(0.602)	(1.007)	(-4.591)	(-1.804)	(0.565)	(11.518)	(3.180)	(1.397)	(1.988)	(-3.922)	(-0.825)	(1.256)
SHO	-0.447*	-0.089	0.404*	-0.486**	-0.734**	0.236	1.081***	-0.180	0.127	0.659***	-0.203	-0.451**	0.485
	(-1.657)	(-0.378)	(1.798)	(-1.957)	(-2.103)	(0.691)	(11.507)	(-0.670)	(0.541)	(2.950)	(-0.825)	(-1.298)	(1.409)
OTH	-0.076	-0.412	-0.646*	0.120	0.234	-0.531*	1.216***	0.225	-0.169	-0.359	0.438	0.553	0.251**
	(-0.211)	**(-1.256)**	**(-1.894)**	**(0.339)**	**(0.592)**	**(-0.674)**	(6.088)	(0.630)	(-0.519)	(-1.063)	(1.256)	(1.409)	(-0.320)

Source: Author's computation, 2017

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*

Appendix H: Domestic Tourism Demand in Eastern Region-Elasticity Estimates

Table H1: Parameter estimates from static AIDS Model: Eastern regional demand Model

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.228	-0.204	-0.053	-0.194	-0.245	0.377	0.319	-0.009
FAD	0.213		-0.270	0.400	-0.189	0.036	0.076	-0.008
TRA	0.209			0.047	-0.058	0.032	-0.228	0.013
RCS	0.273				0.618	-0.062	-0.064	-0.054
SHO	0.220					-0.376	-0.008	0.003
OTH	-0.143						-0.094	0.055

Source: Author's computation, 2017

Table H2: Elasticity estimates from static model: Eastern regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-1.228***	0.010	-0.112	-0.130	0.452***	0.356	0.741***	-1.069***	0.163	0.049	0.046	0.620***	0.533**
	(-5.208)	(0.057)	(-0.735)	(-0.735)	(2.563)	(1.498)	(5.345)	(-4.476)	(0.912)	(0.325)	(0.269)	(3.655)	(2.289)
FAD	-0.099	-1.266***	0.361**	-0.240	-0.066	-0.026	1.251***	0.170	-1.009***	0.633***	0.057	0.218	0.273
	(-0.532)	(-4.919)	(2.152)	(-1.281)	(-0.357)	(-0.113)	(9.064)	(0.912)	(-3.899)	(3.796)	(0.314)	(1.222)	(1.211)
TRA	-0.190	0.371**	-0.998***	-0.051	-0.034	-0.245	1.110***	0.049	0.599***	-0.757***	0.213	0.218	0.020
	(-1.278)	(2.343)	(-5.293)	(-0.321)	(-0.214)	(-1.235)	(9.276)	(0.325)	(3.796)	(-3.999)	(1.396)	(1.431)	(0.103)
RCS	-0.207	-0.189	-0.057	-0.544**	-0.065	-0.150	1.158***	0.041	0.049	0.195	-0.268*	0.198	0.127
	(-1.348)	(-1.204)	(-0.407)	(-2.416)	(-0.414)	(-0.661)	(8.432)	(0.269)	(0.314)	(1.396)	(-1.228)	(1.300)	(0.564)
SHO	0.370**	-0.008	-0.009	-0.031	-1.353***	0.030	1.001***	0.585***	0.198	0.209	0.207	-1.126***	0.269
	(2.334)	(-0.052)	(-0.060)	(-0.187)	(-6.066)	(0.143)	(7.929)	(3.655)	(1.222)	(1.431)	(1.300)	(-5.184)	(1.319)
OTH	0.315	0.079	-0.147	-0.054	0.083	-0.952*	0.758***	0.478**	0.235	0.018	0.126	0.256	-0.771*
	(1.444)	(0.388)	(-0.777)	(-0.232)	(0.406)	(-1.849)	(2.561)	(2.289)	(1.211)	(0.103)	(0.564)	(1.319)	(-1.512)

Source: Author's computation, 2017

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*

Table H3: Estimated parameters of dynamic AIDS model: Eastern regional demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	0.003	-0.005	-0.002	-0.009	0.010	0.003	0.002	-1.123	0.039	0.526	1.665
FND		0.000	0.005	0.007	0.008	-0.016	0.006	-1.110	0.251	0.547	1.980
TRA			0.002	-0.007	0.002	0.000	0.000	-1.147	-0.089	0.568	2.005
RCS				0.006	0.010	0.013	0.009	-0.893	0.035	0.449	2.060
SHO					0.000	-0.008	-0.004	-1.111	-0.008	0.562	1.989
OTH						0.007	-0.013	-0.668	-0.153	0.408	1.981

Source: Author's computation, 2017

Note: DW refers to Durbin-Watson statistic

Table H4: Elasticity estimates from dynamic model: Eastern regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.973***	-0.065*	-0.080**	-0.278	0.388*	-0.054	1.059***	-0.773***	-0.122*	0.299*	-0.083	0.573***	0.111
	(-3.202)	(-0.303)	(-0.384)	(-1.193)	(1.875)	(-0.188)	(6.797)	(-2.584)	(0.573)	(0.476)	(-0.362)	(2.801)	(0.386)
FAD	-0.032*	-1.058***	-0.022	0.237	0.056	-0.036	0.863***	-0.131**	-0.906***	0.124	0.395	0.207	0.099
	(-0.138)	(-3.446)	(-0.099)	(0.940)	(0.266)	(-0.119)	(5.343)	(0.573)	(-2.947)	(0.573)	(1.585)	(1.003)	(0.326)
TRA	-0.014*	-0.053	-0.718**	-0.049	-0.070	-0.060	1.033***	0.011*	0.130	-0.544*	0.140	0.111	0.101
	(-0.356)	(-0.232)	(-2.322)	(-0.200)	(-0.325)	(-0.208)	(7.071)	(0.476)	(0.573)	(-1.751)	(0.576)	(0.522)	(0.350)
RCS	-0.315	0.165	-0.076	-0.995***	-0.308	0.302	1.217***	-0.086	0.380	0.129	-0.772**	-0.095	0.492
	(-1.304)	(0.688)	(-0.340)	(-2.763)	(-1.311)	(0.948)	(7.203)	(-0.362)	(1.585)	(0.576)	(-2.155)	(-0.408)	(1.546)
SHO	0.447**	0.049	-0.045	-0.265	-1.052***	-0.031*	0.902***	0.617***	0.208	0.107	-0.099	-0.893***	0.110
	(1.988)	(0.234)	(-0.221)	(-1.078)	(-3.592)	(-0.102)	(5.213)	(2.801)	(1.003)	(0.522)	(-0.408)	(-3.079)	(0.360)
OTH	-0.036	-0.048	-0.044	0.412	-0.035*	-1.148**	0.904**	0.134	0.111	0.109	0.578	0.123	-1.007*
	(-0.102)	(-0.138)	(-0.136)	(1.080)	(-0.101)	(-1.414)	(2.168)	(0.386)	(0.326)	(0.350)	(1.546)	(0.360)	(-1.244)

Source: Author's computation, 2017

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*

Appendix K: Domestic Tourism Demand in Ashanti Region-Elasticity Estimates

Table K1: Parameter estimates from static AIDS Model: Ashanti regional demand Model

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.295	0.637	-0.484	0.023	0.489	-0.300	-0.365	-0.107
FAD	0.258		0.030	0.092	-0.261	0.059	0.563	0.031
TRA	0.307			-0.207	0.030	-0.333	0.394	0.029
RCS	0.310				-0.319	0.473	-0.412	0.141
SHO	0.335					0.732	-0.632	0.044
OTH	-0.505						0.452	-0.138

Source: Author's computation, 2017

Table K2: Elasticity estimates from static model: Ashanti regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-1.046***	-0.097*	-0.367*	-0.022	0.331*	-0.419*	1.119***	-1.090***	0.030	0.519***	0.097	0.463***	-0.292
	(-5.073)	(-0.638)	(-1.738)	(-0.127)	(1.796)	(-1.796)	(10.095)	(-4.491)	(0.201)	(2.449)	(0.569)	(2.512)	(-1.244)
FAD	-0.084*	-1.148***	0.166	0.026	0.131	0.002	0.872***	0.037	-1.048***	0.284	0.119	0.234	0.101
	(-0.451)	(-4.963)	(0.735)	(0.142)	(0.661)	(0.008)	(8.207)	(0.201)	(-4.555)	(1.254)	(0.647)	(1.181)	(0.426)
TRA	-0.187*	0.120	-1.037***	-0.003	-0.438*	-0.067	1.055***	0.534***	0.240	-0.895***	0.109	-0.314	0.052
	(-1.750)	(0.619)	(-2.978)	(-0.013)	(-1.904)	(-0.243)	(7.848)	(2.449)	(1.254)	(-2.563)	(0.516)	(-1.365)	(0.188)
RCS	-0.016	0.010	-0.001	-1.107***	0.103	-0.013	1.033***	0.127	0.128	0.139	-0.997***	0.225	0.104
	(-0.072)	(0.050)	(-0.002)	(-3.552)	(0.426)	(-0.047)	(8.135)	(0.569)	(0.647)	(0.516)	(-3.217)	(0.931)	(0.380)
SHO	0.408*	0.113	-0.493*	0.097	-1.250***	0.133	0.988***	0.546***	0.226	-0.359	0.202	-1.133***	0.246
	(1.855)	(0.588)	(-1.875)	(0.445)	(-3.853)	(0.523)	(8.406)	(2.512)	(1.181)	(-1.365)	(0.931)	(-3.489)	(0.958)
OTH	-0.484	-0.001	-0.059	0.002	0.149	-0.534**	0.899***	-0.359	0.101	0.062	0.098	0.256	-0.432*
	(-1.664)	(-0.005)	(-0.178)	(0.009)	(0.555)	(-0.857)	(3.238)	(-1.244)	(0.426)	(0.188)	(0.380)	(0.958)	(-0.694)

Source: Author's computation, 2017

Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are't' values.

Table K3: Estimated parameters of dynamic AIDS model: Ashanti regional demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	0.096	0.081	-0.150	-0.295	0.184	0.084	-0.024	-0.880	0.049	0.591	1.959
FAD		-0.146	-0.020	-0.001	0.122	-0.036	0.007	-1.182	0.007	0.605	1.905
TRA			0.516	0.072	-0.135	-0.284	-0.064	-0.853	-0.094	0.479	1.946
RCS				0.035	-0.061	0.249	-0.022	-0.853	0.007	0.434	2.008
SHO					-0.176	0.065	0.017	-1.191	-0.079	0.549	2.775
OTH						-0.078	0.038	-1.081	0.159	0.496	2250

Source: Author's computation, 2017

Note: DW refers to Durbin-Watson statistic

Table K4: Elasticity estimates from dynamic model: Ashanti regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.778***	0.129	-0.171**	-0.324***	0.269**	0.068	0.821***	-0.632***	0.281**	0.124*	-0.176	0.411***	0.210
	(-4.110)	(1.036)	(-1.071)	(-2.542)	(2.035)	(0.359)	(9.457)	(-3.392)	(2.272)	(-0.150)	(-1.373)	(3.107)	(1.110)
FAD	0.103	-1.140***	0.005	0.007	0.141	-0.051	0.940***	0.270**	-0.965***	0.174	0.177	0.304***	0.112
	(0.849)	(-7.450)	(0.033)	(0.063)	(1.201)	(-0.323)	(13.473)	(2.272)	(-6.331)	(1.266)	(1.574)	(2.586)	(0.705)
TRA	-0.023*	-0.028	-0.553**	-0.091*	-0.161*	-0.251	1.117***	0.021*	0.179	-0.353*	0.293**	0.032	-0.057
	(-1.398)	(-0.198)	(-2.179)	(0.613)	(-1.049)	(-1.114)	(11.057)	(-0.150)	(1.266)	(-1.407)	(1.971)	(0.210)	(-0.250)
RCS	-0.335***	0.014	-0.128	-0.959***	-0.054*	0.309*	0.904***	-0.173	0.181	0.291**	-0.796***	0.102	0.466***
	(-2.597)	(0.119)	(0.856)	(-5.771)	(-0.431)	(1.740)	(11.339)	(-1.373)	(1.574)	(1.971)	(-4.760)	(0.812)	(2.622)
SHO	0.256*	0.152	-0.135*	-0.062*	-1.216***	0.074	0.935***	0.423***	0.325***	0.034	0.107	-1.054***	0.236
	(1.847)	(1.198)	(-0.830)	(-0.475)	(-6.470)	(0.387)	(11.124)	(3.107)	(2.586)	(0.210)	(0.812)	(-5.592)	(1.234)
OTH	-0.015	-0.120	-0.291	0.251	0.012	-1.151**	1.012***	0.216	0.120	-0.059	0.485***	0.236	-0.926**
	(-0.074)	(-0.693)	(-1.230)	(1.338)	(0.062)	(-2.631)	(7.264)	(1.110)	(0.705)	(-0.250)	(2.622)	(1.234)	(-2.123)

Source: Author's computation, 2017

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*

Appendix M: Domestic Tourism Demand in Brong Ahafo Region- Elasticity Estimates

Table M1: Parameter estimates from static AIDS model: Brong Ahafo regional demand model

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.892	-0.101	-0.026	0.025	0.034	-0.032	0.100	0.000
FAD	0.612		0.096	0.007	-0.043	-0.008	-0.027	-0.132
TRA	0.567			-0.018	-0.043	0.003	0.027	0.018
RCS	0.846				-0.018	0.037	0.034	0.001
SHO	0.762					-0.007	0.006	0.014
OTH	-2.679						-0.141	0.105

Source: Author's computation, 2017

Table M2: Elasticity estimates from static model: Brong Ahafo regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-1.442***	-0.102	-0.280	0.041	0.126	0.789**	0.861***	-0.682*	0.508**	0.892***	0.779***	0.872***	1.602***
	(-3.730)	(-0.444)	(-1.106)	(0.150)	(0.481)	(1.987)	(9.055)	(-1.792)	(2.264)	(3.707)	(3.053)	(3.637)	(4.087)
FAD	-0.406	-0.584*	-0.145	-0.408	-0.065	-0.270	1.177***	0.633**	-0.249**	0.691***	0.602**	0.954***	0.842**
	(-1.417)	(-1.685)	(-0.530)	(-1.395)	(-0.230)	(-0.75)	(14.075)	(2.264)	(0.710)	(2.622)	(2.153)	(3.652)	(2.372)
TRA	-0.322	0.058	-1.218***	-0.091	0.123	0.348	0.891***	0.109***	0.688***	-0.585**	0.673**	0.895***	1.190***
	(-1.057)	(0.219)	(-3.095)	(-0.293)	(0.434)	(0.941)	(10.244)	(3.707)	(14.075)	(-1.525)	(2.243)	(3.397)	(3.237)
RCS	-0.011	-0.155	-0.096	-0.971***	0.276	0.353	0.920***	0.802***	0.497**	0.557**	-0.182**	1.073***	1.223***
	(-0.039)	(-0.663)	(-0.372)	(-2.660)	(1.092)	(0.962)	(10.732)	(3.053)	(2.153)	(2.243)	(-0.513)	(4.619)	(3.355)
SHO	0.014	0.078	0.030	0.213	-1.139***	-0.152	0.991***	0.889***	0.780***	0.734***	1.063***	-0.281**	0.785***
	(0.056)	(0.366)	(0.133)	(0.885)	(-3.597)	(-0.480)	(13.031)	(3.637)	(3.652)	(3.397)	(4.619)	(-0.945)	(2.491)
OTH	0.473	-0.191	0.070	0.114	-0.286	-1.978***	1.160***	1.498***	0.631**	0.895***	1.110***	0.719***	-0.881**
	(1.201)	(-0.658)	(0.235)	(0.318)	(-0.890)	(-2.645)	(7.171)	(4.087)	(2.372)	(3.237)	(3.355)	(2.491)	(-1.204)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*

Source: Author's computation, 2017

Table M3: Estimated parameters of dynamic AIDS model: Brong Ahafo regional demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	-0.471	0.488	1.677	-2.480	0.347	0.439	0.018	-0.993	-0.027	0.492	1.954
FAD		-2.62	1.023	1.896	0.233	-1.019	0.025	-0.995	-0.074	0.524	1.974
TRA			0.848	0.351	-1.164	-2.736	-0.010	-0.893	-0.019	0.449	1.967
RCS				-0.464	0.389	0.308	0.013	-1.122	0.063	0.555	1.859
SHO					1.84	-1.646	-0.002	-1.126	-0.038	0.599	1.987
OTH						4.654	-0.044	-0.995	-0.076	0.526	2.059

Source: Author's computation, 2017

Note: DW refers to Durbin-Watson statistic

Table M4: Elasticity estimates from dynamic model: Brong Ahafo regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-1.398***	-0.058	-0.207*	-0.404**	-0.050	0.078	1.107***	-0.138**	0.848***	1.105***	0.682***	1.051***	1.131***
	(-4.815)	(-0.331)	(-1.150)	(-2.057)	(-0.265)	(0.289)	(14.236)	(-0.515)	(5.291)	(7.734)	(3.652)	(5.856)	(4.395)
FAD	-0.040	-1.764***	0.200	0.449**	0.022	-0.280	1.070***	0.179***	-0.888***	1.262***	1.500***	1.087***	0.739***
	(-0.162)	(-6.041)	(0.901)	(1.942)	(0.101)	(-0.959)	(13.344)	(5.291)	(-3.221)	(5.837)	(6.707)	(5.127)	(2.637)
TRA	-0.143*	0.212	-0.859***	0.044	-0.238	-0.579**	1.013***	0.497***	0.441***	-0.147**	1.039***	0.770***	0.385
	(-1.585)	(1.093)	(-3.394)	(0.220)	(-1.244)	(-2.184)	(14.352)	(7.734)	(5.837)	(0.582)	(5.367)	(4.204)	(1.530)
RCS	-0.237	0.511***	0.154	-1.221***	0.206	0.156	0.903***	0.791***	1.251***	1.050***	-0.334**	1.105***	1.016***
	(-0.981)	(2.519)	(0.754)	(-4.046)	(0.957)	(0.533)	(11.590)	(3.652)	(6.707)	(5.367)	(-1.116)	(5.362)	(3.642)
SHO	-0.026	0.011	-0.303	0.031	-0.682***	-0.495*	1.079***	1.203***	0.895***	0.768***	1.091***	-0.392**	0.532**
	(-0.113)	(0.059)	(-1.587)	(0.146)	(-2.575)	(-1.894)	(14.901)	(5.856)	(5.127)	(4.204)	(5.362)	(1.488)	(2.144)
OTH	0.424	-0.033	-0.408	0.247	-0.256	-0.108**	0.816***	1.353***	0.635***	0.402	1.048***	0.556**	-0.885**
	(1.192)	(-0.121)	(-1.337)	(0.756)	(-0.846)	(0.176)	(5.211)	(4.395)	(2.637)	(1.530)	(3.642)	(2.144)	(1.485)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*
Source: Author's computation, 2017

Appendix N: Domestic Tourism Demand in Northern Region-Elasticity Estimates

Table N1: Parameter estimates from static AIDS Model: Northern regional demand Model

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.108	-0.003	0.006	-0.005	-0.002	0.001	0.003	-0.002
FAD	0.122		-0.003	-0.004	0.000	0.000	0.001	-0.005
TRA	0.122			0.009	0.001	0.010	-0.010	-0.102
RCS	0.137				0.006	-0.015	0.010	0.041
SHO	0.104					0.001	0.003	0.070
OTH	0.407						-0.007	-0.002

Source: Author's computation, 2017

Table N2: Elasticity estimates from static model: Northern regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-1.250***	-0.363**	-0.247	-0.040	0.309**	-0.036	1.127***	-1.045***	-0.175	0.443***	0.174	0.487***	0.162
	(-5.305)	(-2.182)	(-1.372)	(-0.247)	(2.006)	(-0.148)	(9.392)	(-4.444)	(-1.058)	(2.457)	(1.073)	(3.201)	(0.674)
FAD	-0.355**	-0.963***	0.184	0.051	0.187	0.001	0.900***	-0.192	-0.814***	0.341*	0.222	0.330**	0.158
	(-1.947)	(-4.026)	(0.966)	(0.293)	(1.182)	(0.003)	(7.224)	(-1.058)	(-3.398)	(1.784)	(1.285)	(2.105)	(0.640)
TRA	-0.271	0.150	-1.302***	-0.061	-0.306*	0.192	1.054***	0.403***	0.325*	-1.118***	0.139	-0.140	0.376
	(-1.426)	(0.818)	(-4.670)	(-0.339)	(-1.844)	(0.662)	(7.631)	(2.457)	(1.784)	(-3.986)	(0.774)	(-0.851)	(1.319)
RCS	-0.023	0.021	-0.054	-0.799***	-0.217	0.028	1.043***	0.166	0.194	0.127	-0.601***	-0.052	0.211
	(-0.149)	(0.137)	(-0.329)	(-3.777)	(-1.531)	(0.115)	(8.360)	(1.073)	(1.285)	(0.774)	(-2.855)	(-0.374)	(0.870)
SHO	0.401**	0.201	-0.306*	-0.229	-1.188***	0.252	0.874***	0.560***	0.347**	-0.154	-0.063	-1.050***	0.405*
	(2.283)	(1.220)	(-1.701)	(-1.352)	(-5.436)	(1.031)	(7.431)	(3.201)	(2.105)	(-0.851)	(-0.374)	(-4.843)	(1.675)
OTH	-0.010	-0.012	0.204	0.043	0.211	-1.412**	0.976***	0.168	0.150	0.374	0.228	0.366*	-1.241**
	(-0.039)	(-0.050)	(0.711)	(0.162)	(0.951)	(-2.477)	(3.732)	(0.674)	(0.640)	(1.319)	(0.870)	(1.675)	(-2.184)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*

Source: Author's computation, 2017

Table N3: Estimated parameters of dynamic AIDS model: Northern regional demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	-0.229	-0.310	0.207	-0.001	0.317	0.016	-0.042	-0.864	0.018	0.454	1.965
FAD		0.035	0.146	0.009	0.152	-0.031	0.007	-1.123	-0.038	0.573	1.991
TRA			-0.260	-0.029	-0.252	0.189	-0.019	-1.128	0.227	0.553	1.117
RCS				0.201	-0.225	0.044	0.014	-0.962	-0.125	0.559	2.071
SHO					-0.166	0.174	0.016	-0.849	-0.050	0.501	2.135
OTH						-0.391	0.024	-0.901	-0.108	0.478	1.870

Note: DW refers to Durbin-Watson statistic
Source: Author's computation, 2017

Table N4: Elasticity estimates from dynamic model: Northern regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.967***	0.317	-0.382**	-0.211*	0.159	0.252	0.760***	-0.885**	0.409	0.288*	-0.107	0.239	0.337
	(-2.580)	(1.130)	(-1.273)	(-0.775)	(0.646)	(0.649)	(4.346)	(-2.347)	(1.455)	(-0.963)	(-0.395)	(0.964)	(0.873)
FAD	0.256	-1.093***	0.074	-0.234	-0.012	0.000	1.014***	0.365	-0.971***	0.200	-0.095	0.094	0.112
	(1.025)	(-2.985)	(0.281)	(-0.905)	(-0.050)	(-0.001)	(6.499)	(1.455)	(-2.643)	(0.764)	(-0.369)	(0.400)	(0.314)
TRA	-0.132*	0.100	-0.712**	-0.053	0.414*	-0.257	0.773***	0.049**	0.194	-0.616*	0.053	0.494**	-0.171
	(-1.290)	(0.397)	(-2.005)	(-0.218)	(1.839)	(-0.670)	(4.625)	(-0.963)	(0.764)	(-1.737)	(0.220)	(2.189)	(-0.450)
RCS	-0.186*	-0.198	-0.071	-1.225***	-0.064	0.776**	0.954***	-0.083	-0.083	0.048	-1.094***	0.035	0.882***
	(-0.885)	(-0.883)	(-0.322)	(-4.050)	(-0.333)	(2.367)	(6.334)	(-0.395)	(-0.369)	(0.220)	(-3.638)	(0.181)	(2.711)
SHO	0.122	-0.031	0.445	-0.113	-0.921***	-0.613*	1.155***	0.246	0.109	0.589**	0.046	-0.800**	-0.485
	(0.479)	(-0.113)	(1.651)	(-0.435)	(-2.771)	(-1.618)	(7.176)	(0.964)	(0.400)	(2.189)	(0.181)	(-2.396)	(-1.292)
OTH	0.178	-0.045	-0.364	0.905**	-0.601*	-1.342*	1.042***	0.327	0.122	-0.192	1.095***	-0.457	-1.189**
	(0.473)	(-0.115)	(-0.847)	(2.221)	(-1.688)	(-1.428)	(3.522)	(0.873)	(0.314)	(-0.450)	(2.711)	(-1.292)	(-1.266)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are‘t’ values.*

Source: Author’s computation, 2017

Appendix P: Domestic Tourism Demand in Upper East Region-Elasticity Estimates

Table P1: Parameter estimates from static AIDS Model: Upper East regional demand Model

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.199	-0.142	0.887	-0.029	0.093	0.107	0.084	0.003
FAD	0.144		-0.186	-0.056	0.101	-0.091	0.159	0.034
TRA	0.202			0.257	-0.057	-0.171	0.054	-0.019
RCS	0.143				0.075	0.010	-0.035	0.042
SHO	0.174					0.174	-0.029	0.001
OTH	0.138						-0.234	0.061

Source: Author's computation, 2017

Table P2: Elasticity estimates from static model: Upper East regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-1.119***	0.106	-0.031*	-0.044	0.134	0.117	0.855***	-0.946***	0.262	0.123	0.120	0.284*	0.290
	(-4.496)	(0.662)	(-0.192)	(-0.251)	(0.830)	(0.439)	(6.016)	(-3.828)	(1.639)	(0.767)	(0.703)	(1.735)	(1.111)
FAD	0.100	-1.201***	-0.051	0.121	-0.111	0.208	0.941***	0.291	-1.029***	0.118	0.301*	0.054	0.399
	(0.556)	(-5.374)	(-0.318)	(0.685)	(-0.687)	(0.790)	(6.650)	(1.639)	(-4.582)	(0.749)	(1.744)	(0.331)	(1.546)
TRA	-0.032*	-0.033	-0.680***	-0.022	-0.182	0.129	0.842***	0.138	0.120	-0.529**	0.139	-0.035	0.300
	(-0.176)	(-0.209)	(-2.976)	(-0.126)	(-1.112)	(0.520)	(6.473)	(0.767)	(0.749)	(-2.324)	(0.797)	(-0.211)	(1.230)
RCS	-0.082	0.098	-0.055	-0.953***	0.035	-0.081	1.035***	0.127	0.286*	0.130	-0.755***	0.216	0.128
	(-0.451)	(0.596)	(-0.337)	(-3.904)	(0.216)	(-0.326)	(7.669)	(0.703)	(1.744)	(0.797)	(-3.126)	(1.314)	(0.525)
SHO	0.195	-0.065	-0.155	0.110	-0.851***	0.148	0.664***	0.329*	0.056	-0.036	0.237	-0.735***	0.283
	(1.011)	(-0.382)	(-0.901)	(0.596)	(-3.556)	(0.534)	(4.599)	(1.735)	(0.331)	(-0.211)	(1.314)	(-3.023)	(1.043)
OTH	-0.033	0.068	-0.021	-0.184	-0.035	-1.470***	1.595***	0.290	0.359	0.265	0.121	0.244	-1.147**
	(-0.123)	(0.286)	(-0.094)	(-0.776)	(-0.146)	(-2.619)	(5.701)	(1.111)	(1.546)	(1.230)	(0.525)	(1.043)	(-2.053)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*
Source: Author's computation, 2017

Table P3: Estimated parameters of dynamic AIDS model: Upper East regional demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	-0.001	0.011	-0.009	0.001	-0.003	0.001	-0.011	-0.986	-0.078	0.535	1.985
FAD		0.000	-0.003	0.000	0.006	0.003	0.984	-1.069	0.008	0.533	1.934
TRA			0.004	-0.001	0.006	0.003	0.011	-0.867	-0.064	0.467	2.037
RCS				0.014	-0.012	-0.003	0.014	-1.214	0.137	0.543	2004
SHO					0.004	0.001	0.008	-0.850	-0.036	0.444	2.017
OTH						0.012	-0.006	-1.139	-0.039	0.609	2.068

Note: *DW refers to Durbin-Watson statistic*
Source: Author's computation, 2017

Table P4: Elasticity estimates from dynamic model: Upper East regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-1.009***	0.485**	-0.195*	0.265	-0.271	0.008	0.661***	-0.910***	0.577**	0.120*	0.358	-0.192	0.120
	(-2.756)	(1.969)	(-0.823)	(1.049)	(-1.074)	(0.022)	(3.709)	(-2.490)	(2.357)	(-0.518)	(1.435)	(-0.758)	(0.348)
FAD	0.474*	-0.926***	-0.349	-0.080	0.371	-0.469	0.976***	0.620**	-0.790**	-0.239	0.058	0.487**	-0.303
	(1.797)	(-2.777)	(-1.480)	(-0.325)	(1.547)	(-1.431)	(5.920)	(2.357)	(-2.377)	(-1.033)	(0.237)	(2.022)	(-0.917)
TRA	-0.120*	-0.378	-0.540*	0.227	0.281	-0.022	0.818***	0.058*	-0.293	-0.469**	0.314	0.355	0.083
	(-0.820)	(-1.335)	(-1.374)	(0.781)	(0.957)	(-0.057)	(3.134)	(-0.518)	(-1.033)	(-1.221)	(1.091)	(1.195)	(0.216)
RCS	0.207	-0.103	0.122	-1.042***	-0.432*	0.124	1.149***	0.379	0.057	0.253	-0.880**	-0.295	0.319
	(0.783)	(-0.427)	(0.516)	(-3.000)	(-1.743)	(0.375)	(6.938)	(1.435)	(0.237)	(1.091)	(-2.554)	(-1.182)	(0.960)
SHO	-0.432	0.389	0.192	-0.530*	-0.815*	-0.040	1.283***	-0.240	0.568**	0.338	-0.349	-0.662*	0.178
	(-1.356)	(1.379)	(0.664)	(-1.775)	(-2.019)	(-0.111)	(6.863)	(-0.758)	(2.022)	(1.195)	(-1.182)	(-1.627)	(0.490)
OTH	-0.082	-0.422	-0.086	0.088	-0.024	-0.684**	1.251***	0.106	-0.248	0.056	0.265	0.125	-0.471**
	(-0.266)	(-1.543)	(-0.332)	(0.316)	(-0.094)	(-1.074)	(4.194)	(0.348)	(-0.917)	(0.216)	(0.960)	(0.729)	(-0.742)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*
Source: Author's computation, 2017

Appendix Q: Domestic Tourism Demand in Upper West Region-Elasticity Estimates

Table Q1: Parameter estimates from static AIDS model: Upper West regional demand model

EQUATION	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i
ACC	0.203	0.377	-0.003	0.207	-0.102	-0.134	-0.345	-0.090
FAD	0.168		-0.423	-0.082	0.296	0.111	0.101	0.112
TRA	0.189			-0200	-0.173	0.140	0.108	-0.065
RCS	0.151				0.153	0.023	-0.196	0.017
SHO	0.136					-0.284	0.144	0.116
OTH	0.153						0.187	-0.090

Source: Author's computation, 2017

Table Q2: Elasticity estimates from static model: Upper West regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.622***	0.018	-0.222	-0.085	-0.137	-0.408*	1.012***	-0.433*	0.209	0.405**	0.085	0.022	-0.232
	(-2.695)	(0.114)	(-1.305)	(-0.560)	(-0.852)	(-1.674)	(16.294)	(-1.885)	(1.302)	(2.381)	(0.559)	(0.135)	(-0.956)
FAD	0.018	-1.527***	-0.073	0.263*	0.191	0.115	1.013***	0.207	-1.336***	0.110	0.433***	0.350**	0.292
	(0.114)	(-6.914)	(-0.447)	(1.812)	(1.150)	(0.483)	(17.234)	(1.302)	(-6.070)	(0.674)	(2.977)	(2.099)	(1.228)
TRA	-0.230	-0.075	-1.228***	-0.172	0.119	0.122	1.004***	0.418**	0.115	-1.046***	-0.004	0.277	0.296
	(-1.302)	(-0.435)	(-4.867)	(-1.078)	(0.677)	(0.477)	(15.855)	(2.381)	(0.674)	(-4.139)	(-0.023)	(1.569)	(1.169)
RCS	-0.096	0.294*	-0.189	-0.881***	0.075	-0.226	1.022***	0.095	0.487***	-0.004	-0.710***	0.236	-0.048
	(-0.566)	(1.788)	(-1.094)	(-4.243)	(0.456)	(-0.928)	(16.598)	(0.559)	(2.977)	(-0.023)	(-3.406)	(1.422)	(-0.197)
SHO	-0.135	0.257	0.163	0.107	-1.526***	0.281	0.861***	0.026	0.420**	0.319	0.252	-1.391***	0.431
	(-0.695)	(1.277)	(0.799)	(0.606)	(-5.487)	(1.057)	(13.271)	(0.135)	(2.099)	(1.569)	(1.422)	(-4.965)	(1.633)
OTH	-0.450*	0.114	0.114	-0.226	0.221	-0.850**	1.073***	-0.249	0.316	0.308	-0.046	0.390	-0.663*
	(-1.716)	(0.438)	(0.430)	(-0.965)	(0.920)	(-1.340)	(7.142)	(-0.956)	(1.228)	(1.169)	(-0.197)	(1.633)	(-1.046)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*
Source: Author's computation, 2017

Table Q3: Estimated parameters of dynamic AIDS model: Upper West regional demand model

EQUATION	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	β_i	λ_i	ψ_i	R- sq	DW
ACC	0.014	0.002	0.000	0.005	-0.017	-0.004	-0.004	-1.005	0.038	0.490	2.045
FAD		-0.007	0.007	-0.006	0.001	0.003	0.003	-0.881	0.014	0.467	2.023
TRA			0.006	-0.003	-0.003	-0.006	-0.002	-1.075	0.155	0.506	2.037
RCS				-0.004	-0.003	0.011	0.007	-1.051	0.018	0.515	2.090
SHO					0.013	0.009	-0.008	-1.112	0.087	0.554	2.065
OTH						-0.013	0.005	-1.247	0.212	0.541	2.124

Note: DW refers to Durbin-Watson statistic
Source: Author's computation, 2017

Table Q4: Elasticity estimates from dynamic model: Upper West regional market

	Marshallian (uncompensated) own & cross-price elasticities (ε_{ij})						Expenditure	Hicksian (compensated) own & cross-price elasticities (ε_{ij})					
	ACC	FAD	TRA	RCS	SHO	OTH	elasticity η	ACC	FAD	TRA	RCS	SHO	OTH
ACC	-0.603*	0.102	-0.181*	0.031	-0.594***	0.060	0.897***	-0.482**	0.212	0.193*	0.141	-0.484**	0.171
	(-1.769)	(0.421)	(-0.344)	(0.142)	(-2.493)	(0.178)	(10.387)	(-1.413)	(0.881)	(0.815)	(0.639)	(-2.036)	(0.509)
FAD	0.107	-1.416***	0.089	-0.015	0.256	0.029	0.933***	0.233	-1.301***	0.205	0.100	0.370	0.145
	(0.404)	(-3.936)	(0.362)	(-0.060)	(1.049)	(0.085)	(11.352)	(0.881)	(-3.624)	(0.829)	(0.407)	(1.522)	(0.421)
TRA	-0.059*	0.067	-0.465**	-0.222	-0.200	-0.322	1.112***	0.009*	0.204	-0.326*	-0.086	-0.064	-0.185
	(-0.230)	(0.271)	(-1.344)	(-0.929)	(-0.833)	(-0.919)	(12.444)	(0.815)	(0.829)	(-0.941)	(-0.360)	(-0.266)	(-0.528)
RCS	0.026	-0.018	-0.207	-1.225***	-0.132	0.585*	0.961***	0.156	0.100	-0.087	-1.107***	-0.014	0.704**
	(0.107)	(-0.073)	(-0.854)	(-3.862)	(-0.565)	(1.774)	(11.726)	(0.639)	(0.407)	(-0.360)	(-3.488)	(-0.060)	(2.139)
SHO	-0.663***	0.252	-0.185	-0.133	-0.454***	0.205	0.971***	-0.532**	0.372	-0.065	-0.014	-0.335**	0.325
	(-2.538)	(1.029)	(-0.766)	(-0.573)	(-1.379)	(0.603)	(11.423)	(-2.036)	(1.522)	(-0.266)	(-0.060)	(-1.019)	(0.959)
OTH	0.034	0.004	-0.327	0.559*	0.183	-1.554**	1.134***	0.187	0.144	-0.186	0.698**	0.322	-1.413*
	(0.091)	(0.012)	(-0.927)	(1.709)	(0.544)	(-2.081)	(6.705)	(0.509)	(0.421)	(-0.528)	(2.139)	(0.959)	(-1.894)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are 't' values.*
Source: Author's computation, 2017

Appendix T: A Comparison of Quantile and Bootstrap Regression Models

Table T1: Quantile regression empirical results of same-day visitors

	Quantiles						
Variable	5th	10th	25th	50th	75th	90th	95th
Constant	0.192	0.154	0.638**	1.774**	2.785**	3.213**	3.284**
	(0.137)	(0.101)	(0.051)	(0.020)	(0.051)	(0.178)	(0.203)
Age	0.053**	0.239**	0.214**	0.001	-0.096**	-0.298**	-0.162*
	(0.035)	(0.028)	(0.016)	(0.006)	(0.016)	(0.048)	(0.047)
JSS/MSLC	*-0.522**	*-0.045**	*-0.001*	*0.903***	*0.369*	*-0.202*	*-0.632*
	(1.24)	*(1.083)*	*(0.839)*	*(0.419)*	*(0.899)*	*(1.360)*	*(1.809)*
SSS/'O'/'A'	*-0.103*	*-0.073*	*-0.069***	*-0.021*	*0.013**	*0.038*	*-0.298*
	(0.168)	*(0.147)*	*(0.114)*	*(0.057)*	*(0.122)*	*(0.185)*	*(0.246)*
Dip/Trg A & B	*-0.406*	*0.405***	*-0.115*	*-0.009*	*0.098**	*0.314*	*0.141*
	(0.150)	*(0.131)*	*(0.102)*	*(0.051)*	*(0.109)*	*(0.165)*	*(0.219)*
1st Degree	*0.452*	*0.394***	*-0.227*	*-0.009*	*0.284**	*0.360***	*0.125*
	(0.163)	*(0.143)*	*(0.110)*	*(0.055)*	*(0.118)*	*(0.179)*	*(0.238)*
Post graduate	*0.367*	*0.039*	*0.026***	*0.018*	*0.206***	*0.181***	*0.290***
	(0.432)	*(0.377)*	*(0.292)*	*(0.146)*	*(0.313)*	*(0.473)*	*(0.630)*
Income	0.032**	0.047**	-0.002	0.006**	0.017**	0.087**	0.088*
	(0.016)	(0.013)	(0.007)	(0.003)	(0.007)	(0.023)	(0.026)
Loan	0.208**	0.364**	0.389***	-0.018	-0.409	-0.410**	-0.233*
	(0.109)	(0.083)	(0.037)	(0.013)	(0.036)	(0.124)	(0.137)
Internet	-0.023	-0.061	-0.018	0.002	0.014	-0.102	-0.071
	(0.086)	(0.065)	(0.031)	(0.011)	(0.030)	(0.099)	(0.109)
Car	-0.077	-0.006	-0.007	0.008	0.023	0.031	0.188*
	(0.086)	(0.064)	(0.031)	(0.011)	(0.030)	(0.099)	(0.110)
M phone	0.028	-0.042	-0.004	0.01	0.02	-0.012	-0.051
	(0.087)	(0.066)	(0.031)	(0.001)	(0.030)	(0.099)	(0.111)

Table T2: Bootstrap regression empirical results of same-day visitors

	Quantiles						
Variable	5th	10th	25th	50th	75th	90th	95th
Constant	0.192	0.154	0.638**	1.774**	2.785**	3.213**	3.284**
	(0.137)	(0.101)	(0.051)	(0.020)	(0.051)	(0.178)	(0.203)
Age	0.053**	0.239**	0.214**	0.001	-0.096**	-0.298**	-0.162*
	(0.035)	(0.028)	(0.016)	(0.006)	(0.016)	(0.048)	(0.047)
JSS/MSLC	*-0.522**	*0.045**	*-0.001*	*0.903**	*0.369*	*-0.202*	*-0.632*
	(0.908)	*(0.928)*	*(0.711)*	*(0.465)*	*(0.232)*	*(0.428)*	*(0.468)*
SSS/'O'/'A'	*-0.103*	*-0.073*	*-0.069***	*-0.021*	*0.013**	*0.038*	*-0.298*
	(0.194)	*(0.099)*	*(0.029)*	*(0.013)*	*(0.023)*	*(0.168)*	*(0.260)*
Dip/Trg A & B	*-0.406**	*0.405***	*-0.115*	*-0.009*	*0.098**	*0.314*	*0.141*
	(0.138)	*(0.116)*	*(0.085)*	*(0.019)*	*(0.098)*	*(0.162)*	*(0.199)*
1st Degree	*-0.452**	*-0.394***	*-0.227*	*-0.009*	*0.284**	*0.360***	*0.125*
	(0.143)	*(0.127)*	*(0.088)*	*(0.032)*	*(0.118)*	*(0.154)*	*(0.219)*
Post graduate	*0.367*	*0.039*	*-0.026***	*0.018*	*0.206*	*0.181***	*0.290***
	(0.288)	*(0.119)*	*(0.053)*	*(0.158)*	*(0.820)*	*(0.821)*	*(0.825)*
Income	0.032**	0.047**	-0.002	0.006**	0.017**	0.087**	0.088*
	(0.016)	(0.013)	(0.007)	(0.003)	(0.007)	(0.023)	(0.026)
Loan	0.208**	0.364**	0.389***	-0.018	-0.409	-0.410**	-0.233*
	(0.109)	(0.083)	(0.037)	(0.013)	(0.036)	(0.124)	(0.137)
Internet	-0.023	-0.061	-0.018	0.002	0.014	-0.102	-0.071
	(0.086)	(0.065)	(0.031)	(0.011)	(0.030)	(0.099)	(0.109)
Car	-0.077	-0.006	-0.007	0.008	0.023	0.031	0.188*
	(0.086)	(0.064)	(0.031)	(0.011)	(0.030)	(0.099)	(0.110)
M phone	0.028	-0.042	-0.004	0.01	0.02	-0.012	-0.051
	(0.087)	(0.066)	(0.031)	(0.001)	(0.030)	(0.099)	(0.111)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are standard error*
Source: Author's computation, 2017

Table T3: Quantile regression empirical results of overnight visitors

	Quantiles						
Variable	5th	10th	25th	50th	75th	90th	95th
Constant	-0.225	0.096	1.099**	2.119**	2.916**	3.783**	4.130**
	(0.104)	(0.089)	(0.079)	(0.036)	(0.096)	(0.138)	(0.191)
Age	0.079**	0.173**	0.033**	-0.004	-0.044**	-0.053**	-0.031
	(0.030)	(0.026)	(0.023)	(0.011)	(0.028)	(0.040)	(0.056)
JSS/MSLC	*-0.522*	*-0.045**	*-0.001*	*0.903***	*0.369*	*-0.202*	*-0.632*
	(0.744)	*(0.983)*	*(0.362)*	*(0.473)*	*(0.840)*	*(1.366)*	*(0.877)*
SSS/'O'/'A'	*-0.041*	*-0.062**	*-0.001*	*-0.008*	*0.059**	*0.188*	*-0.059*
	(0.168)	*(0.147)*	*(0.114)*	*(0.057)*	*(0.122)*	*(0.185)*	*(0.246)*
Dip/Trg A & B	*-0.419*	*0.311*	*-0.077*	*-0.004*	*0.511***	*0.463*	*0.164*
	(0.135)	*(0.179)*	*(0.066)*	*(0.086)*	*(0.153)*	*(0.249)*	*(0.160)*
1st Degree	*-0.288*	*0.177*	*0.043***	*0.006**	*0.334**	*0.302**	*0.120*
	(0.175)	*(0.232)*	*(0.085)*	*(0.111)*	*(0.198)*	*(0.322)*	*(0.207)*
Post graduate	*-0.036*	*0.078*	*0.027**	*0.018*	*0.196***	*0.375**	*0.102***
	(0.137)	*(0.145)*	*(0.164)*	*(0.114)*	*(0.280)*	*(0.218)*	*(0.197)*
Income	0.133**	0.052**	0.007**	0.013**	0.210**	0.132**	0.104*
	(0.013)	(0.011)	(0.010)	(0.005)	(0.012)	(0.017)	(0.024)
Loan	0.499**	0.640**	0.566***	-0.317**	-0.219	-0.028**	-0.225*
	(0.070)	(0.060)	(0.054)	(0.025)	(0.065)	(0.093)	(0.129)
Internet	0.068	0.042	-0.007	-0.017*	0.02	0.164	-0.065*
	(0.059)	(0.051)	(0.046)	(0.021)	(0.055)	(0.079)	(0.109)
Car	-0.081	-0.102	-0.01	-0.011	-0.049	-0.059	-0.027*
	(0.059)	(0.051)	(0.046)	(0.021)	(0.055)	(0.079)	(0.109)
M phone	-0.046	-0.062	-0.016	-0.016*	-0.160**	-0.267**	-0.215*
	(0.059)	(0.051)	(0.046)	(0.021)	(0.055)	(0.079)	(0.110)

Table T4: Bootstrap regression empirical results of overnight visitors

	Quantiles						
Variable	5th	10th	25th	50th	75th	90th	95th
Constant	-0.225	0.096	1.099**	2.119**	2.916**	3.783**	4.130**
	(0.104)	(0.089)	(0.079)	(0.036)	(0.096)	(0.138)	(0.191)
Age	0.079**	0.173**	0.033**	-0.004	-0.044**	-0.053**	-0.031
	(0.030)	(0.026)	(0.023)	(0.011)	(0.028)	(0.040)	(0.056)
JSS/MSLC	-0.522	-0.045*	-0.001	0.903**	0.369	-0.202	-0.632
	(0.099)	(0.103)	(0.035)	(0.278)	(0.245)	(0.258)	(0.147)
SSS/'O'/'A'	-0.041	-0.062*	-0.001	-0.008	0.059	0.188	-0.059
	(0.146)	(0.092)	(0.018)	(0.021)	(0.083)	(0.267)	(0.170)
Dip/Trg A & B	-0.419	0.311	-0.077	-0.004	0.511**	0.463	0.164
	(0.139)	(0.161)	(0.061)	(0.025)	(0.216)	(0.281)	(0.171)
1st Degree	-0.288	0.177	0.043**	0.006*	0.334*	0.302*	0.120
	(0.180)	(0.202)	(0.062)	(0.023)	(0.191)	(0.278)	(0.197)
Post graduate	-0.036	0.078	0.027*	0.018	0.196**	0.375*	0.102**
	(0.098)	(0.093)	(0.046)	(0.231)	(0.242)	(0.194)	(0.191)
Income	0.133**	0.052**	0.007**	0.013**	0.210**	0.132**	0.104*
	(0.013)	(0.011)	(0.010)	(0.005)	(0.012)	(0.017)	(0.024)
Loan	0.499**	0.640**	0.566***	-0.317**	-0.219	-0.028**	-0.225*
	(0.070)	(0.060)	(0.054)	(0.025)	(0.065)	(0.093)	(0.129)
Internet	0.068	0.042	-0.007	-0.017*	0.02	0.164	-0.065*
	(0.059)	(0.051)	(0.046)	(0.021)	(0.055)	(0.079)	(0.109)
Car	-0.081	-0.102	-0.01	-0.011	-0.049	-0.059	-0.027*
	(0.059)	(0.051)	(0.046)	(0.021)	(0.055)	(0.079)	(0.109)
M phone	-0.046	-0.062	-0.016	-0.016*	-0.160**	-0.267**	-0.215*
	(0.059)	(0.051)	(0.046)	(0.021)	(0.055)	(0.079)	(0.110)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are standard errors.*
Source: Author's computation, 2017

Table T5: Quantile regression empirical results of domestic visitors

	Quantiles						
Variable	5th	10th	25th	50th	75th	90th	95th
Constant	0.020	0.135	0.784**	1.850**	2.718**	3.218**	3.530**
	(0.087)	(0.094)	(0.059)	(0.027)	(0.086)	(0.158)	(0.121)
Age	0.141**	0.218**	0.119**	-0.001	-0.091**	0.056	-0.071
	(0.024)	(0.026)	(0.016)	(0.007)	(0.023)	(0.043)	(0.033)
Education	-0.044**	-0.038**	-0.008	0.001	0.031**	0.049**	0.038***
	(0.008)	(0.009)	(0.006)	(0.003)	(0.008)	(0.015)	(0.012)
No education	*-0.524***	*-0.422**	*-0.512*	*-0.037*	*0.025*	*0.115*	*0.075*
	(0.160)	*(0.156)*	*(0.125)*	*(0.066)*	*(0.130)*	*(0.168)*	*(0.177)*
JSS/MSLC	*-0.356**	*-0.047**	*-0.005*	*0.777***	*0.365*	*-0.401*	*-0.632*
	(0.124)	*(0.183)*	*(0.139)*	*(0.129)*	*(0.159)*	*(0.160)*	*(0.188)*
SSS/'O'/'A'	*-0.081*	*-0.076**	*-0.054**	*0.031**	*0.013**	*0.046*	*-0.297*
	(0.154)	*(0.148)*	*(0.084)*	*(0.067)*	*(0.112)*	*(0.185)*	*(0.188)*
Dip/Trg A & B	*-0.325*	*0.304***	*-0.215*	*-0.005*	*0.107**	*0.314*	*0.147*
	(0.151)	*(0.121)*	*(0.102)*	*(0.061)*	*(0.099)*	*(0.135)*	*(0.180)*
1st Degree	*-0.512**	*-0.268***	*-0.225*	*-0.007*	*0.282**	*0.360***	*0.125*
	(0.143)	*(0.122)*	*(0.100)*	*(0.065)*	*(0.108)*	*(0.158)*	*(0.170)*
Post graduate	*0.367*	*0.04*	*-0.027***	*0.018*	*0.209***	*0.176***	*0.274***
	(0.132)	*(0.177)*	*(0.185)*	*(0.136)*	*(0.217)*	*(0.136)*	*(0.111)*
Income	0.100**	0.066**	0.001*	0.006**	0.118**	0.144**	0.099**
	(0.010)	(0.011)	(0.007)	(0.003)	(0.010)	(0.018)	(0.O14)
Loan	0.323**	0.466**	0.589***	-0.067**	-0.822	-0.517**	-0.239
	(0.057)	(0.062)	(0.039)	(0.018)	(0.058)	(0.104)	(0.08)
Internet	-0.029	-0.004	-0.004	-0.005	0.012	0.121	-0.080
	(0.048)	(0.052)	(0.033)	(0.015)	(0.048)	(0.088)	(0.067)
Car	-0.115	-0.055	-0.009	0.002	-0.009	-0.065	0.025
	(0.048)	(0.052)	(0.033)	(0.015)	(0.048)	(0.087)	(0.066)
M phone	-0.088	-0.046	-0.001	-0.001	-0.056	-0.121	-0.147
	(0.048)	(0.052)	(0.033)	(0.015)	(0.048)	(0.088)	(0.067)

Table T6: Bootstrap regression empirical results of domestic visitors

	Quantiles						
Variable	5th	10th	25th	50th	75th	90th	95th
Constant	0.020	0.135**	0.784**	1.850**	2.718**	3.218**	3.530**
	(0.109)	(0.058)	(0.067)	(0.041)	(0.080)	(0.129)	(0.128)
Age	0.141**	0.218**	0.119**	-0.001	-0.091**	-0.559	-0.071**
	(0.020)	(0.024)	(0.024)	(0.005)	(0.019)	(0.041)	(0.035)
Education	-0.044**	-0.038**	-0.008	0.001	0.031**	0.049**	0.038***
	(0.009)	(0.009)	(0.002)	(0.001)	(0.007)	(0.019)	(0.014)
No education	-0.524**	-0.422*	-0.512	-0.037	0.025	0.115	0.075
	(0.156)	(0.156)	(0.105)	(0.064)	(0.125)	(0.128)	(0.173)
JSS/MSLC	-0.356*	-0.047**	-0.005	0.777**	0.365	-0.401	-0.632
	(0.111)	(0.153)	(0.107)	(0.131)	(0.161)	(0.160)	(0.156)
SSS/'O'/'A'	-0.081	-0.076*	-0.054*	0.031*	0.013	0.046	-0.297
	(0.144)	(0.149)	(0.094)	(0.057)	(0.102)	(0.174)	(0.158)
Dip/Trg A & B	-0.325	0.304**	-0.215	-0.005	0.107*	0.314	0.147
	(0.147)	(0.122)	(0.098)	(0.065)	(0.097)	(0.137)	(0.175)
1st Degree	-0.512*	-0.268**	-0.225	-0.007	0.282*	0.360**	0.125
	(0.140)	(0.120)	(0.105)	(0.055)	(0.105)	(0.161)	(0.160)
Post graduate	0.367	0.040	-0.027**	0.018	0.209**	0.176**	0.274**
	(0.198)	(0.207)	(0.187)	(0.132)	(0.222)	(0.135)	(0.109)
Income	0.100**	0.049**	0.001	0.006**	0.118**	0.144**	0.099**
	(0.012)	(0.010)	(0.001)	(0.001)	(0.016)	(0.020)	(0.O16)
Loan	0.323**	0.466**	0.589***	-0.067**	-0.822	-0.517**	-0.239
	(0.050)	(0.057)	(0.083)	(0.042)	(0.051)	(0.094)	(0.089)
Internet	-0.029	-0.004	-0.004	-0.005	0.012	0.121	-0.080
	(0.045)	(0.031)	(0.011)	(0.006)	(0.019)	(0.074)	(0.085)
Car	-0.115	-0.055	-0.009	0.002	-0.009	-0.065	0.025
	(0.055)	(0.028)	(0.012)	(0.006)	(0.019)	(0.082)	(0.081)
M phone	-0.088	-0.046	-0.001	-0.001	-0.056	-0.121	-0.147
	(0.053)	(0.032)	(0.012)	(0.006)	(0.033)	(0.082)	(0.064)

*Notes: ***, ** and * indicate the 1%, 5% and 10% significant levels respectively, and values in parenthesis are standard errors.*

Source: Author's computation, 2017

Appendix R: Profile of Domestic Visitors in Ghana

Table R1: Age group of domestic visitors in Ghana, 2013 (percent)

Age group	Same-day	%	Overnight	%	Domestic visitors	%
0-14	146,745	4.6	466,255	8.8	594,193	7.0
15-24	363,673	11.4	381,481	7.2	763,962	9.0
25-44	1,776,892	55.7	2,940,586	55.5	4,719,587	55.6
45-64	768,817	24.1	1,255,710	23.7	2,028,743	23.9
65+	133,985	4.2	254,321	4.8	381,981	4.5
Total	3,190,112	100.0	5,298,354	100.0	8,488,466	100.0

Source: Author's computation, 2017

Table R2: Domestic visitors by marital status, 2013 (percent)

Marital status	Same-day (%)	Overnight %)	Domestic visitors (%)
Never married	28.2	28.3	28.3
Married	55.2	54.6	54.9
Consensual union	2.8	3.0	2.9
Separated	4.8	3.4	4.0
Divorced	5.0	7.0	6.1
Widowed	4.0	3.7	3.8
Total	100.0	100	100

Source: Author's computation, 2017

Table R3: Percentage distribution of domestic visitors by educational attainment, 2013

Educational level attained	Same-day visitors (%)	Overnight visitors (%)	Domestic visitors (%)
None	17.9	25.6	22.4
Primary	6.5	8.4	7.6
Middle/JHS	37.6	31.8	34.2
Vocational/Comm	3.7	3.2	3.4
GCE 'O' Level	2.1	3.6	3
SHS	13.3	10.6	11.7
GCE 'A' Level	1.9	1.8	1.9
Tr. Trg. College A	1.3	1.7	1.5
Tr. Trg. College B	1.3	0.9	1.1
Tech/Prof/Diploma	3.8	5.2	4.6
Degree	8.6	6	7.1
Post Graduate	2	1.1	1.5
Total	100	100	100

Source: Author's computation, 2017

Table R4: Economic status of domestic visitors in Ghana, 2013

Economic status	Same-day (%)	Overnight (%)	Domestic visitors (%)
Employed	32.6	25.3	28.4
Self - employed	48	56.6	53
Unemployed	3.3	1.8	2.4
Student	6.4	3.7	4.8
Home maker	2.7	1.9	2.3
Pensioner	1.5	1.3	1.4
Apprentice	0.8	0.9	0.9
Other	4.6	8.4	6.9
Total	100	100	100

Source: Author's computation, 2017

Table R5: Domestic visitors, by type of sponsorship and sex 2013

Type of sponsorship for the trip	Same-day		Overnight	
	Male (%)	Female (%)	Male (%)	Female (%)
Self-financed	86.6	78.5	81.9	76.1
Financed by parents	6.1	5.3	10.2	10.8
Financed by other relatives & friends	3.8	13	1	9.5
Financed by employer	2.7	0	2.9	0.7
Financed by educational or social dev. schemes	0	1.1	0	0
Financed by voluntary organizations	0.9	2.2	3.9	2.1
Financed by other	0	0	0	0.8
Total	100	100	100	100

Source: Author's computation, 2017

Table R6: Domestic visitors, by mode of travel, 2013

Mode of travel	Same-day visitors (%)	Overnight tourists (%)
Air	0.8	2.7
Sea/lake	0.7	1.2
Road	98.5	96.0
Rail	0.01	0.1

Source: Author's computation, 2017

Table R7: Domestic overnight visitors by purpose of visit and mode of travel, 2013 (percent)

Purpose of visit	Air (%)	Sea/lake (%)	Road (%)
Funeral	0.1	1.2	98.7
Leisure, recreation & holidays	0.1	3.0	96.9
Visiting friends & relatives	0.1	2.5	97.4
Business	0.2	3.3	96.5
Other	0.0	2.8	97.2

Source: Author's computation, 2017

Table R8: Types of accommodation used by domestic tourists in Ghana, 2013

Type of accommodation used by domestic tourists	%
Hotel	3.74
Guest house	4.38
Budget hotel	0.23
Hostel	1.09
Work holiday camp	1.82
Holiday dwelling	0.36
Private/second home	10.69
Friends'/relatives' home	77.68

Source: Author's computation, 2017

Table R9: Same-day visitors' expenditure by category in 2013 and 2012 (million Gh¢)

Category	Same-day (2013)	%	Same-day (2012)	%
Food & drinks	460.00	30.68	391.01	32.58
Transport	776.12	51.77	625.22	52.10
Recreation, culture and sporting activities	33.25	2.22	14.38	1.20
Shopping	200.7	13.39	147.23	12.27
Other	29.07	1.94	22.27	1.86
Total	1499.14	100.00	1200.11	100.00

Source: Author's computation, 2017

Table R10: Expenditure of same-day visitors by region and expenditure category, 2013 (Million Ghana cedis)

REGION	FAD	TRA	RCS	SHO	OTH	TOTAL
Western	9.91	11.22	7.54	0.90	12.16	41.73
Central	34.86	57.91	2.02	14.48	18.43	127.70
Greater Accra	44.56	94.00	26.66	33.59	9.18	207.99
Volta	7.33	14.98	0.67	8.93	0.22	32.14
Eastern	34.06	40.20	1.34	12.02	4.65	92.28
Ashanti	175.99	270.33	11.11	93.12	32.92	583.47
Brong Ahafo	87.06	149.33	5.51	40.24	10.75	292.89
Northern	16.33	24.65	13.34	4.48	9.10	67.90
Upper East	8.22	17.32	5.55	6.41	4.47	41.97
Upper West	1.22	4.01	2.08	1.77	2.00	11.08
TOTAL	419.54	683.96	75.82	215.94	103.88	1,499.14

Source: Author's computation, 2017

Table R11: Expenditure of same-day visitors by region and purpose of visit, 2013 (Million Ghana cedis)

Region	FUN	LRH	VFR	BUS	OTH	TOTAL
Western	13.92	11.10	2.46	16.38	3.62	47.49
Central	44.35	24.44	34.25	24.27	14.14	141.44
Greater Accra	55.87	5.21	53.83	54.61	2.33	171.85
Volta	3.92	8.57	3.58	10.07	4.32	30.46
Eastern	20.63	28.20	15.79	20.99	15.60	101.21
Ashanti	214.58	11.88	218.34	110.38	58.19	613.38
Brong Ahafo	121.36	12.37	73.63	56.79	13.15	277.30
Northern	20.06	11.20	12.22	25.59	3.04	72.12
Upper East	7.11	3.77	4.15	6.55	4.44	26.02
Upper West	6.27	3.12	5.27	2.01	1.11	17.78
TOTAL	508.07	119.86	423.53	328.00	119.95	1499.05

Source: Author's computation, 2017

Table R12: Top six ranking of the most consumed Ghanaian household goods and services by domestic visitors, 2013

Rank	Category of expenditure	Amount (Gh¢)	%
1	Transportation	1,744,998,185.60	45.50
2	Food & drinks	924,831,842.19	24.12
3	Shopping	668,816,683.41	17.96
4	Accommodation	197,782,273.94	5.16
5	Others	184,656,708.38	4.82
6	Recreation, culture & sporting activities	92,524,306.38	2.43

Source: Author's computation, 2017

Table R13: Top five ranking of the most consumed Ghanaian household items by same-day visitors, 2013 (Million GhȻ)

Rank	Category of expenditure	Amount (million Gh¢)	%
1	Transportation	1,055.41	46.38
2	Food & drinks	603.97	26.54
3	Shopping	404.72	17.79
4	Others	156.39	6.87
5	Recreation, culture and sporting activities	54.93	2.41

Source: Author's computation, 2017

Table R14: Top six ranking of the most consumed Ghanaian household items by package tour, 2013

Rank	Category of goods and services consumed	Value (million Gh Ȼ)
1	Food & drinks	1,150.00
2	Transport	618.00
3	Accommodation	360.00
4	Recreation, culture & sporting activities	136.00
5	Shopping	36.00
6	Other	35.00

Source: Author's computation, 2017

Table R15: A comparison of tourists' speed-of-adjustments of tourism goods and services towards long-run equilibrium by region of visit in Ghana

Region	ACC	FAD	TRA	RCS	SHO	OTH
Western	-1.372	-1.028	-1.131	-1.071	-0.959	-0.901
Central	-1.360	-1.089	-1.046	-0.969	-1.035	-1.027
Greater Accra	-0.719	-1.168	-0.946	-1.207	-0.939	-1.179
Volta	-0.896	-0.808	-1.024	-0.904	-1.241	-1.096
Eastern	-1.123	-1.110	-1.147	-0.893	-1.111	-0.668
Ashanti	-1.183	-1.182	-0.853	-0.853	-0.961	-1.081
Brong Ahafo	-0.993	-0.995	-0.893	-1.122	-1.126	-0.995
Northern	-0.864	-1.123	-1.128	-0.962	-0.849	-0.901
Upper East	-0.986	-1.069	-0.867	-1.214	-0.850	-1.139
Upper West	-1.005	-0.881	-1.075	-1.051	-1.112	-1.247
National	-1.002	-0.945	-1.104	-1.047	-1.116	-1.018

Source: Author's computation, 2017

Table R16: A comparison of LAIDS and Bootstrap estimates

	LAIDS Estimates			Bootstrap Estimates		
Variable	Estimate	Standard Error	P- Value	Estimate	Standard Error	P- Value
ACC (p)	-0.0095	0.0071	0.184	-0.0095	0.0073	0.192
FAD(p)	0.0249	0.0077	0.001	0.0249	0.0075	0.001
TRA(P)	0.0131	0.0077	0.007	0.0131	0.0087	0.031
RCS(p)	-0.0079	0.0081	0.331	-0.0079	0.0070	0.264
SHO(p)	0.0019	0.0077	0.807	0.0019	0.0087	0.828
OTH(p)	-0.0228	0.0085	0.007	-0.0228	0.0093	0.014
ACC (ex)	-0.0091	0.0048	0.009	-0.0091	0.0044	0.040
FAD(ex)	0.0037	0.0051	0.461	0.0037	0.0057	0.059
TRA(ex)	0.0092	0.0057	0.107	0.0092	0.0059	0.116
RCS(ex)	-0.0017	0.0054	0.752	-0.0017	0.0060	0.775
SHO(ex)	-0.0018	0.0052	0.733	-0.0018	0.0057	0.755
OTH(ex)	0.00020	0.0054	0.965	0.00020	0.0057	0.967
Budget share (w)	0.0036	0.0049	0.044	0.0037	0.005	0.042
CONST	0.00000	0.0160	0.998	0.00000	0.0165	0.998

Source: Author's computation, 2017

Table R17: Weighted differences and pseudoR^2

Quantiles	RASω_o	TASω_o	pseudoR^2
0.10	660.721	755.716	0.1257
0.25	1203.548	1362.051	0.1164
0.50	1465.904	1468.010	0.0014
0.75	1254.370	1403.866	0.1065
0.90	740.060	820.305	0.0978

Source: Author's computation, 2017

APPENDIX S: DOMESTIC TOURISM HOUSEHOLD QUESTIONNAIRE

DOMESTIC TOURISM HOUSEHOLD SURVEY QUESTIONNARE

1st JANUARY – DECEMBER, 2012 - 2014

(DOMESTIC TOURISM ACTIVITIES)

Name of Interviewer:…………………………………………………………

Name of Supervisor:………………………………………….………..

Date:...

Tel. No. of Respondent..

E. A. Name:…………………………………………..…………………

E. A. Number: …………………………………………..………………..

Region:……………………………………………………………..………

District Name:…………………………………………………….……………

Household Number……………………………………………………..…

Zone………………………………………………………………………..

Section 1: Details of Household Members

1: Household size and composition (starting with household head)

	1	2	3	4		5	6
MEMBER I.D.	List names of household members	What is (name) relationship to head of household? 01. Head 02. Spouse (wife/husband) 03. Child (son/daughter) 04. Grandchild 05. Parent/parent in-law 06. Son/daughter In-law 07. Other relative 08. Step/adopted/foster child 09. House help 10. Non-relative	How old is (name)?	Sex?		What is (name's) present marital status? 01. Married 02. Consensual union 03. Separated 04. Divorced 05. Widowed 06. Never married	To which ethnic group does (name) belong? **Ethnicity (Code)**
				M	F		
01							
02							

03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							

MEMBER I.D.	7 What was (name's) highest educational qualification attained?	8 What is (name's) nationality?	9 How long has (name) stayed here?	10 What is (name's) region of residence?	11 What is (name's) economic status?	12 What is (name's) occupation (what kind of work (name) does)?
	01. None 02. Primary 03. Middle/JSS 04. Vocational/Comm. 05. GCE 'O' Level 06. SSS 07. GCE 'A' Level 08. Tr. Trg. College A 09. Tr. Trg. College B 10.Tech/Prof Diploma 11. Koranic 12. Degree 13.Post graduate 14. Don't know	01. Ghanaian (by birth) 02. Ghanaian (naturalize) 03. Burkinabe 04. Malian 05. Nigerian 06. Ivorian 07. Togolese 08. Liberian 09. U. S. 10. U. K. 11. Japan 12. China 13. Germany 14. U. A. E (Dubai) 15. Other E. U countries 16.Other ECOWAS 17. Other African 18. Other (Specify)		01 Western 02 Central 03 Greater Accra 04 Volta 05 Eastern 06 Ashanti 07 Brong Ahafo 08 Northern 09 Upper East 10. Upper West	01. Employed (>>12) 02. Self-employed (>>12) 03. Unemployed (>>Sec. 2) 04. Student (>>Sec. 2) 05. Home maker (>>Sec. 2) 06. Pensioner (>>Sec. 2) 07. Apprentice (>>Sec. 2) 08. Other (Specify) (>>Sec. 2)	01. Professional/Technical 02. Admin./Managerial 03. Clerical 04. Sales 05. Service 06. Agric./Ani./Husb./Forest/ Fishing/Hunting 07. Production and related work 08. Workers NEC. 09. Home maker 10. Other (specify) 11. Don't know
01						

02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						

M E M B E R I.D.	13 I.D of household members earning income	14 What is the combined income/expenditure of all household members? TOTAL IN GH₵	15 Does the household own a car? 01 Yes 02. No	16 Does the household head or any member own a mobile phone? 01. Yes 02. No	17 Does the household or any member have access to the internet? 01. Yes 02. No	18 Has the household or any member contracted a loan? 01. Yes 02. No
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						

Section 2: Trips in Ghana

3 **Particulars of individual/joint trips made in Ghana by (name) or household in the past twelve (12) months in chronological order, starting from the latest**.

MEMBER I.D.	1	2	3	4				5	6	7
	Has (name or household) visited any place outside his/ her usual environment (place of residence/ work/trade study) in the past twelve (12) months? 1. Yes (>>2) 2. No (>> 12)	Were the places visited within Ghana, outside Ghana or both? 01. In Ghana (>>3) 02. Outside Ghana (>>**End interview)** 03. Both (>>3) (For travels in Ghana)	In which month(s) did (name/household) travel? 01. January 02. February 03. March 04. April 05. May 06. June 07. July 08. August 09. September 10. October 11. November 12. December	What was the main destination? 01. Same-day 02. Overnight **(Write town name & district (code)**				What type of trip? 01. Same-day (>>6) 02. Overnight (>>8)	What was the length of stay of trip made in Ghana? (hours) HOURS	How many same-day visit(s) has (name or household) made in the past twelve (12) months? (>>10) NUMBER
				Same-day visitors	Region & District codes	Overnight visitors	Region & District codes			
01										
02										
03										

04										
05										
06										
07										
08										
09										
10										
11										
12										
13										
14										
15										

	8	9	10		11	12	13
M E M B E R I.D.	How many overnight visit(s) has (name/ household) made in the past twelve (12) months? NUMBER OF VISITS	How many bed nights did (name/household) spend in this place? NUMBER OF BED NIGHTS	What was the Tour type? 1. Package tour 2. Non-package tour		Who sponsored the trip? >> 15 01. Self-financed 02. Financed by parents 03. Financed by other relatives & friends 04. Financed by employer 05. Financed by government 06. Financed by educational or social development schemes 07. Financed by voluntary	What was (name's/ household) reason for not undertaking any trip? 01. No specific motivations 02. Economic reasons 03. Lack of free time due to work/school 04. Family commitments 05. Health and security reasons 06. Lack of awareness on travel possibilities 07. Other (specify)	Is there any plan for (name or house-hold) to undertake a trip in the next twelve (12) months? 1. Yes (>>14) 2. No **(If no, end interview)**
			Same-	Overnight			

			day visitors	visitors	organizations 08. Financed by other (specify)				
					Same-day visitors	Overnight visitors	Same-day	Overnight	
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									

NOTE: A family of 2 adults and 2 children counts as 4 trips; 2 adults and 3 children taking a 3 night trip will count as 15 bed nights.

	14	15		16	17	18		19
M E M B E R I.D.	If yes, what will be the purpose of the trip? **(End interview for non-travellers)**	What was the main mode of travel in Ghana?		What was (name's/household) purpose of visit?	What was the main type of accommodation (Name/household) stayed in?	Which tourism attraction site(s) did (name or household) visit?		What was the main source of information?
	01. Funeral 02. Leisure, recreation &holidays 03. Visiting friends & relatives 04. Business 05. Professional 06. Health treatment 07. Religion/pilgrimage 08. Education/training 09. Shopping 10. Other (specify)	01. Air transport 02. Sea/ lake transport 03. Public transport 04. Railway 05. Private vehicles 06. Rented vehicles 07. Other (specify)		01. Funeral 01. Leisure, recreation & holidays 02. Visiting friends &relatives 04. Business 05. Professional 06. Health treatment 07. Religion/pilgrimage 08. Education/training 09. Shopping 10. Other (specify))	01. Hotel 02. Guest house 03. Budget hotel 04. Hostel 05. Health establishment 06. Work holiday camp 07. Holiday dwelling 08. Tourist campsite 09. Private/second home 10. Friends'/relatives'	01.Same-day visitor 02.Overnight visitor **See Code** IF NONE CODE 00		01. Tourist offices & information centres 02. Airliners 03. Travel agents and tour operators 04. Accommodation establishments 05. Tourist literature, travel magazines & journals 06. Films and other audio-visual media 07. Print & television advertisements 08. General text books and magazines 09. Educational institutions 10. Friends and relatives 11. Own experience
		Same-day visitors	Overnight visitors			Same-day visitors	Overnight visitors	

						home 12. Other (specify) 98. Not applicable (N/A)			12. Employer 13. Other (specify).	
				Same-day visitors	Overnight visitors				Same-day visitors	Overnight visitors
01										
02										
03										
04										
05										
06										
07										
08										
09										
10										
11										
12										
13										
14										
15										

Section 3: Expenditure of Domestic Tourists

Details of expenditure of domestic tourists (on each trip) in Ghana (excluding those paid to tour operator in the case of package tours) in the past twelve (12) months

MEMBER I.D.	1 How much did (name/household) spend on accommodation?	2 How much did (name/household) spend on food and drinks?	3 How much did (name/household) spend on transport?	4 How much did (name/household) spend on recreation, culture and sporting activities?	5 How much did (name/household) spend on shopping?	6 How much did (name/household) spend on other items?	7 Total T1
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							

Section 4: Expenditure of Domestic Same-Day Visitors

Details of expenditure of domestic same-day visitors (on each trip) in Ghana in the past twelve (12) months

MEMBER I.D.	1 How much did (name/household) spend on food and drinks?	2 How much did (name/household) spend on transport?	3 How much did (name/household) spend on recreation, culture and sporting activities?	4 How much did (name/household) spend on shopping?	5 How much did (name/household) spend on other items?	6 Total T2
01						
02						
03						
04						
05						
06						

07						
08						
09						
10						
11						
12						
13						
14						
15						

Section 5: Expenditure of Tourists in Case of Package Tour in Ghana

Items of expenditure covered and total amount paid in the case of package tour in the past twelve (12) months

MEMBER I.D.	1 How much did (name/household) pay on accommodation?	2 How much did (name/household) pay on food and drinks?	3 How much did (name/household) pay on transport?	4 How much did (name/household) pay on Recreation, culture and sporting activities?	5 How much did (name/household) pay on shopping?	6 How much did (name/household) pay on other items?	7 Total T3
01							
02							
03							
04							
05							
06							

07							
08							
09							
10							
11							
12							
13							
14							
15							

Section 6: Expenditure of tourists/visitors for each pre and post trip in the past twelve (12) months in Ghana

MEMBER I.D.	1 Pre – trip expenditure						2 Post – Trip Expenditure					3 Grand Total
	1	2	3	4	Others	Total	1	2	3	Others	Total	T4
01												
02												
03												
04												
05												
06												
07												

08												
09												
10												
11												
12												
13												
14												
15												

APPENDIX W: EXPENDITURE, TRIPS AND BED-NIGHTS

Item	Estimate	Standard error	95% Confidence Interval Lower	95% Confidence Interval Upper	C.V	Design effect	Square Root Design effect	Population size	Unweighted Count
Education	92,021,429	10,277,319.0	70,338,181	113,704,677	0.112	17.124	4.140	25,728,665	1,033
Bed-night	181,990,125.0	36,182,106.6	104,862,426	257,537,574	0.200	10.26	3.200	6,793,808	1,033
Accommodation	91,537,135.1	39,842,286.1	8,470,125	176,494,403	0.431	3.145	1.773	6,557,137	259
Food & drinks	669,461,324.2	189,274,734.4	270,967,949	1,068,637,118	0.282	13.021	3.609	6,557,137	413
Transport	1,199,871,332.8	518,196,407.5	111,331,115	2,297,928,885	0.201	10.217	3.196	6,557,137	591
Recreation, culture & sport. Activities	79,990,128.6	34,839,516.7	7,485,043	154,494,957	0.430	7.779	2.789	6,557,137	469
Shopping	227,420,698.7	64,598,238.5	92,129,629	363,795,549	0.283	4.953	2.225	6,557,137	459
Others	57,990,308.3	16,279,010.8	24,374,291	93,065,709	0.277	3.629	1.905	6,557,137	559
Same-day trips	14,743,817.0	1,701,543.0	11,153,875	18,333,759	0.115	44.459	6.668	10,644,832	1,021
Overnight trips	16,690,504.2	1,941,149.5	12,724,532	20,915,468	0.165	93.631	9.678	4,322,142	1,019
Economic	8,488,466.0	3,651,488.5	784,498	16,192,434	0.080	12.811	3.579	25,555,589	259

Note: C.V = Coefficient of variation

SAMPLING ERRORS

The design effect refers to the ratio of the variance of the indicator which was utilised in the sample design to the variance calculated under a simple random sampling. Should the square root of the design effect be 1, then the sampling design is as efficient as a simple random sampling. But a value more than 1 represents a rise in the sampling error owing to the use of a more complex and a lesser amount of statistically efficient design. A coefficient of variation (c.v) which is not greater than 20% is considered as exact enough for the indicator and shows that the sample size is an ideal one.