

**THE INCIDENCE AND DYNAMICS OF INTRA-INDUSTRY
TRADE BETWEEN GHANA AND ECOWAS**

BY

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**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON, IN
PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF
MASTER OF PHILOSOPHY DEGREE IN ECONOMICS.**

JUNE 2012.

DEDICATION

I dedicate this work to my dear parents Madam Agnes Donkor and Mr Emmanuel C. K. Offei and to my siblings Richard, Mercy and Evelyn Offei. I cannot pay you for the invaluable commitments you have made into my education and my life as whole. God bless you.

DECLARATION

This is to certify that this thesis is the result of research undertaken by EMMANUEL LARBI OFFEI towards the award of Mphil Economics in the Department of Economics, University of Ghana. I hereby solemnly declare that except references made to other works, which have been duly acknowledged, this thesis is entirely my own work and neither part nor whole of it has been presented for another degree anywhere.

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ACKNOWLEDGEMENTS

I thank God for His priceless provisions that sustained me throughout the master's degree program.

I am grateful to my supervisors Ms Abena D. Oduro and Dr. Albert D. Amarquaye Laryea for their insightful contributions. I am especially pleased with their commitment in reading the work and directing me to very useful literature.

This thesis will not have been complete without the assistance of the staff of the Ghana Statistical Service, External Trade Statistics division especially Mr Samuel Mortey who patiently assisted me to gather all the necessary data on trade between Ghana and ECOWAS. To Mr Andrew Agyei-Holmes, I say, God richly bless you for making me a friend and a brother. Your contribution to this thesis is priceless in terms of data collection and access to some critical literature. I extend my loveliest appreciation to Maura Naa Densuah Ashong for her lovely inspiration.

I appreciate the support of the entire staff of the Department of Economics, University of Ghana especially Uncle Peter Juayire. To all my colleagues Mphil Economics students, it has been a wonderful learning process. I thank you for the support you offered me as the leader of the class for the entire duration of the program. I am particularly grateful to Christopher Opoku Nyarko, who always read through my work.

Finally, I am sincerely grateful to the African Economic Research Consortium (AERC) for sponsoring the entire class to Nairobi, Kenya for three months for the Joint Facility for Electives (JFE). The JFE enriched the MPhil program and also offered us huge platform to network with other budding and eminent economists across Africa. The 2012 program is historic because from 2013 University of Ghana students will no longer travel to Kenya because the University now has category C status to organise JFE in Ghana.

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ABBREVIATIONS AND ACRONYMS

ARIA	Assessing Regional Integration in Africa
ASEAN	Association of Southeast Asian Nations
ATL	Akosombo Textiles Limited
BoG	Bank of Ghana
BRIC	Brazil, Russia, India and China
CEAO	Communaute Economique de l'Afrique de l'Ouest
CEFTA	Central European Free Trade Area
CIS	Commonwealth of Independent States
COMESA	Common Market of Eastern and Southern Africa
COPAZ	Co-Prosperity Alliance Zone
EAC	East African Community
EBID	ECOWAS Bank for Investment and Development
ECA	Economic Commission for Africa
ECOWAS	Economic Community of West African States
EEC	European Economic Community
ERP	Economic Recovery Program
ETLS	ECOWAS Trade Liberalisation Scheme
EU	European Union
FDI	Foreign Direct Investment
FEM	Fixed Effects Models
GDP	Gross Domestic Product
GEPA	Ghana Export Promotion Authority
GoG	Government of Ghana
GSS	Ghana Statistical Service
GTMC	Ghana Textile Manufacturing Company
GTP	Ghana Textile Printing Company Limited
H-O	Heckscher-Ohlin
HS	Harmonised System
IIT	Intra-Industry Trade

IMF	International Monetary Fund
ISSER	Institute of Statistical, Social and Economic Research
LM	Lagrange Multiplier
MERCOSUR	Mercado Común del Sur
MNCs	Multinational Corporations
MOTI	Ministry of Trade and Industry
NAFTA	North American Free Trade Area
OAP	Offshore Assembly Provisions
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
PTA	Preferential Trade Area
REM	Random Effects Model
SADC	Southern African Development Community
SITC	Standard International Trade Classification
SME	Small and Medium Scale Enterprises
TSSP	Trade Sector Support Programme
UEMOA	L'Union Economique et Monetaire Ouest Africaine
US	United States
USA	United States of America
WACIP	West African Common Industrial Policy
WAMZ	West African Monetary Zone
WDI	World Development Indicators

ABSTRACT

Since intra-industry trade (IIT) was first noticed in the 1960s, theoretical and empirical studies on this type of trade have been growing rapidly. Very few studies however, have investigated IIT in the Economic Community of West African States (ECOWAS) region. This current study attempts to bridge the literature gap by examining the incidence and determinants of IIT between Ghana and its ECOWAS trading partners using empirical trade data from 2004 to 2010. The results show evidence of IIT between Ghana and ECOWAS although it is low as compared to other regions. Sectors found to exhibit high incidence of IIT are transportation, animal products and chemicals industries. At the country level, Cote d'Ivoire has the highest IIT incidence with Cape Verde and Guinea Bissau having no IIT with Ghana. The determinants of IIT are estimated using the gravity model and the results indicate that per capita income, dissimilarity in per capita income, foreign direct investment, and common language affect IIT positively while gross domestic product and geographic distance influence IIT negatively. The main hypothesis guiding this study is that similarity in per capita income between Ghana and the ECOWAS trading partners stimulates IIT. This hypothesis is however rejected because the study finds a positive correlation between dissimilarity in per capita income and intra-industry trade instead of the a priori expectation of negative sign. The study recommends that policies should be introduced to encourage the expansion of the manufacturing sector in member countries. Exchange rate variability and bottlenecks in the level of traffic flow along interstate corridors must be removed to enhance intra-industry trade within the sub-region.

CHAPTER ONE

INTRODUCTION

1.1 Background

Intra-industry trade (IIT) occurs when a country engages in the simultaneous export and import of similar products (Krugman, 1979). Similarity of products is based on the technical production process or the ease with which one product can be substituted for the other in consumption. IIT is also referred to as “two-way trade” (Gray, 1979) or “trade overlap” (Finger, 1975). For the purpose of this study, an “industry” refers to either a group of products which are close substitutes on the supply side or as a group of products which are close substitutes on the demand side (Krugman, 1981).

According to Grubel and Lloyd (1975) IIT can be defined as “trade in differentiated products which are close substitutes”. It is increasingly becoming evident that a large proportion of global bilateral trade now involves the simultaneous exchange of similarly differentiated products or subset of a broad product group (Brühlhart, 2008). IIT is not simply an artefact of statistical classification and definitions, but an actual phenomenon. This form of trade is a complete departure from inter-industry trade, in which countries exchange products belonging to different industrial classifications.

Linder (1961) provides one of the pioneering theoretical frameworks for the analysis of intra-industry trade. According to his “overlapping demand hypothesis” countries with similar per capita income have similar demand patterns and consequently, identical industries. Although the industries are identical, they differ in terms of the production

process, product characteristics as well as packaging. The differentiation of the industry's product and similarity in per capita income become the bases for exchange of goods. Thus, bilateral trade in similar products is possible because countries have similar per capita income.

Following the initial work by Linder (1961), models of imperfect competition and international trade were developed to explain intra-industry trade (Krugman, 1979, 1981; Helpman 1981). In these models product differentiation and consumers' preference for variety provide the basis for intra-industry trade. Product differentiation is more likely to occur in the manufacturing sector than in the primary commodity sector. When there is a large share of intra-industry trade, expansion in trade will be characterised by lower re-allocation of resources. This is because factors of production are likely to stay within a particular industry than move from one industry to another – for example from an import substitution industry to export industries - as would be the case when most trade is inter-industry. When the share of IIT is large the positive effects of trade expansion will outweigh the income distribution effects (Krugman, 1982). In addition the welfare of consumers is enhanced by providing them with a variety of products. These gains are prompting governments and policy makers in developing countries to devote resources to policies that facilitate IIT in the identified sectors (Sunde et al, 2009).

Although IIT is prominent among developed countries because they engage more in the production and trading of manufactured products, it is also becoming an integral part of trade in developing countries because of its economic benefits (Al-Mawali, 2005). Aside

the additional market it creates, IIT leads to relatively lower level of resources dislocation, as well as enhancing the welfare of consumers by providing them with differentiated varieties of products. Additionally, the simultaneous exchange of similar products promotes free trade by discouraging trade protectionism. These gains are prompting governments and policy makers to devote resources to measures that facilitate IIT in the identified sectors (Sunde et al, 2009).

Expanding trade among member countries is one of the major objectives for the formation of regional blocs of which the Economic Community of West African States (ECOWAS) is not an exception as stipulated in article three of its treaty. Mundell (1961) indicates that countries are able to cope better with external shocks when they form regional blocs rather than on individual country basis. The ECOWAS region comprises fifteen developing countries with an average per capita income of US\$458.78 in 2010 (World Bank, 2011). Although the countries are at similar levels of economic development, they differ in geographic size, population and market size.

In order to foster regional integration, a number of pro-trade measures have been introduced. Prominent among these is the ECOWAS Trade Liberalisation Scheme (ETLS) and the West African Common Industrial Policy (WACIP). The main thrust of ETLS is to establish a common market in ECOWAS through the removal of all custom duties and WACIP is expected to increase the composition of manufactured products in items traded among ECOWAS countries. Indeed, intraregional trade has increased from 3 per cent in the 1970s to about 12 per cent in 2008 (ECOWAS, 2010) as a result of some

of these measures but this is low compared to other regional blocs. A study conducted by Velde (2009) shows that the share of intraregional trade among members of NAFTA, ASEAN and MERCOSUR¹ in 2006 was 43.8 per cent, 24.1 per cent and 16.2 per cent respectively. For the East African Community (EAC) the share was 12.5 per cent for the same period.

At the country level, trade ties between Ghana and ECOWAS have not witnessed any significant improvement over the decades. In 1996, only 3.6 per cent of Ghana's exports went to ECOWAS and ten years later the share increased marginally to 8.4 per cent (IMF, 2009). Similarly, the average share of imports from ECOWAS between 1980 and 2007 was 19.3 per cent, approximately 12.7 per cent in excess of exports over the same period. The composition of exports is mainly wood products, textiles and food items whereas imports are predominantly mineral products from Nigeria.

With a population of over 300 million people, the region's combined economic potential is enormous and it offers large market prospect to stimulate intraregional trade. The revision of the Lagos treaty in 1993 has shifted the Community's goal from bilateral cooperation between states to bringing about closer economic integration among member countries making it relatively attractive for Ghana or any member country to take advantage of the pool of market provided to boost intraregional trade. Nonetheless, intraregional trade still remains low.

¹ NAFTA is the North American Free Trade Area, ASEAN is the Association of Southeast Asian Nations, and MERCOSUR is the Mercado Común del Sur

From the perspective of the traditional trade theories, countries with dissimilar factor endowments are more likely to trade relative to countries with homogeneous resources. In that case, countries will export products that use intensively their abundant factors and import products that utilise intensively their scarce products. This trade outcome is called inter-industry trade in which countries exchange products belonging to different industry classifications. However, given that all ECOWAS countries are developing and similar in income and resource endowments, then on the basis of the inter-industry theory, these countries are not natural trading partners.

On the other hand, the IIT theory predicts that similarity in per capita income and economic activities can be a basis for bilateral trade in differentiated products (Linder, 1961). The theory actually demonstrates that countries with similar income and production activities tend to trade more among themselves than dissimilar countries with the reference point for similarity being income and production activities. This is a complete departure from the proposition of the inter-industry trade theory. Also, Ford (2003) indicates that some of the key consideration in the formation of regional blocs is geographical proximity and similarity in economic activities. Therefore, any form of trade that ensue among such countries will most likely involve the exchange of similar products.

As indicated earlier, trade promotion is one of the core reasons for the establishment of ECOWAS. Hence, the quest for solution to the low intraregional trade cannot be overemphasised. Juxtaposing inter-industry with intra-industry trade theories, the latter

can relatively enhance trade in the region. This is because member countries have similar income and resource endowments. It is therefore important to investigate the phenomenon of IIT in the region as has been done in other regional blocs. Therefore the focus of this study is to test for the existence and scope of intra-industry trade between Ghana and ECOWAS. The study will further examine the determinants of this type of trade in the region.

1.2 The Research Problem

Intra-industry trade (IIT) was first noticed by Verdoon (1960) after the formation of the Benelux customs union among Belgium, Netherlands and Luxemburg in Europe. This customs union was formed in 1948. After this discovery by Verdoon, several studies have been conducted into the scope, types and determinants of IIT. Some of these studies that documents evidence of IIT are conducted on regional economic blocs (see Sunde et al 2009; Musonda 1997), whereas others are on individual countries (see Clark, 2005; Veramaani 2002; Blanes and Martin 2000). Despite the growing knowledge on IIT globally, very little is known about such type of trade among ECOWAS countries.

Although previous studies conducted outside the ECOWAS region have contributed substantially to the literature on IIT, their findings may not be applicable to ECOWAS and for that matter Ghana. A set of determinant factors that have a significant role on the magnitude and direction of intra-industry trade in a particular country or regional economic bloc may prove to be insignificant in the ECOWAS region. For instance, the question of whether the low intra-regional trade observed among ECOWAS countries is a

phenomenon of low IIT cannot be addressed by such studies. However, answers to these questions are very important in tackling the trade bottlenecks in the ECOWAS sub-region.

Earlier, Zantira (1999) conducted a study on the scope and determinants of intra-industry trade between Ghana and its major trading partners from 1995 to 1998. After establishing that there is evidence of IIT between Ghana and its trading partners, the main hypothesis tested was that IIT is more prevalent in trade between Ghana and those trading partners with similar per capita income. This hypothesis was rejected because the study obtained a positive sign for the 'difference in per capita income' variable contrary to the expectation of negative value. A total of twenty (20) countries were included in the study comprising ten (10) developed countries and ten (10) developing countries.

Although this study is very relevant to trade policies in the ECOWAS region, it is fraught with significant limitations. First, the author used only a sample of thirty (30) products groups classified by the HS two-digit level of classification. A sample of thirty products is not a true representation of Ghana's trade, especially, when the two-digit HS code has ninety-nine (99) products groups of which Ghana trades at least in each of them. The extent of IIT is said to be significantly influenced by the level of data aggregation as some critics argue that this type of trade is a statistical artefact that would disappear with finer disaggregation of data. Hence, the two-digit level of data aggregation used by the author is relatively low as the IIT indices obtained will change with finer data classification. Also, only five ECOWAS trading partners² of Ghana out of the fourteen

² The ECOWAS trading partners included in the study are Cote d'Ivoire, Nigeria, Togo, Liberia and Burkina Faso

countries are included in the study. An increase in the number of countries would have been more preferable. Finally, it's been over a decade since the study was conducted, using recent dataset will improve the relevance and currency of the findings to policy.

This study therefore attempts to address all of these limitations by providing recent and extensive evidence on the scope and determinants of intra-industry trade between Ghana and ECOWAS. All the fourteen trading partners are included in this study and the trade data used for the study includes all commodities traded which are classified at the six-digit HS code from 2004 to 2010. The six-digit is a finer level of data aggregation and eight years is a relatively lengthy period. A total of over two thousand products are included in this survey.

1.3 Objectives of the Study

The general objective of this study is to investigate the incidence and determinants of intra-industry trade between Ghana and other ECOWAS countries. Specifically, this study seeks to;

- i. Investigate the incidence/existence of intra-industry trade in ECOWAS
- ii. Identify the industries in which intra-industry trade is prevalent
- iii. Estimate the extent of intra-industry trade between Ghana and each ECOWAS trading partner
- iv. Examine whether similarities in per capita income stimulates intra-industry trade between Ghana and its ECOWAS trading partners.

1.4 Hypotheses

The main hypothesis being tested is that intra-industry trade is more prevalent in trade between Ghana and ECOWAS trading partners with similar per capita income.

Null hypothesis $H_0: \beta_2 = 0$

Alternate hypothesis $H_1: \beta_2 \neq 0$

The other hypotheses being tested in this study are discussed in chapter four under the section on rationale for the choice of variables and the expected signs of the variables.

1.5 Justification and significance of the Study

The importance of this study lies in its contribution to policy and the literature on intra-ECOWAS trade. Most of the studies on intra-industry trade have focused on developed countries more than developing countries³. Even with the few studies on developing countries, very little work has been done on ECOWAS. The present study adds to the small but growing literature on IIT in developing countries (see for example Al-Mawali, 2005; Veramaani, 2002; Sunde et al, 2009) by examining intra-industry trade between Ghana and ECOWAS countries from 2004 to 2011.

The study also provides policy guidelines to improve trade intensity in the ECOWAS sub-region. This is because the study has established that the low intra-regional trade observed among ECOWAS countries is a phenomenon of low intra-industry trade. Hence, by promoting intra-industry trade and eliminating the bottlenecks associated with this type of trade, we expect to see a growing trend in intra-ECOWAS trade over time.

³ see Grubel and Lloyd (1975), Caves (1981) and Kocyigit and Sen (2007)

1.6 The scope and source of data for the study

The study takes place in a panel setting from 2004 to 2010 for fifteen ECOWAS countries including Ghana. All traded goods are included in the estimation rather than only manufactured goods on account of the fact that the share of manufactured products in Ghana's bilateral trade with ECOWAS is low (ECOWAS, 2010). A total of about two-thousand and seventy three (2,073) products are used in this study. The traded products are classified into their respective industries by using the six-digit Harmonised System (HS) of Commodity Description and Coding nomenclature developed by the World Customs Union. Data for the study is sourced from the Ghana Statistical Service and World Development Indicators (published by the World Bank in 2011).

1.7 Organisation of the study

This study is organised into six chapters. Following this introductory chapter, chapter two is dedicated to a review of the theoretical and empirical literature on IIT. Chapter three provides an overview of the economic and trading activities between Ghana and ECOWAS. The fourth chapter focuses on the methodological issues pertinent to the work. The findings of the study are discussed in chapter five and the last chapter summarises the study and outlines policy recommendations based on the findings.

CHAPTER TWO

OVERVIEW OF TRADE BETWEEN GHANA AND ECOWAS

2.1 Introduction

This chapter begins with a highlight of Ghana's economic performance in the last decade and its impact on trade with ECOWAS. This is followed by a review of trade policies of Ghana and ECOWAS. The discussion on the trade policies give an idea of measures being pursued to facilitate trade in the sub-region. A general overview of all ECOWAS countries including the structure of economic production is also provided in this chapter. Finally, particular attention is given to the patterns and composition of trade between Ghana and the other ECOWAS countries.

2.2 Ghana's economic performance in the last decade

Ghana is a developing country with abundant and diverse natural resources. Gold, timber, cocoa and recently crude oil are the major sources of foreign exchange. The volume of measured economic activities in the past decade has witnessed a steady growth averaging 6.4 per cent (see Table 2.1). The real gross domestic product (GDP) growth in 2001 was 4.2 per cent and this increased continually to 4.8 per cent in 2004 after which it stagnated the following year. However, the GDP returned to the upward trend after 2005 until the start of the global economic crisis. The heightening of the crisis particularly in the first half of 2009 led to a sharp fall in real GDP growth to 4.1 percent, about 3.1 per cent less

than the previous year and the lowest in the last decade as shown in Table 2.1. This reduced growth translated into a shortfall in the real per capita income from 4.8 per cent in 2008 to 2.8 per cent in 2009 (ISSER, 2009).

Table 2.1: Selected Macroeconomic Indicators (%), 2001-2011

Year	Real GDP	Average	Sectoral Growth Rate		
	Growth rate	Annual	Agriculture	Industry	Service
Inflation Rate					
2001	4.2	21.3	4.0	2.9	5.1
2002	4.5	15.2	4.4	4.7	4.5
2003	5.2	29.8	6.1	5.1	4.8
2004	5.8	18.2	7.0	4.8	4.7
2005	5.8	15.5	4.1	7.7	5.4
2006	6.2	11.7	4.5	9.5	6.5
2007	6.3	10.7	-1.7	6.1	7.7
2008	7.2	16.5	7.4	15.1	8.0
2009	4.1	19.3	7.2	4.5	5.6
2010	7.7	10.8	5.3	5.6	9.8
2011	13.6	8.73	0.8	41.1	8.3
Average	6.4	16.0	4.5	9.7	6.4

Source: ISSER (various issues); GoG (2012); BoG (2012), GSS (2012)

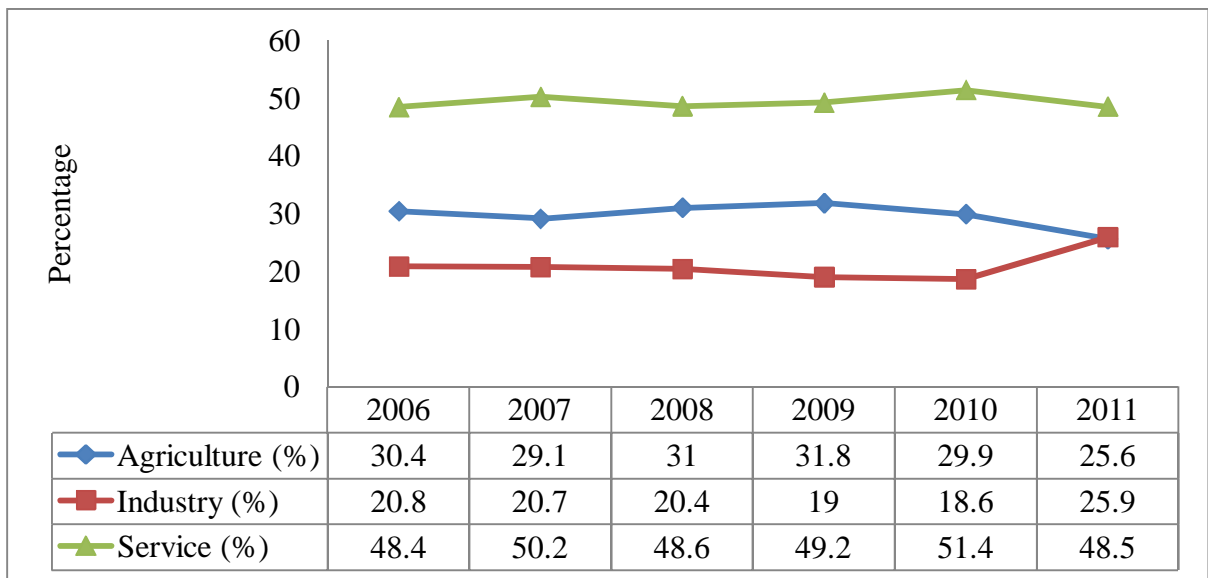
In 2011, the injection of over US\$ 400 million from the sale of crude oil propelled the economy to a real GDP growth rate of 13.6 per cent the highest growth in the history of Ghana and one of the fastest growth rates in the world for that year. The steady growth in real GDP observed over the last decade has contributed to a reduction in poverty by almost 20 per cent pushing Ghana to a lower middle income country (ISSER, 2011).

Before leaving the discussion on the real GDP growth rate it is important to highlight the performance of the various sectors. Growth in the various sectors of the economy has been inconsistent in the last decade. The average expansion of 9.7 per cent in the industrial sector is the highest followed by the services sector 6.4 per cent and finally the agricultural sector 4.5 per cent. Growth in the agricultural sector was the most fluctuated.

The country has dealt fairly well with inflationary pressures over the last decade especially as the country seeks to meet the single digit inflation target, one of the prerequisite for the introduction of the ECO currency in the West African Monetary Zone (WAMZ). Keeping inflation under control is also very critical in promoting international trade. The average annual inflation rate for Ghana in the last decade is 15.95 per cent. One key observation in Ghana over the last decade is that inflation increases before, during and after the year of election. For instance average annual rate of inflation increased to 29.8 per cent in 2003 from 15.2 per cent in 2002. This was one year ahead of the 2004 election. Again in 2008, inflation increased from 10.7 per cent in 2007 to 16.5 per cent and this was held up to 19.3 per cent in 2009.

In terms of sectoral contributions, the services sector has overtaken agriculture as the largest contributor after the economy of Ghana was rebased in 2010. The base year is now changed from 1993 to 2006 which has subsequently transformed the composition of the economy. The services sector is now the engine of growth in Ghana with enormous potential to rapidly expand and create more trading opportunities in the areas of financial intermediation, transportation and hospitality services.

Figure 2.1 Sectoral contributions to GDP at constant 2006 prices



Source: Ghana Statistical Service (2011)

The share of industry in the Ghanaian economy has not changed significantly in the last decade. In the last decade, the contribution of the industrial sector has not exceeded 26 per cent (GSS, 2011). The sector is dominated by small and medium scale enterprises (SMEs). Since 2007, the construction sub-sector contributes over 30 per cent to the industrial sector overtaking the manufacturing sub-sector (ISSER, 2010). Amidst

Ghana's massive infrastructural deficit, the performance of this sub-sector is attributable to the expansion in the construction of roads, hydroelectric dams, schools and health facilities across the country.

However, with the dawn of commercial oil production in Ghana since December 2010, economic analysts anticipate a revamp of the industrial sector in the years ahead. Notwithstanding these future expectations and existing interventions, fluctuation in power supply, rising price of crude oil and other imported raw materials strains the industrial productivity of the Ghanaian economy (Asante, 2002).

The agricultural sector now contributes a smaller share of total GDP in Ghana since the rebasing of the economy (see Figure 3.1). From 39.6 per cent share in 2001, the contribution of the sector declined to 25.6 per cent in 2011. However, foreign exchange earnings from agriculture continue to increase on yearly basis. Between 2008 and 2010 foreign exchange earnings from the agricultural sector increased from US\$ 1,999 million to US\$ 2,639 million, about 32 per cent rise. Cocoa contributes significantly to the agricultural sector and the economy as a whole. In 2010, cocoa contributed 28 per cent of the total foreign exchange earned by Ghana (ISSER, 2010). Overreliance on rainfall, land tenure challenges and insufficient funding greatly hampers productivity in the agricultural sector.

In conclusion, the rebasing of the national accounts has revealed some structural transformation in the economy over the last decade. The economy is currently worth a little over US\$ 61 billion with the services sector as the engine of growth. Since 2010,

Ghana is considered a lower middle income country with per capita income exceeding US\$ 2,500. This transformation in the economy coupled with the commercial production of oil is impacting significantly on the external sector. Total external trade in goods increased from US\$ 1.39 billion in 2009 to US\$ 1.86 billion representing about 34 per cent growth (ISSER, 2011). The future prospects of trade in both goods and services are very positive. It is however important to understand the policies guiding the external sector and this is the focus of the next section.

2.3 Ghana's trade policy

Since independence, Ghana's trade policy has taken many forms. The first policy is the import substitution industrialisation embarked upon immediately after independence. This was mainly to promote large scale and capital intensive manufacturing activities with the central government as a key player in the administration of such enterprises.

The inward-looking and restrictive trade strategy adopted by the government continued to the mid 1960s in an attempt to protect domestic industries and solve the balance of payment deficits of the country. In line with the seven-year development plan of the government from 1963 to 1970, a number of state owned enterprises were established. The specific policies pursued towards achieving this import-substitution industrialisation drive included trade controls, administrative controls over prices and internal distribution of goods. By 1970, the manufacturing sector of the Ghanaian economy was one of the most diversified in sub-Saharan Africa.

Ghana's economic fortunes however encountered some challenges following the implementation of the import-substitution trade policies. Export growth slowed drastically, imports increased due to the over-valued exchange rate and the balance of payment deficits worsened (Ewusi, 1987). The dwindling export earning due to the decline in cocoa price meant there was not enough foreign exchange to import raw material to feed the state owned industries and this set the firms on the path of collapse. Without doubt, the economy was caught in real economic crises that called for change in policy direction.

In response, there was a change in trade regime leading to partial liberalisation of the import control system and the devaluation of the nominal exchange rate in 1967. Also to curtail the challenges of the export sector especially in cocoa, export promotion institutions were established. Specifically, the Ghana Export Company Limited and the Ghana Export Promotion Council were established in 1968 and 1969 respectively. Measures promoting non-traditional export were also actively pursued leading to the addition of a new spectrum of product such as cassava, banana and cut flowers to the items originating from Ghana to other parts of the world.

Although the interventions above led to some improvement in the export sector as well as relative stability in economic growth, it also introduced new challenges to the economy of Ghana. Prolonged foreign exchange crises led to the shrinking of economic activities leading to high unemployment and reduced savings between 1970 and the early 1980. The challenges suffered by the economy were the basis for the launching of the Economic Recovery Program (ERP) in 1983. This led to an improvement in trade and related economic activities.

Ghana's current trade policy dates back to the year 2004 and it covers seven thematic areas including multilateral trade, protection of intellectual property rights, domestic trade, consumer protection and fair trade (GOG, 2004). Implementation of the trade policy is being effected through the Trade Sector Support Programme (TSSP) and is expected to make Ghana a leading agro-industrial country in Africa.

The trade policy is considered as one of the key tools to achieve government's developmental goals and objectives. Considering the relatively small size of Ghana's market, increased international trade is identified by the government as one of the key avenues for rapid economic growth. This also forms the basis for the need to add value to the exported products through industrialisation to enhance their competitiveness on the international market. Hence, the government is developing parallel strategies to strengthen the industry section of the Ministry of Trade and Industry (MOTI). Specifically, the focus is on an export-led and a domestic market-driven industrialisation based on import competition.

Clearly, the current trade policy is a paradigm shift from import substitution industrialisation and the focus now is on export-led industrialisation and market driven import competition. The responsibility is on successive governments to make provision for the necessary infrastructural and administrative supports that are needed for the smooth operation of the private sector.

Considering the fact that this study is more inclined to multilateral trade, it is important to dwell further on Ghana's multilateral trade arrangements. Recognising that international trade rules in the context of globalisation have direct impact on Ghana's development, the

government fully appreciate the need to participate in negotiations during multilateral trade forums. This ensures that the nation's interests are secured and that the trading rules provide the best opportunities for Ghana's development.

In the global trading environment, the government seeks to obtain reduction in tariffs and the elimination of non-tariff barriers on goods produced in Ghana and also improve export opportunities for Ghanaian producers. It also aims at developing the agricultural and industrial sectors to compete on the global markets. To ensure fair competition, the policy advocates for reduction in subsidies on products that compete with Ghanaian goods both home and abroad. Regarding trade in services, the policy objective is to support the development of strong domestic services sector and also provide access to foreign services not readily available in Ghana.

At the ECOWAS level, the government of Ghana realises that a larger market resulting from the full integration of all the countries into a custom union will be beneficial. It is therefore the policy of the government to pursue the establishment of a full customs union by supporting measures that will remove all obstacles to trade. Trade facilitation between Ghana and other ECOWAS countries is been pursued by empowering both the private and public sectors. For instance the government of Ghana through the ministry of trade and industry and the Ghana Export Promotion Authority (GEPA) is promoting exports to ECOWAS market through training and support services to private exporters. This is to enable Ghanaian products to compete in the regional market freely. The annual trade fairs and products exhibitions organised on rotation basis in the ECOWAS countries have Ghanaian exporters fully partaking and this is some of the practical steps towards deepening trade in the region.

Aside the global and ECOWAS trade arrangements, Ghana also seeks closer ties with other African partners to create additional opportunities for trade and economic development. By creating a larger market the African continent is provided with a stronger collective voice on the world stage to shape multilateral trading rules that take into account the interest of Africans⁴.

2.4 General overview of ECOWAS

The Economic Community of West African States (ECOWAS) was formed in 1975 as a free trade area. Cape Verde became the last country to join the regional group in 1976. Mauritania however withdrew from the group in December 2000. The membership of ECOWAS now stands at fifteen⁵ sovereign countries namely Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. The headquarters is in Abuja, the capital city of Nigeria. English, French and Portuguese are the three official languages in the region.

⁴All the information on Ghana's current trade data is from the "Ghana Trade Policy" document by the Ministry of Trade and Industry prepared in 2004.

⁵ ECOWAS is made up of 8 Francophone, 5 Anglophone and 2 Lusophone countries

Article 3 of the Lagos treaty which established ECOWAS outlines the aims and objectives as follows⁶;

- To promote free trade among member countries
- To encourage free movement of factors of production
- To enlarge the market for goods and services
- To promote joint negotiation in international trade
- To promote intraregional peace and co-operation

From table 3.2, the ECOWAS region has a population of approximately 308.9 million people as at the year 2011. Nigeria is the most densely populated country with about 162.3 million people representing about 53 per cent of the region's population. ECOWAS accounts for about 4.6 per cent of the world population and almost 4 out of every 10 persons in sub-Saharan Africa reside in an ECOWAS country (Population Reference Bureau, 2011).

⁶Source of information: www.ecowas.int

Table. 2.2 Characteristics of the member countries of ECOWAS

COUNTRY	CAPITAL CITY**	LANGUAGE**	ARE (SQ. KM) **	POPULATION IN 2011 (Million)	GDP IN 2010 (US\$ Million)****	PER CAPITA INCOME IN 2010 (US\$)
Benin	Cotonou	French	112,622	9.1.0	3.34	1,423.89
Burkina Faso	Ouagadougou	French	274,200	17.0	4.55	1,126.55
Cape Verde	Praia	Portuguese	4,033	0.5	0.94	3,573.46
Cote d'Ivoire	Yamoussoukro	French	322,463	22.6	11.67	1,703.61
The Gambia	Banjul	English	11,295	1.8	0.61	1,265.18
Ghana	Accra	English	238,533	25	8.72	1,468.82
Guinea	Conakry	French	245,857	10.2	4.11	978.37
Guinea Bissau	Bissau	Portuguese	36,125	1.6	0.24	1,064.11
Liberia	Monrovia	English	111,369	4.1	0.62	375.65
Mali	Bamako	French	1,240,192	15.4	4.15	954.98
Niger	Niamey	French	1,267,000	16.1	2.79	653.03
Nigeria	Abuja	English	923,768	162.3	85.6	2,135.46
Senegal	Dakar	French	196,722	12.8	6.97	1,732.20
Sierra Leone	Freetown	English	71,740	5.4	1.57	741.69
Togo	Lome	French	56,785	5	1.72	895.27

Sources: *2011 World population datasheet ** ECOWAS website *** World Development Indicators (2011), this is GDP per capita, PPP (constant 2005 international US\$)

The region is bordered on the south by the Gulf of Guinea and it covers an area of approximately 5,112,903 square kilometres stretching from the Cape Verde archipelago in the west to Nigeria in the east. In terms of geographical size, Niger is the largest, covering an area of 1,267,000 square kilometres. The value of gross domestic product measured at the 2000 constant prices is approximately US\$ 138 billion in 2010 and this offers huge prospects for trade and domestic consumption.

After thirty seven years of existence, the region has made modest gains in achieving its set objectives. The introduction of the ECOWAS travelling cheque in 1998 has greatly facilitated financial transactions among member countries. In the same manner, the establishment of ECOWAS Bank for Investment and Development (EBID) has also fostered financial integration in the region (Barka, 2012). In accordance with the protocol on free movement of persons in the region, ten⁷ out of the fifteen countries currently issues the ECOWAS passport to its citizens. With this arrangement, citizens of member countries do not need a visa to travel to ECOWAS countries.

Prior to the formation of ECOWAS, the francophone countries established a free trade area called Communauté Economique de l'Afrique de l'Ouest (CEAO). Benin, Burkina Faso, Cote d'Ivoire, Mali, Mauritania, Niger and Senegal were the members. Formed in 1973, the main aim was to facilitate trading and harmonise payment and other form of exchanges among members. In 1994, however, the CEAO was replaced by the L'Union

⁷Countries currently issuing ECOWAS passports are Benin, Cote d'Ivoire, Ghana, Guinea, Liberia, Niger, Nigeria, Senegal, Sierra Leone and Togo. Source;<http://news.myjoyonline.com/news/201003/43841.asp>

Economique et Monetaire Ouest Africaine (UEMOA). UEMOA is now a customs and currency union with the CFA Franc as the common currency for all member countries.

Following the success of UEMOA, the Gambia, Ghana, Guinea, Nigeria and Sierra Leone came up with the West African Monetary Zone (WAMZ) in the year 2000 to form a currency union with the ECO as the common currency. Liberia joined WAMZ on 16 February 2010. The target to introduce the currency December 2009 did not materialise due to the inability of member states to meet the basic optimum currency area convergent criteria (ECOWAS, 2005). The date for the introduction of the ECO has since been postponed to 2015⁸. It is expected that the introduction of the ECO will boost trade within the region.

Although ECOWAS has made some modest gains since its establishment, the region is saddled with myriads of challenges in its quest to achieve economic and political integration. The growth of intraregional trade has been very slow not exceeding 12 per cent for the past decades. Political instability in most of the member countries has been the bane to the realisation of the goal of deeper regional cooperation. Liberia for instance experienced one of the bloodiest civil wars in Africa from 1989 to 1996 which claimed over 200,000 lives and made several people refugees in neighbouring countries such as Ghana⁹.

⁸Source of information on the ECO: www.ecowas.com accessed on 20 May 2012

⁹The information was sourced at http://www.wikipedia.org/wiki/First_Liberian_Civil_War

Notwithstanding the fact that some measures have been adopted to boost industrialisation in the region, the industrial sector's contribution to gross domestic product still remains low averaging 7 per cent (ECOWAS, 2010). There are also concerns of low quality products and unattractive packaging and pricing relative to imported products from outside the region. The openness of the ECOWAS economies following trade liberalisation in the 1990s and the fact that there is not enough diversity of exported products makes the region very vulnerable to external price fluctuations. Poor transportation and communication networks linking the countries put further strain on trade ties. One of the key policies that aim at enhancing intraregional trade in ECOWAS is the Trade Liberalisation Scheme adopted in 1979. The next section examines how the ETLS is contributing to trade promotion in the region.

2.5 The ECOWAS Trade Liberalisation Scheme¹⁰ (ETLS)

The ECOWAS Trade Liberalisation Scheme (ETLS) became effective on 28 May 1979. The objective of the scheme is to establish a customs union among all member states. It basically sets the rules for trading and related economic activities within the region. The second phase of the scheme currently in force entails total trade liberalisation in unprocessed goods, traditional handicraft and industrial products that originate from the region.

¹⁰ The information on ETLS was obtained from the internet at <http://www.etls.ecowas.int/index.php> assessed on 20 April 2012.

Specifically, the list of unprocessed items covered under the scheme includes livestock, fish, plant or mineral products that have not undergone any industrial transformation. The second category of products are made up of all traditional handicraft products made by hand with or without the help of tools, instruments or devices that are activated directly by the craftsman can also be exported under this same arrangement. Such products include wooden cooking utensils, fancy goods, small cabinet work, mats, carpets, bed linen, footwear, headgear, prepared feathers, etc. Last but not the least is industrial products of Community origin.

There are some conditions that must be fulfilled by an exporter to be able to qualify for these concessions. Firstly, goods must originate in member states of the Community. Secondly, the goods in question must appear on the list of products annexed to the decisions liberalising trade in that particular products group. Thirdly, the goods must be accompanied by a certificate of origin and an ECOWAS export declaration form. Finally, beneficiary of the Scheme must be resident within the ECOWAS region. Currently, with the exception of Liberia, no ECOWAS country charges tariffs on unprocessed products originating from the Community. However, only Benin has removed tariffs on industrialised goods imported from the region even though Ghana also provides preferential treatment some industrial goods originating from the region.

2.6 The Structure of Production in ECOWAS

The theoretical models suggest that intra-industry trade is more likely to occur in the trade of manufactured products because the opportunity for product differentiation is greater than in the production of primary goods. Empirical evidence also confirms the lower incidence of IIT in trade of primary products (Brühlhart, 2009; Fullerton et al, 2011). The structure of production among trading partners is therefore an important predictor of the likelihood of IIT.

Table 2.3: Structure of Production in ECOWAS countries (%), 2009

	Agriculture	Industry	Manufacturing	Services
Benin	35.9	14.5	8.3	49.6
Burkina Faso	35.2	23.8	12.2	41.0
Cape Verde	8.2	17.8	3.4	74.1
Cote d'Ivoire	26.0	25.6	17.8	48.4
Gambia	28.8	12.9	5.7	58.3
Ghana	31.7	18.9	6.9	49.5
Guinea	25.9	40.3	7.4	33.8
Guinea Bissau	44.6	13.8	11.9	41.6
Liberia	63.7	12.7	7.2	23.6
Mali	39.0	21	5.7	39.9
Niger	44.0	16.1	5.5	39.9
Nigeria	37.1	34.3	2.3	28.7
Senegal	16.7	23.2	14.1	60.1
Sierra Leone	62.0	7.4	2.5	32.5

Source: African Development Bank (2011) *African Development Statistics Yearbook 2011*.

Countries can only exchange what they produce. If the manufacturing sector is not well developed it is unlikely that the incidence of IIT will be very high. In all the ECOWAS countries the share of manufacturing in GDP is less than 20 per cent. Its share ranges between 2.5 per cent in Sierra Leone and 17.8 per cent in Cote d'Ivoire. The services sector is the largest sector in all but Guinea, Liberia, Nigeria and Sierra Leone. The share of services ranges from about 74 per cent in Cape Verde to about 24 per cent in Liberia (see Table 2.3).

2.7 Pattern of trade between Ghana and ECOWAS from 2004 to 2010

Ghana is a net importer from ECOWAS as shown in Table 2.4. In 2004 total imports amounted to US\$ 480.61 million and exports were US\$ 257.74 million. Although exports from Ghana to ECOWAS witnessed a steady growth between 2004 and 2006, it has been declining since then except in 2009. Imports from ECOWAS have been fluctuating from US\$ 480.61 million in 2004 to US\$ 600.82 million in 2010. Rising commodity prices in 2008 increased the import bill to US\$ 1020.05 million which is the highest since 2004. About two-thirds of all imports from ECOWAS are crude oil products from Nigeria

Ghana's imports from the ECOWAS region exceeded its exports during the period 2004-2010 in each year except 2008 (Table 2.4). The ECOWAS share of Ghana's total exports ranged between 7.3 per cent and 9 per cent while between 4 per cent and 11 per cent of Ghana's imports was sourced from ECOWAS. The value of exports to the ECOWAS region has followed an unstable pattern over the period. Standing at \$317.3 million in

2004 export values fluctuated during the period to end at \$569 million in 2010, an increase of 79 per cent over its 2004 value (Table 2).

Table 2.4: Exports and imports values and shares between Ghana and ECOWAS, 2004 – 2010

Year	Exports to ECOWAS US\$ millions	Imports from ECOWAS US\$ millions	Share of Ghana's Exports to ECOWAS (%)	Share of Ghana's total Imports sourced from ECOWAS
2004	317.3	480.4	7.3	14.5
2005	465.8	672.4	9.7	17.5
2006	556.2	585.0	8.4	4.6
2007	325.7	561.8	7.4	10.4
2008	258.5	997.8	9.2	10.4
2009	561.2	309.4	8.8	11.0
2010	569.0	723.4	9.0	10.5

Source: Authors' own calculations based on data from Ghana Statistical Service, 2011

Import values exhibit a similar unstable pattern. They peaked in 2008 at almost double their 2004 values and subsequently declined in 2009 by almost a third of their 2008 values before rising to more than double the 2009 values in 2010. Mineral products, i.e. crude oil, dominate Ghana's imports from ECOWAS. In 2004 almost all imports from ECOWAS, i.e. 98 per cent comprised mineral products. Mineral products share of imports ranged from 98 per cent to about 64 per cent during the period.

2.6.1 Geographical Distribution of Ghana's exports to ECOWAS

Ghana's exports to the ECOWAS region go mainly to four trading partners, i.e. Burkina Faso, Benin, Nigeria and Cote d'Ivoire (see Table 2.5). These countries are the destination for over 60 per cent of Ghana's exports in the region annually although there is considerable fluctuation in the shares going to each country over time. Cape Verde and Guinea Bissau receive minuscule shares of Ghana's exports to ECOWAS and in some years no export trade is reported.

Table 2.5: Geographical Distribution of Ghana's exports to ECOWAS (%)

Country	2004	2005	2006	2007	2008	2009	2010
Benin	27.5	0.5	0.5	1.4	1.9	22.2	22.9
Burkina Faso	0.3	0.2	81.7	43.5	30.1	36.5	13.2
Cape Verde	0.0	0.0	0.0	0.0	0.6	0.1	0.1
Cote d'Ivoire	22.8	3.0	1.8	7.8	11.1	10.8	7.5
Gambia	1.8	0.2	0.1	0.4	0.6	0.3	1.0
Guinea	1.3	0.2	0.2	0.9	1.5	0.9	0.8
Guinea Bissau	0.0	0.0	0.0	0.0	3.2	0.1	0.0
Liberia	3.4	6.1	0.2	0.4	0.6	4.0	0.5
Mali	0.5	0.0	0.2	0.7	2.1	1.6	22.2
Niger	0.5	0.0	0.1	0.5	2.1	0.3	2.6
Nigeria	18.4	84.1	12.8	24.4	33.7	10.5	14.9
Senegal	12.7	2.3	1.7	5.8	6.7	2.2	1.4
Sierra Leone	3.0	3.5	0.2	11.9	0.8	1.6	0.8
Togo	7.7	0.0	0.3	2.1	5.0	8.8	12.1
TOTAL	100	100	100	100	100	100	100

Source: Authors' own calculations based on data from Ghana Statistical Service, 2011

2.6.2 Ghana's import sources within the ECOWAS region

Nigeria is the single largest source of imports from ECOWAS into Ghana. Imports from Nigeria were 96 per cent of the total imported from ECOWAS in 2004 and declined to about 70 per cent in 2007. By 2010 about 76 per cent of Ghana's imports from ECOWAS originated from Nigeria (Table 2.6). Nigeria's dominance in Ghana's imports from the ECOWAS is due to its supply of crude oil, the single largest import category from ECOWAS. Togo follows closely as the next source of Ghana's imports from ECOWAS.

Table 2.6: Ghana's import sources within the ECOWAS region (%)

Country	2004	2005	2006	2007	2008	2009	2010
Benin	0.0	0.0	0.1	0.2	0.0	0.3	0.2
Burkina Faso	0.0	0.0	0.3	1.0	0.4	1.5	0.9
Cape Verde	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cote d'Ivoire	1.5	1.5	2.9	13.4	15.1	16.5	8.2
Gambia	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Guinea	0.1	0.0	3.9	0.2	0.3	1.7	0.8
Guinea Bissau	0.3	0.3	0.1	0.2	0.0	0.2	0.1
Liberia	0.0	1.6	0.0	0.1	0.4	5.4	0.1
Mali	0.0	0.0	0.0	0.0	0.0	0.4	0.0
Niger	0.0	0.0	0.0	0.0	0.2	2.5	1.5
Nigeria	96.4	85.1	80.9	69.5	73.9	41.8	75.5
Senegal	0.2	0.2	0.2	0.4	0.3	0.9	1.2
Sierra Leone	0.0	0.0	0.1	0.0	0.0	0.4	0.2
Togo	1.4	11.1	11.3	14.9	9.3	28.4	11.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' own calculations based on data from Ghana Statistical Service, 2011

2.6.3 Composition of Ghana's exports to ECOWAS

Ghana's exports to ECOWAS in 2004 were initially concentrated in a few product categories (Table 2.7). These are wood and wood products, metals, plastics and rubbers. These three product categories accounted for about 81 per cent of Ghana's exports to ECOWAS. By 2010, there was some diversification in the composition of Ghana's exports to ECOWAS such that the share of these three products had declined to about 48 per cent. The contribution of product categories such as mineral products, foodstuffs and chemical and allied industries has increased since 2004. Together these product categories comprised almost 40 per cent of exports to ECOWAS.

Products of wood, aluminium, tin, iron, copper and other transport equipment are also among the key products exported from Ghana. These products exceeded 50 per cent of the total exports from 2004 to 2010. A total of US\$ 143.10 million worth of wood and wood products was exported from Ghana to ECOWAS in 2004. These wood products consisting of charcoal, furniture, newspapers, printed books and paper boards among others and was Ghana's largest exports to the region in 2004.

Table 2.7 The composition of Ghana's exports to ECOWAS (US\$ million) from 2004 to 2010

Products	2004	2005	2006	2007	2008	2009	2010
Live Animals and Animal Products	5.34	8.69	9.03	22.12	24.6	19.18	5.97
Foodstuffs and vegetable product	7.26	25.37	11.18	59.8	24.3	39.35	81.9
Mineral Products	3.13	0.21	3.29	3.56	6.54	104.7	133.1
Chemical and Allied Industries	1.92	1.37	9.24	23.4	19.3	44.46	50.74
Plastics/Rubbers	21.3	14.38	173.7	49.4	33.2	113.2	62.32
Wood and Articles of Wood	143.1	364.1	57.82	83.4	83.3	171.7	91.67
Textiles and Footwear	21.9	22	272.7	21	14.1	18.86	14.22
Stones and metals	45.1	46.71	18.49	32.9	36.7	60.18	135.3
Transportation and Machinery	8.12	3.69	2.12	25	14.7	16.58	17.07
Others	0.32	0.78	2.33	12	11	4.35	3.14

Source: Author's own calculations based on data from Ghana Statistical Service (2011)

2.6.4 Composition of Ghana's imports from ECOWAS

During the period under review, the import bill of Ghana from ECOWAS shows that mineral products account for almost 90 per cent of all imports. This category of mineral products includes petroleum and petroleum products mostly imported from Nigeria. In 2004, the total value of mineral products imported from ECOWAS amounted to US\$ 472.53 million representing over 90 per cent of total imports from the region. Mineral products imports increased in nominal terms to US\$ 930.82 before peaking at US\$ 1230.33 million in 2010. Mineral product imports from Nigeria may decline drastically in the future with the commencement of commercial crude oil production in Ghana since 2010.

Another major component of Ghana's import from ECOWAS is foodstuffs and other edible products. Import of foodstuffs and vegetables increased consistently from US\$ 0.71 million in 2004 to US\$ 85.62 million in 2010. The foodstuffs include confectionery, beverages, cocoa products and cereals among others. Transportation and machinery imports have been rising steadily over the years amounting to over US\$ 70 million in 2011 from a low value of US\$ 1.83 million in 2004. (GSS, 2011)

Footwear, raw hides, live animals and stone products are among the least traded items accounting for only 1 per cent of the total imports from ECOWAS in 2010. Textiles imports have shown fluctuating pattern since 2004 with the share to total imports amounting to 2 per cent in 2011. In 2010, total imports of textiles were US\$ 11.46 million which was an increase from the US\$ 1.13 million recorded in 2004.

Table 2.8 The composition of Ghana's imports from ECOWAS from 2004 to 2010 (US\$ million)

Products	2004	2005	2006	2007	2008	2009	2010
Live animals and Animal Products	1.94	2.72	2	4.06	1.95	3.37	12.68
Foodstuffs and vegetable products	0.71	5.15	6.78	9.48	21.34	32.56	85.62
Mineral Products	472.5	626.95	537.99	510.99	930.82	207.76	600.82
Chemical and Allied Industries	0.81	2.8	3.26	6.22	11.5	18.29	29.74
Plastics/Rubbers	0.3	1.44	0.93	3.08	3.77	3.58	4.73
Wood and Articles of Wood	0.21	0.99	0.55	0.57	1.58	1.97	2.77
Textiles and Footwear	1.13	9.04	11.6	14.75	9.16	5.12	11.46
Stones and metals	1.07	4.7	8.38	8.71	14.63	18.32	48.21
Transportation and Machinery	1.83	11.39	7.87	19.48	21.89	33.23	72.41
others	0.08	1.36	1.3	1.63	4.41	1.58	7.17

Source: Author's own calculations based on data from Ghana statistical Service (2011)

In conclusion, there are indications of simultaneous exchange of similar products between Ghana and ECOWAS from 2004 to 2010. However, the composition of Ghana's exports to ECOWAS is quite different from its imports from the region. This suggests that the incidence of intra-industry trade will be low and may be concentrated among a few countries and commodities.

For all the products, none recorded zero trade for either import or export for the same year from 2004 to 2010. For instance in 2010, a total of US\$ 81.9 million and US\$ 85.62 million worth of foodstuffs and vegetable products were exported and imported respectively. Similarly, exports and imports of transportation and machinery in 2008 were US\$ 14.71 million and US\$ 21.89 million respectively. The actual incidence of intra-industry trade for the various products and countries is examined into details in chapter five.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter embodies a review of the theoretical and empirical literature guiding the study. The review is divided into three sections beginning with an assessment of the gravity model. This is followed by an analysis of the models that demonstrates the possibilities of intra-industry trade. The final section is devoted to a review of empirical studies on intra-industry trade. This will help to identify the gaps in the existing literature and the contribution of this study.

3.2 The theory behind the gravity model

The origin of the gravity model can be traced to Newton's law of gravitation developed in 1687. The law states that every point mass in the universe attracts every other point mass with a force that is directly proportional to the products of their masses and inversely proportional to the square of the distance between them (Newton, 1687). Applying this concept to international trade, the gravity model in its simplest form demonstrates that trade between two countries increases with the product of their economic sizes and decreases with the geographic distance between them. The gravity model in economics was first developed by Anderson (1979).

Anderson (1979) derives the gravity model from the properties of expenditure functions.

This is based on the assumptions that;

- countries specialise in different varieties of final product
- demand is identical and homothetic across countries and
- trade is free across countries.

Following these assumptions, Anderson (1979) derives the gravity model by showing that the share of national expenditure accounted for by spending on tradable goods is a stable unidentified reduced-form function of income and population and the share of total tradable goods expenditure accounted for by each tradable good category across regions is an identified function of transit cost variables.

The gravity model has subsequently been derived from a number of trade models thereby offering a strong theoretical background in estimating trade flows. For instance, Helpman and Krugman (1985) derived the gravity equation in trade models with differentiated goods using the assumption of increasing returns to scale and economies of scale. The model has subsequently gone through series of modifications to suit various objectives in estimation of trade.

3.3 Theoretical review of IIT

The idea of gains in trade first emerged through the writings of the Mercantilists in the year 1500. The cardinal thinking of the Mercantilists is that a country's wealth is reflected in its holdings of precious wealth. Employing the labour theory of value, the Mercantilists

stress the need for governments to regulate economic activities and not leave it to the prerogative of private individuals. Finally they advocate favourable balance of trade or positive trade balance where exports always exceed imports.

The concept of Mercantilism also known as “political economy of state building” dominated the world of trade leading to governments resorting to bullionism or accumulation of precious metals and tariff imposition as measures to keep positive trade balance. However, Mercantilism became less popular in international trade around 1750 as a result of the emergence of relatively superior trade theories which include the absolute cost advantage by Adam Smith.

Contrary to the views of the Mercantilists, Smith (1776) believes that countries wealth lies within their productive capacities rather than their holdings of precious metals. His advocacy is in favour of laissez faire policies where trade and economic activities thrives in an atmosphere free from government controls. In this case the invisible hand of market forces such as demand and supply are allowed to fully function.

By applying these views on economic activities within a country to trade between two countries, Smith (1776) concludes that a country should specialise in and export products it has absolute advantage in producing and import those products in which its trading partners has absolute advantage in producing. Based on the labour theory of value a country has an absolute advantage when it can produce a commodity more efficiently

(cheaply) because the absolute labour per unit required is less than other countries

However, Ricardo (1817) indicates that although trade based on absolute cost advantage is feasible when factors of production are immobile, gains from trade on the basis of comparative advantage can equally occur when factors of production are mobile. In a two-country, two-commodity scenario, even if one country can produce both goods cheaper than the other, there is still basis for trade and this contrast with the absolute cost advantage proposition. This is possible because one country can produce and export the goods in which it has the lower opportunity cost and import the goods in which it has a higher opportunity cost in producing. In effect, trade will be mutually advantageous as long as the two countries autarky price ratios are different. The absolute and comparative trade theories forms part of the classical trade theories.

The above theories assume that there is only one factor of production, labour. However, in real life there is more than one factor used in production. One of the prominent theories which incorporate more than one factor of production into the trade analysis is the Heckscher-Ohlin (H-O) model developed in 1933. The H-O model makes the key assumption that countries specialise in the production of goods that they are particularly suited to produce based on the availability of factors of production. Hence countries with abundant capital endowments produce goods that are capital intensive and countries that are abundant in labour produce goods that are labour intensive. The theory concludes that specialisation in production and trade between countries based on differences in factor endowments is more beneficial to the participating countries. In this model the tradable

products are assumed to be largely homogeneous in that, there are little or no variations in the products available to consumers.

A key observation is that all the classical and neo-classical theories that existed before the early 1960s only explain inter-industry where countries trade in products belonging to different products classification. However, in the real world situation there is trade in differentiated products among countries with similar income and resource endowments and this cannot be explained within the framework of inter-industry trade. For instance, the question of why America and Japan trade in vehicles simultaneously cannot be addressed within the framework of inter-industry trade. The result of this shortfall is the emergence of new models starting from the 1960s which seeks to explain the incidence of intra-industry trade where countries trade in products belonging to the same industry classification. The subsequent discussions focus on some of these models often classified as 'new trade theories' which demonstrate the possibilities of intra-industry trade.

Linder (1961) provides one of the pioneering bases for the theoretical framework on intra-industry trade. This demand-based model highlights the significance of per capita income in determining the volume of bilateral trade. According to Linder's "overlapping demand hypothesis", the volume of bilateral trade in manufactured products increases with similarity in per capita income. Countries with similar per capita income have similar demand patterns and consequently, identical industries. Although the products of the industries are identical, they differ in terms of the production process, make-up as well as packaging. The differentiation of the industry's product and similarity in per capita

income become the bases for exchange of goods. Thus, trade is possible between countries with similar factor endowment. The theory indicates that the producer always assumes a given domestic market is created for the product before production commences.

Vernon (1966) is credited with the development of the product cycle theory. The theory highlights the importance of research and development in the creation of innovative products in developed countries. The birth of the technologically 'superior' products renders the existing product obsolete and faces extinction from the market with time. In the early stages of the product, the industrialised countries have monopoly over the technology and production of the new product. But with time, the technology diffuses and becomes available to other countries through imitation and technology transfer and the beneficiary countries begin to produce technologically differentiated varieties of the same product. Both countries can now produce and trade in differentiated varieties of the same product. This shows that similar factor endowment can be the basis for intra-industry trade. However, the model is silent of the demand side of trade.

By integrating the assumptions of economies of scale, monopolistic competition and differentiated products Krugman (1979) supports the assertion that large market size presents greater opportunities for economies of scale in the domestic market. Firms can therefore reduce the number of products and simultaneously increase the varieties of the same products. Also the presence of monopolistic competitive market suggests that although the goods produced by all the firms in the industry are similar, there are slight differences between them. The products therefore become close but not perfect substitutes

for each other. The similarities in products tend to drive competition and innovation among producers.

However, despite the fierce competition, each firm appears to have at least a small degree of market control over price and quantity. The product differentiation makes it possible for each firm to create a monopoly and build up a certain amount of consumer brand loyalty for its products. The monopolistic competition best describes most of the real world market situations and this explains why two countries will be able to engage in the simultaneous trading in salon cars for example.

Lancaster (1979) considers products as an intermediary between resources and welfare, such that the characteristics of the products were crucial to the satisfaction derived from the consumption of the products. The focus therefore is not the product consumed but the characteristics of the product. The assumption is that demand for a product is stable and the characteristics of a product are quantifiable. Hence the preference for certain characteristics of a product drives two-way trade in similar products.

By adopting a partial equilibrium model, Falvey (1981) also examines the existence of intra-industry trade based on differences in factor endowment. It begins by assuming a single industry which is considered to be endowed with certain industry-specific capital resources. This endowment makes it possible to produce differentiated products. However, there is the notion that all products are not produced under the same technical conditions. A particular product can have high capital-labour ratio in the home country but

will have a high labour-capital ratio in a foreign country. From the demand side, consumers' choice of a product is informed by the perceived quality and price. Capital intensive products are deemed to be high quality than labour intensive products by consumers. Consumers therefore perceive these two products as different based on the difference in their factor intensities.

Consequently, the possibilities for overlap in demand for varying qualities of a particular product will stimulate two-way trade in the same product. The model further assumes that relative capital availability in a country correlates with its per capita income. Hence, countries that have high per capita income have more capital resources than low income countries. The model therefore hypothesise that intra-industry trade is positively correlated with the differences in per capita income between trading partners.

Brander and Krugman (1983) demonstrate that competition between oligopolistic firms will result in international trade independent of cost advantage or economies of scale. This model is built under the assumption of constant marginal cost within a Cournot duopoly framework. In this model, the rivalry between the firms result in a situation where each firm simultaneously dump their output in the foreign market at a reduced price resulting in two-way trade in the same product. Although the welfare of consumers is enhanced through the availability of several varieties of the same product, there are concerns of the wastage of resources resulting from the needless cross-the-border dumping of products.

When it comes to trading among countries Helpman (1987) postulates that the volume of trade is well explained by the market size and homothetic preference of trading partners. This is at variance with the factor endowment theory in which difference in country size has no particular effect on the volume of trade. Again, Helpman asserts that as countries become similar in size, the volume of trade as a share of gross domestic products rises. Moreover, larger market size provides prospects for firms to enjoy economies of scale and specialize in the production of differentiated varieties of selected products. Therefore, the expected increase in intra-group trade among these identically sized countries is most likely to be in similar rather than unrelated products.

Rivera-Batiz and Romer (1991) attempt an explanation of intra-industry trade in the context of economic integration. In an endogenous growth model, they assert that cross border exchange of goods and ideas deepens economic integration among member countries. Again, the authors make the fundamental assumption that firms in a given industry are able to acquire technical information from a similar firm in the same industry operating in another country. Assuming that this exchange of ideas continues over time, there is the possibility that the technical production processes of these industries will be standardised. This may not be possible in the absence of economic integration and thus all trade will likely be inter-industry trade. But the technological spill over from economic integration will give rise to intra-industry trade.

Markusen and Venables (1996) integrate trade cost and multinational firms to develop a monopolistic-competition model of international trade. In this general equilibrium setting, the presence of trade cost creates incentive for factor mobility from the high cost areas to the low cost country and this may result in the agglomeration of firms in one country and eventually, multinational firms will emerge. When the activities of multinational corporations are targeted at fragmentation of production process by establishing subsidiaries, then it will promote inter-industry trade. However, the mix of national and multinational firms will stimulate intra-industry trade.

3.4 Empirical literature review on IIT

Although often associated with developed countries, there is growing evidence of IIT in developing countries and also between developed and developing countries (Al-Mawali, 2005). The empirical literature focuses mostly on the determinants and measurements of IIT. This section brings to light some of the empirical studies conducted on IIT. The analysis centres on studies conducted in both developing and developed countries. Specifically, each review highlights just one specific explanatory variable although that might not be the only variable investigated by the author. This approach adopted is to reinforce the justification for the inclusion of these variables in the current study.

3.4.1 Developed countries and IIT

The phenomenon of IIT was first noticed by Verdoon (1960) after the formation of Benelux, a customs union in Europe among three neighbouring countries namely: Belgium, the Netherlands and Luxembourg. The study reveals that the formation of the customs union stimulated large two-way trade of similar products among the member countries. There have since been a number of empirical studies into the phenomenon.

Recently, Leitão (2011) analyses the determinants of United State's IIT in the agriculture sector using a panel data from 1995 to 2008 for NAFTA, European Union and ASEAN trading partners. The results indicate that IIT in the agricultural sector relates negatively with the difference in GDP per capita between US and its trade partners. Similarly, Leitão and Faustino (2009) employ the augmented gravity model to examine the determinants of IIT in the automobile sector of the Portuguese economy. However, the results show a positive relationship between IIT and dissimilarity in per capita income of the trading partners. This implies that countries with similar per capita income tend to have a lower level of simultaneous trade in similarly differentiated products. This is contrary to the Linder (1961) hypothesis.

A study conducted by Blanes and Martín (2000) reveals a negative relationship between differences in per capita income and IIT in the Spanish economy. The study uses bilateral trade data at the six-digit level of the Combined Nomenclature (4900 items) between

Spain and 60 countries over the period 1988-1995 for the analysis. The 60 countries used accounts for 95 per cent of Spanish trade in manufacturing. Clark (2005) and Lee (1989) also find a negative sign for the United States and the Pacific Basin countries respectively.

Clark (2005) investigates intra-industry trade between the United States of America and seventy-two trading partners and finds that foreign direct investment contributes positively to IIT. Specifically, the Offshore Assembly Provisions (OAP) in the US tariff code induces industries to undertake specialization of production across national boundaries. These industries are able to transfer one or more production stages abroad and subsequently import a similar product at a more advanced stage. These simultaneous exports and imports of components contribute to IIT because the resulting trade flows involve related goods that are often recorded under the same industry classification.

A similar study by Li et al. (2003) reveals that a high level of foreign direct investment (FDI) significantly raises the volume of trade in insurance products between the United States of America and the trading partners. The study uses cross-sectional as well as a two-year pooled international insurance trade data from 1995 to 1996 on 26 countries. This contrasts the view of the traditional trade theory that considers the role of foreign direct investment as a substitute for trade. The findings of Blanes and Martin (2000) for the Spanish economy equally confirms a positive correlation between foreign direct investment and intra-industry trade

In one of the most comprehensive research on intra-industry trade, Brülhart (2008) uses data on more than 39 million bilateral trade flows between 1962-2006 and the study reveals that 27 percent of global trade was intra-industry if measured at the finest (5-digit) level of statistical aggregation, and 44 percent if measured at a coarser (3-digit) level of statistical aggregation. The study finds a positive sign for per capita income where countries with higher per capita income tend to engage significantly in two-way trade in manufactured products. In this case, economies with higher per capita income become more similar and closely integrated through the simultaneous trading in similar products.

Assessing the contribution of differences in factor endowment on intra-industry trade in Spain, Martin-Montaner and Rios (2002) reveals that Spain specialises in exports of predominantly low quality varieties and imports relative superior quality of similar products from the advanced OECD countries. But more especially, income level of partner countries is found to be positive and significantly related to share of intra-industry trade. Clark (2005) finds a positive sign for the US economy.

Lee (1989) investigates the determinants of intra-industry trade among the Pacific Basin countries; U.S., Canada, Japan, Australia, and New Zealand, Korea, Taiwan, Singapore, and Hong Kong, Indonesia, Malaysia, the Philippines, and Thailand. The significant and negative relationship observed between IIT and distance coefficient support the argument that the removal of barriers augments the share of IIT in total trade. The econometric estimation by Leitão and Faustino (2009) also confirms a negative sign for IIT between

Portugal, the United States of America and the BRIC (Brazil, Russia, India and China) countries between 1995 and 2006.

To investigate the assumption that IIT is more prevalent in sophisticated manufactured products, Chuankamnerdkarn (1997) examines country-specific determinants of Australia's intra-industry trade in pharmaceuticals with its major trading partners for the period 1975-1992. The trading partners selected are France, Germany, the Netherlands, the U.K., the U.S., Canada, New Zealand, Japan, Italy, Belgium, Switzerland, Korea, the Philippines, and Thailand. The results shows that average GNP of countries have a significantly positive influence on Australia's intra-industry trade in pharmaceuticals. Mathews (1998) also finds a positive sign for average market size in pharmaceutical products in the Australian economy.

In yet another study on developed countries, Balassa and Bauwens (1987) analyses bilateral trade flows of manufactured products among thirty eight countries. They adopt the adjusted G-L index to measure the prevalence of IIT and the parameters are estimated using a non-linear least squares procedure. The study finds that the extent of intra-industry trade is positively and significantly correlated with average country size (GDP).

3.4.2 Developing countries and IIT

Zantira (1999) examines the determinants of intra-industry between Ghana and its major trading partners. In all, fifty countries are included in the survey which comprises twenty-five industrialised countries and twenty-five developing countries. Thirty commodities

selected for the study are classified at the two-digit HS code. These products are the major products traded by Ghana and the trading partners. Both the developed and developing countries show high level of IIT with Ghana but the developed countries perform better. Gross domestic product is found to be positive and statistically significant in stimulating IIT. Although this is one of the few studies on Ghana, the selection of only thirty products out of the several products traded raises concerns of selection bias.

In one of the studies that investigates the existence and determinants of IIT in Africa Al-Mawali (2005) focuses on South Africa and its major trading partners. Using GDP as a measure of the size of the country, the findings show the presence of intra-industry trade between South Africa and her major trading partners for the period 1994 to 2000. Specifically, the estimated regression results of the gravity models for horizontal, vertical and total intra-industry trade indicate a positive and significant relationship between GDP and the incidence of IIT. However, this study sampled only manufactured products.

Again in Africa, Musonda (1997) investigates the extent of intra-industry trade among the members of the PTA/COMESA¹¹ regional trading arrangements in East and South Africa. Utilizing the gravity model, the author confirms that distance and IIT are negatively and significantly related. This means that relatively long distance between countries swells up the cost of transportation and makes the exchange process expensive.

¹¹ Preferential Trade Area/Common Market of Eastern and Southern Africa

Shahbaz and Leitão (2010) also employ country specific factors to analyse the determinants of IIT in Pakistan. The sample comprises the major trading partners of Pakistan; United States, United Kingdom, Japan, Germany, Saudi-Arabia, Canada, France, Italy, Netherlands, and Norway. Again, the hypothesis that countries with similar per capita income tend to trade more is supported by the study. The coefficient of the dissimilarity of income variable is negative and statistically significant. Still in Asia, Veeramani (2002) researches on the determinants of intra-industry trade in manufactured products in India. The study observes that the correlation between dissimilarity in per capita income and the share of IIT is negative. Again, the study points out that the rising level of IIT is driven mainly by exports. In other words, the growth in export exceeds that of imports. Dhakal et al (2009) however, find a positive sign for five East Asian countries.

Hu and Ma (1999) reveal that intra-industry trade is an important component of China's international trade in manufactured goods. Again the outcome of the study points out that, China's intra-industry trade varies considerably across trading partners and industries. The gross domestic product is found to be positively correlated with intra-industry trade as the trading partners with larger market sizes has high intra-industry trade prevalence with China relative to smaller markets.

A similar study by Zhang et al (2005) also appraises intra-industry trade in China between 1992 and 2001 with a sample of fifty major trading partners. The result reveals that China's intra-industry trade is not limited to developing countries with similar factor

endowment but there is also a significant two-way trade with developed countries as well. The exercise covers a ten-year period when China actually accelerated the implementation of policies to liberalise international trade and investment.

According to the study, there are indications that those policies on processed tradable products and related export-oriented strategies aimed at attracting foreign direct investment has significantly encouraged intra-industry trade between China and her partners. These policies are transforming the structure of the economy as China does not only exports primary goods and imports manufactured goods but it also exports industrial goods. In effect the study concludes that foreign direct investment positively impacts on intra-industry trade.

Kocyigit and Sen (2007) evaluate the impact of economic openness on intra-industry trade between Turkey and the European Union. The computed Grubel-Lloyd index of intra-industry trade ranged between 25.7 per cent in 1992 and 48.4 per cent in 2005. This partly confirms the assertion that opening up of the economy stimulates intra-industry trade. Trade intensity captures the extent of trade openness among countries. For instance, high trade intensity between two countries implies a high bilateral trade between those countries as a share of global trade.

To establish the fact that intra-industry trade equally associated bilateral trade among developing countries as it is in developed countries, Sunde et al (2009) establishes the

determinants of this two-way trade in Africa. The study is limited to trade between Zimbabwe and the trading partners in the Southern African Development Community (SADC) from 1990 to 2006. Most of the SADC countries trade in more or less the same product a phenomenon the study traces to the type of economic development the countries were subjected to during the colonial period. This has resulted in the countries having similar economic structures that promote the two-way trade in similar products. The study concludes that similarity in per capita income and economic activities positively influences intra-industry trade.

Although China has dynamically integrated into the industrial fibre of East Asia through rapid industrialisation and export oriented trade policies, the question of whether this giant leap in economic development is at the expense of other economies in the region has not been sufficiently addressed. Arip et al (2011) attempts answering this question by investigating the contribution of foreign direct investment in intra-industry trade between China and Japan vis-a-vis Malaysia. The study concludes that China's development is not at the expense of the other countries but rather China attracts a significant inflow of FDI which spills over to neighbouring countries and this to a large extent fuels intra-industry trade in the region. In effect, the study confirms a positive relationship between the inflow of FDI and growth in IIT.

In summary, most of the studies conducted on the determinants of IIT either concentrates on trade in manufactured products only or some selected products. However, this current study includes all products traded between Ghana and ECOWAS. By including each product traded, the problems associated with sampling selection bias are fairly dealt with. Again, with the exception of the study Zantira (1999) which reflects the Ghanaian and

ECOWAS situation, the remaining studies are outside the region. Even with Zantira (1999) only three ECOWAS countries namely Nigeria, Ivory Coast and Togo are sampled. It also included only 30 products. Clearly, studies on IIT in ECOWAS are limited. This study adds to the knowledge of IIT in ECOWAS vis-a-vis Ghana.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter focuses on the methodology of the study. The first section is a discussion of the conceptual framework. This is followed by an assessment of the econometric estimation techniques. An insight into the variables in terms of their measurement as used in this study and their expected results are also provided. The expected signs of the variables also form the bases for the various hypotheses being tested in this study.

4.2 Conceptual Framework

The study is situated within the framework of a bilateral trade flow and the gravity model is adopted for the analysis. Traditionally, the gravity model is the most patronised method in examining bilateral trade flows. The attractiveness of the gravity model lies in its predictive power and ability to fit well to trade data. The dependent variable is the IIT index and the explanatory variables comprises specific characteristic of each ECOWAS country.

The basic form of the gravity model is specified as

$$IIT_{ijt} = \frac{\alpha Y_{it} Y_{jt}}{D_{ij}} \text{-----(1)}$$

Where; IIT_{ijt} represents the share of IIT between country i and j at time t , Y_{it} and Y_{jt} represent the economic sizes of countries i and j respectively. D_{ij} is the geographic distance between countries i and j .

4.2.1 Measurement of intra-industry trade

Several indices have been developed to measure the share of IIT in total trade¹². The most widely used measure is the Grubel-Lloyd (GL) index developed in 1975 which is computed as:

$$GL_{ijk} = 1 - \frac{|X_{ijk} - M_{ijk}|}{X_{ijk} + M_{ijk}} \text{----- equation (1)}$$

Where X_{ijk} is country j 's exports of good i to country k

M_{ijk} is country j 's imports of good i from country k

GL_{ijk} is the Grubel-Lloyd index of intra-industry trade in industry i between country j and country k . The value of GL_{ijk} lies between the range of 0 and 1. When GL_{ijk} is equal to 0 all trade in industry i is inter-industry trade because there are either no exports or no imports of the good in question. When GL_{ijk} is equal to 1 then all trade good i is intra-industry trade, i.e. the value of exports is equal to the value of imports. The

¹² Some of the prominent methods include the indices developed by Balassa (1966), Aquino (1978) and Kandogan (2003a and 2003b).

closer the value of GL_{ijk} is to 1, the higher the degree of IIT in the trade of goods i between the country j and country k .

For an aggregate measure of IIT, Grubel and Lloyd (1975) proposed a weighted average index calculated as:

$$GL_i^w = \sum_{i=1}^n W_i * GL_i \quad \text{-----} \quad (2)$$

Where $W_i = \frac{X_i + M_i}{\sum_{i=1}^n X_i + \sum_{i=1}^n M_i}$ ----- (2a)

GL_i^w is the weighted Grubel- Lloyd index for the average at the aggregate level

GL_i is the standard Grubel- Lloyd index for good i

X_i is exports of good i

M_i is imports of good i

GL_i^w lies between 0 and 1 with the same interpretations as provided for GL_i above. Several indices have been developed to address problem of the bias in the index when there is unbalanced trade (see Grubel and Lloyd, 1975; Clark, 1993; Aquino, 1978). These indices have themselves been criticized on the basis of the extent to which they adequately address the problem of unbalanced trade (Greenaway and Milner, 1983). Vona (1991) put forward the argument that theoretically it is unsound to adjust the Grubel-Lloyd IIT index, as it leads to more distortions and unreliable results than it corrects. Based on this recommendation by Vona (1991), the unadjusted Grubel-Lloyd index in equations (1) will be used in this study to measure IIT.

The extent of IIT in total trade is determined by the definition of industry or level of data aggregation. At lower levels of data disaggregation the incidence of IIT will be higher than at higher levels of disaggregation (see for example Brühlhart, 2009). Thus some critics argued that IIT was a statistical artefact that would disappear with finer disaggregation of data (Finger, 1975). Therefore using a finer classification addresses these criticisms and provides evidence to show that IIT is a real phenomenon and not mere statistical outcome.

A total of about two-thousand and seventy-three (2,073) products at the six-digit Harmonised System (HS) of Commodity Description and Coding classification are used for the estimation of the share of IIT in Ghana's total bilateral trade. The six-digit data is the most reliable data available at the Ghana Statistical Service at the time of the study. For presentation purposes, given the large number of product categories, the estimates of the IIT at the six-digit level are averaged up and presented at the HS 1 digit level as shown in Table 4.1. This will enable us identify the industries or sectors where intra-industry trade is prevalent. The column labelled HS code range in Table 4.1 gives the range of six-digit products groups that have been averaged at the HS one-digit.

Table 4.1 The six-digit HS product classification

HS code range	Industry group/Products
010110 - 051199	Animals and Animal Products
060110 - 152200	Vegetable Products
160100 - 240399	Foodstuffs
250200 - 271600	Mineral Products
280110 - 382590	Chemical and Allied Industries
390110 - 401700	Plastics/Rubbers
410110 - 430400	Raw Hides, Skins, Leather and Furs
440110 - 491199	Wood and Wood Products
500100 - 631090	Textiles
640110 - 670490	Footwear/Headwear
680100 - 711890	Stone/Glass
720110 - 832690	Metals
840110 - 854890	Machinery/Electricals
860110 - 890800	Transportation
900110 - 999999	Miscellaneous

Source: www.foreigntrade.com¹³.

Finally, the share of IIT between Ghana and each of the other fourteen ECOWAS countries is calculated and examined into details. Theory has it that larger countries (measured by market size) are expected to show high prevalence of IIT because these countries are perceived to support industries characterized by economies of scale (Krugman, 1979). To evaluate this theoretical assertion, the aggregate IIT index is computed between Ghana and each of the other ECOWAS member countries for all the products traded.

¹³The original information is at the two-digit level but table 4.1 is modified to suit the 6-digit code in view of the fact that this study uses the six-digit code. The information was accessed on 20th December, 2011.

4.2.2 The empirical model

There are two main approaches to scrutinize the determinants of intra-industry trade. It can be achieved by using either the country specific characteristics of the trading partners¹⁴ or by testing industry characteristics of IIT¹⁵. This study will use the former due to the non-availability of data for the industry specific characteristics suggested by theory which relates to market power, economies of scale and product differentiation among others.

Given the objectives of this study, the basic gravity model is augmented by the variables of interest. Since the gravity model was used in the early 1960s, it has been used for empirical studies on IIT and it has proven very successful (see Al-Mawali (2005), Leitão and Faustino (2009) and Arip et al (2011)).

The basic model is augmented with country specific variables which are basically drawn from theory and other empirical studies. The hypotheses suggested by theory are examined empirically by regressing the IIT index on selected country specific variables. The key variable of interest in this study is the dissimilarity in per capita income between Ghana and the ECOWAS countries.

The original form of the gravity model is multiplicative. However, to make it amenable to the econometric estimation it is linearised by taking the natural logarithm of the variables.

¹⁴See Havrylyshyn and Civan (1985), Lee and Stone (1995), Musonda (1997) and Kandogan (2003b),

¹⁵ See Loertscher and Wolter (1980), Balassa (1986), Balassa and Bauwens (1987)

Consistent with the literature on the determinants of IIT as used by Sunde et al (2009), we estimate the augmented gravity model of the form:

$$\ln IIT_{ijt} = \beta_0 + \beta_1 \ln PCI_{jt} + \beta_2 \ln DPCI_{ijt} + \beta_3 \ln GDP_{jt} + \beta_4 \ln FDI_{jt} + \beta_5 \ln BIEXCR_{ijt} + \beta_6 \ln DIST_{ij} + \beta_7 LANG_j + \varepsilon_{ijt} \quad (3)$$

Where;

β are the coefficients

t is the time subscript

Country i represents Ghana and country j is the ECOWAS trading partner

$\ln IIT_{ijt}$ is the logarithm of the index of intra-industry trade between country i and country j at time t

$\ln PCI_{jt}$ is the logarithm of per capita income of country j

$\ln DPCI_{ijt}$ is the logarithm of dissimilarity in per capita income between country i and j

$\ln GDP_{jt}$ is the logarithm of gross domestic product of country j

$\ln DIST_{ij}$ is the logarithm of distance between country i and country j

$\ln FDI_{jt}$ is the logarithm foreign direct investment received by country j at time t

$LANG_{jt}$ is a dummy for language

$\ln BIEXCR_{ijt}$ is the logarithm of real bilateral exchange rate between country i and j

4.3 Rationale for the choice of explanatory variables and expected results

The variables of the model are described in the ensuing paragraphs. It also highlights the rationale for their inclusion and the a priori signs. The expected signs also double as the hypothesis being tested. For each of the variables, that null hypothesis is; $H_0: \beta = 0$.

4.3.1 Per Capita Income

Per capita income is the income per person in a country. This shows the purchasing power of the consumers. It is calculated by dividing the gross domestic product by the population of the country. Theory has it that high per capita income will lead to consumers demanding a variety of differentiated goods, (Krugman, 1979). One of the major determinants of taste of consumers is their income. The rich can demand and pay for different varieties of goods more than the poor, thereby a high per capita income stimulates demand for varieties and this is the basis for intra-industry trade. Per capita income is expected to be positively related with intra-industry trade. The per capita income (purchasing power parity) of each of the ECOWAS trading partners at the constant 2005 United States dollars (US\$) from the World Development Indicators (2011) is used for this variable. It is expected that countries with higher per capita income will have higher intra-industry trade. Thus it is expected that;

H_1 : countries with higher per capita income have positive effect on the share of intra-industry trade

4.3.2 Dissimilarities in Per Capita Income

This is the absolute difference between the per capita income of Ghana and its trading partners. According to Linder (1961), consumers in countries with similar income and economic structures will develop similar tastes and demand similar goods. Similarity in per capita income represents probable demand structure hence there will be overlapping demand thereby stimulating intra-industry trade. Also per capita income is used as a measure of factor endowment, hence countries with similar income are assumed to be endowed with homogeneous resources. Countries that have similar per capita income will tend to engage more in intra-industry trade than countries that are dissimilar in income. Giving that all ECOWAS countries including Ghana are classified as developing and have similar economic activities and income IIT is anticipated to be prevalent among them. This forms the basis of the main hypothesis guiding this study;

H₁: Dissimilarity in per capita income is negatively related to IIT.

4.3.3 Gross Domestic Product

Gross Domestic Products (GDP) is the market value of all goods and services produced in a country over a period of time usually one year. GDP measures the economic mass of the country which reflects the amount of goods that can be produced and traded. As indicated in the original gravity model, the larger the masses of the objects, the stronger the gravitational pull towards each other. Therefore in international trade, it is anticipated that, the larger the GDP of a country, the bigger the size of the economy and the higher it's potential to trade with other countries. Secondly, large domestic market is likely to

produce differentiated products because it can support large industrial production by taking advantage of economies of scale in production (Helpman, 1987). A positive sign is expected as the larger market size will stimulate two-way trade in similar products. Again, countries with larger GDP such as Nigeria and Ivory Coast are expected to have higher IIT in their trade with Ghana. The GDP of each ECOWAS trading partner measured in US\$ at the 2000 constant prices is used (WDI, 2011). The hypothesis then is; H₁: Countries with larger market size and GDP will exhibit higher intra-industry trade in their trade with Ghana.

4.3.4 Distance

This variable captures the geographic distance between Accra (the capital city of Ghana) and the capital city of the trading partners in ECOWAS. The geographic distance measures the effects of time and transport cost on bilateral trade flows. Distance is one of the variables included in the original gravity model and is found to be negatively related to gravitational force. There is some evidence to indicate that geographical distance is a resistance factor and it negatively impacts on bilateral trade intensity (Hummels and Levinshon, 1995). This is particularly so when road transport is the major mode of transportation of goods. Similarly, Balassa and Bauwens (1987) indicate that more information is required for the characteristics of differentiated products than standardized product. Distance contributes to swelling up the cost of seeking such information. The study predicts an inverse relationship between distance and intra-industry trade. Countries such as Togo, Cote d'Ivoire and Burkina Faso that shares common boundary with Ghana are expected to show higher IIT compared to countries that are farther from

Ghana. The distance is measured in kilometres based on the information available at www.timeanddate.com¹⁶. The hypothesis is;

H₁: Countries that are closer to Ghana will exhibit larger IIT and countries geographically far from Ghana will have low IIT.

4.3.5 Foreign Direct Investment (FDI)

Helpman (1984) and Helpman and Krugman (1985) developed an intra-industry trade theory incorporating foreign direct investment. This follows the new developments in geography and trade which made huge progress in assessing the activities of multinational companies in the intra-industry trade theory. The underlying principle is to highlight the contribution of multinational corporations (MNCs) in bilateral trade and subsequently the share of intra-industry trade. Markusen (1994) extended this concept and argued that IIT theories should always include the positive contributions of FDI. MNCs are able to overcome trade barriers by establishing subsidiaries in different countries and engaging in simultaneous trading in similar products through the subsidiaries. The expected sign is ambiguous.

4.3.6 Language

This is a dummy variable for the trading partners. It takes the value of one if the country is an Anglophone country and zero if otherwise because English is the official language in Ghana. The use of a common language by trading partners is one of the indicators of

¹⁶The distance between Accra (capital city of Ghana) and the capital cities of the other ECOWAS countries is sourced from www.timeanddate.com.

similarity. When countries are familiar with each other's products, it facilitates bilateral trade in general. The UEMOA countries in West Africa have French as their common official language. According to Barka (2012) UEMOA is one of the most successful custom unions in Africa. Although the success cannot be attributed to the common language alone, it remains very instrumental in their trade relations. Familiarity with the products of a country facilitates intra-industry trade and a common language is one of the tools to promote familiarity. A positive sign is expected for the language.

4.3.7 Real bilateral exchange rate

In estimating a demand function for a product, price of the product plays a very important role. Similarly, when estimating bilateral trade flows, it is important to examine how real exchange rate impacts the pattern of trade. Fontagné and Freudenberg (1999) assert that the elimination of exchange rate volatility fosters intra-industry trade and raises its share above that of inter-industry trade. In this study, real bilateral exchange rate is considered as the amount of Ghana cedis needed to buy one unit of the trading partner's currency. Given the volatile nature of the exchange rate in ECOWAS, it is important to examine how it impacts on intraregional trade. A positive sign is expected.

The computation of the real bilateral exchange rate will follow the work done by Montenegro and Soloaga (2006).

$$\text{BIEXCHR}_{ijt} = \frac{(\text{NER}_i/\text{CPI}_i)}{(\text{NER}_j/\text{CPI}_j)} \dots\dots\dots(4)$$

Where

BIEXCHR_{ijt} is the bilateral exchange rate between Ghana (*i*) and the trading partner (*j*) at a particular time (*t*)

$\text{NER}_i/\text{\$}$ is the Nominal Exchange Rate for Ghana

$\text{NER}_j/\text{\$}$ is the Nominal Exchange Rate for the trading partner of Ghana

CPI_i is the Consumer Price Index of Ghana

CPI_j is the Consumer Price Index for the trading partner of Ghana

$\text{\$}$ is the United States Dollar

H_1 : Countries that have a more stable exchange rate with Ghana are likely to have larger IIT share in their bilateral trade.

4.3.8 Trade imbalance

In estimating the share of intra-industry trade, the Grubel-Loyd index becomes smaller with an increase in the size of trade imbalances. To control for the possible bias in the estimation of the parameters, trade imbalance between Ghana and each of the ECOWAS trading partners is included in the model. The variable is very important in this study because of the massive trade imbalance between Ghana and the trading partners.

This study, similar to the study by Lee and Lee (1993) measures trade imbalance as follows:

$$TIMB_{ijt} = \frac{|X_{it} - M_{jt}|}{(X_{it} + M_{jt})} \text{-----} (5)$$

Where;

$TIMB_{ijt}$ is the trade imbalance between Ghana (i) and the ECOWAS trading country (j) at a particular time (t)

X_{it} is the total value of exports from Ghana to the trading partner at a particular time

M_{jt} is the total value of imports from Ghana's trading partner at a particular time

The value of the $TIMB_{ijt}$ ranges between 0 and 1. When the total exports is equivalent to the total imports the trade imbalance is zero (i.e. $X_i = M_j$), but if a country either exclusively exports or imports products, the index equal one (i.e. either $X_i = 0$ or $M_j = 0$ but not both simultaneously). Thus;

H_1 : A negative correlation between trade imbalance and intra-industry trade is anticipated.

4.4 The estimation technique

The nature of the data for this study calls for the use of panel estimation by pooling cross-sectional data from twelve ECOWAS countries and time series data over the period 2004 to 2010. Twelve countries are included in the estimation instead of fourteen because Guinea Bissau and Cape Verde had no IIT with Ghana from 2004 to 2010 so have been dropped. This results in a panel set of eighty-four observations. The panel analysis has certain advantages over the pure time series or cross section analysis. Panel data gives a larger sample size by blowing up the degrees of freedom and this enhances the efficiency of the estimated parameters by minimising the level of bias. Again, panel is able to control for individual unobserved characteristics. It reduces the effects of collinearity among the variables unlike pure time series data where that is a problem (Greene, 2008).

Generally a panel equation is specified as;

$$Y_{it} = \alpha_i + \delta_t + \beta X_{it} + \varepsilon_{it} \quad \text{-----} \quad (6)$$

Where

Y_{it} is a scalar dependent or predicted variable

X_{it} is a vector of the explanatory variables

α_i is the unobserved individual heterogeneity or difference across the individual cross-sections that cannot be observed and does not vary with time

β is a vector of the coefficients of the explanatory variables

ε_{it} is random disturbance or error term assumed to be normal and identically distributed

(IID) with $E(\varepsilon_{it}) = 0$, $\text{Var}(\varepsilon_{it}) = \sigma^2 > 0$.

δ_t captures a common deterministic trend

i is index of the individuals (e.g. country, firms etc)

t is the time index

Following the general panel specification, the empirical model is specified as

$$IIT_{it} = \alpha_i + \delta_t + \beta X_{it} + \varepsilon_{it} \quad \text{-----}(7)$$

Where, IIT_{it} is the intra-industry trade index, the vector X consists of a set of explanatory variables. All variables in natural logarithm form

However, the use of panel model alone is not enough to control for the unobserved country heterogeneity discussed above. There is the need to apply the appropriate regression model. In arriving at the appropriate estimation technique for this study, series of diagnostics tests are performed. Details of the econometric and related diagnostics test necessary for this study are discussed in the next segment.

4.5 Diagnostic tests

It is right to assume that the determinants of IIT are not limited to the variables explicitly modeled. This is because it is likely some individual unobservable country characteristics are not included in the model (Greene, 2008). This may be because how to specify these characteristics explicitly is not known or there are no data on them even if it can be properly specified. Mention can be made of such unobservable characteristics such as political conditions existing in either Ghana or an ECOWAS member country which affects IIT. The presence of these conditions is simply acknowledged by modeling the individual-specific effects and time-specific effects of these countries. However, in arriving at the appropriate estimation technique, series of diagnostics tests need to be performed.

In analysis of panel data, the assumption can be made that no individual or country-specific coefficient exists resulting in a pooled estimation. In this case the parameters are estimated using the Pooled Ordinary Least Squares (Pooled OLS) model. The use of the Pooled OLS assumes away any form of heterogeneity and concludes that the countries are similar at a point in time or over time so they are treated as such in the estimation (Greene, 2008). Therefore the model leaves out the country-specific and the time-specific coefficients in the estimation. There is the need to check the appropriateness of the pooled OLS model in this study. This is undertaken by running the Breusch- Pagan Lagrange multiplier (LM) test (1980).

Alternatively, heterogeneity across the countries and over time are allowed and provisions made for it in the estimation. In that case the heterogeneity among the countries appears in the regression coefficients which may vary across countries and or time. Allowing for heterogeneity raises the question of whether these effects are fixed across the countries or the time periods or whether these effects are random. Making the right choice in terms of the model specification depends on the data and the problem under investigation. The commonest specifications usually adopted in handling unobserved heterogeneity of countries are the fixed effects models and the random effects models (Greene, 2008).

Considering the fact that Ghana's trading partners are heterogeneous in terms of the conditions existing in each of them, this study allows for the inclusion of the country-specific and time specific effects of these countries in the model. Nonetheless, choosing between the random and fixed effects models is a challenging task as each of them leads

to a different conclusion. Arriving at the appropriate choice depends on the assumptions about the possible correlation between the unobserved individual specific effects and the explanatory variables (Greene, 2008).

The rationale behind random effects model (REM) is that the unobserved variations across countries are assumed to be random and uncorrelated with the independent variables included in the model. From equation (7) this assumption is represented as $\text{Cor}(x_{it}, \alpha_i) = 0$. What this means is that if there are reasons to believe that the unobserved country heterogeneity has impact on the dependent variable then random effect model is appropriate. The use of REM makes it possible to include time invariant variables such as distance and language in the estimation.

The use of fixed effects models (FEM) assumes that the unobserved individual characteristics are unique and well defined for each or each time period. In this case the correlation between the unobserved individual country heterogeneity and the explanatory variables are non-zero i.e. $\text{Cor}(x_{it}, \alpha_i) \neq 0$.

The Hausman (1978) test is adopted for the relative fit of either a REM or a FEM. The null hypothesis is that REM is appropriate. Finally, the modified Wald test for group-wise heteroscedasticity is also performed to check whether the variables within the model are correlated. The Wald test posits a constant variance (homoscedasticity) null hypothesis against a non-constant variance (heteroscedasticity) alternative hypothesis. All the estimates in this study are performed using the STATA 11 software package.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Introduction

This chapter discusses the results of the study. The analysis is divided into two parts. The first part examines the share of IIT in Ghana's trade with ECOWAS. The next section contains the results of the econometric estimation of the determinants of intra-industry trade between Ghana and its ECOWAS trading partners.

5.2 The share of IIT in Ghana's bilateral trade with ECOWAS

Previous empirical studies indicate that the formation of regional economic blocs occasions simultaneous trading in similar products (Verdoon, 1960). Rivera-Batiz and Romer (1991) also asserts that cross border exchange of goods and ideas deepens economic integration among members. The results in Table 5.1 indicate the impact ECOWAS is making on the share of IIT in total bilateral trade between Ghana and the other ECOWAS members.

Two pieces of information are used to discuss the incidence of IIT in Ghana's trade with ECOWAS. These are the share of IIT in total bilateral trade between Ghana and ECOWAS member countries and the number of products at the HS 6 digit level for which there is intra-industry trade. The percentage of products that show IIT in each year is in parentheses in column three of the same table.

Table 5.1 The share of IIT in total bilateral trade between Ghana and ECOWAS

Year	Total Number of Products traded	Number of Products with IIT ^{1,2}	Average IIT (%)
2004	968	163 (16.8)	3.0
2005	2073	303 (14.6)	2.7
2006	1850	357 (19.3)	3.5
2007	1937	488 (25.2)	10.0
2008	1814	473 (26.0)	9.0
2009	1627	548 (33.6)	37.0
2010	1450	539 (37.1)	30.7

Source: Authors' own calculations based on data from Ghana Statistical Service, 2011

To begin, the results in Table 5.1 confirm the presence of IIT in Ghana's trade with ECOWAS. This addresses the first research question in this study. The share of IIT trade is very low between 2004 and 2006 and in 2008 at less than 10 per cent (Table 5.1). There is a surge in the IIT index in 2009 and 2010. It increased from 9 per cent in 2008 to 37 per cent in 2009, declining to 30 per cent in 2010. In 2006 the IIT share of Ghana's trade with ECOWAS of 3.5 per cent is less than the world average of 7.3 per cent at the five-digit level calculated by Brühlhart (2009) using data of 214 countries. The subsequent increase in the IIT after 2006 to 30.7 per cent in 2010 suggests that Ghana's IIT trade with ECOWAS is probably comparable to or exceeded the world average.

The IIT index obtained in 2004 means that out of the total bilateral trade value of US\$ 738.15 million between Ghana and ECOWAS, 3.0 per cent involve the simultaneous exchange of products in the same classification group. Put differently, 97 per cent of the total trade comprised exchange of products in different industries and this declined to 69.3 per cent in 2010.

A total of 969 products (based on the six-digit HS classification) were traded between Ghana and ECOWAS in 2004. Out of this, 165 products representing 16.8 per cent of the number of commodities showed evidence of IIT. These items include skins care products, dresses of other textiles and transportation equipment. Each product is classified as a separate industry¹⁷, yielding a total of 969 industries for the year 2004. Hence the word “product” and “industry” can be interchangeably used. One notable observation with the trade data between Ghana and ECOWAS used for this study is that items that show high prevalence of IIT are sometimes among the least traded in terms of volume and value. The total value for an item traded for the entire year can be less than US\$ 50 but it may indicate IIT prevalence as high as 90 per cent. For instance, Ghana’s total imports of dresses of other textiles (HS 620449) in 2004 was US\$ 44.6 and total exports of the same item amounted to US\$ 45.6 showing that IIT is 99 per cent when measured by the Grubel-Lloyd index.

From the bilateral trade data, 83 per cent of the total products traded showed no evidence of IIT in 2004. In effect, trade in these items were one way; it comprised either only exports from Ghana without corresponding imports or only imports from ECOWAS

¹⁷For instance X_i is the total exports of industry i as specified in the Grubel-Lloyd (1975) index

without corresponding exports. Among the products that showed no evidence of IIT are broken rice and cocoa powder. Petroleum oil, cement clinkers, wood items, printed plain cotton weave and household articles of plastics rated high in the traded items; however, there was little evidence of IIT identified in them. The total value of mineral products Ghana imported from ECOWAS in 2004 amounted to US\$ 472.53 million (representing 98.3 per cent of total imports) whereas the total exports of mineral products from Ghana stood at US\$ 3.13 million which yields an IIT of 1.3 per cent.

It is important to note that the share of IIT in 2004 should not be interpreted as though all the industries show low prevalence of IIT in total bilateral trade. Rather, whereas some industries have considerably high incidence of two-way trade, others have either zero or very low incidence and all these put together determines the magnitude of the total IIT for the year. It is therefore fair to indicate that the IIT share of 3 per cent for the year 2004 between Ghana and ECOWAS indicates that products with low IIT considerably outweighed the industries with high prevalence.

From 3.0 per cent in 2004, the share of IIT in total bilateral trade between Ghana and ECOWAS declined marginally to 2.7 per cent in 2005. There were approximately 303 products indicating IIT out of the total 2073 products traded. Evidence shows that the decrease in IIT was export driven as the total value of exports increased by 31.1 per cent to US\$ 487.29 million in 2005. Wood products remained a major source of foreign exchange for Ghana contributing US\$ 364.09 million, an increase of approximately 155.4 per cent over the previous year's value. As expected, mineral products dominated imports from the region. The data shows high IIT incidence in ceramic tableware, wooden

furniture and mowers for lawn. On the contrary, frozen mackerel, diary products and photographic plates shows no evidence of IIT.

The fall in IIT was reversed in 2006 following an increase in the index from 2.7 per cent the previous year to 3.5 per cent. The growth in Ghana's real GDP from 5.8 per cent in 2005 to 6.2 per cent in 2006 occasioned a general improvement in the major sectors of the economy including the external sector. More specifically, items such as smoked fish, artificial waxes, wooden furniture, transportation equipment and cooking appliances contributed significantly to the increase in the share of IIT observed for the year. However, mineral products performed poorly in IIT.

The share of IIT increased further to 10 per cent in 2007. This leaves 90 per cent of total bilateral trade between Ghana and ECOWAS in 2007 to inter-industry. The 2007 data gives 489 products with IIT out of the total of 1940 products traded. Sugar confectionery, chemical products and transportation equipment rated highest with IIT of over 80 per cent in each industry. Footwear and art of apparel also showed considerable share of IIT. However trade in arms and ammunitions, live tree and raw hides were completely inter-industry.

For the year 2008, total IIT observed between Ghana and ECOWAS was 9 per cent which is one per cent less than the value in 2007. The number of products indicating IIT decreased from 489 in 2007 to 474 and the total products traded also declined from 1940 to 1814. The global food and energy crises in 2008 impacted negatively on Ghana's

external sector. Crude oil was selling for more than US\$ 100 a barrel on the world market. Total oil imports from ECOWAS amounted to US\$ 930.82 million. At the same time exports to the region declined from US\$ 332.21 million in 2007 to US\$ 267.81 million. All these events negatively impacted the occurrence of IIT between Ghana and ECOWAS in 2008.

In contrast to the relatively low values observed between 2004 and 2008, the share of IIT in total bilateral trade between Ghana and ECOWAS increased sharply to 37 per cent in 2009. This is comparable to results obtained by Musonda (1997) for the PTA/COMESA region. IIT grew from 474 commodity groups in 2008 to 549 groups in 2009 and the total number of items traded expanded to 1426. Beverages and spirits, ceramic products, malt and organic chemicals are among the products that contributed significantly to the high IIT observed. The value of beverages and spirits exported from Ghana to ECOWAS in 2009 was US\$ 1.74 million and a corresponding US\$ 1.73 million was imported into Ghana from ECOWAS the same year. The result of this simultaneous trading is an IIT incidence of 99.8 per cent using the Grubel-Lloyd (1975) method.

Another important observation is the impact of the global financial crises on the large IIT noticed in 2009. The real GDP of Ghana expanded by 4.1 per cent, 3.1 per cent less than the previous year's. Mineral products imports from ECOWAS reduced drastically from US\$ 930.82 million in 2008 to US\$ 207.76 million which represents about 348 per cent decline (ISSER, 2010). This decline in oil imports were jointly driven by lower crude oil prices and reduced crude oil demand by the Volta River Authority for thermal electricity generation. Total imports from the region declined from US\$ 1021.05 million in 2008 to

US\$ 325.83 million in 2009. However, exports increased from US\$ 267.81 million in 2008 to US\$ 592.57 million in 2009. Global financial crisis forced global trade to shrink by nearly 12 per cent and this was predominantly because the developed countries such as Europe which happens to be the major trading partners were the most affected (ISSER, 2009). This explains why exports from Ghana to ECOWAS expanded by 121 per cent in 2009.

Finally, the share of IIT declined to 30.7 per cent in 2010 partly because of a drop in the products simultaneously traded between Ghana and ECOWAS from 549 in 2009 to 450. Sugars and sugar confectionery, printed books, iron and steel, detergents and footwear contributed immensely to the share of IIT noticed. However, raw hides, silk, firearms and vegetable textile fibres are among the product which were either exported or imported exclusively without any two-way trade.

Clearly, the number of products that shows evidence of IIT is often less than half of the total items traded in each year. For instance in 2004 only 163 products out of the 963 products traded between Ghana and ECOWAS show incidence of IIT. This means only 16.8 per cent of the total items traded show evidence of IIT. Although the share of products with IIT increased consistently from 16.8 per cent in 2004 through 25.2 per cent in 2007 to 37.1 per cent in 2010, the share is still less than 50 per cent (see Table 5.1). Ghana's trade with ECOWAS is more of inter-industry trade than intra-industry trade.

In summary, there is evidence of IIT between Ghana and ECOWAS as indicated in table 5.1. This is widespread in the transportation, beverages, chemicals and machinery industries. The year 2009 has the highest incidence of IIT amounting to 37 per cent and

the lowest is in 2004 with a value of 3 per cent. What stands out clearly is that the share of IIT in total bilateral trade between Ghana and ECOWAS is low and sporadic. Based on this revelation, it can be concluded that the low intra-regional trade observed among the ECOWAS countries is indeed a phenomenon of low intra-industry trade. Since ECOWAS countries have similar economic structures and resource endowments, simultaneous trade in similarly differentiated products is key to deepening intra-regional trade. The next section delves deeper into the scope of IIT in the various industries.

5.3 The trend of IIT in the various sectors and industries

One of the objectives of this study is to identify the product categories where IIT is most prevalent. The estimates of IIT in the various product categories calculated from 2004 to 2010 are displayed in Table 5.2. There is evidence of IIT in all product categories. The share of IIT across product groups has exhibited considerable fluctuation during this period. If 20 per cent is adopted as the critical point between low and high IIT, ten out of the 15 product categories emerge as having a high proportion of IIT in total trade in at least three years during the period 2004-2010.¹⁸ These are animal and animal products, vegetable products, foodstuffs, chemical and allied products, raw hides, skins, leather and furs, textiles, metals, transportation, machinery and miscellaneous products (Table 5.2).

¹⁸ 20% is chosen as the critical cut-off point based on the world average of the incidence of IIT in 2006 calculated by product category has been estimated at 20.5% (calculated at the SITC 5 digit level by Brühlhart, 2009).

Among all the product categories the transportation industry showed the highest proportion of IIT. In 2004, the share of IIT in the transportation industry was 86 per cent and this increased to 94.3 per cent in 2007 the highest among all the industries. Trade in this industry comprises products such as motorcycles, bicycles and vehicles. The incidence of intra-industry trade in the machinery and electrical industry ranged between 16.6 per cent and 88.3 per cent over the period. In 2008, exports from Ghana amounted to US\$ 9.50 million and the corresponding imports were US\$ 11.57 million (Ghana Statistical Service, 2011). Although, these goods are not manufactured in the region, there are vehicle assembling plants in Nigeria and Ghana¹⁹ with similar centres for assembling motorcycles and bicycles dotted in some ECOWAS countries.

¹⁹ Nissan and Peugeot vehicles are assembled in Ghana and Nigeria respectively

Table 5.2 Trend of intra-industry trade as a ratio of total bilateral trade in the various industries (%)

Industry	2004	2005	2006	2007	2008	2009	2010
Animals and Animal Products	45.4	55.2	41.2	30.7	13.9	27.7	60.2
Vegetable Products	3.6	27.5	36.5	13.1	28.3	12.8	19.7
Foodstuffs	17.1	9.4	20.8	9.5	32.9	48.5	26.8
Mineral Products	1.3	0.1	1.2	1.4	1.4	67	36.3
Chemical and Allied Industries	50.2	30.3	42.4	30.8	69.2	43.8	36.4
Plastics/Rubbers	14.6	17.7	1.3	11.7	20.4	6.1	7.2
Raw Hides, Skins, Leather and Furs	30.8	1.5	0.7	24.6	13	76.8	33
Wood and Wood Products	2.9	0.3	1.8	1.1	2.7	2.1	2.2
Textiles	8.1	20.5	1.5	15.2	20.3	28.3	31.2
Footwear/Headwear	10	2.2	4.6	56.8	6.7	11.8	83.8
Stone/Glass	7.7	9.7	3.1	14.4	2.4	5.1	22.3
Metals	15.4	7.9	15.8	18.4	42.4	36.7	20.8
Machinery/Electricals	16.5	54.8	54	63.6	88.3	59.2	80.7
Transportation	86	14.7	23.6	94.3	58.7	81.2	32.4
Miscellaneous	11.5	33.7	27.8	11.4	9	33.9	23.2

Source: Author's own calculations based on data from Ghana Statistical Service, 2011

The machinery and electrical industry exhibited very high incidence of IIT recording 88.3 per cent in 2008. From the trade sheet, exports from Ghana amounted to US\$ 9.50 million and the corresponding imports were US\$ 11.57 million. The machinery and electrical industry presents huge potential for industrialisation and job creation to reduce the high unemployment rate in Ghana and other West African countries. Considering that the world is technology driven, it is very welcoming that this industry showed such impressive IIT. The fact that computers and allied electronics devices fall within this industry is a captivating phenomenon.

The chemicals and other allied industries also showed a high prevalence of IIT ranging from 30.3 per cent to 69.2 per cent and this is consistent with theoretical predictions that IIT is prevalent in manufactured products.. Given the high prevalence of malaria and other tropical diseases, pharmaceutical industries which fall within this category have a huge market to explore and this is an attractive venture to promote industrialisation in the region. The high cost of importing these pharmaceutical products outside the region can also be reduced. Since these products would be made to fit the indigenous conditions it can lead to reduction in the disease resistance.

The production of gas and crude oil will see more trading among the West African countries since these commodities are needed by almost all countries. It will be one of the industries that can facilitate economic integration in the ECOWAS sub region. Although IIT in mineral products have been low in all the years, it increased sharply to 67 per cent in 2009. When the oil industry becomes fully functional in Ghana, it is expected to boost IIT. The petrochemical industry comes with several ancillary industries which will

further entrench trade and movements of labour and capital between Ghana and other ECOWAS countries.

The data in Table 5.2 shows high prevalence of two-way trade in live animals and animal products in all but one year during the period under consideration. Most of these animals are cattle, sheep and goats imported from Burkina Faso, Mali and other landlocked countries in the region. Although in monetary terms the value of trade in this product category is generally low, identical volumes were exchanged simultaneously. This leads to one of the major findings from this study that IIT can be prevalent not only in manufactured products but also in primary products. This result is supported by Brander and Krugman (1983) and Brander (1981).

The textiles industry recorded relatively low IIT in four of the periods between 2004 and 2010 and can be partly attributed to the fact that the once vibrant textiles and garment industries in most ECOWAS countries have collapsed. The domestic textile markets in West Africa are flooded with Chinese garments and second hand clothing from Europe. From over twenty textiles factories in Ghana in the last two decades that employed about 25,000 people, there are only four²⁰ textiles firms in Ghana with almost 90 per cent of the employees laid off (Daily Graphic, 2012). This explains the relatively low intra-industry trade within the region. The imposition of the ban on the importation of some selected used clothing into Ghana is laudable because it can help revamp the textiles industry in Ghana and subsequently promote IIT in the sector.

²⁰ The four surviving firms are the Printex, Akosombo Textiles Limited (ATL), Ghana Textile Printing Company Limited (GTP) and Ghana Textile Manufacturing Company (GTMC)

Although it has a huge potential and a vast market, the wood and wood products followed the trend of the textiles industry with the lowest incidence of IIT from 2004 to 2010. This is mainly because, timber and wood related products are often exported outside the region whilst household and office furniture are also imported from Europe and Asia. The strict regulation on logging and the ban on lumbering of certain timber products have also reduced trade in timber generally and this contributes to the low IIT.

In summary, the study shows evidence of IIT in Ghana's trade with ECOWAS in all products categories from 2004 to 2010 which supports the findings of Musonda (1997) in the COMESA region. The incidence of IIT in primary product sectors such as animals and animal products is quite high contrary to what would be expected theoretically. Specifically, trade in live animals and animal products exhibited high prevalence of two-way trade throughout the period under review although these are basically primary products. This to some extent is not unexpected given that Ghana's trade with ECOWAS was between 15 to 30 per cent of its total trade during the period. The transportation industry has the largest incidence of IIT among all the products categories. This is consistent with theoretical assertion that intra-industry trade is prevalent in highly sophisticated manufactured products (Mathews, 1998). The wood and wood products categories have the lowest incidence of IIT.

One notable observation with the trade data between Ghana and ECOWAS is that items that show high prevalence of IIT are sometimes among the least traded in terms of value. For example IIT in footwear/headwear in 2010 was 83.8 per cent (Table 5.6) even though

the total value of imports and exports was less than US\$1 million. Similarly we find that the high IIT for animals and animal products is associated with trade values of about US\$18.6 million. On the other hand the products that account for the largest shares of Ghana's trade with ECOWAS, i.e. mineral products and wood and wood products have some of the lowest incidences of intra-industry trade.

5.4 The share of IIT in total bilateral trade between Ghana and each of the other ECOWAS countries

From the theoretical point of view, larger countries (measured by market size) are expected to show high prevalence of IIT because these countries are perceived to support industries characterised by economies of scale (Krugman, 1979). This forms the basis for the third specific objective of this study. To evaluate this theoretical assertion, the average IIT index was computed between Ghana and each of the other ECOWAS member countries for all the products traded. The results for each of the countries are displayed in Table 5.3. From the results, six out of the fourteen ECOWAS countries had IIT indices that exceeded 10 per cent in at least two years during the period 2004-2010. These are Benin, Cote d'Ivoire, Guinea, Liberia, Sierra Leone and Togo. Two countries namely Guinea Bissau and Cape Verde had no IIT with Ghana for the entire period implying all exports and imports are completely inter-industry trade. Both these countries have very low trade with Ghana and whatever trade that occurs is entirely inter-industry (Tables 5.3).

Table 5.3 IIT as a share (%) of total bilateral trade between Ghana and each of the ECOWAS countries from 2004 to 2010

Country	2004	2005	2006	2007	2008	2009	2010
Benin	0.7	3.5	37.2	20.0	0.3	0.2	1.0
Burkina Faso	0.1	0.2	0.2	1.0	2.0	1.0	1.4
Cape Verde	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cote d'Ivoire	2.4	4.5	8.1	4.4	4.4	17.0	57.6
Gambia, The	2.8	9.3	1.5	9.5	1.3	2.4	2.7
Guinea	0.2	1.4	0.3	9.3	17.6	13.6	7.5
Guinea Bissau	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	1.6	4.9	11.0	28.6	3.3	9.7	7.4
Mali	3.1	0.6	1.7	1.6	1.4	20.5	0.3
Niger	6.1	5.6	2.1	1.9	2.9	3.2	1.7
Nigeria	0.4	0.4	0.9	1.5	2.4	7.7	2.9
Senegal	0.8	1.1	1.8	12.0	6.9	5.2	8.9
Sierra Leone	0.7	0.9	29.4	0.6	5.6	7.1	40.6
Togo	2.5	0.2	1.5	1.6	3.0	10.3	10.1

Source: Authors' own calculations based on data from Ghana Statistical Service, 2011

Distance between Ghana, Cape Verde and Guinea Bissau partly accounts for the zero IIT. Proximity plays an important role as transport costs are great in the ECOWAS region. There are very high transits cost if goods are hauled across countries together with other inconveniences, for instance handling charges, delays, checkpoints and theft. This gives

an indication that the negative expectation sign for the hypothesis about distance in chapter four is likely to be realised. Aside distance, these two countries are Francophone and Ghana is Anglophone so language barrier is a possible contributor to the lack of IIT.

Cote d'Ivoire has the largest IIT incidence of 57.6 per cent in 2010 partly confirming the hypothesis that similar countries are likely to exhibit high intra-industry trade. The level of development is not so much in divergence if GDP per capita is the means of comparison; in 2010 the per capita income of Ghana was US\$ 1,468.82 while that of Cote d'Ivoire was US\$ 1,703.61. As the second largest trading partner of Ghana within the ECOWAS region, this result is not surprising and moreover Cote d'Ivoire is one of the countries with high importance of manufacturing. Again, Cote d'Ivoire has a large market size which supports manufacturing activities so it partly supports the proposition by Falvey (1981) that larger market supports IIT.

Again, being the world's largest producer of cocoa, it is not unexpected that the high IIT is spurred by the cocoa and ancillary industries. Machinery, transportation and electrical industries are also important sources of IIT between Ghana and Cote d'Ivoire. Aside Nigeria which supplies most of Ghana's imports, Cote d'Ivoire is the next largest source of imports. Given that Cote d'Ivoire shares border with Ghana, the question that comes to mind is whether the geographical proximity has any influence on the quantum of IIT observed. Cote d'Ivoire is among the three countries that shares common boundary with Ghana and is hypothesised to have larger IIT because of proximity.

However, the IIT in Ghana's trade with Cote d'Ivoire has not always been this high. It was quite low in 2004 at 2.4 per cent and rose to 8.1 per cent in 2006, dipped in 2007 and 2008 to about 4 per cent before rising to 17 per cent in 2009. From a total of US\$ 18.44 million in 2004, total bilateral trade between Ghana and Cote d'Ivoire increased sharply to US\$ 104.43 million in 2007 and again to US\$ 107.99 million in 2010. Cote d'Ivoire is the second largest economy in West Africa with a GDP of over US\$ 30 billion. This indicates that Ghana's trade with Cote d'Ivoire is steadily inter-industry. Machinery, transportation and electrical industries are the product categories that are important sources of IIT between Ghana and Cote d'Ivoire.

Although just about 347 kilometres apart, Benin is not on the list of Ghana's major trading partners in the ECOWAS region. Total trade between the two countries in 2004 was approximately US\$ 13.12 million and this increased to US\$ 131.68 million in 2010 (GSS, 2010). Trade with Benin is concentrated in few items such as cotton, foodstuffs, plastics, steel, mechanical appliances and wood products. The Co-Prosperity Alliance Zone (COPAZ), established in 2007 among Ghana, Nigeria, Benin and Togo, is a special arrangement that is helping to enhance trade ties among these countries.

Ghana's trade with Benin is more of inter-industry than intra-industry as the IIT values for most of the year are less than one per cent. However, the sharp increase in IIT observed in 2006 and 2007 is attributable to transactions in products such as electrical machinery, mechanical appliances, cotton and fish. In 2006 mechanical appliances valued at US\$ 3,087.34 were exported to Benin and about US\$ 3156.72 worth of the same product were imported from Benin which translates into IIT of 99 per cent two-way trade

for that industry. Benin is a Francophone country which may partly explain the low level of trade given that Ghana is an Anglophone country.

Intra-industry trade with Gambia never exceeded 10 per cent from 2004 to 2010. The highest share of IIT is 9.5 per cent in 2007 with the lowest been 1.3 per cent in 2008. Foodstuffs, beverages, plastics and wood products and detergents are some of the items Ghana exports to the Gambia and imports include groundnuts, electronics, fish and transportation equipments. These are the industries where two-way trade with Ghana dominates. The low IIT is however attributed partly to the fact that trade in general is low between the two countries. As at 2010, only US\$ 6.16 million of Ghana's exports went to Gambia with total imports from amounting to only US\$ 43.39 thousand. Although Gambia has a low population (about 1.8 million peoples in 2011), the per capita income of US\$ 1,265.18 is sufficient to create a good market for Ghana's exports.

Guinea is among Ghana's least traded partners with trade volumes not exceeding US\$ 19.74 million in 2011. With a per capita income of US\$ 978.37, the tertiary sector dominates the Guinean economy contributing about 36.7 per cent of GDP in 2011(African Economic Outlook, 2012). This is mainly due to a significant growth in commerce and transport services. The real GDP expanded by 4 per cent in 2011 and is expected to grow by 5.1 per cent in 2012 (African Economic Outlook, 2012). However, political instability is a bane to the growth of the economy and this also hampers trading activities. Sugar, confectionary, pharmaceutical and plastic products are some of Ghana's

exports to Guinea and imports include food products and personal effects. The low IIT from 2004 to 2010 is somehow attributable to distance which is seen as resistance.

Liberia is in transition from post-conflict reconstruction to medium-term growth and is among the poorest countries in the world with a per capita income of only US\$ 375 and a GDP of less than US\$ 1 billion. This low economic profile obviously filters into the very low IIT observed. Exports from Ghana to Liberia are mostly textiles, cereals, and confectionary, pharmaceutical and plastic products. Iron-ore is the largest source of foreign exchange to Liberia and also is among its major exports to Ghana explaining in part the low IIT between the two countries. In effect, Ghana's exports to Liberia differs considerably from the imports in terms of products types.

Mali is one of the landlocked countries in the region which uses Ghana's ports for imports and exports. This arrangement is however not significantly impacting on the volume of trade between the two countries. Ghana's trade with Mali was US\$ 127.31 million in 2010 representing 6.1 per cent of the total trade with ECOWAS. Gold is the major source of foreign exchange but its exports to Ghana are usually raw hides and articles of plastic Ghana also in turn exports textiles, pharmaceutical products, mineral fuel and detergents. In effect there is little coincidence of products exchange. This accounted for the less than one per cent IIT between 2004 and 2010. Mali is developing its cotton and iron ore extraction industries to diversify foreign exchange revenue away from gold and this has the prospects of improving IIT in the future.

Although it is the largest country in West Africa with an area of 1,267,000 square kilometres, this does not translate into trade volumes. Niger is also in the league of countries with little trading activities in Ghana. Exports from Ghana far exceeded imports by almost 80 per cent between 2004 and 2010. The economy of Niger centres on subsistence crops, uranium, livestock and oil production. Salt, fertilizers, footwear and furniture are imported from Ghana. The low IIT also follows the fact that these two countries trade in different products. With the Zinder oil refinery fully operational since 2011, the future prospects of IIT with Ghana are positive as Ghana also commences commercial production of oil the same year.

Nigeria is the largest economy in ECOWAS and arguably the single largest trading partner of Ghana within the region. For instance in 2007, the share of Ghana's imports from ECOWAS compared to total global imports was 19.6 per cent out of which 15.1 per cent was sourced from Nigeria. Given that Nigeria is the largest economy in ECOWAS, it is expected to show a very high incidence of IIT, but this assumption is not supported by the data. On the contrary, the share of IIT in bilateral trade between Ghana and Nigeria is among the least values observed remaining below 10 per cent throughout the period from 2004 to 2010. Most of the import from Nigeria is crude oil, however Ghana does not export crude oil related commodities to Nigeria. So although there is high trade intensity with Nigeria, most of the trade is inter-industry. The highest share of IIT is 7.7 per cent observed in 2009 and the lowest is 0.4 for 2004 and 2005.

Even though Sierra Leone is a relatively smaller economy with a GDP of about US\$ 5.1 billion it shows larger IIT with Ghana relative to other countries. In 2004 there were only 7 commodities exhibiting IIT but this increased to 16 commodities in 2010. These commodities include furniture, articles of iron, paper products and articles of wood. This contributed to an IIT of 40.6 per cent in 2010 which is next only to Cote d'Ivoire. Ghana has cordial relationship with Sierra Leone at the political and economic level which helps promote trade. Ghana can ride on the common language between the two countries to deepen trade relations.

Senegal is one of the countries in the ECOWAS region that show very little IIT with Ghana. This is not surprising since the two countries are not known major trading partners. Total exports from Ghana to Senegal increased from US\$ 7.48 million in 2004 to US\$ 16.48 million in 2011 where as imports increased from US\$ 0.83 million in 2004 to US\$ 29.34 million in 2011. In fact, the share of Senegal's trade to total with the ECOWAS region is less than 3 per cent. The trade items are usually detergents, diary products, paperboard, plastic products and cocoa preparations.

There is scattered IIT between Ghana and Togo which is sporadic. The proximity is quite a favourable factor as Lome is the closest capital city from Accra with a distance of 171 kilometres. Again Togo has a special relation with Ghana as they both belong to the Co-Prosperity Alliance Zone (COPAZ) and therefore expectedly, more efforts are being committed to promote trade. Togo is the third largest trading partner in ECOWAS after Nigeria and Cote d'Ivoire. IIT between the Ghana and Togo increased from 7 industries

in 2004 to 51 industries in 2010 however, the share is not large enough to pull the industries with significantly low and zero incidence.

In summary, the IIT indices as indicated in Table 5.2 range between 0 and 57.6 per cent for all the countries. However, for several countries in most years the IIT index was less than 5 per cent. This is very low and means that the formation of ECOWAS to a large extent has not stimulated much IIT in Ghana's trade with several member countries. Thus, the assumption that economic integration stimulates IIT is not fully supported based on this study.

Since IIT can be a way of measuring similarity between economic structures, the study reveals that the ECOWAS economies are weakly integrated. There is low similarity between economic structures in the region and this indirectly impedes economic integration. It can also be suggested that the economy still remains agrarian with little or no structural transformation or industrialisation. From table 5.2, none of the countries exhibited consistency in growth of IIT from 2004 to 2011.

5.5 Results of the diagnostics tests

As discussed under the methodology in chapter four, the Breusch- Pagan Lagrange multiplier test helps to choose between the Pooled OLS and the random effects model for the estimation. The results in Table 5.4 fail to reject the null hypothesis at any statistically significant level because P-value of the chi square obtained is 0.25 which is greater than 0.10. The conclusion is that the random effects model is appropriate.

Table 5.4 Results of the Breusch- Pagan Lagrange multiplier (LM) test

	Variance	Standard Deviation
lnIIT	1.996	1.413
e	1.270	1.127
u	0.008	0.091

Test: $\text{Var}(u) = 0$

Chi square =1.320

Prob > chi2 =0.250

By rejecting the Pooled OLS it means the various countries are not similar but they have some unobserved individual country heterogeneity. The Hausman specification test helps to determine if the unobserved heterogeneity is random or not. The results of the Hausman test in Table 5.5 fail to reject the null hypothesis and this confirm the choice of the random effect model over the fixed effects model.

Table 5.5 Results of the Hausman test between the random effect and the fixed effect models

	---- Coefficients ----			
	(b)	(B)	(b-B)	Standard
	fixed	random	Difference	Errors
lnPCI	10.078	2.279	7.798	5.481
lnDPCI	0.254	0.479	-0.225	0.309
lnGDP	-1.323	-1.127	-0.196	2.878
lnBIEXCHR	0.514	0.402	0.112	0.113
lnTIMB	-0.315	-0.482	0.167	0.076
lnFDI	0.167	0.483	-0.316	0.120
Prob>chi2	=	0.258		

The modified Wald test rejects the null hypothesis of homoscedasticity because the P-value obtained is 0.00. This suggests the presence of a group-wise heteroscedasticity. Greene (2008) indicates that the usual standard errors reported should not be used because it can bias the parameter estimates downward. The effect of group-wise heteroscedasticity is taken care of in this study by estimating the model with a robust standard error. This helps reduce the standard errors without altering the magnitude and signs of the parameter estimates. The correlation coefficient and the VIF of the explanatory variables in appendix II show that the multicollinearity is not severe. According to Jensen (2003), a liberal view is to assume multicollinearity when

correlation coefficient in more than 0.9. The results of the random effects estimates with robust standard errors are presented in Table 5.6.

5.6 The estimation results

The results of the country-specific determinants of IIT between Ghana and ECOWAS is displayed in Table 5.6

Table 5.6 Results of the random effect model estimation

Variable	Coefficient	Robust Standard Errors	P-Value
lnPCI	2.279	0.616	0.000***
lnDIST	-0.242	0.154	0.117
lnGDP	-1.127	0.263	0.000***
lnBIEXCHR	0.402	0.041	0.000***
lnTIMB	-0.482	0.172	0.005***
lnFDI	0.483	0.161	0.003***
LANG	0.354	0.178	0.047*
lnDPCI	0.4790	0.143	0.001***
CONSTANT	-8.8220	2.828	0.002***
Rho	= 0.006		
Number of Observations	= 84		
Prob > F	= 0.000		
R ²	= 0.389		

Where ***, **, * represents 1 per cent, 5 per cent and 10 per cent levels of significance respectively

The descriptive statistics of the variables used in the estimation are in Table 1 of appendix II. Before taking the natural logarithm of the variables the minimum difference in per capita income is US\$ 14 which is between Ghana and Benin in 2008. The maximum value is US\$ 1,093 between Ghana and Liberia in 2010. This supports the claim that the ECOWAS countries are similar in income. After taking the natural logarithm, the dissimilarity in per capita income has a minimum value of 2.66 and a maximum value of 6.99.

The main hypothesis underlying this study is that similarity in per capita income stimulates intra-industry trade (Linder, 1961). This is examined by the inclusion of the dissimilarity in per capita income variable into the model. The coefficient of this variable as shown in table 5.6 is positive and significant at the one per cent level. The interpretation is that when difference in per capita income between Ghana and any other ECOWAS country increases by one per cent, the share of IIT to total bilateral trade will increase by 0.48 per cent. The positive sign observed is contradictory to the hypothesis formulated. It therefore leads to a rejection of the main hypothesis guiding this study. Leitão and Faustino (2009) also find a positive sign for the Portuguese automobile sector. The results also confirm the findings of Zantira (1999) who also obtain a positive and significant value for dissimilarity in per capita income between Ghana and its major trading partners.

The coefficient of the per capita income variable is also positive and significant at the one per cent. This means that when the per capita income of a trading partner increases by one per cent, the share of IIT with Ghana will increase by 2.2 per cent. The positive sign

is consistent with the initial expectation. Cote d'Ivoire has a very high per capita income and also shows the largest share of IIT, confirming the theoretical assertion underlying this type of trade (Table 2.2 and 5.3). This result compares favourably with the outcome obtained by Musonda (1997) in the PTA/COMESA region.

The results also show that gross domestic products (market size) and intra-industry trade are negatively related within the ECOWAS regional bloc. This stems from the negative coefficient of the GDP variable which is significant at one percent. The interpretation is that one per cent increase in the market size of a country reduces intra-industry trade by 1.1 per cent. This outcome is counter-intuitive because the expectation was a positive sign. However, the data indicates that ECOWAS countries with large market size persistently show little prevalence of IIT with Ghana. Nigeria is the largest economy in the ECOWAS region but the highest IIT for the period 2004 to 2010 is only 7.7 per cent in 2009. Das (2005) also finds a negative sign for the Indian economy although Zantira (1999) indicates a positive sign for Ghana. All the ECOWAS members are developing countries and have relatively smaller market size. The smallness of their market size makes it difficult for large scale production and economies of scale. This acts as a deterrent for firms to exploit economies of scale to produce differentiated products and this may explain the negative sign (Helpman, 1987).

In terms of the relationship between trade imbalance and IIT, the study points to a negative correlation. In effect, when there is high trade imbalance, it reduces the share of IIT in total bilateral trade. This coincides with the a priori expectation. Trade imbalance

means that Ghana may be exporting more to a country than it imports from that country or vice versa. Therefore in the extreme case of complete trade imbalance, all possibilities of IIT are totally exterminated. However, as the trade imbalance reduces, the share of IIT begins to improve. This finding is similar to that obtained by Lee and Lee (1993) for a sample of developed and developing countries.

The positively significant coefficient of the foreign direct investment (FDI) variable means, when FDI inflows into a particular country increase by one per cent, it increases IIT by 0.5 per cent. Therefore, when FDI inflows double, IT will increase by half that amount. The positive correlation between FDI and IIT satisfies the theoretical assertion by Markusen (1994) and the result can be seen in the light of multinational companies establishing subsidiaries in the West African countries. Unilever Company limited which manufactures personal effects such as soap, toothpaste and beverages has subsidiaries at least in Ghana, Nigeria and Ivory Coast. This significantly contributes to a two-way trade in these items in the region as a shortfall in stock in one country is easily augmented by imports from a neighbouring country.

Despite the fact that the distance between two countries is insignificant in explaining IIT as indicated in table 5.5, the negative coefficient indicates that it certainly acts as a barrier to trade. This outcome compares favourably with the theoretical prediction. By extension, the farther the countries are apart, the less likely they are to engage in IIT. The case of Senegal is evident as it is the most distant country from Ghana and one of the two countries that had low IIT incidence. The capital city Dakar is 2,139 kilometres from

Accra. Also, Cape Verde is excluded from the sample because it shows no evidence of IIT with Ghana, coincidentally it is the farthest country from Ghana. The distance is inevitably a reason for the zero IIT. Veeramani (2002) finds a negative sign for the Indian economy.

The coefficient of the language dummy is positive and weakly significant at ten per cent. With respect to the use of a common language, countries with the same language tend to engage more in IIT according to this study. Balassa and Bauwens (1987) indicate that more information is required on the characteristics of manufactured products than on the characteristics of homogeneous products and a common language can facilitate this process. These include information on how to use the product, composition of the product, country of origin, dangers or side effects associated with it. Acquiring these pieces of information is relatively easy when both countries use the same language and the information are written in a common language. Again, the uniformity of language promotes familiarity of products of partner countries. This means that products from Anglophone countries are more likely to be imported into Ghana than from non-Anglophone countries.

Finally, the real bilateral exchange rate variable has a positive and significant coefficient. This means that depreciation of the Ghana cedi stimulates IIT. A depreciation of the Ghana cedi by 10 per cent will increase IIT by 4 per cent. When there is exchange rate variability, traders lose their wealth when exchanging their currencies from the domestic currency to foreign currency. Traders in Ghana often have to change their domestic currencies to the US dollars (US\$) before changing it again to the trading partners

currency for the purposes of transaction and this draws a wedge between the value of the currencies. The introduction of the ECO currency by WAMZ will leave the ECOWAS region with only two currencies; the CFA Franc and the ECO. This can help minimize the impact of real exchange rate volatility in the region will most likely boost IIT in the region.

When the unobserved individual country heterogeneity is controlled by estimating the fixed effects model (FEM), the time-invariant variables such as distance and the language dummy are automatically eliminated from the estimates. The per capita income and trade imbalance are found to be weakly significant in explaining the incidence of IIT. Variability in real bilateral exchange rate significantly improves IIT when minimized. This is indicated by the negative sign of the real bilateral exchange rate variable. The results of the fixed effects model and the Pooled OLS estimations are displayed in Table 5.7.

Table 5.7 Results of the Fixed Effects Model (FEM) and the Pooled Ordinary Least Square estimates

Variable	Fixed Effects	Pooled OLS
lnPCI	10.078*	2.271***
lnDPCI	0.254	0.475**
lnDIST	-	-0.242
lnGDP	-1.323	-1.130***
lnBIEXCHR	0.514***	0.401***
lnTIMB	-0.315*	-0.484***
lnFDI	0.167	0.489***
LANG	-	0.347
CONSTANT	-59.516***	-8.750**

Prob > F = 0.0001

Rho = 0.9111

R² = 0.3893

Adjusted R² = 0.3241

Number of Observations = 84

*, ** and *** means 10 per cent, 5 per cent and 1 per cent level of significance respectively

Apart from the per capita income, trade imbalance and the real bilateral exchange rate, all the other variables are not significant in explaining the share of IIT based on the FEM estimates. The main variable under investigation which is the dissimilarity in per capita income variable still has the positive sign but now insignificant in the model.

Another important observation from the FEM estimates is the magnitude of the rho as shown in the table. The rho value of 0.91 means, about 91 per cent of variations in the dependent variable (IIT) are accounted for by changes in the unobserved individual country heterogeneity. These may include the political situation in Ghana and the corresponding ECOWAS countries, cultural differences, climate change and most importantly artificial trade barriers. Difficulty in obtaining data on these variables explains their exclusion from the model. However, limitations and or opportunities offered by these country specific heterogeneity especially artificial trade barriers cannot be overemphasised.

The results of the Pooled Ordinary Least Squares (Pooled OLS) are not different from the random effects model (REM) estimates in terms of the magnitude and signs of the coefficient. As indicated earlier in chapter four, the difference between the Pooled OLS and the REM is, the Pooled OLS assumes away the individual country heterogeneity but the REM upholds it. In the end only the constant term changes in both estimations. For the REM the size of the constant term is 8.82 whereas it is 8.75 for the Pooled OLS but they both have a negative sign. Apart from this difference all the variables have the same magnitude and signs as the REM. The R-squared value indicates that about 38.9 per cent

of the variations in the dependent variable (IIT index) are caused by changes in the explanatory variables. This means the Pooled OLS estimation shows low explanatory power.

As shown earlier in Tables 2.7 and 2.8, mineral products are the largest traded commodity group between Ghana and ECOWAS. Given that these products show very low incidence of IIT, it is suspected to be a key contributor to the low IIT in the region. To evaluate this assertion, separate estimation of the determinants of IIT is conducted without mineral products (i.e. HS 250200 – 271600). The results as presented in Table 4 of appendix IV show that the relatively smaller IIT prevalence goes beyond the volume of trade in mineral products in the region.

In summary, the study shows that IIT between Ghana and the other twelve ECOWAS countries depends positively on per capita income, foreign direct investment, dissimilarity in per capita income and the elimination of exchange rate volatility. However, gross domestic products and trade imbalance negatively impacts intra-industry trade. Though the dissimilarity in per capita income variable is significant at one per cent, the positive sign contradicts the Linder (1961) hypothesis.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This final chapter summarises the results of the study and makes concluding remarks based on the findings. Recommendations based on the findings of the study are also outlined.

6.2 Summary of the study

The fundamental objective of this study is to test the IIT theory using empirical trade data between Ghana and ECOWAS from the period 2004 to 2010. This study is motivated by the Linder (1961) hypothesis which states that countries with similar income and economic activities tend to trade more among themselves than dissimilar countries. A total of fifteen ECOWAS countries including Ghana are sampled for the survey. These countries are Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, the Gambia, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

Every item traded within the period 2004 to 2010 is considered for this study rather than only manufactured goods as is often done for most studies on IIT. The decision to include all products in this study is on account of the fact that the share of manufactured products traded within ECOWAS is low (ECOWAS, 2010). The traded products are classified into their respective industries at the six-digit Harmonised System (HS) of Commodity Description and Coding nomenclature developed by the World Customs Union. A total of about two-thousand and seventy-three (2,073) products are used for this study.

Using the Grubel-Lloyd index, the study finds evidence of IIT in total bilateral trade between Ghana and ECOWAS. Specifically, the results show an IIT prevalence of 3.0, 2.7, 3.5, 10.0, 9.0, 37.0 and 30.7 per cent for 2004, 2005, 2006, 2007, 2008, 2009 and 2010 respectively. Although the incidence of IIT is relatively low as compared to other regions, it is actually non-zero for the period between 2004 and 2010. Most of the products with high incidence of IIT are the least traded in volume and value.

After establishing the presence of IIT, the next objective is to identify the sectors and industries in which IIT is most prevalent. The study reveals that transportation, machinery, electrical and chemicals industries have relatively higher IIT prevalence than the other industries. The transportation industry has the largest share of 94.3 per cent in 2007. Even though live animals and animal products are classified as primary products the study reveals high prevalence of IIT in these products in the region. The results indicate that in 2010, 60.2 per cent of trade in animals and animal products constituted IIT. This results raise questions about the theoretical assertion that primary products have very little tendency for two-way trade. At least from this survey, there is evidence of IIT even in primary products.

Mineral products constitute more than seventy per cent of Ghana's tradable products with ECOWAS, however, it shows the least incidence of IIT among all the products which is 0.1 per cent in 2005. This is mainly because mineral products constitute over 80 per cent of imports from ECOWAS but exports of mineral products from Ghana to ECOWAS are negligible. Almost all these mineral products are sourced from Nigeria.

Concerning the IIT between Ghana and each of the ECOWAS trading partners, the study finds that Cote d'Ivoire has the highest prevalence. In 2010, the share of IIT in total bilateral trade between Ghana and Cote d'Ivoire was estimated at 57.6 percent. This partly confirms the theoretical assertion that larger market size measured by GDP supports IIT (Helpman, 1987). On the other hand, Cape Verde and Guinea Bissau have no IIT with Ghana implying all transactions between these countries and Ghana are exclusively inter-industry trade. Coincidentally, Cape Verde is among Ghana's least trading partners so the low IIT is expected. Distance, which constitutes transportation cost, is considered as a key contributor to the zero IIT as Cape Verde is the farthest distance from Ghana with a distance of 2,753 kilometres between Praia and Accra, the capital cities of Cape Verde and Ghana respectively.

Nigeria is the largest economy in ECOWAS and is expected to have the largest incidence of IIT with Ghana. However, the results indicate otherwise, as Nigeria is among the countries with the least incidence of IIT. This is because mineral products constitute over 80 per cent of Ghana's imports from Nigeria but exports to Nigeria are non-mineral products. Therefore, the low IIT noticed between the two countries is not surprising although it contradicts the larger country assumption by Helpman (1987).

After finding evidence of IIT, the study further examines its determinants within the ECOWAS region. This is carried out using the gravity model in a balanced panel setting.

The twelve countries that show evidence of IIT with Ghana are included in the sample. Cape Verde and Guinea Bissau are excluded from the sample because they show no evidence of IIT with Ghana from 2004 to 2010. The random effects model is used for the estimation of the parameters following the results of the Hausman test for the relative fit of the random effects and fixed effects model.

The main hypothesis being tested by this study is that ECOWAS countries with similar per capita income as Ghana will have larger intra-industry trade with Ghana. The estimation results reveal that per capita income, dissimilarity in per capita income, foreign direct investments and common language positively influences the share of IIT between Ghana and the other ECOWAS countries. However, gross domestic product and geographic distance impact negatively on intra-industry trade. The use of a common language on the other hand does not contribute to intra-industry trade according to the available data because the coefficient is not statistically significant. The study finds a positively significant value for the dissimilarity in per capita income variable contrary to a priori expectation.

6.3 Conclusions

The overall conclusion of the study is that there is evidence of intra-industry trade in total bilateral trade between Ghana and the ECOWAS trading partners. However, this type of trade is relatively low. This conclusion is based on the empirical estimation of the indices of IIT using bilateral trade data from 2004 to 2010. The Grubel_Lloyd (1975) index is the technique used for the estimation and the trade data is classified using the

six-digit level of the HS commodity classification. At the country level, Cote d'Ivoire has the largest share of IIT whereas Guinea Bissau and Cape Verde show not IIT with Ghana. Transportation industry is the sector that shows the largest incidence of intra-industry trade (94.3 per cent in 2007) with the raw minerals products recording the lowest incidence of 0.7 per cent in 2005.

The formation of ECOWAS has not stimulated enough trade among member countries as expected. Since the establishment of this trade bloc, the share of intra-ECOWAS trade to global trade still falls below 15 per cent. Inter-industry trade largely dominates trade within the region than intra-industry trade.

The determinants of IIT as estimated using the framework of the gravity model do not support the Linder (1961) hypothesis. A positive correlation is obtained for the dissimilarity in per capita income variable. Based on the negative sign obtained, this study rejects the hypothesis that similarity in per capita income stimulates IIT in bilateral trade between Ghana and the ECOWAS trading partners. However, this result is not surprising, because almost all ECOWAS countries mostly trade in manufactured goods with high-income industrialised countries rather than among themselves. The result compares favourably with that of Zantira (1999) who also obtained a positive value for dissimilarity in per capita income when he examined the determinants of IIT in total bilateral trade between Ghana and its major trading partners from 1995 to 1998.

6.4 Recommendations

The results of this study have key policy implications. First, the study indicates that IIT exists between Ghana and its ECOWAS trading partners and it is prevalent for the transportation, machinery, electrical and chemicals industries. On the bases of these findings, there is the need for the governments and the private sector to devote resources to the sectors identified, so that the gains associated with IIT can be exploited. The Ghana Investment Promotion Centre and the Ghana Export Promotion Authority should encourage investors to direct their resources to these sectors. Given that most of the sectors identified with high prevalence of IIT comprise processed and manufactured products, the government of Ghana and other ECOWAS countries must give the needed attention to strategies that promotes industrialisation.

Through industrialisation, differentiated varieties of similar products can be produced and traded simultaneously among countries. When countries trade in the same product simultaneously, the incentive for tariffs imposition by each country is low and this can foster the smooth implementation of the ECOWAS Trade Liberalisation Scheme. The positive coefficient of the per capita income variable also means that when ECOWAS countries focus on industrialised and per capita income increases, there will be an expansion in IIT. Most countries that are doing well on the global market such as China and Brazil are all focusing on rapid industrialisation.

Theoretically, the cost of adjustment is lower with intra-industry trade than with inter-industry trade. Since intra-industry trade is usually associated with trade in manufactured

products, the low level of intra-industry trade between Ghana and ECOWAS countries can be a crude indicator of the contribution of manufacturing in the ECOWAS region.

ECOWAS countries should now focus on IIT than inter-industry trade, because after pursuing inter-industry trade policies for over three decades, intraregional trade still remains low. Hence, the alternative to boosting intra-ECOWAS trade is intra-industry trade.

Secondly, this study indicates that distance significantly limit the extent of intra-industry trade between Ghana and ECOWAS countries. The geographic distance measures the effects of time and transport cost on bilateral trade flows. This is particularly so when road transport is the major mode of carting goods among ECOWAS countries. It is recommended that the road networks linking the various countries should be improved to reduce the time spent in travelling and minimise the frequent vehicular breakdowns on the roads. Air and water transportations should also be developed to provide faster, cheaper and more convenient alternatives for moving goods from one country to another in the ECOWAS region. The onerous checkpoints and road blocks at the various entry points in ECOWAS member countries should be drastically reformed to reduce cost of transportation. The possible removal of these trade barriers is important for intra-industry trade to grow among ECOWAS countries.

The elimination of real bilateral exchange rate variability is established to impact positively on IIT in this study. Subsequently, the study recommends that the West African Monetary Zone (WAMZ) countries namely Gambia, Ghana, Guinea, Nigeria, Liberia and Sierra Leone should be committed to strategies that will hasten the

introduction of the Eco as a common currency for member countries. This will help boost IIT and further integrate these economies.

Finally, trading partners should increase the foreign direct investments in the sectors identified with high incidence of IIT to increase its output, improve exports and promote simultaneous exports and imports of these similarly differentiated products among the trading partners within the sub-region. The various governments can achieve this by providing incentives to foreign national to establish subsidiaries for production and assembling of vehicles and related transport equipments in their countries.

6.5 Limitations and areas for further studies

Although this thesis has successfully achieved its aims, there are some limitations. First of all, due to difficulty in getting reliable trade data, the study is restricted only to the period 2004 to 2010. The thesis grant from the government of Ghana is inadequate thereby pushing all the cost of undertaken the study on the author. The situation is further compounded by the fact that the disbursement of research grant from AERC has been withdrawn since 2011.

The current study has established that there is evidence of intra-industry trade between Ghana and ECOWAS and this is determined by country-specific characteristics such as per capita income, foreign direct investment, market size and real bilateral exchange rate. Future studies can be extended to cover all African countries.

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APPENDICES

Appendix I: List of Ghana's trading partners in ECOWAS used in the study

Benin	Guinea	Nigeria
Burkina Faso	Guinea Bissau	Senegal
Cape Verde	Liberia	Sierra Leone
Cote d'Ivoire	Mali	Togo
Gambia, The	Niger	

Appendix II: Description of the Variables

Table 1: Descriptive statistics of the explanatory variables

Variable	Obs	Mean	Std. Dev.	Min	Max
InPCI	84	6.903719	.4630976	5.758934	7.666437
InDPCI	84	5.742326	.8897772	2.660959	6.996837
InDIST	84	6.806181	.7084017	5.141664	7.668094
InGDP	84	9.235776	1.350976	6.929761	12.73171
InBIEXCHR	84	1.177215	1.258231	-1.609438	4.041647
InTIMB	84	-.6895214	.895356	-3.912023	.0769611
InFDI	84	5.041144	1.417165	1.342865	9.054253
lang	84	.3333333	.4742358	0	1

Table 2: Correlation matrix of the variables

	InIIT	InPCI	InDPCI	InDIST	InGDP	InBIEX-R	InTIMB	InFDI	lang
InIIT	1.0000								
InPCI	-0.1105	1.0000							
InDPCI	0.1737	-0.4839	1.0000						
InDIST	0.0922	-0.0040	0.0844	1.0000					
InGDP	-0.1608	0.7458	0.0229	-0.1080	1.0000				
InBIEXCHR	0.2444	-0.1619	0.2758	-0.0634	0.0405	1.0000			
InTIMB	-0.3598	0.0129	-0.1191	-0.0438	-0.0469	-0.1776	1.0000		
InFDI	0.0931	0.3742	0.2253	0.0777	0.6900	-0.1121	-0.0799	1.0000	
lang	0.1188	-0.2285	0.2074	0.3906	-0.1948	-0.3254	0.1678	0.2343	1.0000

Table 3: Variance Inflation Factor of the variables

Variable	VIF	1/VIF
InGDP	7.20	0.138824
InPCI	6.00	0.166678
InFDI	2.97	0.336244
InDPCI	2.58	0.387302
Lang	1.88	0.531887
InBIEXCHR	1.38	0.724013
InDIST	1.32	0.759566
InTIMB	1.11	0.902969
Mean VIF	3.06	

Appendix III: Breusch-Pagan and Hausman tests

Table 1: Test between Pooled Ordinary Least Squares and random effects model estimations

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{Init}[\text{countrid}, t] = Xb + u[\text{countrid}] + e[\text{countrid}, t]$$

Estimated results:

	Var	sd = sqrt(Var)
Init	1.996066	1.412822
e	1.26958	1.126756
u	.0081857	.0904747

Test: $\text{Var}(u) = 0$

chi 2(1) = 1.32
 Prob > chi 2 = 0.2499

Table 2: Results of the Pooled Ordinary Least Squares (OLS) estimations

```
. regress Iniit Inpci Indpci Indist Ingdp Inbiexchr Intimb Infdi lang
```

Source	SS	df	MS			
Model	64.489301	8	8.06116263	Number of obs =	84	
Residual	101.184145	75	1.34912193	F(8, 75) =	5.98	
Total	165.673446	83	1.99606561	Prob > F =	0.0000	
				R-squared =	0.3893	
				Adj R-squared =	0.3241	
				Root MSE =	1.1615	

Iniit	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Inpci	2.271282	.6743328	3.37	0.001	.9279422	3.614622
Indpci	.4753755	.2302398	2.06	0.042	.0167143	.9340366
Indist	-.2416256	.206502	-1.17	0.246	-.6529987	.1697475
Ingdp	-1.129632	.2532836	-4.46	0.000	-1.634199	-.6250655
Inbiexchr	.4006561	.1190838	3.36	0.001	.163429	.6378833
Intimb	-.4840529	.1498492	-3.23	0.002	-.7825678	-.185538
Infdi	.4884926	.1551454	3.15	0.002	.1794271	.7975581
lang	.3472438	.3686231	0.94	0.349	-.3870911	1.081579
_cons	-8.749945	3.980686	-2.20	0.031	-16.67988	-.8200116

Table 3: Results of the fixed effects model estimation

```
. xtreg Iniit Inpci Indpci Indist Ingdp Inbiexchr Intimb Infdi lang, fe
note: Indist omitted because of collinearity
note: lang omitted because of collinearity
```

Fixed-effects (within) regression

Group variable: countrid	Number of obs =	84
	Number of groups =	12
R-sq: within = 0.3378	Obs per group: min =	7
between = 0.0289	avg =	7.0
overall = 0.0008	max =	7
corr(u_i, Xb) = -0.9583	F(6, 66) =	5.61
	Prob > F =	0.0001

Iniit	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Inpci	10.07772	5.523004	1.82	0.073	-.9493166	21.10475
Indpci	.254213	.3868592	0.66	0.513	-.5181764	1.026602
Indist	(omitted)					
Ingdp	-1.32283	2.889403	-0.46	0.649	-7.091708	4.446049
Inbiexchr	.5142745	.1651641	3.11	0.003	.1845138	.8440352
Intimb	-.3153531	.1682475	-1.87	0.065	-.6512699	.0205638
Infdi	.1672835	.1962323	0.85	0.397	-.224507	.5590739
lang	(omitted)					
_cons	-59.51603	21.38119	-2.78	0.007	-102.2049	-16.82712
sigma_u	3.6078996					
sigma_e	1.1267565					
rho	.9111344	(fraction of variance due to u_i)				

F test that all u_i=0: F(11, 66) = 1.25 Prob > F = 0.2760

Table 4: Results of the Random Effects Estimates without mineral products

InIIT	Coefficient	Standard Error	P-Value
InPCI	1.927	0.686	0.005***
InDPCI	0.025	0.191	0.894
InGDP	-0.121	0.176	0.491
InFDI	0.335	0.164	0.042**
InTIMB	-0.461	0.160	0.004***
InBIEXCHR	0.314	0.132	0.017**
InDIST	-0.135	0.241	0.575
LANG	0.961	0.435	0.027**
CONSTANT	0.304	2.282	0.894
Prob > chi2	=	0.000	
Number of Observations	=	84	
Rho	=	0.050	

Table 5: Results of the Fixed Effects Estimates without mineral products

InIIT	Coefficient	Standard Error	P-Value
InPCI	8.405	5.691	0.144
InDPCI	0.265	0.402	0.512
InGDP	2.547	1.695	0.138
InFDI	0.097	0.202	0.634
InTIMB	-0.310	0.173	0.077
InBIEXCHR	0.509	0.171	0.004***
InDIST	-	-	-
LANG	-	-	-
CONSTANT	-25.235	14.518	0.087
Prob > chi2		=	0.000
Number of Observations		=	84
rho		=	0.910

Table 6: Results of Random Effects Estimations without Nigeria

InIIT	Coefficient	Standard Error	P-Value
InPCI	1.917	0.745	0.010 **
InDPCI	0.439	0.234	0.060 *
InGDP	-0.746	0.484	0.123
InFDI	0.459	0.158	0.004***
InTIMB	-0.534	0.156	0.001***
InBIEXCHR	0.345	0.139	0.013**
InDIST	-0.311	0.228	0.172
LANG	0.918	0.745	0.218
CONSTANT	-9.040	-2.150	0.031
Prob > chi2	=	0.000	
Number of Observations	=	77	

Table 7: Results of the Fixed Effects estimations without Nigeria

InIIT	Coefficient	Standard Error	P-Value
InPCI	8.387	6.074	0.172
InDPCI	0.297	0.401	0.462
InGDP	-1.224	2.983	0.683
InFDI	0.175	0.205	0.396
InTIMB	-0.350	0.179	0.055
InBIEXCHR	0.513	0.171	0.004
InDIST	-	-	-
LANG	-	-	-
CONSTANT	-48.865	25.455	0.060
Prob > chi2		=	0.000
Number of Observations		=	77
rho		=	0.866

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