

**EXPORT DIVERSIFICATION AND ECONOMIC GROWTH IN
SUB-SAHARAN AFRICA**

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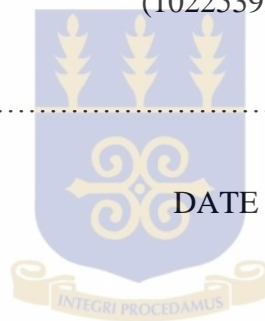
DECLARATION

I, *LOUIS SITSOFE HODEY*, hereby declare that this thesis is the original research undertaken by me under the guidance of my supervisors; and with the exception of references to other people's work which have been duly cited, this thesis has neither in part nor in whole been submitted for another degree elsewhere.

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DEDICATION

This thesis is dedicated to the Sovereign God who reigns in majesty forever and ever; to my parents, Mr. Reuben K. Hodey and Mrs. Comfort A. Hodey who defied economic logic by successfully demanding education for their children even in the absence of their ability to pay; and finally to all who have dedicated their lives to the dissemination of knowledge through teaching and research.



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ABSTRACT

Most economies in Sub-Saharan Africa (SSA) have been associated with low and volatile growth performance over the years. Export diversification is identified in the literature as growth-inducing. However, the assessment of the effect of export diversification on economic growth has not received much attention in Sub-Saharan Africa. The study provides evidence on the relationship between export diversification and economic growth using panel data of forty-two (42) Sub-Saharan African (SSA) countries for the period 1995–2010.

The study adopts the system GMM estimation technique in order to obtain consistent and efficient estimates of the effect of export diversification on economic growth. In relation to most previous empirical studies, this study accounts for time series variations in the data, captures the unobserved country-specific time-invariant effects, and also controls for endogeneity in the estimation model.

The estimation results attest to a positive effect of export diversification on economic growth. Evidence from the regressions does not support a hump-shaped relationship between export diversification and economic growth in SSA. The study further shows that other control variables such as gross fixed capital formation, human capital, and foreign direct investment are significant positive determinants of economic growth in SSA. Population growth rate on the other hand is found to have a negative significant effect on economic growth in SSA.

It is recommended that governments in SSA should promote export diversification together with investment in human and physical capital, keep population growth under control, and pursue policies that will attract foreign direct investment into growth-enhancing productive sectors of their economies.

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ACRONYMS

ADI	African Development Indicators
CDI	Critical Diversification Index
EC	Export Concentration
ECI	Export Concentration Index
ED	Export Diversification
EDI	Export Diversification Index
EDUMMY	Dummy for East Africa countries
FDI	Foreign Direct Investment
FE	Fixed Effects
GDP	Gross Domestic Product
GLS	Generalised Least Squares
GMM	Generalised Method of Moments
HHI	Hirschman–Herfindahl Index
IMF	International Monetary Fund
IV	Instrumental Variable
MDUMMY	Dummy for Middle (Central) Africa countries
OLS	Ordinary Least Squares
RE	Random Effects
SDUMMY	Dummy for Southern Africa countries
WDI	World Development Index
WDUMMY	Dummy for West Africa Countries

CHAPTER ONE

INTRODUCTION

1.1 Background

Growth is central to the study of economics and has been a major subject of concern for nations and economists all over the world. The idea that export diversification (ED) induces economic growth is not alien to the development economics literature. In a general sense, export diversification may be seen as a change in the composition of the existing export structure of an economy. Dennis and Shepherd (2007) look at export diversification as a process of widening the range of products that a country exports. It may also be referred to as the spread of a country's production and exports over many sectors (Samen, 2010). Two main types of export diversification are identified in the literature. These are horizontal export diversification and vertical export diversification. Horizontal export diversification is defined as the process of increasing the number of export products of a country by diversifying into goods within the same broad category of commodities (meaning that it takes place within the same sector by introducing new export products to an existing export basket in the same sector); while vertical export diversification is seen as a process of shifting from the export of primary commodities to the export of manufactured products (Agosin, 2007).

The idea that the degree of specialisation (concentration) and diversification of the production and trade structure of a country matters for its economic development is one of the earliest discoveries in the economic development literature (Naudé and Rossouw, 2008).

There have been several debates in the literature in relation to whether developing countries should diversify their exports as a means of attaining higher economic growth or on the contrary, specialise in order to enjoy gains from comparative advantage. The work of classical trade theorists, notably Adam Smith and David Ricardo emphasised the role of specialisation for economic development. This idea is also largely favoured by neoclassical economists.

Export diversification came to light in the literature through the widely cited works of Prebisch (1950) and Singer (1950) who question the pro-free trade views mainly held by the classical trade theorists and argue that because of the tendency of the terms-of-trade between primary and manufactured products to decline over time, specialisation is not in the best economic interest of developing countries. This is because developing countries largely depend on the production and export of primary commodities. It is further observed that specialisation mainly around primary commodities exposes countries to adverse external shocks, resulting in deteriorating terms-of-trade which subsequently slows down growth (Hesse, 2008). Hausmann and Klinger (2007) established that a country's export pattern is a good predictor of its future growth. They further stipulate that for a country to become rich, it needs to export "rich country" exports. This means that for developing countries to attain the income level of developed countries, they must diversify their exports from primary to manufactured goods which are largely considered as "rich country" exports.

The contribution of export diversification to economic growth has therefore assumed a central stage in the development literature and has intrigued researchers over the past six decades. Lederman and Maloney (2003) identify export diversification as a promoter of economic growth in developing countries. According to Yokoyama and Alemu (2009),

export diversification can be seen as a process of widening comparative advantage which is essential to economic growth. Countries like South Korea, Taiwan, Mauritius, Finland, China, and Chile are said to have attained high economic growth rates largely as a result of export diversification (Agosin, 2007).

Diversification into new primary export products or manufactured goods is generally viewed as a positive development. Its benefits include higher and more stable export earnings, job creation and learning effects, and the development of new skills and infrastructure that would facilitate the development or discovery of new export products (Osakwe, 2007).

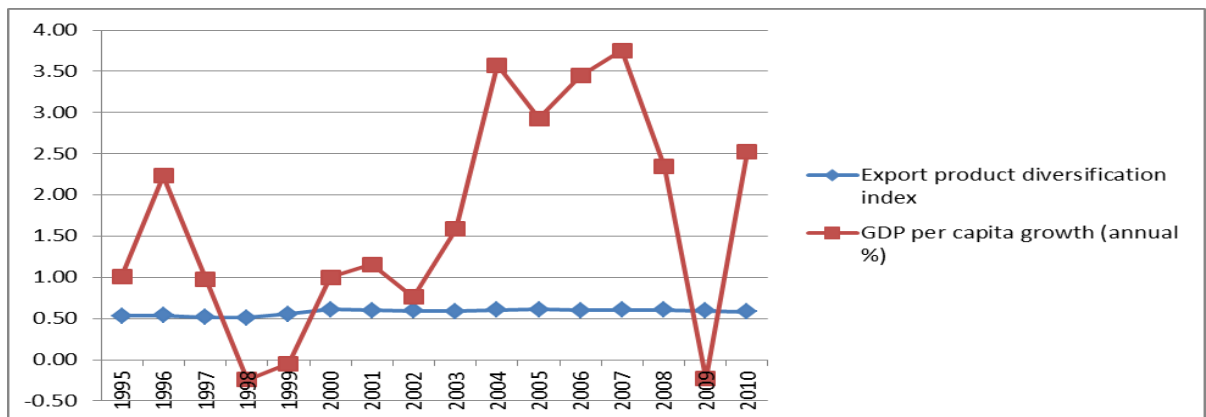
Notwithstanding the foregoing observations, the assessment of the effect of export diversification on economic growth in Sub-Saharan Africa (SSA) has not received much attention. This study therefore seeks to explore the relationship between export diversification and economic growth in SSA.

The Sub-Saharan Africa (SSA) region consists of forty-eight (48) African countries geographically lying in the south of the Sahara. It covers a total land area of 23,638,000 square kilometres and has an estimated population of 841 million people with an annual average population growth rate of 2.5 percent for the period 1995–2010. In the same period, the region's annual GDP per capita growth rate ranged between –0.2 and 3.8 percent (World Bank, 2012).

1.2 Problem Statement

Most Sub-Saharan Africa countries are associated with the problem of low and volatile growth in the face of high incidence of poverty over the years. Poverty is essentially not a good in a nation's commodity basket; and which according to Hesse (2008), cannot be reduced in isolation of economic growth. The idea has been that export diversification can lead to higher growth. But this assertion over the years has largely remained theoretical since empirical literature explaining the amount of growth that could be induced by export diversification is sparse, especially in the case of SSA.

It is observed from the literature that the export baskets of high income countries contain high value-chain commodities whilst that of low income countries; especially those in SSA largely produce and export primary goods which are very low value-added products (Yokoyama and Alemu, 2009). Economic theory suggests that relative to manufactured products, agricultural (primary) commodity prices are prone to inherent world market volatilities (Osakwe, 2007). Also, the emergence of synthetic substitutes over the years has further deepened the woes of the exporters of primary products by displacing them as intermediate inputs (Yokoyama and Alemu, 2009). Following in a similar analogy, Pinaud and Wegner (2004) observed that the economies of Africa still lack the necessary "shock absorbers" to withstand internal and external shocks. The point may therefore be advanced that Africa's efforts at climbing the economic heights have partly been crippled by high dependence on a few primary export commodities. In effect, SSA has over the years been considered the poorest region in the world and the only region where economies are stagnating; half of its population live on less than one dollar a day; and life expectancy is falling (Yokoyama and Alemu, 2009).

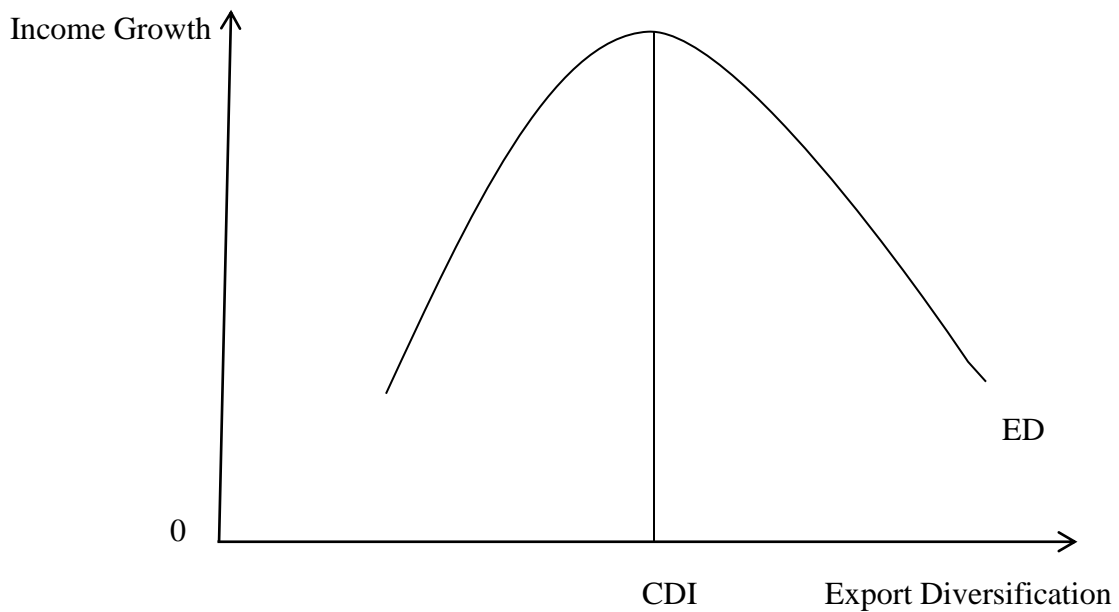
Figure 1: Evolution of Real GDP per Capita Growth and EDI in SSA, 1995–2010

Source: World Bank, World Development Indicators Online, 2012.

It is observed from Figure 1 that SSA as a whole has not significantly diversified its exports over the period under review. GDP per capita growth rate has also been fluctuating, attaining negative values in 1998, 1999 and 2009. The point is made that the growth experiences of many developing countries, especially those in East Asia are associated with export diversification (Yokoyama and Alemu, 2009). The observation regarding SSA is that the economies in the region recorded low growth rates over the years but are yet to significantly diversify their exports. The question that therefore arises is whether export diversification in SSA would bring about economic growth as it did for East Asia.

Further, the available theoretical and empirical literature largely suggests a hump-shaped relationship between export diversification and growth (see Imbs and Wacziarg, 2003; Aditya and Roy, 2007; Hesse, 2008); meaning that export diversification would promote economic growth to a point beyond which it would slow down growth. The point beyond which export diversification slows the pace of growth is referred to as the Critical Diversification Index (CDI).

Figure 2: The Hump-shaped Relationship between ED and Economic Growth



Interestingly, most of the empirical literature on export diversification and growth in SSA has not considered testing the hump-shaped relationship; hence the critical diversification index (CDI) for SSA remains unknown. Knowledge of the CDI for SSA is essential because it would help determine appropriate policy prescriptions regarding export diversification. This therefore necessitates further empirical work on SSA in this area of study and this current study follows in that direction.

1.3 Research Questions

The study seeks to provide answers to the following questions:

- What is the effect of export diversification on economic growth in SSA?

- Does a hump-shaped relationship exist between export diversification and economic growth in SSA?
- What is the Critical Diversification Index (CDI) for SSA if a hump-shaped relationship exists between export diversification and economic growth?

1.4 Research Objectives

The general objective of the study is to empirically investigate the relationship between export diversification and economic growth in Sub-Saharan Africa. The specific research objectives of the study are to:

- Examine the effect of export diversification on economic growth in SSA;
- Test the hypothesis of a hump-shaped relationship between export diversification and economic growth for SSA.
- Compute the Critical Diversification Index (CDI) for SSA if a hump-shaped relationship exists between export diversification and economic growth.

1.5 Significance of the Study

Poor growth performance has been one of the major problems confronting most SSA countries over the years (Yokoyama and Alemu, 2009). This phenomenon has caught the attention of researchers who sought to explain the possible reasons for the rather dismal economic performance of SSA countries over the years. Prominent among the various contributing factors is the concentration of African economies on the export of a few

traditional primary exports which are highly sensitive to international price fluctuations (Osakwe, 2007).

The point is made that dependence on a narrow range of exports results in risks associated with the lack of diversification; thereby increasing a country's vulnerability to international economic shocks. Export diversification aims at mitigating these risks, including the volatility and instability in export earnings which subsequently exert adverse macroeconomic effects on growth, employment, investment planning, export capacity, foreign exchange reserves, inflation, capital flight and debt repayment (Samen, 2010). This is because according to the United Nations (2012), the world economy is entering a period full of uncertainties and challenges hence African economies must vigorously pursue structural transformation in order to ensure sustained growth, create jobs and reduce vulnerability to external shocks. This study attempts to inquire if export diversification is worth considering in this structural transformation process.

In addition, economic theory seems to suggest that export diversification policies may lead to faster economic growth; but whether such a relationship exists in reality still remains an empirical issue. A plethora of empirical studies have been undertaken in this context over the past decade (see *inter alia* Al-Marhubi, 2000; Herzer and Nowak-Lehman, 2006; Agosin 2007; Lederman and Maloney, 2007, Imbs and Wacziarg, 2003; Klinger and Lederman, 2005; Aditya and Roy, 2007; Hesse, 2008; Yokoyama and Alemu, 2009). However, the findings of these studies are not conclusive on the “export diversification – economic growth” nexus, thereby calling for further research in the field. The point is that while some studies find a monotonic relationship between export diversification and growth, others provide evidence of a non-monotonic relationship.

This study contributes to the existing literature by examining the link between export diversification and economic growth in SSA. It also seeks to test the hump-shaped relationship between ED and economic growth; and if such a relation exists, compute the critical diversification index for SSA.

Furthermore, the previous studies do not control for the diversity in the economic performance of the various regional blocks in SSA. The study acknowledges these differences and therefore introduces regional dummies for West, South, East and Central African countries. The study also uses very recent data on export diversification for forty-two (42) SSA countries for the period 1995–2010 in its analysis.

1.6 Scope and Source of Data for the Study

The study uses panel data on forty-two (42) SSA countries¹ for the period 1995–2010 for which consistently sufficient data are available. The study could not cover all the forty-eight (48) countries in SSA due to unavailability of consistent data for six countries. Data for all variables used for the analysis are extracted from the World Bank's World Development Indicators (WDI) Online Database, 2012.

1.7 Overview of Chapters

The study has six (6) chapters. This introductory chapter is followed by chapter two, which is dedicated to an overview of GDP per capita growth and its determinants in SSA. A review of the theoretical and empirical literature on the relationship between export diversification and

¹ See Appendix I for the list of the countries in the study classified in their various regional groupings.

economic growth is provided in chapter three. The fourth chapter presents the methodology and the empirical model adopted by the study. Empirical results are presented and discussed in chapter five. The summary, conclusions and policy recommendations emerging from the study are presented in chapter six.

CHAPTER TWO

OVERVIEW

2.1 Introduction

This chapter provides a trend analysis of the variables under study for the period 1995–2010 in SSA. The next section analyses the GDP per capita growth performance of the region, followed by a discussion of the performance of the region in terms of export diversification in Section 2.3. In Sections 2.4, 2.5, 2.6 and 2.7, a trend analysis of population growth, FDI, gross fixed capital formation, and gross secondary school enrolment are respectively provided for SSA for the period under review.

2.2 GDP per Capita Growth

The growth performance of SSA countries has been very low and volatile over the years. SSA countries have also been associated with the age old stories of extreme poverty over the years. Elsewhere, the African continent which is composed mainly of SSA countries earned the accolade: “the dark continent”. This has been the picture of the region. However, since attaining independence in the 1950s and 60s, most SSA countries made some significant economic strides raising hopes for better economic performance in subsequent years. But this performance was short-lived; and as a result, the 1970s and 80s have been rightly christened: “the lost decades” of the region.

Most countries in the region adopted the Economic Recovery Programme initiated by the World Bank and IMF in the 1980s under the umbrella of the Washington Consensus to

reverse the worsening economic trends of countries in the region. The recovery process has been very slow, raising doubts about the efficacy of the ERP, with severe criticisms against the World Bank and IMF from many researchers especially from the sub-region. Economic performance of the region in recent times especially since the early 2000s has been quite positive. However, according to the World Bank (2013), though the economic prospects for Sub-Saharan Africa looks quite strong, growth in the region is still vulnerable to sharp declines in commodity prices.

Table 2.1: Sub-regional Growth and Export Diversification Performance, 1995–2010

Variable	East Africa	Middle Africa	Southern Africa	West Africa	SSA
Real GDP per capita (Constant US\$)	1,489.01	1,182.03	1,896.73	588.95	1,452.29
Real GDP per capita growth (annual %)	4.4	2.3	2.2	2.4	4.96
Export diversification index	0.80	0.76	0.76	0.78	0.77

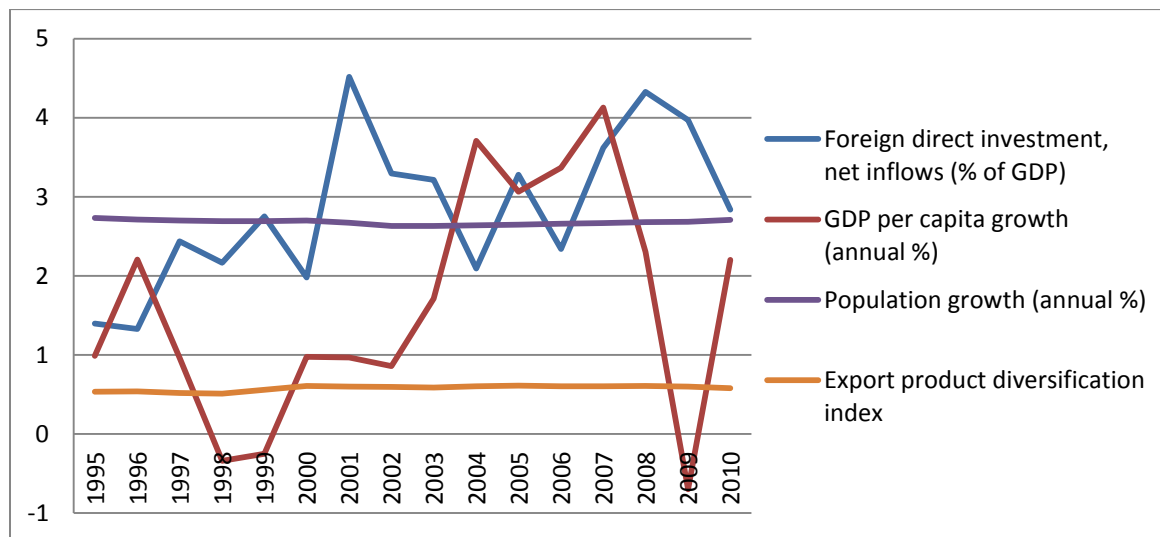
Source: Author's Computation Using STATA 12.

Aside the fact that the GDP per capita of the region on aggregate has not been quite impressive, there has also been wide disparity gaps between countries to the extent that the GDP per capita of the richest SSA country is 83 times larger than that of the poorest (World Bank, 2012).

2.3 Export Diversification

From Figure 2, we observe that growth in per capita GDP has been volatile between 1995 and 2010. Among others, the volatile growth trend has been partly attributed to the reliance of the region on primary products for export earnings (Osakwe, 2007). The ability of a diversified export base to reduce the volatility in export earnings and for that matter smoothen economic growth is not a recent discovery (see *inter alia* Presbisch, 1950; Singer 1950; and Hesse, 2008). However, export diversification has improved much in SSA over the years; and according to the World Bank (2012), in 21 percent of SSA countries, one or two products accounts for at least 75 percent of total exports. From Figure 2, we observe that the index of export diversification has not experienced any significant change during the period under review.

Figure 3: Trend of FDI, GDP per Capita Growth, ED and Population Growth in SSA, 1995–2010



Source: Author's computation from World Bank's WDI Database (2012)

2.4 Population Growth

Over the period under review, the population growth rate of the region has not changed significantly. The average population growth rate of the region remained about 2.7 percent during the period. It is observed from Figure 2 that for the bulk of the period under review, the population growth rate far exceeds the GDP per capita growth rate. The implication of this is that standard of living would be worsening.

2.5 Foreign Direct Investment

Though FDI inflows into the region largely follow an upward trend over the years, inflows into the region have been considered low compared to some other developing regions of the world. For instance, Latin America and Caribbean recorded 3.0 percent as compared to 2.9 percent on average for SSA during the period under review (see Table 2.2). This is evident in the region for instance recording 1.8 percent as compared to 16.2 percent for East Asia in 2005 (Yokoyama and Alemu, 2009). FDI inflows into the region are not only low; they also exhibit certain geographical and sectoral biases. FDI inflows usually move to natural resource-rich countries such as South Africa, Nigeria, Angola, and Sudan; and the natural resource sector, especially the mineral-extracting industry remains the largest recipient of FDI inflows into the region (Alemu and Yokoyama, 2009). It has been argued time and again that FDI into such sectors of the economic is followed by capital flight after the mining operations. This notwithstanding, FDI inflows as a percentage of GDP has followed an increasing trend over the period under discussion; from about 1.4 percent of GDP in 1995, it attained a peak of about 4.5 percent in 2001 before slightly falling to about 2.8 percent in 2010.

Table 2.2: Selected Macroeconomic Variables in Various Regions of the World, 1995–2010

Region	Enrolment secondary (% gross)	FDI, net inflows (% of GDP)	GDP/capita (constant 2005 US\$)	GDP/capita growth (annual %)	Gross fixed capital formation (% GDP)
East Asia & Pacific	67.4	1.9	4,469.53	2.8	27.7
Europe & Central Asia	95.3	3.4	17,359.82	1.9	20.0
Latin America & Caribbean	83.6	3.0	4,873.83	1.6	18.9
Middle East & North Africa	70.5	2.2	4,034.26	2.3	21.7
North America	96.0	1.8	39,130.78	1.5	18.5
South Asia	47.7	1.3	647.38	4.9	25.6
Sub-Saharan Africa	30.1	2.9	834.35	1.6	18.6
World	62.8	2.5	6,733.87	1.5	21.4

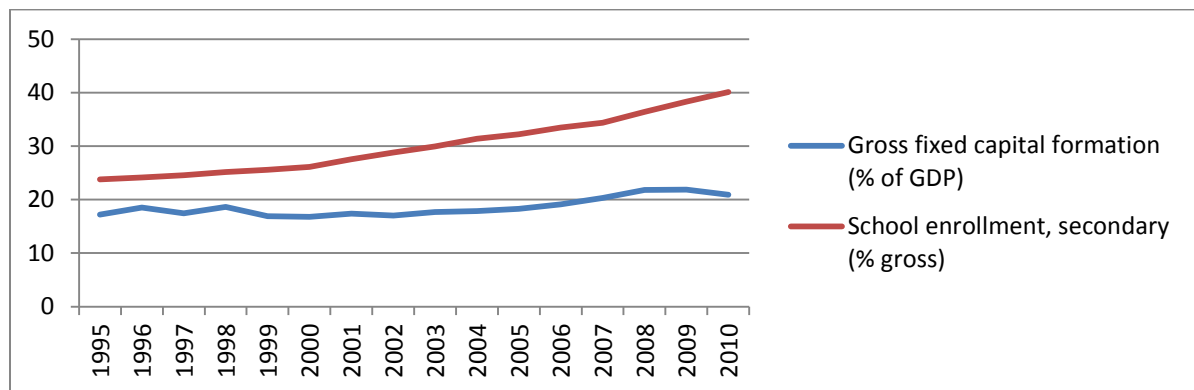
Source: Computed from World Bank WDI Database, 2012.

2.6 Gross Fixed Capital Formation

Insufficient resource mobilisation and low level of capital formation have been characteristic of most SSA countries over the years. This phenomenon continues to impede investment and productivity in their economies. Empirical evidence and international comparisons indicate that gross fixed capital formation in SSA is very low. Though gross fixed capital formation has been increasing for the region during the period under review (see Figure 3), From Table 2.1, the region's level of capital formation (18.6 percent) is still low as compared to other developing regions of the world such as East Asia and Pacific (27.7 percent), South Asia (25.6 percent), Latin America and Caribbean (18.9 percent). Also, the level of capital formation of the region falls below the world average for the period under review. This is a major concern because private investment has been considered as having great growth-inducing effect than government investment because of its close association with efficiency and corruption (Hernandez-Cata, 2000). Again this is a major concern because the official

development assistant which is a major source of funding for the bulk of public sector investments in the SSA region has been on the decline in recent years (World Bank, 2012). Low capital formation may therefore imply low domestic investment which may consequently result in low productivity and growth.

Figure 4: Trend of Gross Fixed Capital Formation and School Enrolment for SSA, 1995–2000



Source: Author's computation from World Bank's WDI Database (2012)

2.7 Gross Secondary School Enrolment

Gross Secondary School Enrolment which has been used severally employed in the literature as a measure of human capital has improved remarkably over the period under review, rising from 23.8 percent in 1995 to 40.1 percent in 2010. However, in comparison to other developing regions of the world, SSA recorded the lowest average enrolment rate of 30.1 among all the other regions, falling far below the world average of 62.8 over the period (see Table 2.2). Since education is an essential element of human capital accumulation, low level of enrolment may therefore imply that the human capital accumulation may also be low (Mankiw *et al*, 1992).

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter of the study provides theoretical and empirical underpinnings in support of the study. Literature is reviewed on the theories and empirical works that provide explanations as to why export diversification may result in the acceleration in economic growth. This chapter has two main sections. The next section presents a review of the theoretical literature, while Section 2.3 is dedicated to the review of the empirical literature. The chapter intends to identify the gaps in the existing literature and establish the essence and contribution of this current study.

3.2 Theoretical Literature

First of all, it must be noted that though the benefits of a diversified export base is well-pronounced in the literature, there exists no unified theoretical framework explaining the driving forces of export diversification at the macroeconomic level (Bebczuk and Berrettoni, 2006).

Judging from the various ideological perspectives on trade in the literature, export diversification and specialisation (concentration) appear to represent two different views on trade. Classical trade theories favour the view that countries should specialise in the production and export of commodities in which they have comparative advantage. This is supported by the point that by specialising in production and exports, resource allocation will

be more efficient and each country will increase its welfare and growth. Critics of this view are of the opinion that by specialising and exporting a relatively small number of products, countries, especially those with low incomes may increase their degree of vulnerability to external shocks. Policymakers must therefore adopt strategies to handle the trade-off between efficiency and vulnerability. This vulnerability is considered to be very severe for economies that have comparative advantage in the production and export of primary products (Osakwe, 2007).

Furthermore, it has been pointed out that the prediction of the classical trade theories that specialisation is efficient hinges partly on the assumption that there exists no uncertainty in production and exports of commodities (Osakwe, 2007). Evidence is available in the literature to the effect that in the presence of uncertainty and risk aversion, diversification may prove a better policy option than specialisation (Turnovsky, 1974; Ruffin, 1974). This is because in most developing countries, majority of people live in rural communities, with imperfect and underdeveloped financial markets, and access to borrowing is limited (Osakwe, 2007). According to the World Bank (2011), 48 percent of the world's population live in rural areas; 64 percent and 69 percent of the population of SSA and South Asia respectively live in rural areas. Diversification therefore serves as a mechanism to cushion agents against income fluctuations in such rural economies associated with market imperfections and unavailable social safety nets. For these reasons, notwithstanding the theoretical arguments for specialisation from comparative advantage, policymakers in developing countries may consider diversification of their production and export structure as a means of minimising the vulnerability of their economies to external shocks.

Yokoyama and Alemu (2009) see export diversification as a means of widening a country's comparative advantage and further present three main theoretical arguments that may be considered in explaining the possible reasons why export diversification may positively affect economic growth. These are the traditional argument, the endogenous growth theory, and the structural models of economic development. These are subsequently discussed as follows.

The traditional argument is of the view that less developed countries are exporters of a limited number of primary products which are highly vulnerable to international market demand. The instability in their export demand results in unstable export earnings, and since most developing countries depend to a very large extent on export earnings for income, growth in national income also becomes volatile. The point is that diversification of a country's export portfolio has the ability to smoothen export earnings in the face of unstable world market conditions, thereby ensuring stability in income earnings. It has been argued that in the absence of export diversification, developing countries are highly likely to experience foreign exchange and balance of payments instability, which have negative implications for debt servicing, economic management and investment planning (Osakwe, 2007). These implications consequently create uncertainty in the macroeconomic front, thereby discouraging domestic investment, especially for risk-averse investors (Ali *et al*, 1991). For this reason, a more diversified export mix may enhance economic stability and growth of countries. Export diversification has therefore been projected for its ability to avert the problem of unstable foreign demand and thereby shielding developing countries from its detrimental economic consequences.

From the perspective of the endogenous growth theory, aside the ability of export diversification to smoothen export earnings, it also has the capacity to bring about benefits in terms of new comparative advantage associated with the diversification of a country's production structure. It is considered to widen the comparative advantage of developing countries from a few primary production sectors to higher value production sectors which may result in better allocation of productive resources. The argument is further forwarded that through backward and forward linkages, new industries will be created through diversification of the production structure. Export diversification generates new production technologies and management efficiencies through international competition, thereby leading to increasing returns to scale and spillover effects which ultimately affect growth in the long-run. In effect, export diversification enables countries to benefit from dynamic gains from trade as it leads to an expansion in the production possibility frontier of the exporting economy.

The structural models of economic growth indicate that in order to attain meaningful sustainable growth, export diversification policies should be targeted at moving away from primary commodities towards manufactured goods. This is likely to generate backward and forward linkages which are capable of creating new industries and expanding existing ones (Chenery, 1979; Syrquin, 1989). The structural argument seems to suggest that vertical export diversification possesses greater ability to impact growth as compared to horizontal export diversification. This suggests that the content rather than the number of products in a country's export basket is very essential to its economic prosperity.

Following Yokoyama and Alemu (2009), the means by which export diversification may influence a country's national income or growth may be summarised in five (5) essential

points as follows. First of all, since export diversification generates spillover effects in an economy, it may be considered as a production catalyst (a production factor) that increases the productivity of the other factors of production (Romer, 1990). Secondly, export diversification may increase income by expanding the possibilities to spread investment risks over a wider portfolio of economic sectors. Thirdly, export diversification is considered as a component of Total Factor Productivity (TFP) and is expected to exert positive impact on TFP growth, thereby promoting economic growth. TFP has been identified as the single most influential factor affecting the growth of SSA countries (Fosu, 2012). Fourthly, export diversification may also have a positive effect on growth because of the existence of economies of scope in production. This exists when a given level of inputs generates greater inputs per unit profits when spread across many outputs than when dedicated to any one output. Finally, through forward and backward linkages, production of a diversified export structure is also likely to induce the creation of new industries and expansion of existing ones in the economy.

Notwithstanding the various arguments and the theoretical explanations forwarded for the channel through which export diversification translates into growth, the evidence as to whether export diversification impacts growth for countries and regions of the world remains an empirical issue. The next section provides a review of the recent and relevant empirical literature available on the diversification–growth nexus.

3.3 Empirical Literature

The literature over the years seeks to establish a link between export diversification and economic growth through cross-country, regional, country-level and firm-level studies. The findings of the available studies are however mixed as some find a monotonic relationship between export diversification and economic growth while others find a non-monotonic relationship. Even with those that find a monotonic relationship, there seems to be ambiguity regarding the effect of export diversification on growth; as some find a positive effect (see *inter alia* Al-Marhubi, 2000; Herzer and Nowak-Lehman, 2006; Agosin 2007; Lederman and Maloney, 2007) while others find a negative effect (see Guiterez de Pineres and Ferrantino, 2000).

Though the theoretical and empirical literature largely points to a positive relationship between export diversification and growth, there exists literature (using cross-country and regional data) suggesting that some countries gain from export concentration while others benefit from export diversification. This mixed evidence was first introduced into the literature by Imbs and Wacziarg (2003) who provide theoretical and empirical proof of a U-shaped relationship between export concentration and economic growth. The paper shows that countries first diversify by spreading economic activity more equally across sectors, but there exists a point in the development process at which they start specialising again. Using a wide panel of countries, the paper informs the theoretical debate about the evolution of sectoral diversification across time and across countries. The empirical results show a non-monotonic relationship between export diversification and per capita income; implying that as poor countries begin to diversify, it is not until they attain relatively high levels of income per capita that incentives to specialise become relevant to their economic growth. The

evidence of a non-monotonic (hump-shaped) relationship means that export diversification is associated with production in the early stages of a country's development; and then turns to specialisation as the country attains higher income per capita of about US\$25,000 GDP per capita in PPP.

This finding is a departure from the monotonic relationship predicted by existing trade and growth theories between income growth and export diversification; and therefore generated much interest in the literature, resulting in similar studies among others as Klinger and Lederman (2006), Cabellero and Cowan (2006), Hesse (2008), and Cadot *et al* (2009) which use different data periods and methodologies but find evidence in support of the non-monotonic relationship between export diversification and growth in per capita income. Hesse (2008) for instance, estimating an augmented Solow growth model using the system GMM estimator for a sample of ninety-nine (99) countries finds some evidence of a non-monotonic relationship. Klinger and Lederman (2006) also show that the exports of countries evolve in a manner similar to that of domestic production and reveal that the per capita income level beyond which export concentration will benefit a country is about US\$25,000; implying that low income countries will benefit from export diversification while advanced countries benefit from export concentration. Similar results emerged from the study by Cadot *et al* (2009), who use data of a hundred and fifty-six (156) countries over nineteen (19) years and find a hump-shaped relationship between economic development and export diversification. However, Cadot *et al* (2009), unlike Klinger and Lederman (2006), and Imbs and Wacziarg (2003), find the turning point at which export specialisation will benefit a country to be about \$22,000 GDP per capita at purchasing power parity (PPP). The implication of the non-linear relationship is that as poor countries begin to diversify, it is not

until they attain relatively high levels of income per capita that incentives to specialise become relevant to their economic growth. It is therefore concluded that developing countries would benefit from export diversification and developed countries would benefit from export concentration. The problem with these studies is that conclusions are drawn for all developing regions lumped together; without taking into account the specific developmental challenges of the various developing regions of the world. It is in this consideration that this current study specifically aims at assessing the relationship between export diversification and economic growth in SSA.

Aside the literature suggesting a hump-shaped relationship between export diversification and growth, other studies provide evidence of a positive monotonic relationship. This evidence is widely established across country-specific, regional and cross-country findings using diverse methodological approaches.

First of all, a widely cited work in the literature, Al-Marhubi (2000), using a cross-country sample of ninety-one (91) countries for the period 1961–1988, finds evidence across different model specifications and different measures of export diversification that export diversification leads to faster growth. A major drawback of this paper is that it fails to test the hypothesis of non-monotonic relationship between ED and growth which was found to be significant in similar cross-country studies such as Imbs and Wacziarg (2003), Hesse (2008) and Cadot *et al* (2009). Other cross-country studies such as Herzer and Nowak-Lehman (2006); Agosin (2007); and Lederman and Maloney (2007) provide evidence of a positive effect of export diversification on economic growth but fail to account for the non-monotonic relationship between export diversification and economic growth. The non-monotonic hypothesis is very essential in cross-country studies as it provides an idea about

whether countries are likely to benefit from export diversification or export specialisation (concentration). Failure to test this hypothesis may lead to misleading policy prescriptions. For instance, if there is evidence of a non-monotonic relationship which is not accounted for, a country that should benefit from export specialisation may embark on an export diversification policy which may result in declining economic growth rates. This current study considers the non-monotonic hypothesis in its analysis so as to establish a clear export diversification policy prescription for countries in Sub-Saharan Africa.

The literature on export diversification and growth is not limited to cross-country studies; it also extends to some regional and specific country studies. For instance, Herzer and Nowak-Lehmann (2006) analyses the diversification and growth experience of Chile, establishing a positive effect of diversification on growth. Naudé and Rossouw (2008) find evidence of a U-shaped relationship between GDP per capita and export specialisation for the period 1962–2000 in South Africa using a Computable General Equilibrium Framework; providing further evidence in the same study that export diversification Granger causes GDP per capita. Contrary to the findings of Herzer and Nowak-Lehmann (2006) and Naudé and Rossouw (2008), Guiterez de Pineres and Ferrantino (2000) earlier in their study rejected the hypothesis that export diversification promotes economic growth. Using time series analysis for Chile and Colombia, they find a negative relationship between export diversification and growth. However, Herzer and Nowak-Lehmann (2006), in a critique to the work of Guiterez de Pineres and Ferrantino (2000) reveal many flaws in their methodological approach; to the extent that standard time series statistical tests as cointegration, normality, heteroscedasticity and autocorrelation tests were not conducted. The statistical integrity of the findings of Guiterez de Pineres and Ferrantino (2000) is therefore in question. Many other specific

country studies are in conformity with the findings of Herzer and Nowak-Lehmann (2006) by producing evidence of a positive relationship between export diversification and economic growth (see Agosin 1999, Arip *et al*, 2010).

Notwithstanding the relatively vast number of studies in the field of export diversification and growth, only a handful of studies specifically attempt to test the diversification–growth hypothesis for Sub–Saharan Africa (see Yokoyama and Alemu, 2009; Songwe and Winkler, 2012; Cabral and Veiga, 2012). Yokoyama and Alemu (2009) examine the effects of export diversification on growth in SSA in comparison to East Asia. Using a panel data of forty–one (41) countries from SSA (9 countries) and East Asia (32 countries) for the period 1975–2004, the paper empirically investigates the separate effects of vertical and horizontal export diversification on economic growth. The study shows that East Asian countries have been successful in diversifying their exports; whereas diversification attempts of SSA were weak and its contribution to growth and structural change on the economy was largely insignificant. The study also reveals that though horizontal diversification positively affects growth, its contribution is inferior as compared to vertical diversification for economic growth. The reason is forwarded that whilst vertical diversification focuses on growth and possesses strong dynamic spillover effects on an economy, horizontal diversification aims at economic stability, with minimal spillover effects and is therefore not very impressive at promoting economic growth. The paper therefore challenges the recommendations of certain researchers that African countries should increase their primary export base. The paper argued that SSA should rather promote vertical diversification through the production of value–added goods which provide forward and backward production linkages, and therefore

results in the creation of sufficient levels of human and physical capital, infrastructure, appropriate policies and strong institutions.

Though the study by Yokoyama and Alemu (2009) is intensive and widely cited in the literature, the paper did not test the non-monotonic relationship between export diversification and economic growth in SSA and East Asia. This current study fills that gap by testing the hypothesis of a non-monotonic relationship between export diversification and economic growth. It also includes dummies for the various regional blocks of SSA so as to capture the specific effects of export diversification on economic growth for the various sub-regions.

Generally, a survey of the available empirical literature shows that whilst some studies indicate a positive monotonic relationship between export diversification and economic growth (Al-Marhubi, 2000; Herzer and Nowak-Lehman, 2006; Agosin 2007; Lederman and Maloney, 2007), others reveal a non-monotonic (hump-shaped) relationship between export diversification and economic growth (Imbs and Wacziarg, 2003; Klinger and Lederman, 2006; Aditya and Roy, 2007; Hesse, 2008). These studies largely use datasets for different time periods and regions across different methodologies. There seems to be mixed evidence in the empirical literature regarding the specific functional relationship between export diversification and growth; which calls for further studies in the field. This study contributes to the literature by investigating this relationship in the context of SSA since the functional relationship between export diversification and growth matters for policy.

3.4 Concluding Remarks

While some empirical studies provide evidence of a positive monotonic relationship between export diversification and economic growth, others find a negative relationship while others also find a non-monotonic relationship. This obvious ambiguity in the empirical literature regarding the functional relationship between export diversification and economic growth necessitates further research in the field to provide new evidence using recent data. The study therefore aims at providing further evidence on the relationship between export diversification and economic growth in SSA. The next chapter of the study provides a discussion of the methodology that would be employed in determining the relationship between export diversification and economic growth in SSA.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter discusses the theoretical framework and statistical techniques employed in determining the relationship between export diversification and economic growth. This chapter has seven (7) sections. The theoretical framework is discussed in the next section. Section 4.3 discusses the explanatory variables and data sources, followed by the model for empirical estimation in Section 4.4. The estimation technique employed is discussed in Section 4.5. In Section 4.6, some diagnostic tests on the model are discussed, followed by the chapter conclusion in the Section 4.7.

4.2 Description of Variables and Data Sources

Economic theory and existing empirical studies inform the choice of the explanatory variables for the study. The study includes the following explanatory variables which are considered as essential for economic growth in SSA. The variables are: Initial Real GDP per Capita, Human Capital, Physical Capital, Population Growth, Foreign Direct Investment (FDI), Export Diversification, Export Diversification Squared, Regional Dummies and Interacted Variables of Export Diversification with the Regional Dummies. These variables are discussed in the ensuing paragraphs with focus on their expected relationship with Real GDP per Capita growth and their proxies. Data on all the variables are sourced from the World Development Indicators (WDI) Online Database of the World Bank, 2012.

Initial Real GDP per Capita: In a dynamic panel model, the coefficient of the lagged dependent variable measures the speed of adjustment of the dependent variable. A good reason for introducing this variable as a regressor is to control for specification bias and also account for the persistence in real GDP per capita growth over time. It is expected from the theory of convergence that the coefficient of this variable would be negative. The first lag of real GDP per capita is used as a proxy for initial GDP per capita.

Human Capital: Mincer (1981) posits that national income growth is affected by human capital in the same way as accumulation of personal human capital yields individual income (economic) growth. He further argues that the contribution of human capital to growth far outweighs that of physical capital. He considers human capital as both “a condition and consequence of growth”. The point is also made that human capital goes beyond the accumulation of existing knowledge to the creation of new knowledge which is the bedrock of innovation and technological change; ultimately resulting in increased productivity and economic growth. As Mincer (1981) puts it, the benefit accruing from the new knowledge generated by human capital is not limited to the domestic country alone, but spills over to the entire world, leading to global economic growth. It is widely accepted in the literature that human capital stock contributes positively to economic growth. According to Yokoyama and Alemu (2009), developing human capital within an economy should be seen as a long-term process which would enhance the innovative ability of the economy. Many empirical studies provide evidence that human capital influences growth positively (see Mincer, 1981; Mankiw *et al*, 1992). Gross secondary school enrolment is commonly used in the literature as a proxy for human capital and this study follows in that line. From the human capital augmented

Solow model, it is therefore expected that human capital would positively affect growth in this study.

Physical Domestic Capital: This according to the predictions of the augmented Solow model, would raise the steady state of capital per worker, thereby resulting in an increase in output per effective worker; therefore higher growth. *Mankiw et al* (1992) empirically demonstrate that accumulation of physical capital has significant positive effects on growth. The coefficient of physical domestic capital in the estimation model is therefore expected to be positive. Following the usual practice in most growth estimation models, gross fixed capital formation as a percentage of GDP is used as a proxy for physical domestic capital.

Foreign Direct Investment (FDI): The literature on FDI–growth nexus gives conflicting theoretical predictions with regards to the effects of FDI on economic growth. It is widely known that the flow of FDI has been increasing over the years; and developing nations especially are implementing FDI–inducing policies to attract foreign investment. On one hand, it is believed that technological transfers and spillovers accompany FDI flows; and since there is an existing knowledge gap between poor and rich countries, such gaps could be bridged through FDI flows. Further, technology plays a vital role in the production process; hence productivity would increase in the domestic economy alongside other spillover effects in the entire economy. FDI is also expected to positively affect growth due to its ability to make scarce capital resources available and also increase competition in the domestic economy. On the other hand, it is argued that the introduction of FDI into the domestic economy would result in distortions (in prices and financial markets) which are detrimental to resource allocation and subsequently slows growth (Carkovic and Levine, 2002). Other theories also suggest that FDI can only be growth–inducing under certain conditions. These

conditions include the availability of efficient domestic financial markets, level of education in the domestic economy, availability of skilled labour and other factors that strengthen the capacity of the domestic economy to absorb the gains accruing from FDI. Empirically, while some researchers find positive effect of FDI on growth (see Alfaro *et al*, 2004), others find no significant effect of FDI on economic growth (see Blomstrom, Lipsey and Zejan, 1994; Carkovic and Levine, 2002). The precise effect of FDI on economic growth therefore remains theoretically ambiguous. Net FDI inflows as a percentage of GDP is used as the measure of FDI.

Export Diversification: According to Imbs and Wacziarg (2003), export diversification would positively affect growth up to a certain level of per capita income beyond which it would affect growth negatively. Again, assessing export diversification in terms of its contribution to economies of scale, dynamic spillover effects and total factor productivity gives convincing belief that it has positive inducements on economic growth (Matthee and Naudé, 2007). The export product diversification index² is used to measure export diversification. Following Al-Marhubi (2000), Yokoyama and Alemu (2009), and Hesse (2008) among others, we expect a positive relationship between export diversification and growth in real per capita GDP.

Export Diversification Squared: This variable is included in the model of estimation in order to capture the possible non-linear (hump-shaped) relationship between ED and economic

² The index is measured as: $ED_j = \frac{\sum_i |h_{ij} - h_i|}{2}$, where h_{ij} is the share of commodity i in total exports of country j and h_i is the share of commodity i in world exports. Its value ranges between 0 (for less diversified exports) and 1 (for more diversified exports).

growth. The coefficient of this variable is expected to be negative since a non-linear relationship is expected between export diversification and real per capita GDP growth (Imbs and Wacziarg, 2003; Hesse, 2008). The point is that there would be a hump-shaped relationship between export diversification and economic growth if the coefficient of ED is positive and that of its squared term is negative. Evidence of a hump-shaped pattern would mean that not all countries in SSA would benefit from diversifying their exports. The critical diversification index (CDI) for SSA would be computed subject to the evidence of a hump-shaped relationship between export diversification and growth.

Population Growth: From the literature, the precise relationship between population growth and economic growth is theoretically ambiguous. According to the augmented Solow model, countries with high population growth rate would have very low capita per worker and therefore record low growth rates. This idea is empirically tested by Mankiw *et al* (1992) with the evidence that high population growth negatively affects growth. The argument forwarded is that in the presence of high population growth, the available capital spread over a very large population would lead to very low capital per labour which reduces output per labour and ultimately slows growth. On the contrary, the endogenous growth model predicts that larger economies would perform better than smaller ones. Simon (1989) argues that population growth essentially promotes growth as it forms the labour supply of an economy. It is further argued that a larger population size if given the required training and skills would culminate into a very strong human capital base which promotes economic growth. In addition, large population size would provide a very large market size for domestic producers; and this would lead to large scale production thereby resulting in the benefits of

economies of scale. The coefficient of population could therefore be either positive or negative.

Regional dummies: These are introduced into the estimation equation to determine if significant differences exist between the various regional blocks of SSA regarding the effect of the explanatory variables on economic growth. The regional dummies are for East Africa, Central (Middle) Africa, Southern Africa and West Africa. The regional dummies are generated in such a way that for a particular regional dummy, countries in that region assume a value of 1 and all other countries assume 0 values in that data column. These dummies are further interacted with the export diversification index in order to determine if the effect of export diversification on growth differs across the sub-region. East Africa is used as a reference region since the region performs better relative to the other regions in terms of ED and GDP per capita growth in the sample (see Table 2.1). Table 4.1 below provides a summary of the explanatory variables, their proxies, and the expected sign of their coefficient in relation to real per capita GDP growth.

Table 4.1: Summary of Explanatory Variables, their Expected Signs and Data Sources

Variable	Indicator	Expected Sign of Coefficient
Initial Real GDP per Capita	Initial GDP per capita (constant 2000 US\$)	Negative
Export Diversification	Export Product Diversification Index	Positive
ED Squared	Squared term of ED	Negative
FDI	Net FDI as a percentage of GDP	Positive/Negative
Human Capital	Gross Secondary School Enrolment	Positive
Physical Capital	Gross fixed capital formation (%GDP)	Positive
Population	Annual Population Growth Rate	Positive/Negative

Note: Data for all the variables are sourced from the World Development Indicators (WDI) Online Database of the World Bank.

4.3 Theoretical Framework

In order to analyse the effect of export diversification on economic growth, a dynamic panel growth regression model is estimated from the human capital augmented Solow growth model introduced by Mankiw *et al* (1992). According to the human capital augmented Solow growth model, growth in output per worker is a function of the initial output per worker, the initial level of technology, the rate of technological progress, rate of depreciation, rate of savings, and human capital accumulation.

The study adopts the dynamic panel growth framework in order to account for temporal autocorrelation, reduce the level of potential spurious regression which may lead to inaccurate inferences and inconsistent estimates. It also includes the lagged dependent variable as a regressor in order to capture the lagged effects (persistence) of the dependent variable.

The dynamic panel growth model is specified as:

$$y_{it} = \alpha y_{i,t-1} + x_{it}'\beta + \varepsilon_{it} \quad (4.1)$$

Where

$$\varepsilon_{it} = \mu_i + v_{it}.$$

That is, the error term in equation (4.1) is decomposed into two components with the first component measuring the unobserved country-specific effects while the second component is the idiosyncratic error term.

Equation (4.2) can therefore be re-written as:

$$y_{it} = \alpha y_{i,t-1} + x_{it}'\beta + \mu_i + v_{it} \quad (4.2)$$

Where i indexes the countries under study, t denotes the years, y_{it} is the real GDP per capita growth, $y_{i,t-1}$ is the lagged real GDP per capita, x_{it} is a matrix of all the explanatory variables including export diversification, μ_i is an unobserved country-specific time-invariant effect, and v_{it} is the idiosyncratic error term.

4.4 Model for Empirical Estimation

From the dynamic panel equation (4.2) and following Al-Marhubi (2000); Hesse (2008); and Alemu and Yokohama (2009) with few modifications based on the description of the variables in Section 4.3, the model to be estimated is therefore written as:

$$\begin{aligned} RGDPG_{it} = & \alpha_1 RGDPG_{i,t-1} + \alpha_2 GFCE_{it} + \alpha_3 ED_{it} + \alpha_4 ED_{it}^2 + \alpha_5 POP_{it} + \alpha_6 ENROL_{it} + \\ & \alpha_7 FDI_{it} + \alpha_8 \sum_1^4 D_i + \alpha_9 \sum_1^4 ED * D_i + v_{it} \dots \dots \dots (4.3) \end{aligned}$$

Where

$RGDPG_{it}$ = Real GDP per capita growth.

$RGDPG_{i,t-1}$ = Initial real GDP per capita.

$GFCE_{it}$ = Gross fixed capital formation (used as a proxy for domestic physical capital or domestic investment).

ED_{it} = Index of export diversification.

ED_{it}^2 = Squared term of the index of export diversification.

POP_{it} = Population growth rate.

$ENROL_{it}$ = Gross secondary school enrolment rate (a proxy for human capital).

FDI_{it} = Foreign direct investment as a percentage of GDP.

D_i = Regional dummy for four regional blocks (East, Central, Southern and West Africa sub-regions).

$ED * D_i$ = Product (interaction) of export diversification index and the regional dummies.

v_{it} = Idiosyncratic error term.

The index i represents the countries and t indexes the time period in years. In exception of the regional dummies (D_i), natural logarithms are taken for all the variables in the regression model.

The Critical Diversification Index (CDI) is derived by setting the partial derivative of real GDP per capita with respect to the index of export diversification to zero from equation (4.3).

The CDI indicates the point at which turn around in real GDP per capita occurs in relation to export diversification.

$$\text{Hence, } \frac{\partial RGDP_{it}}{\partial ED_{it}} = \alpha_3 + 2\alpha_4 ED_{it} = 0$$

$$\text{This gives: } ED_{it}^* = \frac{-\alpha_3}{2\alpha_4} > 0 \quad (4.4)$$

Equation (4.4) gives the Critical Diversification Index that will be computed if there is evidence of a hump-shaped relationship between export diversification and economic growth.

It can be shown that the second order condition is satisfied in the optimisation process above.

$$\text{Thus, } \frac{\partial^2 RGDPPC_{it}}{\partial ED_{it}^2} = 2\alpha_4 < 0$$

The export diversification index is measured using the Absolute Deviation of Country Commodity Shares, which is widely used by UNCTAD. It measures the extent of the difference between the structures of trade of a particular country and the world average. The index signals whether the structure of exports of a given country or group of countries differ from the export structure of the world. It is given by the formula:

$$ED_j = \frac{\sum_i |h_{ij} - h_i|}{2} \quad (4.5)$$

Where h_{ij} is the share of commodity i in total exports of country j and h_i is the share of commodity i in world exports.

The diversification index ranges from 0 (for less diversified exports) to 1 (for more diversified exports), revealing the extent of the differences between the structure of trade of the country or country group and the world average. The index values closer to 1 indicate a bigger difference from the world average.

4.5 Estimation Technique

The perceived endogeneity associated with the model for empirical estimation will render estimates using the Ordinary Least Squares (OLS) estimator biased and inconsistent. Many other estimation techniques could be used to estimate equation (4.3) in the presence of endogeneity; but the dynamic panel model is best estimated using the General Method of Moments (GMM) estimation techniques. The GMM procedure is best suited for dynamic panel models because it resolves the “dynamic panel bias” problem resulting from endogeneity associated with such models. The dynamic panel equation (4.2) is confronted with the dynamic panel bias problem; and in the presence of dynamic panel bias, estimations using Ordinary Least Squares (OLS) produce inconsistent and positive biases as the lagged dependent variable correlates with the error term.

There are two estimation techniques which are considered as special cases of the GMM estimation procedure. These are the Instrumental Variable (IV) and the Two-Stage Least Squares (2SLS) estimation techniques. These techniques could equally be used to estimate the regression equation in which some variables are suspected to be endogenous; but the limitation is that they make use of “external” instruments. The problem with using external instruments is that they are usually weak and hardly satisfy the conditions of “validity and relevance” in order to yield unbiased estimates. It is also very difficult to obtain instruments which are correlated with the endogenous variables and at the same time uncorrelated with the stochastic error terms. In this case, the GMM technique is preferable as it uses the lags of the endogenous variables as instruments; in which case the endogenous variables are predetermined and are therefore not correlated with the stochastic error terms. According to

Baum *et al* (2003), in the presence of heteroscedasticity, the GMM estimation techniques yield more efficient estimates than the 2SLS and the IV.

Generally, the GMM estimation techniques yield consistent and efficient estimates when the data-generating process exhibits the following features:

- Some explanatory variables are endogenous.
- There is a lagged dependent variable which affects the dependent variable.
- There exist country-specific fixed effects which are randomly distributed.
- There is country-specific serial correlation and heteroscedasticity in the stochastic error term.
- There is no correlation between the stochastic error terms across countries.
- The instruments are “internal”, that is, they are lags of the endogenous regressors.
- The time period (T) is small and the number of countries (N) is large.

Two types of GMM estimation procedures are identified in the literature. These are the differenced GMM introduced by Arellano and Bond (1991) and the system GMM introduced by Arellano and Bover (1995) and Blundell and Bond (1998). The differenced GMM estimation procedure resolves the inconsistency problem resulting from the endogeneity of some regressors. This procedure eliminates the source of the inconsistency in the estimation by applying the first difference operator to the estimation equation. After differencing, the equation is subsequently estimated by the differenced GMM by including the lags of the regressors as instruments. The differenced equation is of the form:

$$y_{it} - y_{i,t-1} = \alpha_1(y_{i,t-1} - y_{i,t-2}) + \alpha_2(x_{it} - x_{i,t-1}) + (v_{it} - v_{i,t-1}) \quad (4.6)$$

As stated earlier, equation (4.6) removes the unobserved country-specific effect by taking first differences of equation (4.3); thereby tackling the inconsistency and biases resulting from the endogeneity of the explanatory variables by using lagged values of the endogenous explanatory variables as instruments. The differenced GMM estimator is based on the following moment conditions under the assumptions that the regressors are weakly exogenous and the error term is not serially correlated.

$$E[y_{i,t-1} \cdot (v_{it} - v_{i,t-1})] = 0, \text{ for } t = 3, 4, \dots, T \quad (4.7)$$

$$E[x_{i,t-1} \cdot (v_{it} - v_{i,t-1})] = 0, \text{ for } t = 3, 4, \dots, T \quad (4.8)$$

The differenced GMM is not without statistical and conceptual shortcomings. In the first place, the time-invariant country-specific effects may be of interest in the estimation process. Therefore, completely eliminating them may lead to misspecification problems. Secondly, the procedure poses serious biases when the dependent variable is highly persistent, and there is a weak correlation between the instruments and the endogenous variables (weak instruments). Weak instruments are harmful to the small-sample and asymptotic properties of the differenced estimator. The weak instruments actually increase the variance of the coefficients and bias the coefficients in small samples. The real per capita GDP in the estimation model is considered to be highly persistent, thereby rendering the differenced GMM estimator not very appropriate for estimating equation (4.3).

The system GMM estimator is intended to overcome the problem of weak instruments associated with the differenced GMM by using a system of two equations, which are, the

level equation and the differenced equation. The endogenous variables in the level equation are instrumented by lag differences. These instruments are appropriate under the following additional moment conditions, given the assumptions that there may be correlation between the country-specific fixed effects and the right-hand side variables; and that the lagged differences and the country-specific fixed effects are uncorrelated. The additional moment conditions are stated below:

$$E[(y_{i,t-1} - y_{i,t-2}) \cdot (\mu_i + v_{it})] = 0, t = 3, 4, \dots, T \quad (4.9)$$

$$E[(x_{i,t-1} - x_{i,t-2}) \cdot (\mu_i + v_{it})] = 0, t = 3, 4, \dots, T \quad (4.10)$$

The argument made is that efficiency of the estimation equation would be greatly improved when the moment conditions of its level form and first difference forms are combined (Roodman, 2006). Hence the system GMM estimator is preferred to the differenced GMM when the dependent variable is persistent.

However, the instruments used must be valid in order for the system GMM estimator to give consistent and reliable estimates. Two main tests are therefore conducted to determine the validity of the instruments. First of all, a Sargan test of overidentifying restrictions which tests the null hypothesis that the overidentifying restrictions are valid would be conducted. Secondly, Arellano-Bond test is used to examine the hypothesis that there exists no serial correlation between the error terms.

In summary, the system GMM is preferable to the other estimation techniques because:

- It overcomes the problem of endogeneity through the use of lagged values of explanatory variables as instruments.

- It eliminates the problem of information loss in cross-sectional regressions as it allows for multiple observations for each country across time.
- It allows for the use of level and lagged values of the variables in the estimation equation.
- It is able to give consistent estimates even when T (time periods in years) is small and N (countries) is large.

4.6 Diagnostic Tests

4.6.1 Endogeneity

Equation (4.2) specified above may suffer from the problem of endogeneity. There is endogeneity when there is correlation between any of the explanatory variables and the random error term. This phenomenon may occur as a result of omitted variable bias, measurement error or reverse causality.

Thus, in the presence of endogeneity, $Cov(\mu_i, x_{it}) \neq 0$

Where μ_i is the time-invariant country-specific effect; and x_{it} is the set of explanatory variables.

Introducing lagged real per capita GDP as an explanatory variable is suspected to give rise to endogeneity. This is because the value of current real per capita GDP depends on previous ones; hence its values are likely to correlate with the error terms. Also, Imbs and Wacziarg (2003) both theoretically and empirically provide evidence of reverse causality between export diversification and economic growth. There also exists evidence of reverse causality

between domestic investment and economic growth (Barro and Sala-i-Martin, 1998). The evidence on reverse causality implies that these variables are likely to be endogenous in the regression model. In order to confirm endogeneity in the model, a Durbin–Wu–Hausman (DWH) test for endogeneity would be conducted for the residuals of all suspected endogenous explanatory variables as a function of all the exogenous variables (Alemu and Yokoyama, 2009). The suspected endogenous variables are lagged real GDP per capita, physical capital, human capital, and openness. The presence of endogeneity would render estimates using the OLS estimation technique biased and unreliable; but the system GMM estimator produces consistent estimates under this condition. Endogeneity in the explanatory variables would therefore favour the system GMM estimation technique as most appropriate for the estimation of the specified model.

4.6.2 Autocorrelation and Heteroscedasticity

The dynamic panel model in equation (4.2) is known to be associated with two main sources of persistence over time. First of all, there is the case of autocorrelation as a result of the presence of the lagged dependent variable as a regressor. This is the case because if the dependent variable is a function of a component of the error term, then its lag is also a function of the error term. Taking a lag of equation (4.2) gives the following equation:

$$y_{i,t-1} = \alpha y_{i,t-2} + x'_{i,t-1} \beta + \mu_i + v_{i,t-1} \quad (4.11)$$

From equations (4.3) and (4.11), we observe that the dependent variable and its lag are both functions of the country–specific time–invariant component of the error term.

That is: $y_{it} = f(\mu_i)$ and $y_{i,t-1} = f(\mu_i)$. This means that the lagged dependent variable is correlated with the error term in the model. The dynamic panel model is therefore associated with the problem of autocorrelation.

The second source of persistence associated with the dynamic panel model is heterogeneity among the countries as a result of individual country-specific effects. This is the case because the countries under study possess unique economic, social and geographical characteristics which must be considered in the estimation process. The presence of these sources of persistence renders the ordinary least squares (OLS) estimator inappropriate for estimation; since it gives biased and inconsistent estimates even if the error term (ν_{it}) is not serially correlated.

4.6.3 Fixed Effects (FE) versus Random Effects (RE)

Two different assumptions are made regarding correlation between the time-invariant error term (μ_i) and the explanatory variables in the econometrics literature. These assumptions result in the Fixed Effects (FE) and Random Effect (RE) models.

The RE model assumes that the unobserved country-specific time-invariant effects are uncorrelated with the explanatory variables. The model is used when variation across countries is assumed to be random and uncorrelated with the explanatory variables.

Thus, $Cov(\mu_i, x_{it}) = 0$.

The model therefore includes the country-specific characteristics as explanatory variables in the estimation equation. These country-specific characteristics may include institutional, cultural, historical and geographical factors which are mostly unique for each country and are time-invariant. The RE model assumes that the country-specific time-invariant error terms are not correlated with the regressors, therefore allowing for time-invariant variables to be included in the model as explanatory variables. These individual characteristics which may either influence the explanatory variables or not need to be well specified.

The point however is that, even if the country-specific time-invariant characteristics are not correlated with the explanatory variables, such effects must be well specified in the estimation model. From equation (4.2), while the explanatory variables (x_{it}) can be easily observed, the time-invariant country specific effects (μ_i) cannot be easily observed.

The fixed effects (FE) model on the other hand assumes that the country-specific time-invariant effects are correlated with the explanatory variables, and thereby controls for them. The FE model is therefore used when it is assumed that the countries possess certain individual characteristics which are unique to them and are time-invariant. The presence of these country-specific time-invariant effects leads to the problem of endogeneity and subsequently biases the estimates. The FE model eliminates the time-invariant effects from the estimation by using the within transformation to demean the variables. From equation (4.2), the within transformation process is described in the equation below:

$$y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i)\beta + (\mu_i - \bar{\mu}_i) + (v_{it} - \bar{v}_i) \quad (4.12)$$

Where $\bar{y}_i = \frac{1}{T} \sum_{t=1}^T y_{it}$, $\bar{x}_i = \frac{1}{T} \sum_{t=1}^T x_{it}$, $\bar{v}_i = \frac{1}{T} \sum_{t=1}^T v_{it}$, and $\bar{\mu}_i = \mu_i$.

In the within transformation process described in equation (4.12), the mean of the variables are calculated and subsequently subtracted from their actual values; and since the country-specific error terms (μ_i) do not change over time, its mean value ($\overline{\mu_i}$) is the same as the actual values. This process therefore eliminates the country-specific effects from the equation. The presence of heteroscedasticity in the estimation model would therefore favour the FE model, as it assumes heterogeneity in the error term across countries. The Hausman test is used to choose between random effect and fixed effect for the estimation. The GMM estimation procedure would yield reliable estimates if the data fits the fixed effects model.

4.6.4 Stationarity (Unit Root) Test

Although Unit Root problem is usually regarded as a time series problem, conducting unit root test in panel datasets could also be very appropriate in order to ensure that the variables under study are stationary thereby avoiding the trap of spurious regressions which relates to the occurrence of unrelated regressions. As stated by Gujarati (2003 pp.713), “a stochastic process is said to be stationary, if its Mean, and Variance are constant overtime and the value of Covariance between two time periods depends only on the distance between the two time periods and not on the actual time at which the Covariance is computed”. This study adopts the Fisher test. According to Choi (2001), the Fisher test may be preferred to other tests because of the following reasons:

- It does not require a balanced panel as in the case of the IPS test
- Different lag lengths can be used in the individual ADF regressions.
- It can be carried out for any unit root test.

- It does not require simulating adjustment factors that are specific to the sample size and specification.

4.6.5 Other Diagnostic Tests

In order to ensure reliable estimates from the system GMM estimation procedure, certain essential conditions must be fulfilled. First of all, the results from the system GMM estimations can only be deemed valid if there is no higher order autocorrelation in the error terms. The Arellano–Bond test for second order autocorrelation in first differenced errors will therefore be conducted to test for serial autocorrelation in the idiosyncratic errors.

Secondly, for the system GMM estimator to give reliable estimates, it is required that the instruments used must be valid. For the instruments to be valid, the conditions of relevance (correlation between the instruments and the endogenous explanatory variables) and exogeneity (instruments are orthogonal to the residuals) must be satisfied. The validity condition therefore implies that the instruments used must be truly exogenous; that is, there should be no correlation between the residuals and the explanatory variables and the instruments must be correlated with the endogenous explanatory variables. This condition can be tested by using the Sargan test under the null hypothesis that the overidentifying restrictions are valid. A test procedure suggested by Hansen (1982) could also be used to test the validity of the instruments, but the test becomes weaker as the number of instruments increases; making the Sargan test more appropriate.

4.7 Concluding Remarks

In summary, the dynamic panel growth equation for the estimation is specified from the human capital augmented Solow growth model. It is perceived that certain sensitivity issues such as endogeneity, heteroscedasticity, autocorrelation and some other estimation problems are likely to be associated with the estimation equation. These will be verified in the next chapter of the study. The study adopts the system GMM estimation technique in order to obtain consistent and efficient estimates of the effect of export diversification on economic growth. In relation to most previous empirical studies, this study takes the time series variations in the data into consideration, captures the unobserved country-specific time-invariant effects, allows for the inclusion of the lagged real GDP per capita as an explanatory variable and also controls for endogeneity in the estimation model. The discussion of the results emerging from the estimations using the system GMM approach is presented in the next chapter.

CHAPTER FIVE

RESULTS AND DISCUSSION

5.1 Introduction

This chapter presents the estimation and discussion of the results. StataCorp's statistical package version 12 (STATA 12) is used for the computation of the empirical estimations. The chapter is in four main sections. The next section provides descriptive analysis of the variables under consideration; followed by Section 5.3 which presents the results of some diagnostic tests. The discussion of the empirical findings is presented in Section 5.4; followed by the conclusion in Section 5.5.

4.2 Descriptive Analysis

The descriptive statistics pertain to forty-two (42) SSA countries for the period 1995–2010. The statistics under consideration are the mean, the standard deviation and the minimum and maximum values of the variables. Table 5.1 reports on the descriptive statistics.

Over the period 1995–2010, the average real per capita GDP of SSA was US\$1,047.57. The range is between US\$54.51 and US\$8,787.77. This range gives an indication of the wide income disparity gap among countries in the SSA region. Concerning real GDP per capita growth, the region recorded an average of 2.7 percent growth rate during the period.

Table 5.1: Descriptive Statistics of Real GDP per Capita (Growth) and its Determinants, 1995–2010.

Variable	Mean	Standard Deviation	Minimum	Maximum
Real GDP per Capita Growth (annual %)	2.7	7.3	-33.8	92.6
Real GDP per Capita (US\$)	1,047.57	1,644.96	54.51	8,787.77
Gross Fixed Capital Formation (% GDP)	20.7	11.2	2.0	113.6
Export Diversification Index	0.77	0.07	0.38	0.92
Population Growth (annual %)	2.4	1.0	-1.4	9.8
Enrolment (gross secondary school %)	37.3	25.7	5.2	122.9
FDI (net inflows % GDP)	5.3	13.1	-82.9	145.2

Source: Author's Computation Using STATA 12.

Some countries recorded negative growth rates while others performed very well. A critical look at the data shows that such countries as Burundi, Chad, Congo DR, Congo Republic, Cote d'Ivoire, Niger and Zimbabwe performed below the regional average; while countries such as Cape Verde, Equitorial Guinea, Ghana, Mauritius, South Africa, Sudan and Uganda performed quite above the regional average over the period.

The average export product diversification index for the region over the period is 0.77; indicating that on average, SSA countries are slowly picking up in their efforts at diversifying exports. This performance could however be attributed to an increase in the number of primary exports, which may not bring much gains to countries in the sub-region as compared to manufactured exports (Yokoyama and Alemu, 2009).

The average secondary school enrolment rate over the period is 37.3 percent, with a minimum of 5.2 percent and a maximum of 122.9 percent. The average net FDI as a percentage of GDP is 5.3 percent with a minimum of -82.9 percent and a maximum of 145.2

percent. This seems to imply that a wide disparity gap exists among SSA countries in terms of FDI inflows into the region. Average population growth rate in SSA over the period is 2.4 percent.

5.3 Estimation Results

This section presents the results from the estimations based on the augmented Solow growth model using the system GMM estimator. Table 5.2 displays the regression results based on the forty-two (42) SSA countries for the period 1995–2010. The first regression model involves all the explanatory variables with the exception of the regional dummies and the interacted variables (i.e. export diversification with the regional dummies). In the second regression model, the regional dummies are added to the variables of the first model. In the third regression model, the interacted variables of export diversification with the four regional dummies are introduced into the model together with the other explanatory variables. The regional dummies, export diversification and the squared term of export diversification are not included in the third regression model because they show severe collinearity with the interacted variables ($ED*MDUMMY$, $ED*SDUMMY$ and $ED*WDUMMY$).

From Table 5.2, the significant Wald Chi-squared for all the regressions shows that the explanatory variables are jointly significant. The Arellano–Bond test AR(2) in first differences fails to reject the null hypothesis of no two-period serial correlation in the residuals.

Table 5.2: System GMM Estimations based on the Augmented Solow Growth Model

Variable	Regression Model		
	1	2	3
Initial Real GDP per Capita (Constant 2000 US\$)	0.022 (0.016)	-0.060*** (0.020)	-0.020** (0.009)
Gross Fixed Capital Formation (% GDP)	0.338*** (0.052)	-0.147 (0.299)	0.021 (0.150)
Export Diversification (ED)	1.025*** (0.266)	1.760*** (0.482)	
Export Diversification Squared	-0.291 (0.178)	0.016 (0.289)	
Population Growth (Annual %)	-0.192** (0.087)	-0.755*** (0.172)	-0.473*** (0.132)
Enrolment (Gross Secondary School %)	0.166*** (0.043)	1.009*** (0.255)	0.554*** (0.125)
FDI (Net inflows % GDP)	0.020 (0.030)	0.049 (0.043)	-0.007 (0.038)
Middle Africa Dummy (MDUMMY)		-2.088*** (0.267)	
Southern Africa Dummy (SDUMMY)		-2.770*** (0.363)	
West Africa Dummy (WDUMMY)		0.408 (0.372)	
ED*MDUMMY			0.619*** (1.095)
ED*SDUMMY			0.517*** (0.236)
ED*WDUMMY			-1.731*** (0.572)
Wald Chi -squared (Prob > Chi -squared)	0.000	0.000	0.000
Number of Observations	229	229	229
Arellano-Bond [AR(2), Prob > Z]	0.378	0.770	0.810
Sargan test (Prob > Chi -squared)	0.388	0.631	0.703

*Note: The dependent variable is real GDP per capita growth. Figures in parenthesis are the standard errors of the estimates and ***, ** and * refers to statistical significance of the estimates at 1%, 5% and 10% respectively. The dependent variable is the log of GDP per capita growth. Except for the dummies, all the other variables are in logs.*

Source: Author's Computation Using STATA 12.

Also, the Sargan test for overidentifying restrictions shows that the overidentifying-restrictions are valid in the model; hence the model is not weakened by too many

instruments. One period lags of the endogenous variables are used as instruments for the first difference equation whilst first difference of the endogenous variables are used as instruments for the levels equation.

5.4 Diagnostic Tests

In this section, diagnostic tests are conducted for endogeneity, heteroscedasticity, autocorrelation, overidentifying restrictions, and the choice of fixed or random effects models. Each of these is analysed in the ensuing sub-sections. The main aim of these tests is to ensure that the data fits the model and that the results from the system GMM estimations are valid and reliable.

5.4.1 Endogeneity

The study employed the Durbin–Wu–Hausman (DWH) test to verify the presence of endogeneity among some of the variables. This is an augmented regression test which is applied to the residuals of each endogenous explanatory variable as a function of all other exogenous variables (Yokoyama and Alemu, 2009). If the null hypothesis that the regressors are uncorrelated with the error term holds, then OLS would be appropriate because the variables are not correlated with the error term. Otherwise, the rejection of the null hypothesis indicates that the variables are endogenous; hence OLS estimators would be inconsistent. The results of the Durbin–Wu–Hausman (DWH) test show that initial real GDP per capita, gross fixed capital formation, export diversification, and enrolment are correlated with the error term (see Table 5.3). This implies that the variables are endogenous; and

endogeneity of these explanatory variables implies that they should be instrumented with appropriate instruments. In this case, the assumption of strict exogeneity of the explanatory variables with the idiosyncratic errors no longer holds. This gives an indication that the system GMM approach fits the model and would yield consistent and efficient estimates since it is developed under the assumption of endogeneity of the explanatory variables.

Table 5.3: Durbin–Wu–Hausman (DWH) Test for Endogeneity

Null Hypothesis	P-value (Prob > Chi2)
Initial real GDP per capita is uncorrelated with the error term.	0.001
Gross fixed capital formation is uncorrelated with the error term.	0.021
Export Diversification is uncorrelated with the error term.	0.003
Enrolment is uncorrelated with the error term.	0.011

Note: The residuals of the variables are predicted and tested for significance after regressing them on all the other exogenous variables.

Source: Author's Computation Using STATA 12.

5.4.2 Heteroscedasticity

The Breusch–Pagan / Cook-Weisberg test is conducted to test for the presence of heteroscedasticity. The test rejected the null hypothesis of constant variance at the 5 percent level of significance, thereby confirming the presence of heteroscedasticity (see Table 5.4). In this case, using the OLS estimation technique would yield biased and inconsistent estimates, resulting in unreliable and misleading results. The system GMM approach is developed such that it is able to yield consistent and unbiased estimates even in the presence of heteroscedasticity.

Table 5.4: Breusch –Pagan / Cook –Weisberg Test for Heteroscedasticity

Ho: Constant variance
Chi2 (6) = 5.80
Prob > Chi2 = 0.0164

Source: Author's Computation Using STATA 12.

5.4.3 Autocorrelation

This test is conducted using the Arellano–Bond test for autocorrelation in the first difference errors. The test results are reported together with the estimation results in Table 5.2. The test fails to reject the null hypothesis of no autocorrelation in second order for all the regressions. This means that the error terms are not correlated with each other and the condition of no autocorrelation is therefore satisfied for the use of the system GMM estimation technique.

5.4.4 Validity of Overidentifying Restrictions

A major requirement for the use of the system GMM estimation technique is that the instruments used must be valid in order to yield consistent estimates. The Sargan test of overidentifying restrictions which tests the null hypothesis that the overidentifying restrictions are valid is conducted; and the results are reported together with the regression results in Table 5.2. The test fails to reject the null hypothesis, thereby showing that the overidentifying restrictions are valid for all the regression equations. This therefore means that together with the evidence of no autocorrelation, the condition of validity of the instruments is satisfied for the system GMM estimator to yield consistent and reliable estimates.

5.4.5 Fixed Effects and Random Effects

This sub-section presents the results of the Hausman test to determine whether the fixed or random effects models fit the data for estimation. As indicated in the previous chapter, the presence of heteroscedasticity would imply the existence of heterogeneity across countries and therefore confirms the assumption of the fixed effects model that the unobserved country-specific effects vary across countries. The Breusch-Pagan / Cook-Weisberg test for heteroscedasticity (see Table 5.4) confirms the presence of heteroscedasticity thereby indicating fixed effects model would be appropriate. The result of the Hausman test (see Table 5.5) also confirms the appropriateness of fixed effects model by rejecting the null hypothesis that favours random effects model at the 5 percent level of significance. The system GMM estimation procedure can therefore be applied to the model as it requires a model that fits fixed effects to yield consistent and reliable estimates.

The results of the foregoing diagnostic tests show that the system GMM estimation technique is appropriate for the estimations and its estimates are reliable.

Table 5.5: Hausman Test for Fixed versus Random Effects

Ho: Difference in coefficients not systematic (there is random effect)

$$\begin{aligned} \text{Chi2}(6) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 16.04 \end{aligned}$$

Prob > Chi2 = 0.0135

Source: Author's Computation Using STATA 12.

5.4.6 Stationarity (Unit Root) Test

The results of the Fisher stationary (unit root) test of the variables in the model are shown in Appendix VIII. The null hypothesis of the test is that the variables have no unit roots. As a robust check, the four unit root test statistics are reported. The null hypothesis that all the panels contain unit roots is rejected by all the four tests (see Table 5.6). According to Choi (2001), when the number of panels is finite, the inverse chi-squared test becomes very appropriate and powerful tool for testing unit roots. Since this study has a finite number of panels, the null hypothesis of unit roots is therefore rejected for all the variables on the basis of the inverse chi-squared test. Aside the other inverse chi-squared test, all the other tests reported significant results of all the variables, thereby indicating that the variables are stationary. The conclusion is therefore drawn that the panels are not associated with unit roots hence there is no tendency for any possible spurious or unrelated regressions.

Table 5.6: Fisher-Type Stationarity (Unit Root) Test

Variable	Inverse chi-squared		Inverse normal		Inverse logit t		Modified inv. chi-squared	
	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob
GDP/Capita Growth	288.470	0.000	-11.348	0.000	-12.005	0.000	15.775	0.000
Gross Fixed Capital Formation	188.938	0.000	-6.701	0.000	-6.817	0.000	8.350	0.000
Export Diversification (ED)	243.791	0.000	-9.619	0.000	-9.889	0.000	12.328	0.000
ED Squared	242.914	0.000	-9.585	0.000	-9.854	0.000	12.261	0.000
Population Growth	294.154	0.000	-10.175	0.000	-11.485	0.000	16.214	0.000
Enrolment	64.426	0.083	-0.984	0.063	-1.007	0.058	1.443	0.075
FDI	249.420	0.000	-9.594	0.000	-9.904	0.000	12.763	0.000

Source: Author's Computation Using STATA 12.

4.5 Discussion of Results

The main findings on the relationship between real GDP per capita and the explanatory variables, including export diversification are discussed below.

Export Diversification: In conformity with *a priori* expectations, the coefficient of export diversification (ED) is positive. The coefficients of export diversification in regression models (1) and (2) suggest that a percentage increase in the export diversification index of a country in SSA will cause a further growth of about 1 percent and 1.8 respectively. This finding of a positive relationship between ED and growth is not uncommon in the export diversification literature. It follows the findings of many previous studies, for example Al-Marhubi (2000); Hesse (2008); Yokoyama and Alemu (2009) and some other cross-country studies on export diversification and economic growth. This result suggests that for Sub-Saharan Africa, countries with higher levels of export diversification are likely to experience a faster growth than those with low levels of export diversification.

Export Diversification Squared: The coefficient of the squared term of export diversification is not significant in the regression models. The implication is that there is no evidence of a hump-shaped relationship between export diversification and economic growth in SSA. This finding does not follow that of Imbs and Wacziarg (2003), and Hesse (2008) who find a non-linear relationship between export diversification and economic growth using cross-country data. This means that countries in SSA can intensify export diversification in order to attain higher growth.

Regional Dummies: The regional dummies are introduced in model (2). East Africa³ is used as the reference region. With exception to the West Africa dummy, the coefficients of the regional dummies indicate that the aggregate growth effect of the explanatory variables differs across the sub–regions of SSA. It is observed from regression model (2) in Table 5.2 that the aggregate growth effect of the explanatory variables is lower for Middle (Central) and Southern Africa countries as compared to countries in East Africa. The coefficient of the West Africa dummy is however insignificant, implying that there exists no significant difference between West and East Africa countries in terms of the aggregate growth effects of the explanation variables.

Interacted Variables: The export diversification index is interacted with the regional dummies in regression model (3) in order to determine if the effect of export diversification on growth is the same for all the sub–regions in SSA or not. The coefficients of the interacted variables are significant, implying that the effect of ED on growth is not the same for the sub–regions. The results show that compared to East Africa, the effect of ED on growth is higher for countries in Central (Middle) and Southern Africa countries. On the contrary, the effect of ED on growth is lower in West Africa as compared to East Africa. The coefficient of the first interacted variable in model (3) suggests that a percentage increase in the export diversification index in the Central Africa region would result in about 0.6 percent higher growth in that region than in East Africa.

Initial real GDP per capita: It is observed from the results in Table 5.2 that the coefficient of the initial real GDP per capita is negative and statistically significant at 1 percent in model

³ The region is used as the reference region since it performs fairly better than the other regions in terms of real GDP per capita (growth) and export diversification (see Table 2.1).

(2). It indicates that countries with lower initial real GDP per capita have the tendency to grow faster than those with higher initial real GDP per capita. This result is in line with the theoretical predictions of the convergence theory which predicts that income per capita of countries would converge over time. It also confirms the findings of other previous studies such as Hesse (2008) and Al-Marhubi (2000) who find a negative relationship between real GDP per capita growth and initial real GDP per capita. This means that the income per capita of countries in the SSA region have been converging over the period. The result however contradicts the findings of other previous studies which find a positive relationship between real GDP per capita growth and initial GDP per capita (see Slaughter, 2001; Aditya and Roy, 2007), though these studies use cross-country samples. The evidence of convergence is also at odds with that of Yokoyama and Alemu (2009) who find no evidence of convergence in SSA.

Gross Fixed Capital Formation: The augmented Solow growth model predicts a positive relationship between physical capital and economic growth. This prediction is confirmed by the positive and significant coefficient of gross fixed capital formation in the first regression model in Table 5.2. The result indicates that capital formation has played a crucial role in the economic growth of SSA countries over the period. The interpretation of the regression coefficient in model (1) for instance is that a percentage increase in gross fixed capital formation would lead to about 0.3 percent further increase in GDP per capita growth.

Population Growth: The relationship between population growth and economic growth has not been theoretically unambiguous. The precise relationship is subject to empirical research which also depends on the region and the time period under consideration. The available empirical findings are also not devoid of the ambiguity associated with relationship between

economic growth and population growth. While some studies find a positive relationship (Al-Marhubi, 2000; Yokoyama and Alemu, 2009), others find a negative relationship (Hesse 2008). This study supports the finding of the latter that population growth inversely affects economic growth. The results in the regression models in Table 5.2 respectively imply that a percentage increase in the population growth rate would reduce the pace of growth by about 0.2 percent, 0.8 percent and 0.5 percent. This indicates that rapid population growth slows down the pace of economic growth in SSA.

Enrolment: The positive coefficient of gross secondary school enrolment in all the regression models is also consistent with *a priori expectation* and findings in the existing empirical literature. It confirms the prediction of the human capital augmented Solow growth model that human capital is paramount for economic growth. The coefficient of enrolment in the regression models respectively implies that a percentage increase in the school enrolment rate would lead to about 0.2 percent, 1 percent and 0.6 percent further growth in SSA. Other studies such as Mankiw *et al* (1992), Al-Marhubi (2000) and Hesse (2008) also find positive relationship between human capital and economic growth.

4.6 Concluding Remarks

The data for estimation favours fixed effects model which is a requirement for the use of the system GMM estimation procedure. The other diagnostic tests: autocorrelation, heteroscedasticity, and overidentifying restrictions yield results that are favourable for the use of the system GMM estimation technique. The estimation results show that export diversification positively affects growth in real GDP per capita SSA. The findings do not

support the hypothesis of a non-monotonic (hump-shaped) relationship between export diversification and economic growth in SSA. Since there is no evidence of a hump-shaped relationship, the critical diversification index (CDI) could not be computed for SSA. The estimation results also show that other control variables; that is, gross fixed capital formation, human capital, foreign direct investment are significant determinants of economic growth in SSA. The population growth rate on the other hand is found to affect economic growth negatively in SSA.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary, conclusions and policy recommendations based on the findings of the study. The next section is dedicated to the summary and conclusions drawn from the findings in the study. Section 6.2 gives policy recommendations based on the findings and Section 6.3 discusses the limitations of the study and suggests areas for further research.

6.2 Summary and Conclusions

The growth performance of Sub-Saharan Africa (SSA) countries has been an issue of concern to individuals, governments, organisations and researchers over the years. Research shows that developing countries that diversified their exports like those in East Asia have been able to achieve higher growth; even though they were at a similar level of growth with SSA countries about five decades ago (Yokoyama and Alemu, 2009). The main objective of this study is to assess the effect of export diversification on growth in SSA; and also to test the hypothesis of a hump-shaped (non-linear) relationship between export diversification and growth as well as compute the critical diversification index (CDI) for SSA; given that a non-linear relationship exists.

The empirical literature shows mixed evidence on the exact relationship between export diversification and economic growth. While some studies attest to a positive monotonic

relationship between export diversification and economic growth, others show a hump-shaped (non-monotonic) relationship. Others also show negative relationship between export diversification and economic growth. These conflicting results coupled with the existence of just a few studies on SSA are the motivations for this study.

In order to empirically establish a relationship between export diversification and economic growth, the model for estimation is specified from the dynamic panel growth framework based on the predictions of the human capital augmented Solow model, and estimated using the system GMM estimation procedure. This procedure overcomes the estimation problems commonly associated with other estimation techniques such as the OLS, IV and the traditional panel estimations.

The estimation results from this study show a positive relationship between export diversification and economic growth in SSA. This satisfies the first objective of the study. Concerning the second objective which seeks to test the hypothesis of a hump-shaped relationship, the results do not show evidence of a hump-shaped (non-monotonic) relationship between export diversification and economic growth. The third objective of computing the critical diversification index (CDI) for SSA could not be realised since it is conditioned on the evidence of a hump-shaped relationship between ED and growth.

6.3 Policy Recommendations

The major conclusion drawn from the results in the previous chapter is that export diversification positively affects economic growth and that there is no evidence of a non-monotonic relationship between export diversification and economic growth in SSA. This

implies that for countries in SSA, further diversification would propel the pace of growth. Export diversification should therefore be promoted in the region.

First of all, in order to promote further diversification, it is recommended that governments of countries in SSA should implement entrepreneurship support schemes and create a favourable investment climate in order to encourage investment in new production sectors, and also expand existing sectors for exports. Diversification in domestic production is required for export diversification which would ultimately lead to economic growth in the long run.

Countries in SSA can also promote export diversification and reduce their dependence on a few primary products through trade facilitation measures to reduce trade costs. Administrative bottlenecks which take the form of domestic entry barriers, trade restrictions, huge costs and delays in business registration among other trade inhibiting procedures should be scaled down to the barest minimum.

Governments in the sub-region should also initiate policies targeted at promoting research into new production sectors, especially agriculture which is the main production activity of countries in the sub-region and also into agro-processing to add value to the raw agriculture exports, since value added products command higher and stable prices on the international market and also ensure sustained foreign exchange earnings.

It is suggested by endogenous growth theory that export diversification can occur through learning-by-doing and learning-by-exporting and also through the imitation of the production activities of developed economies (Guiterez de Pineres and Ferrantino, 1997). Governments of SSA should seriously consider this recommendation in their economic and

development policy objectives as it has the propensity to trigger export diversification and make meaningful contributions to the overall economic progress of the economies in the region.

It is also recommended that governments in SSA should create the business environment for FDI inflows which show positive effects on growth in real GDP per capita. Investment in human capital in the form of education and skills training should be promoted rigorously to propel growth. Population growth should however be kept under control since the coefficient of population in the study is negative with implication that high population growth slows down the pace of growth in the region.

Notwithstanding these findings, governments of SSA countries should avoid introducing unnecessary distortions to domestic production as a means of promoting export diversification in order to attain long-term growth. This is because, according to Al-Marhubi (2000), unnecessary distortions to international trade and market-oriented resource allocation that are contrary to a country's comparative advantage are not healthy for economic efficiency and growth performance. Export diversification policies should therefore be targeted at sectors in which countries have comparative advantage in order to yield the expected economic benefits.

Finally, as Yokoyama and Alemu (2009) put it, export diversification is just one of the key policy measures to be undertaken for structural transformation and economic growth. It should therefore not be regarded as a panacea for the economic problems of countries in Sub-Saharan Africa.

6.4 Limitations of the Study and Areas for Further Research

The study did not look at some other aspects of export diversification such as vertical and horizontal dimensions of export diversification, various measures of export diversification, comparison of the relationship between export diversification and economic growth across the various developing regions of the world, and specific–country analysis of the relationship between export diversification and economic growth for all the countries in the sample. These areas of study would also make very meaningful contributions to the existing literature and therefore should be considered by future studies on the diversification–growth nexus.

REFERENCES

- Acemoglu, D. and Zilibotti, F. (1997); Was Prometheus Unbound by Chance? Risk Diversification and Growth. *The Journal of Political Economy*, 105(4): 709–751.
- Acharyya, R. (2007). *Emerging Pattern of India's Merchandise Exports: Prospects and Possibilities*: Vanijya, May (DGCI&S, Ministry of Commerce GOI).
- Aditya, A. and Roy, S. S. (2007). *Export diversification and economic growth: Evidence from cross-country analysis*. Mimeo, 1–25.
- Agosin, M. R. (1999): Trade and growth in Chile, *Cepal Review*, 68: 79–100.
- Agosin M. R. (2005). *Export diversification and growth in emerging economies*. Paper presented at conference on growth and equity. CEPAL, Santiago
- Agosin, M. R. (2007). Export Diversification and Growth in Emerging Economies. *Working Paper No. 233*, Departamento de Economía, Universidad de Chile, Santiago
- Agosin, M., Álvarez, R., Bravo–Ortega, C., and Puentes, E. (2011): Determinants of Exports Diversifications around the World: 1962–2000. *Working Paper No. 605*, Central Bank of Chile
- Alfaro, L., Chand, A., Kalemli–Ozcan, S. and Selin Sayek, S. (2004). FDI and Economic Growth: The Role of Local Financial Markets, *Journal of International Economics*, 64: 113–134.

- Ali, R., Alwang, J. and Siegel, P. (1991): Is export diversification the best way to achieve export growth and stability? A look at three African countries: *Policy Research Working Paper Series*, No. 729, Washington, DC.
- Al-Marhubi, F. (2000): Export Diversification and Growth: An Empirical Investigation, *Applied Economics Letters*, 7(9): 559–562.
- Arailym K. (2011). *The Effect of Export Diversification on Country Growth*, A Master of Arts in Economics Thesis Presented to the Department of Economics of the Central European University, Budapest, Hungary.
- Arellano, M. and Bond S. (1991): Some Tests of Specification for Panel Data: Monte Carlo Evidence with an Application for Employment Equations, *Review of Economic Studies*, 58: 277–297.
- Arellano, M. and Bover O. (1995): Another Look at the Instrumental-variable Estimation of Error-Component Models, *Journal of Econometrics*, 68 (1): 29–51.
- Arip, M., Yee, L. and Abdul Karim, B. (2010): Export diversification and economic growth in Malaysia, *MPRA Paper No. 20588*; Reitaku University. Unimas
- Athukorala, P. (1991). An Analysis of Demand and Supply Factors in Agricultural Exports from Developing Asian Countries, *Weltwirtschaftliches Archiv*, 127(4): 746–791.
- Baltagi, B. H. (1996). *Econometric Analysis of Panel Data*, Chichester: John Wiley & Sons Ltd.
- Barro, R. and Sala-i-Martin, X. (1998): *Economic Growth*, Cambridge, Massachusetts: MIT Press.

- Baum, C. F., Schaffer, M. E. and Stillman S. (2003): Instrumental Variables and GMM: Estimation and Testing, *Stata Journal* 3: 1–31.
- Bebczuk, R. N. and Berrettoni, N. D. (2006); Explaining Export Diversification: An Empirical Analysis: *CAF Research Program on Development Issues*.
- Bernard, A. B. and Jones C.I. (1996): Comparing Apples to Oranges: Productivity Convergence and Measurement across Industries and Countries, *American Economic Review* 86: 1216–1238.
- Blomstrom, M., Lipsey, R. and Zejan, M. (1994): Is Fixed Investment the Key to Economic Growth? *CEPR Discussion Papers*, 870
- Blundell, R. and Bond S. (1998): Initial Conditions and Moment Restrictions in Dynamic Panel Data Models, *Journal of Econometrics* 87: 115–143.
- Bond, S. (2002). Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice, *Portuguese Economic Journal* 1: 141–162.
- Branson, H.W. (1989). *Macroeconomic Theory and Policy*, 3rd Edition, 129–256, New York: Harper & Row Publishers.
- Cabellero, R.J. and K. Cowan (2006). *Financial Integration without the Volatility*, MIT Mimeo
- Cabral, C.H.M and Veiga P. (2012): *Export Diversification and Sophistication and Economic Development in Sub-Saharan Africa*. Part of an NBER project on African development successes described in Macedo and Pereira (2009).

- Cadot, O., Carrère, C. and Strauss-Kahn, V. (2009): Export Diversification: What's Behind the Hump? *Centre for Economic Policy Research Discussion Paper* No. 6590.
- Carkovic, M. and Levine R. (2002): Does Foreign Direct Investment Accelerate Economic Growth? *Working Paper*, University of Minnesota
- Chang, K. (1991). Export Diversification and International Debt under Terms-of-Trade Uncertainty. *Journal of Development Economics*, 36(2): 259–279.
- Chenery, H. (1979). *Structural Change and Development Policy*, New York, Oxford University Press.
- Choi, I. (2001). Unit Root Tests for Panel Data, *Journal of International Money and Finance* 20 (2001), 249–272
- Collier, P. (2003). Primary Commodity Dependence and Africa's Future, in B. Pleskovic and N. Stern (eds.), *Annual Proceedings of the World Bank Conference on Development Economics*, Oxford University Press and World Bank, New York.
- Davidson, R. and Mackinnon (1993): *Estimation and Inference in Econometrics*, New York: Oxford University Press.
- De Ferranti, D., Perry, G.E., Lederman, D., and Maloney, W. (2002): *From Natural Resources to the Knowledge Economy*, Washington, DC: The World Bank.
- DeRosa, D.A. (1991). Increasing Export Diversification in Commodity-Exporting Countries: A Theoretical Analysis, *IMF Working Paper* WP/91/105, Washington DC: The IMF.

- Dennis, A. and Shepherd, B. (2007): Trade Costs, Barriers to Entry, and Export Diversification in Developing Countries. *Policy Research Working Paper* No.4368, World Bank.
- Dornbusch, R., Fischer, D. and Samuelson, P.A. (1977): Comparative Advantage, Trade, and Payments in a Ricardian Model with a Continuum of Goods: *American Economic Review*, 67(5): 823–839.
- Easterly, W and Levine, R. (1997), "Africa's Growth Tragedy: Policies and Ethnic Divisions," *Quarterly Journal of Economics*. CXII (4), 1203-125.
- Eberechukwu, U. (2013). The relation between capital formation and economic growth: evidence from sub-Saharan African countries, *Journal of Economic Policy Reform*, Available at <http://dx.doi.org/10.1080/17487870.2013.799916>.
- Economic and Social Commission for Asia and the Pacific – ESCAP (2004): Export Diversification and Economic Growth: the experience of selected Least Developed Countries. *Development papers No. 24*, United Nations, New-York.
- Economic Commission for Africa–ECA (2006): Diversification: Towards a New Paradigm for Africa's Development, *Work in progress No. 35*, African Trade Policy Centre, 2006.
- Elbadawi, I. (1999). Can Africa Export Manufactures: The Role of Endowment, Exchange Rates, and Transaction Costs. *World Bank policy Research Working Paper*: No. 2120.
- Fosu, A. K. (1990). Export Composition and the Impact of Export on Economic Growth of Developing Economies. *Economics Letters* 13(1990): 67–71.

- Fosu, A. K. (1996). Primary Exports and Economic Growth in Developing Countries. *World Economy*, 19(4): 466–475.
- Fosu, A. K. (2012). Growth of African Economies: Productivity, Policy Syndromes and the Importance of Institutions. *CSAE Working Paper WPS/2012–11*, Centre for the Study of African Economies.
- Fukuda S. and Toya H. (1995) *Conditional Convergence in East Asian Countries: The Role of Exports in Economic Growth*. University of Chicago Press, Vol. 4.
- Greene W. H., (2003): *Econometric analysis, 5th Edition*: Prentice Hall.
- Gutierrez de Pineres, S.A. and Ferrantino M. J. (1997): Export Diversification and Structural Dynamics in the Growth Process: The Case of Chile, *Journal of Development Economics*, 52: 375–391.
- Gutierrez de Pineres, S. A. and Ferrantino, M. J. (2000): *Export Dynamics and Economic Growth in Latin America*. Vermont: Ashgate Publishing Ltd, Burlington.
- Gujarati N. D. (2003). *Basic Econometrics*, Tata: McGraw-Hill Publishing Company.
- Habiyaremye, A. and Ziesemer, T. (2006): Absorptive Capacity and Export Diversification in Sub-Saharan African Countries, *Working Paper Series* No. 2006-030. United Nations University, UNU–Merit.
- Hammouda, B. H., Karingi, S.N., Njuguna, A.E. and Sadni-Jallab M. (2006): Africa’s (Mis) fortunes in Global Trade and the Continent’s Diversification Regimes, *Journal of World Investment and Trade*, 7(4): 587–616.

- Hansen, L. P., (1982). Large Sample Properties of Generalised Method of Moments Estimators, *Econometrica*, 50: 1029 –1054.
- Hausman, J. A. (1978). Specification Test in Econometrics: *Econometrica*, 46: 125 –1272.
- Hausmann, R. and Klinger, B. (2006): South Africa's Export Predicament. *CID Working Paper* No 129. Cambridge, MA: Centre for International Development, Harvard University.
- Hausmann, R., and B. Klinger, B. (2007): The Structure of the Product Space and the Evolution of Comparative Advantage: *CID Working Paper* No. 146, Centre of International Development, Harvard University.
- Hausmann, R. and Rodrik D. (2003): Economic Development as Self-Discovery, *Journal of Development Economics* 72(2): 603–633.
- Hausmann, R. and Rodrik, D. (2006): Doomed to Choose: Industrial Policy as Predicament. *Paper presented at the first Blue Sky seminar*, 9 September. Cambridge, MA: Centre for International Development, Harvard University.
- Hausmann, R., Hwang, J. and Rodrik, D. (2007): What you export matters. *Journal of Economic Growth* 12 (1), 1–25.
- Hernandez-Cata, E. (2000), Raising Growth and Investment in Sub-Saharan Africa: What Can Be Done? *Finance & Development*, 32(4): Available at: <http://www.imf.org/external/pubs/ft/fandd/2000/12/hernande.htm>.
- Herzer D. and Nowak-Lehmann F. (2006): What Does Export Diversification do for Growth?: An Econometric Analysis. *Applied Economics*, 38(15): 1825–1838.

- Hesse, H. (2008). Export Diversification and Economic Growth. The World Bank Commission on Growth and Development, *Working Paper 21*: 1–25.
- Hirschman, A. (1958). *The Strategy of Economic Development*, Yale University Press: New Haven.
- Gerber, J. (2005). *International Economics (3rd Edition)*, New Jersey: Pearson Education, Inc.
- Imbs, J. and Wacziarg R. (2003): Stages of diversification, *American Economic Review* 93 (1): 63–86.
- IMF (2002): Finance & Development, vol. 29, No. 3 (September), available at <http://www.imf.org/external/pubs/ft/fandd/2002/09/index.htm>.
- Jawaid, S.T and Raza, S.A (2012): Foreign Direct Investment, Growth and Convergence Hypothesis: A Cross –Country Analysis. *Munich Personal RePEc Archive*
- Klinger, B. and Lederman D. (2004): Discovery and Development: An Empirical Exploration of New Products. *World Bank Policy Research Working Paper* No. 3450: Washington, DC.
- Klinger, B. and Lederman D. (2006): Diversification, Innovation, and Imitation inside the Global Technological Frontier: *World Bank Policy Research Working Paper*. No 3872, Washington, DC.
- Koren, M. and Tenreyro, S. (2007): Volatility and Development, *Quarterly Journal of Economics*, 122(1): 243–287.

- Krugman P. (1981). Intra-industry Specialisation and Gains from Trade, *Journal of Political Economy*, 89(5): 959–973.
- Lederman, D. and Maloney, W. F. (2003): Trade Structure and Growth, *Policy Research Working Paper No. 3025*, World Bank, April.
- Lederman, D. and Maloney, W. F. (2007): Trade Structure and Growth, *In Natural Resources: Neither Curse nor Destiny*, D. Lederman and Maloney W., eds. Palo Alto, Stanford University Press.
- Levine R. and Renelt D. (1992): A Sensitivity Analysis of Cross Country Growth Regression, *American Economic Review* 82(4): 942–963.
- Mankiw, N.G., Romer, D. and Weil, D. N. (1992): A Contribution to the Empirics of Economic Growth, *Quarterly Journal of Economics*, 107(2): 407–437.
- Matthee M. and Naudé W. (2007): Export Diversity and Regional Growth. Empirical Evidence from South Africa: United Nations University, *Research Paper. No. 11, 2007*
- Matthee, M. and Naudé, W. (2008): Export Diversity and Regional Growth in a Developing Country Context: Empirical Evidence, *Paper submitted to the Regional Studies Association International Conference: Regions: The Dilemmas of Integration and Competition*, Prague.
- Mejia, J. F. (2011). *Export Diversification and Economic Growth: An Analysis of Colombia's Export Competitiveness in the European Union's Market*. Heidelberg: Springer-Verlag Berlin Heidelberg.

- Michaely, M. (1962): *Concentration in International Trade*, Amsterdam: North Holland Publishing Company.
- Mincer J. (1981): Human Capital and Economic Growth, *NBER Working Paper Series*, Working Paper No. 803.
- Naudé, W. and Rossouw, R. (2008): Export Diversification and Specialisation in South Africa: Extent and Impact. *Working Papers* RP2008/93: World Institute for Development Economic Research (UNU–WIDER).
- Naudé, W. and Rossouw R. (2011): Export Diversification and Economic Performance: Evidence from Brazil, China, India and South Africa. *Economic Change and Restructuring*, 44(1): 99–134.
- Osakwe, Patrick. (2007). Foreign Aid, Resources, and Export Diversification in Africa: A New Test of Existing Theories. *African Trade Policy Paper 61*, Economic Commission for Africa, Addis Ababa.
- Pesaran, M.H. (2004). *General Diagnostic Tests for Cross-Section Dependence in Panels*, Mimeo: University of Cambridge.
- Pinaud, N. and Wegner, L. (2004): African Economic Performance in 2004: A Promise of Things to Come? *Policy Insights*, No.6: OECD.
- Prebisch, R. (1950). The Economic Development of Latin America and its Principal Problems reprinted in *Economic Bulletin for Latin America* 7, 1962: 11–22.
- Ricardo, D. (1817). *On the Principles of Political Economy and Taxation*: London.

- Rodriguez, F. and Rodrik, D. (2001): Trade Policy and Economic Growth: A Sceptic's Guide to the Cross-national Evidence. *NBER Macroeconomics Annual* 15: 261–338.
- Rodrik, D. (2005). Policies for Economic Diversification, *CEPAL Review*, 87: 7–23.
- Rodrik, D. (2006). What's so special about china's exports? *China & World Economy* 14 (5): 1–19.
- Rodrik D. (1997): *Trade Policy and Economic Performance in Sub-Saharan Africa*: Swedish Ministry for Foreign Affairs.
- Romer, P. M. (1986); Increasing returns and long–run growth, *Journal of Political Economy*, 94 (5): 1002–1037.
- Romer, P. M. (1990): Endogenous Technological Change, *Journal of Political Economy*, 98: 71–102.
- Roodman, D. (2006). How to do xtabond2: An Introduction to Difference and System GMM in Stata. *Working Paper 103*, Centre for Global Development.
- Ruffin, R. J. (1974): International Trade under Uncertainty, *Journal of International Economics*, 4(3): 243–259.
- Sachs, J. and Warner A. (1995): Natural Resource Abundance and Economic Growth, *NBER Working Paper No. 5398*, Cambridge, MA: National Bureau of Economic Research.
- Samen S. (2010). *A Primer on Export Diversification: Key Concepts, Theoretical Underpinnings and Empirical Evidence*. Growth and Crisis Unit World Bank Institute

- Simon, J. L. (1989). On Aggregate Empirical Studies Relating Population Variables to Economic Development, *Population and Development Review*. 15: 323–332.
- Singer, H. (1950). The Distribution of Gains between Investing and Borrowing Countries, *American Economic Review, Papers and Proceedings* 40: 473–485.
- Slaughter, M.J (2001): Trade Liberalisation and per Capita Income: A Difference-in-Differences Analysis, *Journal of International Economics*, 55(1):203–228.
- Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*, London: Strahem and Caddell.
- Solow, R. M. (1956). A Contribution to the Theory of Economic Growth, *Quarterly Journal of Economics*, 70(10): 65–94.
- Songwe, V. and Winkler D. (2012): Exports and Export Diversification in Sub-Saharan Africa: A Strategy for Post-Crisis Growth. *Working Paper 3*, Africa Growth Initiative, Brookings.
- StataCorp (2011), *Stata Longitudinal Data/Panel-Data Reference Manual Release 12*, Texas: Stata.
- StataCorp (2011): *Stata: Release 12. Statistical Software*, College Station, TX: StataCorp LP.
- Syrquin, M. (1989): *Patterns of Structural Change*, Handbook of Economic Development, Amsterdam: Elsevier Science Publishers.
- Turnovsky, S. J. (1974). Technological and Price Uncertainty in a Ricardian Model of International Trade, *Review of Economic Studies*, 41(2): 201–217.

- UNCTAD (2003): *Economic Development in Africa: Trade performance and Commodity Dependence*. New York and Geneva: United Nations
- United Nations Economic Report on Africa (2007): *Accelerating Africa's Development through Diversification*, Addis Ababa, Ethiopia: United Nations Economic Commission for Africa.
- United Nations Economic Report on Africa (2012): *Unleashing Africa's Potential as a Pole of Global Growth*. Addis Ababa, Ethiopia: United Nations Economic Commission for Africa.
- Vernon, R. (1966). International Investment and International Trade in the Product Cycle, *Quarterly Journal of Economics*, 80(1966): 90–207.
- Viner, J. (1952): *International Trade and Economic Development*, Glencoe: The Free Press
- Wood, A. and Mayer, J. (2001): Africa's Export Structure in a Comparative Perspective, *Cambridge Journal of Economics*, 25(3): 369–394.
- Wooldridge, J. (2002). *Econometrics Analysis of Cross Section and Panel Data*, Massachusetts: MIT Press.
- World Bank (1993): *The Asian Miracle: Economic Growth and Public Policy*. Oxford: Oxford University Press.
- World Bank (2005): *Economic Growth in the 1990s: Learning from a Decade of Reform*. World Bank, Washington, D. C.
- World Bank (2011): *World Development Indicators (WDI)*, Washington, DC: World Bank.

World Bank (2012): *African Development Indicators (ADI)*, Washington, DC: World Bank.

World Bank (2012): *World Development Indicators (WDI)*,. Washington, DC: World Bank.

Yokoyama K. and Alemu M. A. (2009): The Impacts of Vertical and Horizontal Export Diversification on Growth: An Empirical Study on Factors Explaining the Gap between Sub-Saharan Africa and East Asia's Performances. *Ritsumeikan International Affairs*, 17(41), Institute of International and Area Studies: Ritsumeikan University.

APPENDIX**Appendix I: List of the 42 SSA countries in the study by region**

East Africa	Middle Africa	Southern Africa	West Africa
Burundi	Angola	Botswana	Benin
Ethiopia	Cameroon	Lesotho	Burkina Faso
Kenya	Chad	Namibia	Cape Verde
Madagascar	Congo, Dem. Rep.	South Africa	Cote d'Ivoire
Malawi	Congo, Rep.	Swaziland	Gambia, The
Mauritius	Equatorial Guinea	Zambia	Ghana
Mozambique	Gabon		Guinea
Rwanda	Sudan		Guinea-Bissau
Seychelles			Liberia
Tanzania			Mali
Uganda			Mauritania
Zimbabwe			Niger
			Nigeria
			Senegal
			Sierra Leone
			Togo

Source: Based on United Nation's Classification of Countries

Appendix II: GDP per Capita (growth) and Export Diversification for SSA, 1995–2010.

Years	GDP per Capita (constant 2000 US\$)	GDP per Capita Growth (annual %)	Export Product Diversification Index
1995	491.32	1.0	0.53
1996	502.29	2.2	0.54
1997	507.21	1.0	0.52
1998	505.98	-0.2	0.51
1999	505.73	-0.1	0.56
2000	510.80	1.0	0.61
2001	516.71	1.2	0.60
2002	520.64	0.8	0.59
2003	528.89	1.6	0.59
2004	547.80	3.6	0.60
2005	563.84	2.9	0.61
2006	583.26	3.4	0.60
2007	605.15	3.8	0.60
2008	619.34	2.4	0.61
2009	617.92	-0.2	0.60
2010	633.54	2.5	0.58

Source: Author's Computation Using STATA 12.

Appendix III: Summary of Some Key and Recent Literature Reviewed

Author & year	Study Period & Region	Methodology & Variables	Findings	Gaps in the study
Al-Marhubi (2000).	Cross-country sample of 91 countries including SSA (1961 -1988).	(Traditional Panel Model). Real GDP per capita, Initial GDP per capita, Secondary enrolment, Investment, Population growth, Openness, Share of manufactures in total exports, three different measures of ED.	ED is associated with faster growth and the relationship is robust to different model specifications and different measures of export diversification.	Did not consider the non-linear relationship ED and growth. Did not discuss sensitivity issues associated with panel data.
Imbs and Wacziarg (2003)	A sample of 93 countries including SSA (1963–1997).	GDP per capita, and various measures of domestic sectoral concentration across countries.	U-shaped relationship between income per capita and domestic sectoral concentration across countries.	Did not control for other variables affecting growth.
Agosin (2007).	Cross – country data of 106 countries over the period 1980-2003.	(OLS and IV techniques). Real GDP per capita, initial real GDP per capita, gross fixed capital formation, ED, openness.	A positive effect of export diversification on economic growth.	Did not test the non-monotonic relationship between export diversification and growth.
Hesse (2008).	Cross– country sample of 99 countries for the period 1965 – 2000.	(System GMM Estimation) real GDP per capita growth, Initial GDP per capita, Schooling, Population growth, Investment, Export concentration, Openness	Non-linear link between export diversification and growth.	Did not consider regional diversities in among developing regions of the world.
Yokoyama and Alemu	Data for 41 countries, 32 from SSA	(SURE, 3SLS and IV), GDP per capita, initial GDP per capita,	Both horizontal and vertical ED affects growth	Did not account for the functional relationship between

(2009).	and 9 East Asia for the period 1975 – 2004.	vertical ED, horizontal ED, domestic capital, human capital, population growth, FDI, exchange rate, openness, political instability, rule of law.	positively; but the latter has greater effect than the former. East Asia performed better than SSA in terms of ED and economic growth.	export diversification and economic growth.
Cadot <i>et al.</i> , (2009)	Cross-country sample of 156 countries including SSA (1988–2006).	(System GMM Estimation), various measure of ED, GDP per capita, squared term of GDP per capita, raw materials.	Find a hump-shaped relationship between economic development and export diversification.	Did not consider the effect of regional differences in the sample.

Source: Author's Compilation.