

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

Terms of Trade Deterioration and Income Convergence in
Sub Saharan Africa

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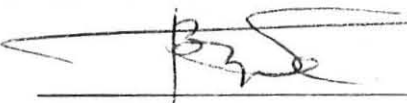
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Indeed God does everything at the right time. He is my hope when I despaired. He is everything to me in harsh time. Thank you God, you did great thing to me

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Abstract

To undertake the study of the terms of trade deterioration a north and south model has been used. In the north model, the export price of manufactured commodities has been formulated and estimated using time series econometrics. In the south model, the export price of the primary commodities have been taken in to consideration and estimated using the same techniques. Concerning the income convergence sub section, time series econometrics method is used to estimate the absolute income convergence while system GMM is used to estimate the conditional income convergence.

From the econometric results, the supply side factors (which are included in the economy of each region) affect the long run prices in both regions. The income in the south also positively affects the export price of manufactured goods. Here the import-compressed economies can agitate the problem of terms of trade deterioration. The income of the north positively affects the price of all primary products but remain insignificant for beverage and agricultural products. The interest rate is a significant variable, which affects the short run price of beverages and agricultural raw materials but insignificant to affect the price of all primary commodities except oil.

When we come to the income convergence sub section the sub Saharan Africa countries are diverging from the average per capital income of developed countries (absolute income convergence). But they are converging to different per capital level (conditional income convergence). In the growth regression saving, export share and previous year investment positively affects the growth rate in SSA while population growth, inflation and M/GDP negatively affects the growth rate in this region. Openness, illiteracy rate and foreign direct investment remained poor to affect the growth rate of SSA.

Chapter one

1.1 Introduction

Economic growth was reasonably strong in much of Sub-Saharan Africa (SSA) between 1960 and 1973. For most countries, however, the subsequent two decades were a period of stagnation or decline. Pritchett (1998) shows that there was typically a single main break in the growth trends for most African economies occurring at some point between 1973 and 1980, followed by persistent stagnation until 1992. Deceleration of growth in Sub-Saharan Africa set in during the second half of the 1970s. It was sustained during the 1980s mainly as the result of exogenous shocks and policy misdirection. Key among the exogenous shocks were the collapse of the price of primary commodities, an increase in the interest rate on foreign debt, and a sharp cut in net foreign inflow during the first half of the 1980s. Policy misdirection was of two types. First, which has been referred to as capital habit, investment was driven beyond sustainability. Second, the anti-export policy bias of the 1970s contributed to the decline in the export growth. Structural maladaptation was also related to a wrong expectation that the exogenous shocks of the 1970s were short term and could be ridden out (B.Ndulu, 1991).

Many countries have shown modest recovery since 1994, but levels of growth have tended to remain far below the early phase. For the four decades as a whole, SSA's average per capita income growth of 0.9 percent falls short by 1.5 percentage points vis-à-vis other developing countries, and approximately 3 percentage points below that of the high performing African (Botswana and Mauritius) and East Asian economies (Hakim Hammouda, 2004).

The consequence of the long period of stagnation in growth for a large number of African economies combined with high population growth rates has meant little or no progress in raising the standards of living in these countries. Between 1960 and 1994, out of 35 SSA countries for which comparable data exist, 16 suffered at least 20% loss in income per-capita measured in 1985 constant US dollars. Most of the losses were registered after 1975 (Roderick, 1998). In contrast to the situation of SSA, Pritchett (1998) shows that developed countries have sustained a remarkably steady per capita growth of approximately 2 percent for about 100 years and the newly industrializing countries have maintained income growth rates above 3 percent for nearly three decades enabling them to gain significant ground on the industrialized countries.

Historically growth hasn't been sufficient to reduce poverty in Africa substantially. Despite the progress in some countries of Africa (Botswana and Mauritius), overall growth in Africa has average about 3% compared to 5% needed to keep the number of poor from rising (ADI, 2005). GDP growth in Africa in 2003 was 3.9%. Low growth is linked with poor trade performance. From 1970 to 1990s, Africa's share of world trade dropped from 3.5% to 1.5% (ADI, 2005). The African share of world trade decreased due to terms of trade deterioration (UNCTAD, 2002). According to a recent World Bank(2004) study too, the cumulative terms of trade losses of for non-oil exporting SSA countries, between 1970 and 1997, amounted to 119% of regional GDP, and 51 and 68 percent of cumulative net respectively. Between 1980 and 1998 international price of agricultural commodities fell by about 35% while those of manufactured products increased by 40%. The terms of trade between agricultural products and manufactured products deteriorated considerably, falling by more than 58 % (FAO, 2000)

1.2 Statement of the problem

Africa has left behind the rest of the world in terms of economic growth and prosperity. Its per capital income growth didn't show improvement in the last decades. Some parts of the world (south East Asian countries), which were poor like Africa, have shown rapid economic growth. The slow growth rate, that SSA has experienced, has urged many scholars to find the reasons of it. Ndulu (1991) tried to explain the causes of slow growth in Africa. He indicated that capital underutilization via policy misdirection and, external shocks are the causes of slow growth.

Results from aggregate growth accounting give a more prominent role to the productivity residual in explaining Africa's relatively slow growth than is usually acknowledged in the literature. Only about half of the growth difference between Africa and other developing countries is due to slower accumulation of physical and human capital. The remainder is accounted for by slower growth in the productivity residual. Thus, factors behind slow productivity growth are essential part for the slow African growth (Collins and Bosworth, 1996). Africa's slow growth is explained by relatively slow accumulation of capital, low productivity growth, and pressures from high population growth rates.

Sachs and Warner (1997) presented one of the most comprehensive analyses of the sources of slow growth in developing countries with a particular emphasis on Sub-Saharan Africa over the period 1965 - 1990. The authors included a wide range of explanatory variables such as openness, geography, climate, natural resources, institutional quality, inflation, life expectancy, neighborhood effects, ethnic fractionalization, and population growth. They found that both natural factors and

inappropriate economic policies were responsible for the slow growth in developing countries including Sub-Saharan Africa.

The paper by Hoeffler (1999), painstakingly confirms the significance of slow accumulation and high population growth in explaining Africa's slow economic growth. The ratio of investment to GDP in SSA averaged 9.6 percent of GDP (measured in international prices) relative to nearly 15.6 percent in other developing countries (south East Asian countries). SSA's stock of human capital is well below developing countries norm and the region's relative position has deteriorated over time, particularly with respect to attainment of secondary education. But in much of the growth literature, the author found that the impact of these differences is much smaller than that of differences in physical capital accumulation. The relatively delayed demographic transition in SSA, in contrast, significantly depresses capital per worker and income per worker, unmitigated by technological innovation.

The recent study, conducted by Stephen A. O'Connell and Benno J. Ndulu (2000), takes into account many variables to explain the slow growth rates that Africa has experienced. In their study it is indicated that slow accumulation of capital, slow productivity growth, and delayed demographic transition contribute importantly to Africa's relative performance. On top of that, Azam et al (2002) refers to five factors (that can broadly be classified into 'domestic' and 'external' factors) that affect the growth process in Africa. These are macroeconomic factors, macroeconomic uncertainty, human capital and regional factors, regional spillover effects, external shocks, and institutional/political uncertainty.

Africa has faced slow growth trends, which are accounted by both domestic and external factors. Among the external factors terms of trade deterioration is the one. According to

Johnson (1954), the lower income elasticity of the demand for raw materials ought to be reflected in slower economic growth in the countries specializing in those products or in a tendency for raw material prices to decline. This effect depends entirely on income-elasticity, but the lower the price-elasticity of the demand for raw materials is, the larger the decrease will be. This has happened in Africa since 1980s.

After enjoying an upturn in terms of trade during the commodity price booms of 1970s, Africa has experienced a downward trend from early 1980s. The levels of terms of trade for SSA and North Africa at end of 1990s were 21 and 24 percent respectively below those attained in 1970s. The overall trend, since 1980s has been downward. While there was some upward trend after 1993, contributing to SSA's economic recovery, this lasted just three years, and the terms of trade of SSA in 1998 was 15% below the peak of 1996. This secular decline is an important reason for the marginalization of Africa in world trade (UNCTAD, 2002). A significant part of the decline of SSA in share in world exports over the past two decades could be explained by declines in prices of African exports to that of the result of the world. If African terms of trade had stayed at the level of 1980s, its share in world exports now would have been almost twice as high (UNCTAD, 2002).

The study, therefore, will focus on sorting out factors that cause poor economic growth in Africa and their impact on income convergence. It will also assess the impact of terms of trade deterioration on economic growth and explains what factors determines it.

1.3Hypothesis

- i) Most of Sub Saharan African countries export primary products, and these products are susceptible for frequent price shock and suffer from terms of trade



deterioration. As demand^a and supply^b vary across primary products and manufactured products, the factors that cause the terms of trade deterioration may vary among these products.

ii) Sub-Saharan Africa countries have relatively the same economic structure as they have low capital per labor. Thus, there will be club income convergence in these countries (Convergence of income to different steady state percapita income after different growth factors are taken into consideration). On the other hand, these countries did not achieve fast and sustainable economic growth in the last decades. Therefore, they may not be able to converge the developed countries' percapita income.

1.4 Objectives of the Study

Terms of trade deterioration and lack of fast and sustainable economic growth are the two chronic problems of Sub-Saharan Africa. Therefore the objectives of the study are;

1) To point out factors that affect growth and convergence in sub Saharan Africa countries. These factors include :

- Internal factors (like saving, population growth and investment).

- Policy factors (like monetary policy)

2) To sorting out factors that affect terms of trade deterioration in sub-Saharan Africa countries. These factors include:

- Supply side factors

- Demand side factors

^a Here demand implies both as consumption and as raw materials in the north(developed countries)

^b supply implies export supply

1.5 Methodology and data collection

To analyze the stated objectives and to test the hypotheses listed above, both panel data and time series econometrics techniques are applied. The data is collected from IMF CD room, WB CD room, Penn table, Saches and Warner data sources and UNCTAD CD rooms. So as to examine the terms of trade deterioration and income convergence (time series econometric techniques), data from 1970 to 2003 are used. The panel data used for income convergence analysis also ranges from 1980 to 2003.

1.6 The Significance of the Study

Most of the studies conducted on the terms of trade deterioration concentrated on the analysis of the size (trend) of the deterioration. This study tries to focus on the cause of the terms of trade deterioration. The study also focuses on the analysis of income convergence and concentrates on sorting out factors that cause the slow growth in Africa. Thus, the study focuses on the two fundamentals problems of Africa. The study will explore the causes of commodity specific terms of trade deterioration, which will have good relevance for policy makers.

1.7 Limitation of the study

The study tries to investigate how the terms of trade deterioration can be studied in North^c- South^d model. But, all countries in the North and in the Sub-Saharan Africa are not included to model the export price equations in the two regions. The study tries to explore how different factors affect the price formulation in the two regions. Here, institutional and political factors are not incorporated in the price equations.

On the income convergence sub section, selected sub-Saharan Africa countries are taken in to consideration. Therefore, the limited size of the cross section dimension might affect the desired coefficients negatively. On top of that, the study incorporates

^c The north in this context applies developed nations, which include USA, Japan, Germany, Canada, Sweden, and France.

^d The south includes sub Saharan Africa countries included in the study.

economic, and demographic variables to explain growth and convergence in the region. The study doesn't incorporate the influence of political and institutional factors to explain growth and income convergence in SSA.

Chapter Two

2.1 The theoretical Review on terms of Trade Deterioration

The conventional trade theories^e argue that countries should produce and export commodities that let them keep their comparative advantage and extensively use the abundant resources respectively. The abundant resource for sub-Saharan Africa countries is unskilled labor, which is used in the production of primary commodities. So, to keep their comparative advantage and to use their abundant resource; African countries should produce and export primary commodities. However, these theories could not indicate the problem attached to primary commodities when they trade with the manufactured goods. Gebrehiwot (1920), for the first time, indicated the existence of terms of trade deterioration for primary commodities. Later, Prebisch(1950) and Singer (1950) also made their own contribution in this regard.

The original formulation of the Prebisch-Singer (P-S) hypothesis combined two different, but clearly complementary, variants whose theoretical development proceeded along parallel lines in the subsequent economic literature. On the one hand, there was the negative effect that the income-inelasticity of demand for raw materials had on the terms of trade for developing countries. On the other, there were the asymmetries present in the conditions underlying price formation mechanisms for primary commodities and manufactures and, in turn, the functioning of labor markets in the “centre” and the

^e The conventional trade theories imply comparative advantage (David Ricardo) and the neoclassical factor endowment theories (Heckscher-Ohlin) respectively,

“periphery” of the world economy. The fundamental conceptual difference between these two variants is that, in the first case, the downward pressure on real commodity prices is generated through product markets (i.e., via the *barter* terms of trade), whereas in the second it is generated through factor markets (i.e., via *factoral* terms of trade) and only indirectly, by the effects that production costs have on the barter terms of trade. Another difference is that, as a consequence of the above, the first variant of the P-S hypothesis applies only to commodities (or, more generally, to products for which the income elasticity of demand is low), whereas the second affects all goods and services produced in developing countries, regardless of the characteristics of those goods and services or of their final demand. (José Antonio Ocampo and María Angela Parra ^f)

According to Johnson (1954), the lower income elasticity of the demand for raw materials ought to be reflected in slower economic growth in the countries specializing in those products or in a tendency for raw material prices to decline. This effect depends entirely on *income*-elasticity, but the lower the *price*-elasticity of the demand for raw materials is, the larger the decrease will be.

In a neoclassical (Heckscher-Ohlin) trade model, any factor that increases the supply of a given good will result in a decrease in its relative price. Thus, in countries or regions that are large enough to influence international prices, technological change in export industries will be reflected in deterioration in their barter terms of trade. Interesting variation on this type of model can be constructed by taking into account the fact that developing countries’ capital goods (machinery and equipment, in particular) are

^f www.econwpa.wustl.edu/eps/it/papers

imported. In this case, low income and price elasticities will tend to dampen growth in developing countries not only due to their direct impact on incomes but also because the resulting deterioration in the terms of trade diminishes these countries' ability to transform export products into capital goods.(ibid).

Samuelson (1982) indicated that when the price of a commodity increases, the reward to the factor that intensively used in the production process would increase. Countries export primary commodities if the export price is greater than the domestic price .So the reward to the factor that intensively used in the production process increases .In the primary sector the factor that intensively used is the unskilled labor. But, Lewis (1954) indicated that there is excess supply of unskilled labor in the developing countries thus the supply force doesn't allow the price of labor (wage) to increase. Thus the terms of trade deterioration continues, as wage for primary commodities remain unchanged.

The "unequal exchange" literature sees the international trend in the terms of trade as reflecting the relationship between labor income trends in developed and developing countries. According to which the international terms of trade are determined by relative wages in developing versus developed countries. (Emmanuel, 1972)

The entire impact of technological change in export sectors is transmitted ("exported") to the rest of the world via deterioration in the terms of trade is depicted by the north - south models. In this analysis the terms of trade are determined by structural differences between developing and developed economies. The economy being modeled is one in which the North determines the pace of the world economy's growth and in which the South adapts to that pace. In the long run, the North appropriates the full benefits of its own process of technical change; while the South's productivity gains lead to a commensurate deterioration in its barter terms of trade (its technical changes are

“exported”. This is a reflection of the asymmetrical effects that technological change has on real wages. While in the North wage increases are proportional to increases in productivity, in the South real wages are not affected by technological change. (José Antonio Ocampo and María Angela Parra, Joyati , Bhattacharya and Ajitava Rychaudhuri, 2004)

Singer, elaborated on the influence of scientific and technological capacities on the terms of trade of developing countries. Since, he argued, the developed countries have a near-monopoly of technological innovation, they can effectively determine not only the direction of technical progress in developing countries, but also of the access to all the relevant information necessary for successful bargaining. This asymmetry results in a deterioration of the position of the developing countries in all their dealings with developed countries, including deterioration in their terms of trade (Singer, 1971). The argument is especially relevant to the exchange of manufactures between developed and developing countries. (Alfred Maizels ^g)

The circular terms of trade deterioration theory indicates that *the* structure of supply and demand is such that industrialized countries offer industrial products and buy raw products and the developing industries do the reverse. According to Engel's law, the demand for raw materials tends to be inelastic while the demand for industrialized goods is elastic. The technological progress in the production of industrialized goods not only makes it possible for industrial countries to increase their incomes and thus the standard of living, but, because of the elastic demand on the world market, also to enforce higher prices. The situation in developing countries is the opposite, technological progress in

^g www.southcentre.org/southletter

primary production results in lower prices because of the inelastic demand. This mechanism leads to deteriorating exchange relations between industrialized and developing countries (kuhen^h)

2.2 Empirics on the terms of trade deterioration in Africa

By adoption conventional semi logarithmic trend model for the period 1950-1994, David Sapsford and John-ren Chen (1998) found out that there is term of trade deterioration. They revealed a negative trend (1.64 per annum). On the other hand John-ren Chen and Herbert stockers (1998), by applying a principal components analysis and by introducing additional economic structure to reduce potential misspecification, affirmed the terms of trade deterioration. They took specific commodities to analyze the terms of trade deterioration.

Eventually, they concluded that there is a secular pattern of motion that governs the long-term behavior of the relative prices of primary commodities

After enjoying upturn in terms of trade during the commodity price booms of 1970s, Africa has experienced a downward trend from early 1980s. The levels of terms of trade for SSA and North Africaⁱ at end of 1990s were 21 and 24 percent respectively below those attained in 1970s. And the overall trend, since 1980s, has been downward. While there was some upward trend after 1993, contributing to SSA's economic recovery, this

^h <http://www.professor-frithjof-kuhnen.de/publications/causes-of-underdevelopment/2-1-1.htm>

ⁱ North Africa includes Algeria, Tunisia, Egypt, and Morocco,

lasted just three years, and the terms of trade of SSA in 1998 was 15% below the peak of 1996. This secular decline is an important reason for the marginalization of Africa in world trade (UNCTAD, 2002). A significant part of the decline of SSA in share in world exports over the past two decades could be explained by declines in prices of African exports to that of the rest of the world. If African terms of trade had stayed at the level of 1980s, its share in world exports now would have been almost twice as high (UNCTAD, 2002)

According to a recent World Bank (2002) study too, the cumulative terms of trade losses of for non-oil exporting SSA countries, between 1970 and 1997, amounted to 119% of regional GDP in 1997, and 51 and 68 percent of cumulative net.

Between 1980 and 1998 international price of agricultural commodities fell by about 35% while those of manufactured products increased by 40%. The terms of trade between agricultural products and manufactured products deteriorate considerably, falling by more than 58 % (FAO, 2000)

According to recent empirical research, the expansion of manufacturing exports from the developing countries have also been associated with a downward trend in terms of trade - a trend much more pronounced with respect to exports of labor-intensive manufactures than skill- and technology-intensive products. This poses an additional problem for Africa. (Chakravathi Raghavan^j)

^j <http://www.twinside.org.sg/title/massive.htm>

An important initial study of the trend in the terms of trade of developing countries in their exchange of manufactured goods with the developed countries was carried out by Professors Sarkar and Singer (1991). The first part of their analysis showed that the unit values of exports of the developing countries declined by about 1 per cent a year in relation to those of the developed countries (cited in Alfred Maizels)

If, as Singer has argued, the level of scientific and technological development is indeed a general underlying influence on the terms of trade of developing countries, this should in principle apply also to different groups of developing countries at different stages of scientific and technological development. An analysis of trends in the net barter terms of trade of the various developing regions in their trade with developed countries would thus provide an additional empirical test of the deterioration thesis. The results of such a test are summarized in the Table based on EUROSTAT indices for EU trade in manufactures (goods included in the sections 5-8 of the UN Standard International Trade Classification), with major developing regions. The regions are listed in the Table in order of their general level of scientific and technological development. The conclusions from this table are First, there does seem to be a definite pattern, with the most technological advanced, South and South-East Asia, experiencing the smallest annual rate of deterioration in the manufactures terms of trade, and the least technologically advanced, the 'least developed', consisting mainly of countries in sub-Saharan Africa, experiencing the greatest annual rate of terms of trade deterioration. Latin America and Mediterranean developing countries fall into intermediate positions, in terms both of their levels of technology and of the degree of their manufactures terms of trade deterioration. (Alfred Maizels)

Table 2.1 The terms of trade deterioration among countries with different technological level

	Unit value	Volume	Developing countries' Terms of Trade		
List of groups of countries	EU imports	EU exports	EU imports	NBTT ^b	ITT ^c
All developing countries ^a	2.0	4.2	7.9	-2.2	5.5
Least developed	-1.3	4.4	...	-5.7	...
Latin America	1.3	4.9	4.8	-3.6	1.0
Mediterranean Basin ^d	2.1	4.4	6.6	-2.3	4.1
East and South-East Asia ^e	2.9	4.1	8.1	-1.2	6.8

Source: Alfred Maizels

a. excluding china

^b Net barter terms of trade (defined as ratio of unit value of EU manufactures imports to unit value of EU manufactures exports).

^c income terms of trade (defined as nbtt multiplied by EU import volume).

^d Algeria, Cyprus, Egypt, Israel, Jordan, Lebanon, Malta, Morocco, Turkey, Tunisia and former Yugoslavia.

^e The 4 NICs plus the ASEAN-4.

One possible inference from the findings is that countries at early stages of industrial development, with manufactures exports comprising mainly labor-intensive and resource-intensive goods, sell in highly competitive world markets which operate very much as do the markets for primary commodities. By contrast, the exports of the industrially more advanced developing countries include a substantial proportion of skill-intensive and capital-intensive products, where markets are much more influenced by technological innovation, and where prices are determined generally on a 'cost plus' basis. If developing countries' manufactures trade with the EU is reasonably representative as regards unit value trends, the results of the test in regard to regional differences in terms of trade over the period since 1979 do support Singer's line of argument. (Alfred Maizels)

2.3 Some Growth Facts of Africa

African countries lagged behind the world in terms of economic growth and development. Historical data indicates that African countries couldn't bring the desired economic growth. Economic growth and development needs the improvement of the wellbeing of the nations and should achieve structural transformation. Historical data testifies that Africa couldn't undertake structural transformation to bring the desired growth. Lewis (1954) indicates that when countries undergo structural transformation the share of agriculture to DGP declines. But in Africa the share of agriculture remains intact and still contributes the lion share of GDP. The table below indicates that the level of development of Africa in the 1990 is equivalent to that of the south East Asian countries

in 1965. From different growth theories^k, it is noted that investment and other factor of production accumulation is very fundamental for growth. But, the share of investment to GDP for African countries is not enough to bring the desire growth. Human capital accumulation of sub-Saharan Africa countries is not comparable with the south East Asian countries. The literacy rate of the south East Asian countries in 1965 is greater than that of the African countries in 1990. The social development indicators remain poor when compared to the rest of the world (compiled from World Bank, 1994)

From historical data, it is clear that countries that had higher per capita incomes in 1965 still had higher per capita incomes in 2002. At the same time, countries that had lower per capita incomes in 1965 still had lower per capita incomes in 2002, which indicates that there has been very little catching up among these countries over the period. Also, as seen in terms of real GDP per capita growth over the period 1965 to 2002, the experience has been mixed across countries. Whereas countries such as Malawi recorded over 24 percent average growth in per capita GDP, others such as Congo, Madagascar, Niger and Djibouti recorded negative growth rates on average. On the other hand, most of the countries have actually stagnated. When one looks at the composition of GDP across countries in the region one notices that countries that had lower per capita GDP tended to have a higher share of agriculture in the GDP basket. On the contrary, for most such countries the share of industry tended to be smallest. For example, Guinea-Bissau has over sixty percent share of GDP from agriculture, which is the highest among the set of countries in Sub-Saharan Africa. On the contrary, its industry share accounts for only (8) percent of GDP. The other countries that had between forty-percent and sixty percent of

^k These growth theories include Harod- Domar growth theory, Solow growth theory, endogenous growth theory, and Ak growth theory

GDP coming from agriculture include; Congo, Central African Republic, Burundi, Ethiopia, Sierra Leone, Rwanda, Niger Tanzania, Togo, Uganda, etc. Clearly, their industry shares are correspondingly small and their per capita incomes are among the lowest in the sub-region (compiled from World Bank, 2003)

Relatively few countries¹ have per capita incomes in 2002 exceeding one thousand dollars. Most of the remaining countries have per capita incomes below six hundred US Dollars, and Ethiopia, Congo DR, and Burundi have the lowest per capita incomes in the region. In terms of population growth rates, average growth rates range between 2 percent and 3 percent. On the other hand Niger, Madagascar, Kenya, The Gambia, Djibouti, Cote d'Ivoire, Congo DR, and Botswana have consistently grown at over 3.5 percent on average. Clearly, these growth rates are very high relative to some of the OECD countries where growth rates are less than one percent. Finally, in terms of foreign direct investment, there has indeed been a steady rise in flows to the region since 1992. However, two issues can be observed with the flows. The first is that, relative to GDP, the flows appear to be going to the same countries. Secondly, in relative terms, the countries that appear to be most appealing to foreign investors are, Equatorial Guinea, Angola, Chad, and the Congo. Clearly, these are oil-producing countries and hence it must be the case that foreign direct investment in the sub region is largely driven by expected returns on such investment. Therefore it is not very surprising that the flows are attracted to the oil and minerals sector that is believed to yield the appropriate returns (ibid).

¹ These include South Africa, Botswana, Gabon, Mauritius, Congo republic, Namibia, Equatorial Guinea, Swaziland, Cape Verde, and Djibouti.

Table2. 2:Sub-Saharan Africa in the 1990 vs. Southeast Asia in 1965.

Characteristic	Mean value for	
	<u>For Asia 1965</u> Indonesia, Malaysia, Thailand	For Africa 1990
GDP per capita	1320	1030
Agriculture share %GDP	37	35.3
Manufacturing share %GDP	10.3	11
Saving share GDP(%)	17	16
Investment share GDP(%)	16	16
Export share GDP	21	29
M2 share	19	19

Note: **Source:** The World Bank (1994: 38)

2.4 Sectoral Contribution to GDP and Economic Transformation: Empirical facts about SSA

As indicated in the above, section 4.3, economic growth and structural transformation go side by side. If a country undertakes structural transformation, the share of agriculture to GDP declines. It is also indicated that sectoral contribution to GDP and economic growth correlates with each other. To assess this fact, data from World Development Indicators

1998 (World Bank, 1998) were used to compose four panel data sets with 38 countries: 26 Sub-Saharan countries, 4 North African countries, 5 successful African performers, and 3 Southeast Asian countries for 1960–96. To examine the structural transformation in Africa, the five good performers^m and North Africa are each compared with three Southeast Asian countriesⁿ. These three Southeast Asian countries are chosen because they achieved resource-based industrialization and thus provide a useful benchmark for many resource-rich African economies.

Table2. 3: Growth of labor share in agricultural and nonagricultural sectors, 1961–90 (percent)

Sector	1961- 90	1961- 79	1980- 90
Agriculture			
Sub-Saharan Africa	-0.69	-0.66	-0.75
G5	-2.67	-2.28	-3.35
North Africa	-1.85	-1.33	-2.73
Malaysia, Indonesia, and Thailand	-1.55	-1.40	-1.81

^mThe five good performers (G5) are Botswana, Mauritius, Morocco, South Africa, and Tunisia

ⁿThe three south east Asian countries are Malaysia, Indonesia, and Thailand

Non agricultural			
Sub-Saharan Africa	2.31	2.68	>1.68
G5	1.37	1.47	>1.21
North Africa	1.83	1.63	<2.18
Malaysia ,Indonesia ,and Thailand	2.31	2.49	<2.61

Source: cited from ECA from Cho 2000.

In Malaysia, Indonesia, and Thailand the agricultural share declined more than 5 percentage points in every decade while the industrial share increased almost 5 points for each period. Moreover, these countries maintained average industrial growth of 9%, enabling them to pursue resource-based industrialization through incentive-driven dynamic comparative advantage.

There is no evidence of sectoral dynamism^o in the five successful African economies (G5), whose average 1998 income was similar to that of Malaysia, Indonesia, and Thailand. So these and other African economies have not been able to benefit from the positive effects of sectoral dynamism on productivity growth and economic growth. Nor has Sub-Saharan Africa countries enjoyed sectoral dynamism, though there have been modest structural changes (the share of agriculture has declined slightly since the 1960s). The output share of both agriculture and industry, however, has hardly changed during

^o Sectoral dynamism implies the transformation of an economy from agriculture dominated economy to industry based economy

the period of economic stagnation since 1974. The industrial sector's average growth rate was about a third of that in Malaysia, Indonesia, and Thailand. Indeed, it was either stagnant or declining in Sub-Saharan Africa. When labor force employed in the industrial sector is taken into account, the average growth rate of output per worker in Malaysia, Indonesia, and Thailand was about 3% a year, while that of Sub-Saharan Africa was negative. In the 1980s the cumulative rate for 10 years was 29% in Malaysia, Indonesia, and Thailand and 5.6% in Sub-Saharan Africa. The evolution of the ratio of industrial to agricultural sector output and GDP during 1980–96 confirms the dynamic interaction between structural changes and sustained growth in Malaysia, Indonesia, and Thailand. Through improvements in productivity growth this transformation substantially contributed to sustainable growth in these Southeast Asian economies. But this was not the case in Africa. (E.C. A ,2004)

2.5 factors of Production and Economic Growth: Some Empirical Facts about SSA

Lewis (1954) argues that the central feature of modern economic development is a reallocation of factor of production from low traditional (agriculture) to modern (industry) sector, observing this intersectoral shift was one of the most systematic correlates of rising per capita income.

The share of labor in agriculture declined in the G5 and in North Africa in 1961–90, but not in Sub-Saharan Africa. Moreover, the declines were deeper in 1980–90 than before. The growth of the labor share in non-agricultural sectors shows significant differences among the groups. In Sub-Saharan Africa and the G5 countries the growth rate declined

at a slower rate in the 1980s than earlier, while it increased in North Africa and Malaysia, Indonesia, and Thailand, reflecting continual labor absorption and employment creation. Indeed, non-agricultural and manufacturing employment increased 1.5–2 times as fast as the aggregate working population in Malaysia, Indonesia, and Thailand. The resource-based industrialization in these three Southeast Asian countries has greatly benefited from this dynamism, especially from the labor reallocations and productivity gains. The growth of total factor productivity in the selected African economies during their high growth period shows that human capital accumulation was critical. This is partly explained by the extremely low human capital accumulation in Sub-Saharan countries. Human capital contributed significantly to total factor productivity growth. Reallocation of labor from agriculture to the (more productive) non-agricultural sectors also has contributed significantly to the growth of total factor productivity. In Botswana, reallocation of labor has contributed more to productivity growth by inducing productivity gains of 2.6 percentage points on average in 1961–90 (ibid)

Since there was little evidence of labor reallocation from agricultural to non-agricultural sectors in Sub-Saharan countries, these economies could not enjoy significant productivity growth. Moreover, the productivity gains dropped sharply in the 1980s. Unexpectedly, neither North Africa nor the G5 countries enjoyed significant productivity growth, despite the relatively high rate of labor growth in their non-agricultural sectors. Presumably this was due mainly to the small increase of high value-added outputs in non-agricultural sectors and less to the migration of non-skilled labor from agricultural to non-agricultural sectors in these countries. In contrast, Malaysia, Indonesia, and Thailand enjoyed enormous productivity growth over the three decades. They were able to double the total factor productivity gains in the 1980s with the large increase in high value-

added outputs and skilled labor in their non agricultural sector because in Indonesia, Malaysia, and Singapore growth was extensive and led by physical investments. It was more intensive and closely dependent up on productivity growth in Japan, South Korea, Hong Kong, Taiwan, and Thailand. It also went hand in hand with considerable efforts in the areas of education and research. The African experience is different in that even in when investment rates were high in the 1970s they never equaled with those of the Asian countries and Africa lacks conducive ways of channeling investment as high investment rates could exist with declining actual growth as long as the decline in capacity utilization exceeds the increase in capacity growth .for a given resource constraint there may be a trade off between capacity growth and capacity utilization. A number of African economies experienced this during 1975 to 1981. As capacity underutilization accelerated, while investment rates increased. This was reflected in the study by Gulhati and Datta(1983)which observed rapid increase in ICORs^p and a decline in investment productivity from 83.8% during 1961 to 1973to 6.3%during 1980to 1987(cited in world bank, 1987)the process of growth does not only depend on factors that influence capacity growth but also those affecting the rate of capacity utilization. This contention is note worthy given the fact that savings and hence investment ultimately depend on actual income growth. Resource allocation between capacity expansion and capacity utilization becomes as important as resource mobilization for investment to enhance capacity growth (Ndulu, 1991)

As Ndulu (1991) indicated intermediate that imports are the single most important constraint to capacity utilization thus import instability translates in to growth instability

^p ICOR implies incremental capital out put ratio and it can be calculated as the ration of capital to total out put. Lower ICOR indicates efficiency in capital usage.

in SSA. The remarkable instability of the ratio between real imports of capital goods and real investment over the last decades suggests a close to fixed proportional relation ship. For SSA as a whole, the ratio of real capital imported (machinery and transported equipment) to real investment increased very slightly from 35.4%in 1980 to 36.8%in 1987. In spite of a steep deceleration in import volume, growth the share of capital goods in total imports increased very slightly between1980and from 31%to 32%. However, the economy wide ratios of real intermediate imports to value added seem to have shown compression during the last decades of foreign supply bottlenecks. While the annual growth rates of import volumes decelerated from 7.6%during 1973 to 1980 to 5.8% during 1980 to 1987 the rate of growth of production declined from 2.5% to 0.5%. The capacity utilization ratio declined proportionally less than the reduction in real intermediate imports. This was achieved through change in the relative sectoral contribution to GDP in favor of the less import dependent sectors in production, particularly agriculture (Ndulu, 1991)

2.6 Institutional Factors Policy Factors and Growth in sub-Saharan Africa

The recent empirical growth literature has suggested a wide range of growth correlates⁹. These ultimate sources of growth have been shown to be as important as the proximate factors of growth ¹⁰(Samir Makdisi, Zeki Fattah, and Imed imam, 2000). Jeffrey D. Sachs and Andrew M. Warner(1997) find that poor economic policies have played an especially important role in the slow growth, most importantly Africa's lack of

⁹The list includes among others, initial conditions, macroeconomic performance, trade openness, government size; income distribution, financial market development, natural resource abundance, institutions, politics and physical geography.

¹⁰ The proximate factors of growth incorporates, physical capital, labor and the efficiency with which these factors are combined

openness^s to international markets. In addition, geographical factors such as lack of access to the sea and tropical climate have also contributed to Africa's slow growth. Sachs (2003) argues that geographical factors still have potential direct effects on per capita incomes, even after controlling for the quality of institutions. Thus far, the recent wider empirical literature seems to reach a consensus that historical factors as well as geography explain the growth puzzles in regions such as Africa

Several underlying factors^t can affect the rate of output change. A country's macroeconomic policies will affect its growth performance through their impact on certain economic variables. A high rate of inflation is generally harmful to growth because it raises the cost of borrowing and thus lowers the rate of capital investment. At the same time, highly variable inflation makes it difficult and costly to forecast accurately costs and profits, and hence investors and entrepreneurs may be reluctant to undertake new projects. When financial resources in the form of domestic savings and foreign grants and loans are limited, a larger budget deficit will mean that more of those limited resources must be devoted to financing the budget deficit. Fewer resources will thus be available for the private sector. If the fiscal deficit increases to an unsustainable level, private investors' perception of country risk is likely to become increasingly negative and hurt private investment macro policy^u (Anupam Basu, Evangelos A. Calamitsis, Dhaneshwar Ghura, 2000)

AJRT (2002), RST(2004) argued that institutions are very fundamental factors for growth. They said institutions triumph everything else. According to AJRT (2002), distortionary macro policies^u are symptoms of the effect of weak institutions. On the

^s Openness can be calculated in different ways. Here, the researcher used Sachs and Warner openness index to measure openness.

^t Key among these are the rate of investment, increase in the size of the workforce, and changes in economic policies

^u In the study, macro policy includes high inflation, large budget deficits and misaligned exchange rates

other hand, Levin (1997) argued that ethical diversification affects growth via direct and indirect ways as ethical diversification has a strong link to high black market premiums political instability, and poor financial developments. Ojo and Ashikoya(1995)studied the determinants of long term growth in a cross section of African countries over the period 1970-1991. The authors argued that initial per capita income, investment, population growth, macro economic conditions (inflation and exchange rates), external factors (export growth, external debt, and terms of trade) political environment, and human capital development affect growth in sub-Saharan Africa (cited Johnson P. Asiamama and Maurice Kugler, 2004). Pritchett (1999) identifies adequate macro economic policy, adequate openness and private sector orientation, and adequate governance as three requirements for growth.

According to Batch (1990), Poor countries lack sufficient domestic resources to finance investment and the foreign exchange to import capital goods and technology. Aid to finance investment can directly fill the savings-investment gap and, as it is in the form of hard currency, aid can indirectly fill the foreign exchange gap. As official aid is issued to government, it can also fund government spending and compensate for a small domestic tax base (cited from Ghura and Hadjimichael, 1996). On the other hand, William Easterly (1999) indicated that a lump sum transfer like aid would have no effect on the rate of investment. There is also a moral hazard problem with giving aid on the basis of a “financing gap.” Recipient countries will have an incentive to maintain or increase the “financing gap” by low saving (i.e. high consumption) so as to get more aid.

Johnson P. Asiama and Maurice Kugler (2004) considered variables such as government consumption, excessive money growth, inflation, openness^v, financial development (financial development is proxied by the ratio $((M2-M1)/GDP)$, foreign direct investment, and infant mortality rate to proxy poverty (that probably leads to a cycle of lower savings and capital accumulation, hence lower growth in per capita income) to augment the Solow model. They used the $M2/GDP$ ratio to proxy excessive money growth in these countries. The literature on foreign direct investment suggests that it can have either a positive effect or negative effect on growth. The positive effect might arise through productivity gains that are expected to occur through technology spillovers and the introduction of new methods as well as processes that could be learnt, and used to modernize the national economy, and spur productivity growth. On the other hand, the negative effects could arise due to unfair competition if multinationals use their technological and scale advantages over domestic firms to extend their monopolistic power into the domestic market. In that case, foreign direct investment would crowd-out domestic investment (Andrew Mold^w).

2.7 Empirical Evidence on Growth in Africa

The recently coming growth focused economists and authors have clearly introduced a new dimension to empirical work on the varied growth experiences across the world. AJR (2001) and AJRT (2002) found that economic outcomes were largely dependent on the type of institutions that have persisted since the colonial era. In places where Europeans faced high mortality rates due to the different disease environment, they could

^v The researchers used Sack and Warner openness index to measure openness Sachs/Warner openness is the proportion of years 1965-90 that a country is deemed 'open' by the criteria of Sachs and Warner (1997). This includes low average tariffs, low black market premium, absence of government monopoly of exports, and non-socialist government

^w www.regionetdeveloppement.u-3mrs.fr/pdf/R20_Mold.pdf

not settle and they were much more likely to set up extractive institutions. These institutions (e.g. political institutions that do not constrain politicians and political elites, ineffective enforcement of property rights for investors, widespread corruption, and a high degree of political instability, etc) have largely persisted even after independence. According to AJRT (2002) distortionary macroeconomic policies^x, were mere symptoms of the effect of such weak institutions. Consequently, when the authors corrected for the effect of institutions, they found that macroeconomic distortions had had only a minor impact on economic outcomes. On top of that, RST2 (004) found that the effect of institutions “trumps” everything else. Once institutions were controlled for, conventional measures of factors such as geography and trade had at best very weak direct effects on incomes. On the other hand, Ghura and Hadjimichael (1996) investigated long run growth in Sub-Saharan Africa over the period 1981-1992 by Using feasible generalized least squares techniques on a panel of 29 Sub-Saharan African countries. The authors found support for conditional convergence, even though absolute convergence was rejected. On the control variables, the authors found that both private and public investment had a positive and significant effect on growth. Other variables that affected long run growth significantly were the budget deficit, inflation, real exchange rate, and population growth. Sachs and Warner (1997) found that both natural factors^y and inappropriate economic policies^z were responsible for the slow growth in developing countries including Sub-Saharan Africa. Easterly and Levine (1997) also contributed some valuable empirical perspective on the growth tragedy in Sub-Saharan Africa in particular. The paper investigated both the direct and indirect effect of ethnic diversity on

^x In the study, distortionary macroeconomic policies include high inflation, large budget deficits and misaligned exchange rates

^y The natural factors, incorporated in the study, include natural resource dependence, tropical climate, and limited access to the Sea

^z Economic policy factors, incorporated in the study, includes openness to international trade, government saving, market supporting institutions, life expectancy, and demographic factors

growth. The paper makes some interesting observations. First, it was reported that ethnicity had a significant negative direct effect on growth. Second, it was found that high levels of ethnic diversity were strongly linked to high black market premiums, political instability, poor financial development, low provision of infrastructure, and low levels of education. Since these variables were also found to have a negative effect on growth, this means that ethnic diversity has both a direct as well as an indirect effect on growth. The paper also found evidence of non-linear convergence in growth rates. Temple (1998) sought to extend the analyses in Easterly and Levine (1997) and Sachs and Warner (1997) by explicitly exploring the effect of initial conditions and social arrangements on growth in Africa. Using "re-weighted least squares", the paper found that more than half of the variation in growth rates could be explained by observable variables capturing initial conditions. Further, it was found that social capital mattered for growth in the sense that countries that had relatively low social capital were more likely to have dismal policy outcomes, low investment and slow growth. Saviddes (1995) also studied the determinants of per capita growth rates across Africa for the period 1960-1987. Using a fixed effects panel model based on endogenous growth theory, the paper found support for both absolute and conditional convergence. It was further reported that both economic and political variables influence growth in Africa. The economic variables include initial conditions, investment, population growth, trade orientation, inflation, financial development, and government expenditure. Ojo and Oshikoya (1995) found out that, on average the most significant variables influencing long-term growth in the sample of African countries over the study period were investment, external debt, population growth, and the macroeconomic environment(cited in Johnson P. Asiama and Maurice Kugler(2004).

Johnson P. Asiama and Maurice Kugler(2004) found out that government consumption, inflation, poverty and excessive monetization have negative effects on growth. The effect of government consumption is believed to work through distortionary tax –financed government purchases, while inflation creates uncertainty that affects the ability of economic agents to extract information from relative prices, thus leading to inefficient resource allocation, and hence lower growth. On the other hand, openness, financial development, and foreign direct investment have a positive effect on growth in Africa.

2.8 Export Structure and income Convergence

From the table below it is apparent that the dominant trend in the last 40 years has been increasing divergence between the average income per capital of LDCs and that that of the world 20 richest countries. weighted by population the income per capital of the 20 richest countries was 11 times higher that of the the LDCs in 1960 and 19 times higher in 1999.however there are major differences in the trends between LDCs that have diversified out of commodities ,and those that have not done so (UNCTAD, 2002)

The simple average of income per capital in the non- oil commodity exporting LDCs was almost the same in 1999 as it was in 1960s.It was lower in 1999 than in 1990,lower in 1990 than in 1980.lower in 1980 than in 1970 .On the basis of average weighted by population the income per capital of the richest 20 countries was 16 times greater than that of the non- oil exporting LDCs in 1960.In 1999 it was 35 times greater .A strong divergence between the richest countries and the non- oil exporting LDCs has also been associated with convergence among this group of LDCs ,particularly from the 1970 to the 1990.However there was an increasing divergence in average per capital incomes among this group of LDCs in the 1990s.(UNCTAD, 2002)

Table2. 4: Trend in GDP per capital income in the worlds20 richest countries, LDCs and LDCs subgroups (a), 1960-1999

(GDP per capital, in ppp 1985\$)	1960	1970	1980	1990	Average
World's20 rich countries(b)					
Simple average	6535.1	9124.2	11851.1	13636.4	16723.5
Weighted average	7591.7	100008.6	12584.0	15316.9	17880.0
Standard deviation	1529.7	1736.8	1500.5	2673.0	1767.4
LDCs©					
Simple average	661.1	771.9	843.8	760.0	779.8
Weighted average	685.0	857.3	766.7	813.9	948.0
Standard deviation	264.7	326.2	491.2	338.5	446.1
Non oil commodity exporting countries LDCs(d)					
Simple average	594.5	673.5	668.6	609.2	587.5
Weighted average	477.7	553.4	535.4	499.7	515.7
Standard deviation	219.2	298.1	236.8	164.4	197.6
Manufacturing and /or service exporting LDCs(e)					
Simple average	780.1	905.6	1161.6	1028.0	1136.4
Weighted average	933.7	1194.0	1042.8	1211.1	1545.5
Standard deviation	290.3	324.5	671.3	414.3	556.2

Source UNCTAD secretariat estimates based on summers and Heston international comparison programme and World Bank development indicators 2001.CD room

Note a -the subgroups are defined according to their export composition in the late 1900s

b-the set of the worlds 20 richest countries varies over time

c-based on 31 LDCs for which data available the countries listed in d and e plus Angola

d-Benin ,Burkina Faso, Burundi, central Africa republic, Chad ,Democratic Republic of the Conge ,Ethiopia ,Guinea ,Guinea –Bissau, Malawi, Mali,Mauritania, Niger, Rwanda, Sierra Leone, Togo, Uganda ,United Republic of Tanzania ,and Zambia

e Bangladesh ,Cape Verdi , Comoros ,Gambia ,Haiti ,Lesotho, Madagascar, Mozambique ,Nepal ,Samoa ,and Senegal

Initial per capital incomes in the LDCs that have diversified in to manufactures and /or service exports were much higher in 1960 than those in non- oil commodity exporting LDCs, and overtime these countries have done better than the latter group. The weighted average of incomes per capital in the manufactures and /or service exporting LDCs was almost twice as high as that in the non –oil commodity exporting LDCs in 1960 and by 1999 it was almost three times higher. The ratio between income per capital in the 20 richest countries and that in the manufacturers and /or service exporting LDCs increased between 1960 and 1990. But the income gap is smaller than that between the richest countries and the non oil commodity exporting LDCs and the increase much less. Weighted by the population the average income per capital in the 20 richest countries was 8 times that of the manufactures and service exporting LDCs in 1960. In 1999 it was 12 times greater .During the 1990s there was actually a slow convergence between the weighted average income percapita in the manufacturers and /or service exporting LDCs although the result is strongly dependent on the economic performance of Bangladesh. (UNCTAD, 2002)

2.9 Generalization: Comparative Growth Trends between South East Asian and African Countries

The first difference between the Asian and Africa countries is the weak growth in the latter and the recorded growth rates achieved by the former. From 1965 to 1990 according to world bank estimates the eight Asian countries (Japan, south Korea, Taiwan, Hong Kong ,Singapore, Malaysia, Thailand, and ,Indonesia) had the world

highest growth rates .It should be noted that the growth was accompanied by high investment rates in most African countries

The annual average was more than 20%of GDP between 1960 and 1990. However, while in Indonesia, Malaysia, and Singapore growth was extensive and led by physical investments. It was more intensive and closely dependent up on productivity growth in Japan South Korea, Hong Kong, Taiwan, and Thailand. It also went hand in hand with considerable efforts in the areas of education and research. The African experience is different in that even in when investment rates were high in the 1970s they never equaled with those of the Asian countries (Hakim Hammouda, 2004).

It is therefore clear that the major difference between the Asian and the African countries is that the Asian countries maintain fast economic growth with high investment and with considerable productivity gains. But the African countries did not maintain fast economic growth and their investment remained weak and unsustainable.

The other fascinating difference between the Asian and the Africa countries was the successful agricultural transformation that the Asian countries achieved .This played a major role in the Asian economies through achieving food self sufficiency and improving the livelihoods of rural households that inurn created demand for industrial products .while that failure that Africa encountered in agricultural transformation led impoverishing rural population and food dependency (Hakim Hammouda, 2004).

In Africa, on top the failure on the agricultural sector, industrial developments were faced many limitations. Industrial growth was strong in the 1970s and the African countries were able to develop certain industrial sectors. The crisis of the 1980s counteracted those efforts and industrial developments strategies were unable to provide

the African economies with coherent and competitive industrial sector. Industrial development played that major role in the Asian economies. Between 1950 and 1990, these countries enjoyed considerable growth in manufacturing sector employment. It increased from 15.4% to 24.1% in Japan, from 7% to 26.9% in south Korea, from 12% to 32% in Taiwan, from 19% to 29.5% in Singapore (world bank 1993). Growth in manufacturing sector let these countries transform their export structure with an increase in manufacturing exports at the expense of their traditional exports. Between 1967 to 1993 the proportion of industrial exports in total exports rose from 93.4% to 96.8% in Japan, from 67.3% to 93.7% in south Korea from 21% to 78% in Singapore, from 3.7% to 50.5% in Indonesia, from 12.6% to 65.5% in Thailand and from 24.9% to 68.4% in Malaysia. (UNCTAD, 1996)

Chapter Three

3 Modeling and Estimation Methods

3.1 Modeling Export Price in the North and the South

The earlier formulation of the export supply function for primary commodities used lagged current and expected price as a determinant factors for export of primary commodities. Ezekiel(1938) took lagged prices as a determinant factor for export while Nerlone (1950) indicated that producers are influenced by their perception of normal prices which could be captured by the adaptive expectation scheme. Later, Chu and Morisson (1988) used current and lagged prices, exchange rates and supply shocks indicators to model export supply of primary commodities (as cited in Alemayehu, 1997). Ndulu (1991) argued that the export supply of primary commodities is constrained by supply factors in the domestic. Thus, supply-constrained factors should be incorporated to model the export supply of primary products. Consequently, he solely used the supply of primary products and the exchange rates as the basic variable to model export supply of primary commodities. To explain the supply-constrained factors, focusing on capacity utilization and capacity expansion is inevitable. Capacity utilization is a short run phenomenon and is a response to price and other supply factors. While capacity expansion depends on the investment that have been made and let producers to respond through change in potential output. (Ndulu 1991, Alemayehu ,1997) . By following the argument of Chu and Morrison (1986), Alemayehu (1999) incorporated the expected profitability theory and other factors as a determinant factor for the export supply for primary commodities.

To model the demand for primary commodities in the north, we have to examine what factors determine the demand for primary commodities. According to Sapsford (1998) the demand for primary commodities in the north is emanated from two sources: to use them for direct consumption and to use them as inputs in the production process. Thus, those factors that affect consumption in the north will affect the price level via affecting demand. Alemayehu (2002) indicated that demand for stock purpose is also one variable that affect the demand for primary commodities. Among the variables that affect the stock demand, the interest rate is the one. Indeed, the destination of the stock is either to ultimate consumers for consumption or to producers for input. The issue here is that the stock saved may not be channeled to producers or consumers in the same year as the stock holders need some sort of profit, speculative motive, thus those factors that affect the stock demand shall be incorporated to the model.

Domestic factor amelioration is becoming a big deal after the fallacy of composition comes in to picture. When there is an increase in income in the domestic, it affects the price of primary commodities in three ways. First, it affects the export supply by increasing domestic consumption of primary commodities. Therefore, supply of primary commodities at the international market will decrease. Second, when income increases, the demand for domestically produced manufactured products increases. This increases the demand for primary commodities as an input in the manufacturing sector in the south^{aa}. At last, when there is an increase in income in the south, the demand for imported goods increase. This inurn increase the demand for primary commodities in the north to use them as input. The first two factors decrease the supply for export while the last one increases the demand of primary products in the north. Therefore, these factors

^{aa} Here.south implies the sub Saharan Africa countries

allow the price of the primary commodities increases as domestic income increases. In return the increase in income may emanate from the agricultural sector and this sector may be the sources of foreign exchange for the country in the short run. The increase in income in the south may affect the price of the primary commodities and it depends on the structure of the economy. If the economy undertakes structural transformation, it will affect the export price negatively through demand effect. If the economy did not achieve structural transformation it affects the export price negatively through supply effect

3.2 Determining export price of primary products in the south

Demand for primary products arise both from its use as raw material in manufacturing and from direct consumption in the north (David Sapsford, 1998). Following this argument, the demand function can be presented ^{bb} as:

$$X_{id} = \gamma (X_{idc})^{\theta_1} (X_{idm})^{\theta_2} \dots\dots\dots 1$$

$$\theta_1 + \theta_2 = 1$$

Where X_{idc} denotes demand for primary commodities for direct consumption in the north. X_{idm} denotes demand for primary commodities to use them as raw materials in the north.

Let us follow the HarryBlock and David Sapsford (1998) approach to find the demand for primary commodities used as raw material in the north. They begin by assuming a CoubDouglas production function for manufacturing and allowing for factor augmenting technical progress as well as periodic disturbance to production. Following the argument of singer (1971), factor augmentation is allowed to occur only for labor and raw

^{bb} The important presumption in this specification is that the demand function is homothetic of degree 1

materials with θ being the exponential annual rate of saving and Ψ being the corresponding rate of saving raw materials. Thus

$$Y_n = \beta(\varepsilon^{\theta t} L_x)^{\beta_1} (\varepsilon^{\Psi t} X_{ss})^{\beta_2} K_{xm}^{\beta_3} \varepsilon_x \dots\dots\dots 2$$

Where L_x is the labor force used in the north to produce Y

K_{xm} Denotes the level of capital used in the north to produce y

They assumed that the manufacturers or producers in the north utilize the cost minimization choice of labor and primary products. Thus the short run demand^{cc} for primary products is give as follows

$$X_{idm} = \varepsilon^{-\Psi t} \left[(Y(\beta \varepsilon_x)^{-1} K_{xm}^{-\beta_3} e^{\beta_1(\theta-\Psi)t} \left(\frac{W_x}{P_{ex}} \right) \left(\frac{\beta_2}{\beta_1} \right)^{\beta_1} \right)^{\frac{1}{\beta_1+\beta_2}} \dots\dots\dots 3$$

Alemayehu (2002) specified the equilibrium version, following an econometrics analysis, of demand of primary products in the north.

$$X_{idc} = a_0 + b_1 Y_n - c i_w - d \left(\frac{P_{ex}}{P_n} \right) \dots\dots\dots 4$$

Since Alemayehu (2002) employed logarithmic expression in his analysis, it is possible to compress the above equation in the following exponential form.

$$X_{idc} = a_0 Y_n^{b_1} i_w^c \left(\frac{P_{ex}}{P_n} \right)^d \dots\dots\dots 5$$

Thus, by substituting equation 3 and 5 in equation 1, the demand for primary commodities can be written in the following form

^{cc} The short run demand is calculated based on the usual techniques of microeconomics, which is, $W = MP_l P_{ex}$ and solving for X_{idm} from the equilibrium condition gives the above specification. Here it is assumed that the price of export (P_{ex}) is the equilibrium price in the north.

^{dd} Y implies gross domestic product in the north

$$X_{idm} = (a_0 Y_n^{b_1} i_w^c (\frac{P_{ex}}{P_n})^d)^{\theta_1} (\varepsilon^{-\psi t}) \left[(Y(\beta \varepsilon_x)^{-1} K_{xm}^{-\beta_3} e^{\beta_1(\theta-\Psi)t} (\frac{W_x}{P_{ex}})(\frac{\beta_2}{\beta_1})^{\beta_1}) \right]^{\frac{1}{\beta_1+\beta_2}})^{\theta_2} \dots\dots\dots 6$$

To form the supply function for primary commodities, many authors have adopted the neoclassical specification. On the other hand, others tried to use a simple micro economic concept of profit maximization and cost minimization as a stepping-stone, to build the export supply model for primary commodities. In both approach, the issue is how to incorporate the relevant variables to come up with a workable model. The later approach mainly emphasis the short run aspects and is relevant to see the response of primary exports to current price. Many authors (like Ndulu, 1991 and Alemayehu, 1997) take the domestic side as a determinant variable for supply of primary commodities. Here, long run supply factors have to be incorporated to build a relevant supply model for primary products. Alemayehu (1997), by taking three factors in to account (capacity utilization to see the short run effect, capacity expansion to see the long run effect via capital accumulation and expected profit), modeled the export function of primary products. He presented the supply equation as a composition of both the short run and a long run impact of price and capital accumulation indicators. He further splitted the capital accumulation sub section in to different sources: government investment, availability of domestic credit and foreign sources, and used a logarithimic transformation to present the supply equation.

$$X_{es}^{ss} = \phi_0 \left[e \frac{p^{ex}}{p_d} \right]^{\alpha_1} \left[e \frac{p^{ex}}{p_d} \right]^{\alpha_2}_{t-i} K_{t-i}^{\alpha_3} \dots\dots\dots 7$$

In the short run, the price of primary commodities in the domestic depends on two factors, the supply side factors and the demand side factor .The supply side argument follows the HarryBlock and David Sapsford (1998) approach. According to them,

primary producers are short run cost minimizers with labor being the only variable input to production and they argued that the domestic price depends on the wage rate and the capital accumulation (the previous investments). This argument is similar to the capacity utilization argument where the availability of the variable input determines the output. Samuelson (1982) indicated that when the price of a commodity increases, the reward to the factor that intensively used in the production process would increase. Countries export primary commodities if the export price is greater than the domestic price. So, the reward to the factor that intensively used in the production process increases. In the primary sector the factor that intensively used is the unskilled labor. But, Lewis (1954) indicated that there is excess supply of unskilled labor in the developing countries therefore the supply force doesn't allow the price of labor (wage) to increase. Thus, the terms of trade deterioration continues, as wage for primary commodities remain unchanged.

Demand^{ee} for primary commodities depends on the income level (following the Keynesian relationship which postulates that current consumption depends on current income) and the interest rate that let the consumer hold other interest-bearing asset than consumption. But the last argument is not valid in the context of sub Saharan Africa where the availability of financial assets is minimal. So following the above arguments, the domestic price can be specified as follows,

$$P_s = \sigma + \beta_1 Y_s + \pi_2 K_{st-i} \dots\dots\dots 8$$

Thus, export price for primary commodities^{ff} can be written in the following way.

^{ee} Demand here implies direct consumption demand in the north

^{ff} Price for primary commodities implies export price of primary commodities which is found by substituting equation 8 in equation 7 and, by solving the equilibrium export price at the equilibrium condition ($X_{es}^{ss} = X_{idm}$) so that export price will be the function of capital, interest rate, wage rate, exchange rate and per capital income.

$$P_{ex} = \gamma_0 + \gamma_{11} Y_{tw} + \gamma_2 k_{t-i} + \gamma_6 \left[e \frac{P_{ex}}{P_d} \right]_{t-1} + \gamma_7 I_w^{gg} \dots \dots \dots 9$$

The expressions in the bracket may also be a function of lagged income of the north and the south as price of the previous years' is determined by the previous years' income (demand effect) and investment (supply effect)

As it is possible to sort out the total economy in to different sectors, it is also possible to divide the economy in to demand and supply to determine the price of goods and services. The following, mathematically summary can help us understand the above illustration.

$$Y = (\delta + \varphi)Y \dots \dots \dots 10$$

Where $\delta + \varphi = 1$ and Y is the total GDP of a given economy. For example it is possible to disintegrate the effect of investment in to demand effect and supply effect as investment affects both demand and supply. It creates demand and it also influences supply.

Where δ the demand is effect and φ is the supply effect.

If we further assume that the above disintegrated coefficients influence the price as the theory postulates (when supply increases, price will decrease and, when demand increases, price increases thus the net impact on the price level depends on how strong is the force of each variables which determine the price level), their impact on the price level will be designated as follows

^{gg} Y_{tw} is the composite GDP that holds both Y_s and Y_n

$$P = f((\delta - \varphi)y) \dots\dots\dots$$

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Let us also assume and extend this argument to the north and the south economies. On top of that it is implicitly assumed that the capital sub section is incorporated in to the supply effect as it can be functionally written in the following way. So the refined model will be features as follow

$$K = \psi Y \dots\dots\dots \text{Where}$$

$$0 < \psi < 1 \dots\dots\dots 12$$

Thus, the model can be written as follows

$$P_{ex} = \gamma_0 + \gamma_{il}Y_s + \gamma_{il}Y_n + \gamma_3I \dots\dots\dots 13$$

3.3 Export price formation in the north

The northern (manufactured) price equation is based on the kaleckian mark up pricing approach, which assumes an oligopolistic market structure in the north. The specification follows recent works of Taylor (1981,1983,1991) Darity and Fitz Gerarld (1982) Marqueze and Pauly (1987) and Vos (1994). The price of manufactured goods is positively related to price of intermediate inputs, comprising wages, imported raw materials and oil price and inversely related to excess capacity in the north (cited in Alemayehu, 2002).

$$P_n^m = a + bP_{oil} + cW_n + dP_R - eK_{exc} \dots\dots\dots 14$$

Harry Block and David Sapsford (1998) indicated that industrial pricing studies in the north generally find a relative stable relationship between price of manufactured goods

and the combined unit cost of labor and material. These findings are explained by reference to a model in which prices in the north are set by multiplying the sum of unit labor cost and unit material cost by a mark up factor. Combining this pricing assumption with the production function for manufacturing goods yields the following equation for the price of manufactured goods. Here, it is further assumed that the manufacturers use a cost minimization choice of labor and primary product inputs.

$$P_n^m = b_1 + b_2 Y_n + b_3 P_R + b_4 W_n + b_5 K_n \dots\dots\dots 15$$

The difference of the two (models) lies on the dissociation of the price of primary commodities in to price of oil and other primary commodities price in the first specification, and the inclusion of GDP in the north in the second specification.

Thus if we combine the above equations, it yields

$$P_n^m = b_1 + b_2 Y_w + b_3 P_R + b_4 P_{oil} + b_5 W_n + b_6 K_n \dots\dots\dots 16$$

From the above equation it is possible to add one thing .The economies of the south are import compressed economies. So when income increases in the south they import more manufactured economies to operate their economies well as they badly need intermediate and capital goods (which are skill intensive in nature and cannot be substituted and manufactured by the domestic economy of the south in the short run) to run their economies . Hence the south economies are the other sources of demand for the north economies.

$$P_n^m = b_1 + b_2 Y_n + b_3 Y_s + b_4 P_r + b_5 P_{oil} + b_6 W_n \dots\dots\dots 17$$

3.4 Models for Income Convergence

Analyzing income convergence was born from Solow's growth theory^{hh}. On the other hand, as capital is high in the developed world and its productivity is low, growth will be low to these countries for they are reaching to steady state. Thus, cross sectional analysis of income convergence became a major tool of analysis. Most of these studies tried to investigate the correlation between initial per capital income and growth rates in a cross-country and cross-region set up (Barro and Sala Martin 1991). A negative association between income differences and initial income level is taken as evidence of convergence as it indicates that the per capita income growth rate of the initially poor economies is growing faster than those richer economies. In a later review and specification, the evidence of a negative correlation between income differences and initial income levels with the cross sectional framework cannot be taken as evidence of income convergence. Instead, it only conveys the idea of catching up but not yet converged (Bernard and Durlauf, 1996, Hock-Annlea, Kian -PingLim, M.Azali, 2005). The specification of time series framework lies on its ability to tell weather there is economic convergence, divergence, or weather the country under specification is catching up the target leader. The slow growth rates, that sub-Saharan Africa countries achieved, called many scholars to investigate the real cause of it as investment was high in the 1970s but growth was not as much high. This affirms that the conventional growth theory of Solow doesn't work to explain growth in this region (Ndulu, 1991). But the recently coming literatures on growth indicate that capital is not the sole factor to explain growth in the developing regions like sub-Saharan Africa. Other factors, like institutional and policy factors, also

^{hh}Solow's growth theory postulates that countries can catch up or converge to the developed countries via capital accumulation, as capital is low in the underdeveloped countries and its productivity is high there.

have their own impact on the growth process in these regions. Most of these studies concluded that institutional and policy factors are very fundamental variables to explain growth in this region (Ndulu and Oconell, 2000). So functioning output only for labor and capital, and examining income convergence with this set up (neoclassicalⁱⁱ) doesn't yield dependable result. Currently, cross-country regression in a panel data set up incorporates institutional and policy variables and the inclusion of these variables lay down the balanced growth path and let the examiners get the good coefficient for conditional income convergence.

3.5 Time Series Approach to Income Convergence

The methodology employed in times approach, to analyze income convergence, is simple and straightforward. Suppose that $\ln^{Y_w}$ and $\ln^{Y_{ss}}$ denotes the logarithm of real GDP per capita of the world average and the sub-Saharan Africa countries respectively at time t . Unit root test income convergence hinges on the time series properties of logarithm differences of real GDP per capita between the world average and the sample sub Saharan Africa countries. If the logarithm difference $(\ln^{Y_w} - \ln^{Y_{ss}})$ contains a unit root then the real GDP per capita in the two economies will diverge .on the other hand the absence of the unit root but with a significant trend terms conveys the idea of catching up but not yet converged; where as if the trend term is insignificant, then the results provide evidence of long run convergence. This can be framed using the following Dickey _Fuller approach (Bernard and Durlauf, 1995 & Kian-Ping Lim,M.Azali,Hock-Ann Lee, 2005)

$$\Delta(\ln^{Y_w} - \ln^{Y_{ss}}) = \mu + \beta t + \alpha(\ln^{Y_w} - \ln^{Y_{ss}})_{t-1} + \sum_{k=1}^n C_k \Delta(\ln^{Y_w} - \ln^{Y_{ss}})_{t-k} + \varepsilon_t \dots\dots\dots 18$$

ⁱⁱ Neo classical implies the Solow growth theory

if $\alpha = 1$ (the presence of unit root), then the real GDP per capital the two economies will diverge. The absence of unit root, $\alpha < 1$, indicates either catching up if $\beta \neq 0$ or long run convergence if $\beta = 0$. In the implementation of the ADF unit root test, selecting optimal lag length is inevitable. Here AIC (Akaike information criterion) will be employed.

3.6 Dynamic Panel Approach to Income Convergence

As cited in Johnson P. Asiama and Maurice Kugler (2005), the classic paper by CEL (1996) challenged the existing single cross-section empirical literature about the treatment of the country specific effect (which led to omitted variable bias) and also the issue of endogeneity among the explanatory variables. Consider the general specification often used in most cross-country studies of growth:

$$\ln Y_{it} - \ln Y_{it-1} = \phi \ln Y_{it-1} + \gamma X_{it-1} + \eta_i + \nu_t + \varepsilon_{it} \dots\dots\dots 19$$

Where X_{it} is a vector of control variables determining economic growth, i is a country-specific effect, t is a time specific effect, V_t is a period specific constant, and ε_{it} is an error term. ϕ, γ are parameters. Clearly, for cross-section regressions in particular, OLS will only be consistent if the individual country effect is uncorrelated with the explanatory variables. This is

$$E[\eta_i (\ln Y_{it-1})] = E[\eta_i (\phi \ln Y_{it-2} + \eta_i + \nu_{t-1} + \varepsilon_{it-1})] \neq 0 \text{ Since } E[\eta_i^2] \neq 0 \dots\dots\dots 20$$

This can be shown that omission of the country-specific effect V_i only leads to a downward bias in the convergence coefficient. Secondly, there is a possibility of endogeneity of a subset of X_i , such that treating them as exogenous, only introduces endogeneity bias into the results. The lagged dependent variable is expected to be positively and directly related to the country specific effect. Hence, it can hardly be

assumed that individual effects are random. By induction, therefore, CEL argues that whereas any panel data studies attempt to correct for endogeneity bias, they did not address the issue of correlated individual effects adequately and hence their results suffer from omitted variable bias.

The authors therefore proposed a consistent estimator based on the general method of moments (GMM) approach, which is able to address both issues of omitted variable bias and endogeneity bias. Hence, one applies the GMM (differences) approach to the usual expression for the behavior of a country's growth rate around the steady state

$$\ln Y_{it} - \ln Y_{it-1} = -\left(1 - e^{\lambda}\right) \frac{\alpha}{1 - \alpha} [\ln(s) - \ln(n + g + d)] + \eta_i + \varepsilon_{it} \dots\dots\dots 21$$

Where $\lambda = (n + d + g)(1 - \alpha)$

The introduction of the GMM-systems estimator (Blundell and Bond, 1998), as an alternative to the GMM-differences estimator, a subsequent paper by Bond, Hoeffler and Temple (2001) suggested an extension of the CEL approach further. BHT showed that, if time series are persistent, the first-differenced GMM estimator can be "...poorly behaved since lagged levels of the series provide only weak instruments for subsequent first-difference. This problem is worsened in finite samples. Hence in such circumstances, the use of a more efficient GMM-systems estimator is recommended for estimating empirical growth models.

3.7 How the Model Works?

Factors that affect the price of export in the north and in the south, via supply and demand sides, affects the terms of trade. The reactions of these (demand and supply) factors affect the price of primary commodities in relative to the manufactured goods. Demand and supply side variables are captured by two equations. The variables in the

two equations let us exhaustively watch factors that affect the terms of trade. The difference in the wage rates in the two areas causes the difference in the price of goods produced in the two sites (Prebisch effect). This is supply side effect. While the demand, for primary commodities in the north, is depending on the income level via capital level accumulation in the north, and the interest rate in the north. Supply side factors in the domestic may affect the terms of trade by affecting the global supply of primary commodities. On the other hand these factors may also affect the export sector by increasing the domestic price. Thus, the net effect that it imposes on the export price depends on these two factors.

The structure, the status and the domestic economic policy of the economy determine where to invest, how to invest and what to invest. Thus, the spending that made by each country may be attracted by the primary sector in the south as it contributes the lion share of the GDP. Therefore, these spending may increase the supply of primary commodities for export. On the contrary government spending may increase the domestic price, which decreases the export volume.

Actions that have been taken by a country to foster the export of primary commodities, if other countries in the south repeat it, may affect the global supply of primary commodities, which eventually affects the prices of the primary commodities at the international market. The prices of the primary commodities can be easily affected, when supply increases, as they are homogenous in nature and the market is relatively competitive. So, if the government expenditure, the domestic credit, and the foreign inflow of SSA countries go to foster the primary sector it will boost the global volume of primary commodities that eventually reduces the price. On the other hand, these spending may be channeled to other sectors, which increase the consumption of these

primary products at the domestic, which in turn increase the domestic price. Here, the export volume of primary commodities decreases so that the export price will increase at the international market. So the net effect of these factors on the terms of trade deterioration depends on the two contradictory impulses that they exert on the domestic price and the export volume of primary products.

The structure of the economy dictates the kind of investment made by the government and the kind of policy that will be functional and enacted by a given nation. These policies and actions are taken on the basis of the conditions and macroeconomic set up of the country. Sub Saharan Africa countries are suffering from balance of payment deficit. Thus they will be engaging in actions and investment that foster their export sector. Much of their exports are from primary sector, and investments may be channeled to foster this sector as they want to come out from the balance of payment deficit trap. The governments will invest in infrastructures and warehouses to collect the primary products for export and encourages exporters via providing incentives and credits. Credits may be available to help the export sector and will be given to primary product producers to provide them the necessary inputs (fertilizers and pesticides).

When we come to the policy aspect, each country devalues its currency to foster its export. But the problem of terms of trade deteriorations happens when countries take similar actions simultaneously to increase their export of primary commodities in the south (the fallacy of composition). Critics of export promotion policies have pointed to the fallacy of composition hypothesis, where what is viable for small country acting in isolation may not be viable when pursued by a group of countries simultaneously. Since, by definition, developing countries are unable to compete in the world market in

industrial products or services, their economic policies have been directed towards increasing exports of primary products, the only sector where they have a chance of achieving a competitive advantage.

The kind and the destination of the investment made by the government in the north and in the south differ. This is emanated from the difference in the structure of the economy. In the north, investment made by the government targets towards research and development sector to come up with new products or to add value on the previously produced goods and services. While in the south investment made by the government targets to help the agricultural sector and in the provision of infrastructures that agitates for export, in the country.

The inflows of capital toward these regions also differ. According to UCTAD (2004), FDI inflows in to Africa rose by 28% to \$15 billion. The recovery was led by investment in the natural resources. Natural resources rich countries (Angola, Chad, Equatorial Guinea, Nigeria and South Africa) are the principal destination of FDI. But UCTAD (2004) indicated that the composition of FDI has shifted towards services. These two facts indicate that the kind and the composition of FDI flows to develop and developing countries are different hence it may affect the terms of trade as FDI foster the skill based sector in the north and the primary sector in the south or Africa. On top of that, the foreign inflow towards SSA countries, in the form of aid and loan, may increase the domestic price that eventually affects the terms of trade. The other argument, which can be added here is that so as to pay their debt SSA export their products even though the

international price is low^{jj}. This in turn may influence the terms of trade deterioration. All these variables relate with the nature and the structure of the economy.

3.8 Unit Root Test

Time series variables cannot be directly used for analysis as they are many times suffer from unit root problem. There are many ways of testing unit roots. The non-parametric test of Phillips and Peron (PP test), and the Dickey-Fuller (DF) are widely used in most empirical studies.

To illustrate the DF test consider a first order autoregressive (AR) process for a series Y_t as follows

$$\begin{aligned} \rho \\ Y_t &= \rho Y_{t-1} + U_t \\ \Delta Y_t &= \rho^* Y_{t-1} + U_t, U_t \sim \text{IID}(0, \sigma^2) \quad \dots\dots\dots 1 \\ \rho^* &= \rho - 1 \end{aligned}$$

The null hypothesis for DF test is then $H_0: \rho = 1$ or $\rho^* = 0$ against the alternative $H_a: \rho < 1$ or $\rho^* < 0$. The proper way of testing this hypothesis is to calculate a t-statistic for comparing it with ADF t-distribution computed using Monte Carlo techniques (Gujarati, 1995; Harris and Sollis, 2003).

If we further increase the Y_t to a ρ^{th} order of AR, $AR(P)$, leads us to the Augmented Dickey-Fuller (ADF) test as:

$$\begin{aligned} Y_t &= \psi_1 Y_{t-1} + \psi_2 Y_{t-2} + \dots + \psi_p Y_{t-p} + U_t \\ \text{Or} & \quad \dots\dots\dots 2 \\ \Delta Y_t &= \psi^* Y_{t-1} + \psi_1 \Delta Y_{t-1} + \dots + \psi_{p-1} \Delta Y_{t-p+1} + U_t \\ U_t &\sim \text{IID}(0, \sigma^2) \end{aligned}$$

Where, $\psi^* = (\psi_1 + \psi_2 + \dots + \psi_p) - 1$. The null in this case is $H_0: \rho = 1$ against $H_a: \rho < 1$. Then the calculated DF t-statistic $(\psi^* / \text{s.e}(\psi^*))$ Will be compared with the tabulated DF t-statistic

^{jj} Singer (1991) elucidated that debt servicing is becoming the other factor that cause terms of trade deterioration as poor countries export their product at any price so as to get the hard currency to pay their debt.

for decision. The basic assumptions of the DF tests are that the errors are statistically independent and have constant variance (Enders, 1995: 239).

Phillips and Perron (in Enders 1995) proposed a nonparametric test of unit root that doesn't assume that the errors terms are not white noise and allows the disturbances to be weakly dependent and heterogeneously distributed.

Unlike the ADF test, the PP test makes correction for higher order autocorrelation to the t-statistic of the coefficient from the ADF (I) regression. The correction is nonparametric since it uses an estimate of the spectrum at frequency zero that is robust to heteroscedasticity and autocorrelation on unknown form. Phillips and Perron (Enders 1995) showed that their test statistic:

$$PP = (\hat{\gamma}_0 / \lambda^2)^{1/2} \left\{ \frac{\sum_{t=2}^T (y_{t-1} - y_{-1})}{\sum_{t=2}^T (y_{t-1} - y_{-1})^2} \right\} \dots \dots \dots 3$$

PP Has the same asymptotic distribution as the ADF t-statistic. Under the null hypothesis, let y_t be generated by $\Delta y_t = \mu + \psi(L)\varepsilon_t$, where $\psi(L)$ is a power series in the lag operator L and ε is zero-mean white noise with variance ε . Then $\hat{\gamma}_0$ and λ^2 are consistent estimators of the short and long-run variances, defined as:

$$\gamma_0 = E[(\mu + \psi(1)\varepsilon)^2] \quad \lambda^2 = \sigma^2 \varepsilon \psi(1)^2$$

3.9 Co integration Test and the Error Correction Model

Once unit root test of the variables indicate that variables are integrated of order one, I (I), or unit root, we have to test for co integration among variables. The Engle-Granger two-step procedure and the Johansen Procedure are the two mostly used method of co integration tests. The first one requires two steps, where static regressions in the first step and the residual from this regression tested for unit root in the second step. Stationary error term then means co integration. This procedure has however, limitations in when the number of variables is greater than two. In the latter case, there may be more than one co integrating vectors

The Johansen Multivariate cointegration analysis that starts from an unrestricted vector AR(VAR) process as follows

$$X_t = \Pi_1 X_{t-1} + \Pi_2 X_{t-2} + \dots + \Pi_k X_{t-k} + \Phi D_t + \varepsilon_t, t = 1, \dots, T \dots \dots \dots 4$$

Where X_{t-a} vector of all possibly endogenous variables integrated of order one, D_t deterministic terms (constant, trend, dummies and other repressors that we consider fixed and non-stochastic), E_t vector error terms assumed to be independent Gaussian with zero mean and variance Ω , the initial values $X_{-k+1}, \dots, X_0$ are fixed and the parameters to be estimated are $(\Pi_1, \Pi_2, \dots, \Pi_k, \phi, \Omega)$ (Johansen and Juselius, 1990; Johansen, 1995; Harris and Sollis, 2003).

This unrestricted VAR can be transformed in to a vector error correction model (VECM) as:

$$\Delta X_t = \Pi X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \Phi D_t + E_t, t = 1, \dots, T \dots \dots \dots 5$$

$$\text{Where, } \Pi = \sum_{i=1}^{k-1} \Pi_i - \Gamma_i \text{ and } I = - \sum_{j=i+1}^k \Pi_j, I\text{-identity matrix.}$$

Testing for co integration in the Johansen procedure requires analyzing the rank of the matrix Π , whereby we have three possibilities. First, Π has full rank indicating that the vector process X_t is stationary and hence no spurious problem. Second, $\text{rank}(\Pi) = 0$, i.e., the matrix Π is a null matrix implying that there is no co integration among the variables (no long run relationship) and hence the appropriate mode is a VAR in first differences. Third, Π has reduced rank, i.e. 0, $\text{rank}(\Pi) = r < n$ (where n is the order of the matrix) implying that there are $n \times r$ matrices α and β such that $\Pi = \alpha\beta'$, where α – are vector of adjustment coefficients and β vectors are co integrating vector. Hence under the third scenario, it is possible to write the above equation in the following form

$$\Delta X_t = \alpha\beta'X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \Phi D_t + \varepsilon_t, t=1, \dots, T \dots \dots \dots 6$$

The co integration vectors β have the property that $\beta' X_t$ is stationary even though X_t itself is non stationary (Johansen and Juselius, 1990 & Johansen, 1995)

Testing for the null hypothesis that there are at most r co integrating vectors amounts to testing whether the last $(n-r)$ eigen values of the matrix Π are zero. That is,

$$H_0: \lambda_i = 0, i = r+1, \dots, n$$

The test statistic 25, which is known as the lambda trace can be calculated as :

$$\lambda_{\text{trace}} = -2\log(Q) = -T \sum_{i=r+1}^n \log(1 - \lambda_i), r = 0, 1, \dots, n-1 \dots \dots \dots (7)$$

Where,

$$Q = (\text{restricted maximum likelihood} \div \text{unrestricted maximum likelihood})$$

Johanes and Juselis (1990) also provided an alternative test that there are r co integration vectors against the alternative that $r+1$ exists. This test is referred to as the λ_{max} (lambda max) statistic and is given by:

$$\lambda_{\text{max}} = -T \log(1 - \lambda_{1+r}), r = 0, 1, \dots, n-1 \dots \dots \dots 8$$

Another issue in the Johansen analysis is restriction tests for the vectors and adjustment coefficients. In the former case, we can under take different linear restrictions to test the different hypotheses and to identify the vectors. The latter test helps us to test whether the right hand side variables are weakly exogenous or not.

3.10 Panel unit root test

Panel unit root tests are normally distributed (Baltagi and Kao, 2000). Thus the study by Levin and Lin (1992) IM, Peseran and Shin (1997) and Madalla and wu (1999) tests the null of unit root test. The following section elucidates these tests in brief (cited in Baltagi and Kao, 2000).

3.10.1 Levin and Lin test (LL) test

Consider the model

$$Y_{it} = \rho_{it} Y_{it-1} + Z_{it} \gamma + u_{it} \quad I=1 \dots N; t=1 \dots T \dots \dots \dots 9$$

Where Z_{it} are the deterministic components and U_{it} is a stationary process. Z_{it} Could be zero, one, the fixed effect or fixed effect as well as time trend. Assuming that U_{it} is distributed I I D $(0, \delta^2)$ and $\rho_i = \rho$ for all i. Levin and Lin tests the null $H_0: \rho < 1$ (for the detail see Baltagi and Kao, 2000)

3.10.2 IM, Pesaran and shin (IPS) test

Unlike the Levin and Lin test which assumes that $\rho_i = \rho$ (for the detail see Baltagi and Kao, 2000), The IPS test allows for heterogeneity coefficients of Y_{it-1} , ρ_i and different patterns of serial correlation and proposes an alternative test based on averaging individual unit root test statistics (Baltagi and Kao, 2000). This test is stronger than that of Levin and Lin test so this test has been used in the study to test the panel unit root test.

Let

$$\Delta Y_{it} = \alpha_{it} + \rho_i Y_{i,t-1} + u_{i,t} \quad i=1 \dots N, \text{ and } t=1 \dots T \dots \dots \dots 10$$

The null hypothesis is $H_0: \rho = 1$ for all I against $H_a: \rho < 1$ for at least one i. Allowing for

serial correlation of the error term we have $U_{it} = \sum_{j=1}^{pi} \phi_{ij} \Delta Y_{i,t-j} + \varepsilon_{it}$, we can thus rewrite

as

$$\Delta Y_{it} = \alpha_{it} + \rho_i Y_{i,t-1} + \sum_{j=1}^{pi} \phi_{ij} \Delta Y_{i,t-j} + \varepsilon_{it} \dots \dots \dots 11$$

The IPS t -bar statistics is defined as the average of the individual ADF statistics as:

$$\bar{t} = \frac{1}{N} \sum t_{\rho_i} \dots \dots \dots 12$$

Where t_{ρ} is the individual t statistics $H_0: \rho_i = 1$. it is show that as $T \longrightarrow \infty$ followed by $N \longrightarrow \infty$ sequentially, the IPS test statistics are asymptotically distributes as standard normal as

$$t_{ips} = \frac{\sqrt{N(t - E[\frac{t_{it}}{\rho_i} = 1])}}{\sqrt{\text{var}[t_{it/\rho_i} = 1]}} \Rightarrow N(0,1) \dots\dots\dots 13$$

Where $E[t_{it/\rho_i} = 1]$ and $\text{var}[t_{it/\rho_i} = 1]$ are the mean and variance of t_i statistics which have been computed by IPS through simulation for different values of T and ρ_i (Baltagi and Kao, 2000)

3.11 Panel co integration test

Like time series co integration test, there is panel co integration test. In the this study, I deployed the likely hood based test (LR) panel co integration rank test based on the average of the individual rank trace statistics developed by Johansen (1995). The author considered the following model

$$Y_{it} = \sum \pi_{ik} y_{i,t-k} + \varepsilon_{it} \quad I=1,2,\dots\dots\dots N \dots\dots\dots 14$$

Where the y are considered to be fixed and the errors ε_{it} are IID as $\varepsilon_{it} \sim N_p(0, \varphi)$, then the heterogeneous error correction representation is given by :

$$\Delta Y_{it} = \pi_i Y_{i,t-1} + \sum \Gamma \Delta Y_{i,t-k} + \varepsilon_{it} \quad I=1 \dots\dots\dots N \dots\dots\dots 15$$

Where Π_i is order of $p \times p$ and is of reduced rank, with $\Pi_i = \alpha_i \beta_i'$, α_i and β_i are of order $p \times r_i$ and of full column rank.

The panel unit root tests $H_0: \text{rank}(\Pi_i) = r_i \leq r$ for all $I=1 \dots\dots N$ against $H_p: \text{rank}(\Pi_i) = p$ which means that the N groups in the panel have at most r co integrating relationships among the p variables under the null .

Larsson et al (2001) defined the LR bar statistics as the average of the N individual trace statistics as

$$\bar{LR} \left\{ \frac{H(r)}{H(p)} \right\} = \frac{1}{N} \sum_{i=1}^N LR_{iT} \left\{ \frac{H(r)}{H(p)} \right\} \dots\dots\dots 16$$

They standardized this statistics as a basis for the panel co integration rank test defined as:

$$\gamma_{LR} \left\{ \frac{H(r)}{H(P)} \right\} = \frac{\sqrt{N} \left(LR \left\{ \frac{H(r)}{H(P)} \right\} - E(Z_k) \right)}{\sqrt{\text{var}(Z_k)}} \dots\dots\dots 17$$

The E (Z_k) is the mean and Var (Z_k) is the variance of the asymptotic trace statistics tabulated in Larsson et al (2001)

Chapter Four

4 Terms of trade Deterioration and Income Convergence

4.1 Terms of Trade Deterioration

The unit root test indicated that all the variables included in the co integration test are found to be $I(1)$ (for the detail see appendix 3 and 4).

The method of analysis deployed to test co integration is the Johansen's multivariate co integration analysis. The analysis takes all variables as endogenous. Thus To begin the estimation process we take all variables as endogenous. Even though we do that in the beginning there are restrictions and tests that we should follow to determine the significance of variables to estimate the long run relationship. On top of that there is another restriction that is imposed to check whether variables are weakly endogenous to system or not.

The main aim of the study is to examine the effect of the nature (the structure) of the economy on the terms of trade. There are four equations that have been used to determine the price equation of the north and the south economies based on the models that are featured in section 3. 2 and 3.3. To determine the equation of the south, the two main sources of foreign exchange for sub-Saharan African countries (beverage and agricultural raw materials), are used.

In the specification process of these equations the income of the world is divided in to income of the developed countries and the income of the south (income of the specified sub Saharan Africa countries)

4.2.1 The price equation of the north

Nested F test of system reduction is used to determine the lag length .The maximum lag length that is taken in to consideration is 3 as the sample size incorporated in the study is relatively small .But the nested F test method of reduction confirms that the optimal lag length is 1.

The co integration test of using the trace and max statistics of Johansen showed that there is one co integration vector (see appendix 3 and 4).

As indicated below the export price of the developed countries is affected by the price of raw material the income in the north and the south ,the price of metals and other ores, wage in the north and , the price of oil.

The Johansen co integration tests indicated that there are three co integration vectors (for the result see appendix 5)

Once the co integration relationships are identified we can test some restrictions to identify the variables that constitute the co integration relationship. For the identification of the vector we imposed beta restrictions that let us determine variables that constitute the long run relationship. From the restriction we have assured that the income in the north and the wages determine the price of the long run static equation. The imposition of the beta coefficient to zero implies that the stated variable is not a significant variable to affect the long run relationship .The result shows that the restrictions are rejected by some variables implying that those variables that reject the restriction constitutes the co integration relationship. The results are featured below.

Beta restrictions

*North test of restrictions: $\chi^2(1) = 9.4476 [0.0021]**$*

South test of restrictions: $\chi^2(1) = 1.9038 [0.1677]$

agri test of restrictions: $\chi^2(1) = 0.81267 [0.3673]$

metalLR test of restrictions: $\chi^2(1) = 0.15011 [0.6984]$

lnoilLR test of restrictions: $\chi^2(1) = 1.4473 [0.2290]$

*lnwageLR test of restrictions: $\chi^2(1) = 9.3126 [0.0023]**$*

Variables used restricted: lnsouth, lnnorth, worldi, lnaallgr

We can interpret the result of the result of the vector diagnostic test result. The vector diagnostic result shows that the income in the north and wage in the north constitutes the long run vector with their expected sign. While the price of raw materials, income in the south, the price of oil and metals determine VECM.

The vector is indicated below

$$\begin{aligned} CIV_{pm} = & PM + 2.0913norh - 3.0873bwage \\ & (0.255828) \quad (0.49779) \end{aligned}$$

Where:

PM indicates price of manufactures products in the north

CIVpm the vector of the price of manufactured products in the north

Wage is the wage rate in the north

North implies income in the north

On top of that the imposition of the alpha restriction let us identify the endogeneity nature of the variables to the system .The result below affirms that the export price of the manufacturing commodity is exogenous to the system

Alpha restriction

LR test of restrictions: $\chi^2(1) = 1.2884 [0.2563]$

Thus, in the short run relationship of VECM formulation ,the first difference of the export price of the developed country were modeled as a function of the first difference of income in the south ,the price of oil , the price of metals and the error correction term.

Table 5.1 The short run export price equation of manufactured products

The dependent variable is Dpm			
Variable	coefficients	S.E	tvalue
<i>Constant</i>	0.00937634	0.008455	1.11
<i>Vmanu north_1</i>	-.219310	0.1267	-1.73
<i>Dlaagri_1</i>	0.288438	0.07250	3.98
<i>Dmetal_1</i>	-0.105109	0.1057	-0.994
<i>Dlnoil_1</i>	0.0336030	0.02936	1.14
<i>Dlnsouth</i>	0.0427783	0.01257	3.40
<i>Dlnsouth_1</i>	0.0568609	0.01405	4.05
<i>Dlaagri</i>	0.204073	0.09092	2.24
<i>Dmetal</i>	0.330833	0.08342	3.97
<i>Dlnoil</i>	0.102358	0.03378	3.03

Where

Vmanunorth indicates the vector error term

Laaagri_1 indicates the price of the agricultural products at time $t-1$

Metal_1 indicates the price of metals and other ores at time $t-1$

Lnoil_1 indicates the price of oil at time $t-1$

Lnsouth₋₁ indicates income in the SSA at time t-1

Laagri price of the agricultural products used in the north

D shows difference of the illustrated variables

Dpm is the difference of the price of manufactured products

As indicated in the econometric outcome all factors, the price of oil, the price of raw materials, the price of metal and other ores and the income in the south affect the export price of the north positively. Economic growth in the north negatively affects the price of export as these countries trade with each other so that the increase in the economy of these countries manifest it self by increasing supply for new manufactured products. The supply effect outweighed the demand effect.

When there is an increase in income in the south increases demand for importing of intermediate inputs and manufactured good from the north. These economies heavily depend on imported capital goods from the north. So when income increase in the south it leads to intensify the demand for intermediate and capital good from the north which further intensifies the demand for manufactured products for the products of the north. The increase in the economy of the south may emanate from the increase in the agricultural sector so that the export supply of raw material increases thus the price of the raw material decreases. But the econometric out comes affirms that its effect on the price of the north is significant.

4.2.2 Price in the south

4.2.2.1 Export price formation for all primary commodities except oil

The unit root test indicated that all the variables included in the co integration test are found to be I (1) (for the detail see appendix 3 and 4) .

The method of analysis employed to test co integration is the Johansen's multivariate co integration analysis .As usual the nested F test of system reduction to determine the lag length is used. Lag length 3 is taken as the maximum lag length as the sample size is relatively small .But the nested F test method of reduction confirms that the optimal lag length is 1.

The co integration test of using the trace and max statistics of Johansen show that there is one co integration vector (see appendix 5).

Once the co integration relationships are identified we can test some restrictions to identify the variables that constitute the co integration relationship. For the identification of the vector we imposed beta restrictions to identify the variables that determine the long run static equation. The variables that are incorporated in the long run equation showed the right sign with the expected theoretical background .The beta estimation indicates that the income in the north and in the south affects the long run static effect.

Beta restrictions

priceofn allpc LR test of restrictions: $\text{Chi}^2(1) = 1.5656 [0.2109]$

linsouth LR test of restrictions: $\text{Chi}^2(1) = 4.5938 [0.0321]^$*

lnnorht LR test of restrictions: $\text{Chi}^2(1) = 4.6852 [0.0304]^$*

worldi LR test of restrictions: $\text{Chi}^2(1) = 3.1348 [0.0766]$

The alpha restriction test affirms that the price of export of primary commodities is exogenous.

For the identification of the long run vector beta vectors are imposed and it is indicate that the price of raw materials in the long run is determined by the income in the north and the south.

$$CIV_{pall} = Pall + 0.85821 \ln south - 0.58078 \ln north$$

$$(0.29295) \quad (0.14931)$$

Where

CIV_{pall} indicates price of all primary commodities except oil

$Pall$ indicates price of all primary commodities except oil

$\ln south$ indicates income in the north

$\ln North$ indicates income in the north

Alpha restriction

LR test of restrictions: $\chi^2(1) = 0.33116 [0.5650]$

From the above restriction test, in the short run relationship of VECM formulation, the first difference of the export price of the primary commodities can be modeled as a function of the first difference of world interest rate and the error correction term.

Table 5.2 The short run estimation of the export price of all primary products except oil

The dependent variable is $DPall$				
	Coefficient	Std.Error	t-value	t-prob
$V_{priceofn\ allpc_1}$	0.333668	0.2288	1.46	0.156
$Dworldi_1$	-0.0137988	0.02720	-0.507	0.616

Where:

$V_{poricefnallpc_1}$ implies the vector error term

$Dworldi_1$ implies the difference in the interest rate

$DPall$ implies the price of all primary commodities

The VECM show us that the interest rate is not the salient determinant of price of primary commodities in the short run.

The increase in the economy of the south decreases the price of the primary commodities. This may be due to the fact that these countries couldn't achieve structural transformation and, the increase in income in the south mostly comes from the growth of the agricultural sector which increases the export supply of primary commodities.

In a related argument, the increase in income in the south negatively affects the export price of primary commodities. This is due to the fact that the economy of the south depends on the import of intermediate inputs and capital goods. So these countries are eager to get the hard currency at any cost. Thus they sell their agricultural products at any price to acquire the hard currency to buy the most needed intermediate inputs which in turn creates demand for manufactured products of the north. So import compressed economy^{kk} of the south intensifies the problem of the terms of trade deterioration.

The economy of the south is not integrated as most of the trading partners of the SSA countries are found in the north. So the increase in income in the north presumed to affect the price of the south goods positively. The econometric result also testifies this fact.

The increase in the economy of the south favors the price of the north goods. Here one fact is visible. Most of the south countries couldn't bring structural transformation and their economies growth is depending on the growth of agriculture this is testified from the fact that if countries achieve structural transformation the share of export of primary commodities decreases so that the supply of agricultural products decreases at the world

^{kk} Import compressed economy implies a kind of economy which depends on the import of intermediate inputs for the production of goods and service in the domestic

market and their economy would substitute the imported goods by the domestic equivalent which increases the demand for primary commodities in the domestic. Thus the supply of agricultural products declines at the international market. As these countries did not bring structural transformation the increase in their income, which is emanated from the agricultural sector, goes to import raw materials. So the structure of the economy affects the term trade.

4.2.2.2Beverage

The unit root test indicated that all the variables included in the co integration test are found to be $I(1)$. (See appendix 3 and 4)

The method of analysis employed to test co integration is the Johansen's multivariate co integration analysis

As usual the nested F test of system reduction to determine the lag length is used. A maximum lag length of 3 is taken as the sample size is relatively small .but the nested F test method of reduction confirms that the optimal lag length is 1.

The co integration test of using the trace and max statistics of Johansen show that there is one co integration vector. (For the detail see appendix 5)

Once the co integration relationships are identified we can test some restrictions to identify the variables that constitute the co integration relationship. For the identification of the vector we imposed beta restrictions to identify the variables that determine the long run static effect. From the restriction we have assured that the income of the south determines the price of the long run static equation. The results are featured below.

Beta restrictions

LR test of restrictions: $\chi^2(1) = 0.19335 [0.6601]$

LR test of restrictions: $\chi^2(1) = 5.1282 [0.0235]^$*

LR test of restrictions: $\text{Chi}^2(1) = 2.4236 [0.1195]$

LR test of restrictions: $\text{Chi}^2(1) = 3.1834 [0.0744]$

The long run vector can be written as follows

VICbev=bev+7.1016lnsouth

(0.56027)

Where:

VICbev is the price of beverages

lnsouth is the income in the south

Alpha tests or weakly ergogeneity test

The alpha test indicated that the price of primary commodity is exogenous to the system.

LR test of restrictions: $\text{Chi}^2(1) = 0.18007 [0.6713]$

Once all the necessary tests and specification has been done, it is possible to estimate the short run VECM analysis.

Table 5.3 The short run estimation of the export price of beverage

<i>The dependent variable is Dpbev</i>				
<i>variables</i>	<i>Coefficient</i>	<i>Std.Erro</i>	<i>t-value</i>	<i>t-prob</i>
<i>Dworldi_1</i>	<i>-0.0417363</i>	<i>0.03932</i>	<i>-1.86</i>	<i>0.0998</i>
<i>Vbeverageln_1</i>	<i>0.0356806</i>	<i>0.1927</i>	<i>0.185</i>	<i>0.855</i>
<i>Dlnynorth_1</i>	<i>-0.0418680</i>	<i>0.1517</i>	<i>-0.276</i>	<i>0.785</i>

Where

Dpbev is the difference of price of beverages

Dworldi_1 is the difference of the interest rate

Dlnynorth_1 is the difference of income in the north

As the econometrics output testifies the income in the north affects the price of beverage insignificantly. But the interest rate affects it negatively. This is happened due to the fact that when there is an increase in interest rate in the north consumers will be attracted by other financial asset that benefits them.

4.2.2.3 Raw materials

The unit root test indicated that all the variables included in the co integration test are found to be I (1) (for the detail appendix 3 and 4).

The method of analysis employed to test co integration is the Johansen's multivariate co integration analysis

As usual the nested F test of system reduction to determine the lag length is used. I started from the lag length of 3 as the sample size is relatively small .but the nested F test method of reduction confirms that the optimal lag length is 1.

The co integration test of using the trace and max statistics of Johansen show that there is one co integration vector. The result is indicated in appendix 5

Once the co integration relationships are identified we can test some restrictions to identify the variables that constitute the co integration relationship. For the identification of the vector we imposed beta restrictions to identify the variables that determine the long run static effect. From the restriction we have assured that the income of the south determines the price of the long run static equation. The results are featured below

Beta restrictions

agriLR test of restrictions: $\chi^2(1) = 4.4137 [0.0357]^$*

*InsouthLR test of restrictions: $\chi^2(1) = 8.6440 [0.0033]^{**}$*

InnorthLR test of restrictions: $\chi^2(1) = 2.7061 [0.1000]$

interestLR test of restrictions: $\chi^2(1) = 4.3333 [0.1374]$

thus the long run vector can be written as

$$VICrm=RM+0.72303lnsouth$$

Alpha restriction or weakly erogeneity test

0LR test of restrictions: $\chi^2(1) = 1.9061 [0.1674]$

Table 5.4 The short run estimation of the export price of raw materials

<i>The dependent variable is RM</i>				
<i>variables</i>	<i>Coefficient</i>	<i>Std.Error</i>	<i>t-valu</i>	<i>t-prob</i>
<i>Constant</i>	<i>0.0282163</i>	<i>0.02295</i>	<i>1.23</i>	<i>0.231</i>
<i>Dworldi_1</i>	<i>-0.0431809</i>	<i>0.02391</i>	<i>-1.81</i>	<i>0.083</i>
<i>Dlnynorth_1</i>	<i>0.00989676</i>	<i>0.07058</i>	<i>0.140</i>	<i>0.890</i>
<i>Vlaagri_1</i>	<i>0.239193</i>	<i>0.2043</i>	<i>1.17</i>	<i>0.253</i>
<i>Dlnynorth</i>	<i>0.000438791</i>	<i>0.07691</i>	<i>0.00570</i>	<i>0.995</i>
<i>Dworldi</i>	<i>0.0821989</i>	<i>0.01723</i>	<i>4.77</i>	<i>0.000</i>

Where

Dworldi_1 is the difference world interest rate .

Dlnynorth_1 is the difference of income in the north

Vlaagri_1 is the vector error term

RM implies the price of ram materials

The result that depicted in the above shows that the income of the north affects the price of the agricultural commodity insignificantly. This is unlikely to happen. If we want to attach the economic explanation about this effect, it may indicate that the economy of the south, by now, relies on skilled intensive products which use limited amount of



agricultural products .The recent economic expansion in the north doesn't use agricultural products as their immediate input.

4.3 Summary of the Analysis on the Terms of Trade Deterioration

The terms of trade deterioration highly depends on the structure of the economy .As long as there is structural difference among the north and the south; inevitably, there will be terms of trade deterioration. Oscillation of the interest rate in the north also affects the price of primary commodities in the short run. This also causes the terms of trade deterioration. From the simple profile of wage rate it is possible to see that the wage rate in the north increase with out any discontinuity. The economy of the south is also the other market of the developed countries. Here, it is the structure of the economy that lets the south depends on the north. Thus the growth of the economy of the south agitates more import to diversify their economy. Here it is implicitly understood that there are skill intensive products that are exported to the south which they cannot produce them in the short run with the existing technology and skill of the south. Thus the economic growth of the south increases the demand for the manufactured goods of the north. The econometric results indicated that economic growth of the north increases the demand for the manufactured products. And the increase in the income of the north did not bring any increment on the price of raw materials as it is insignificant to explain price functionally. There would have been one circular argument concerning about the terms of trade deterioration. If there is an increase in the economy of the south, which most probably comes from the growth of the agricultural sector, it will increase the export volume of the primary commodities at the international level which in turn decreases the price of the raw materials. Had the price of raw materials been the significant variable to determine

the price of manufactured goods, there would have been action and reaction type of force that let the price of both regions keep constant. But raw materials are not the significant variable to explain price of the manufactured goods. This analysis accepts the first hypothesis

4.4 Income Convergence

4.4.1 Absoulute income convergence

Using a time series econometrics method (a model in section 3.5) all the selected countries of Africa are diverging from the developed countries average per capital income. Growth of per capital income was not consistent in African countries in the last decades. The lag length included in the study is selected based on Akaiake information criteria.

Table 5.5 Estimation of income convergence using time series econometrics

The dependent variable is $D(Y_{it}-Y_{itu})$					
Countries	c	η	lag 0	a	t value
<i>Cameroon</i>	0.038314	0.0039052		-0.97710	-5.0440
<i>C.Africa</i>	-0.0033277	-0.0033277	0	-1.1559	-6.0887
<i>Demo Congo</i>	-0.0074223	0.0018544	0	0.79121	-4.1850
<i>Ethiopia</i>	0.099847	-0.0018922	0	-0.80924	-4.3438
<i>Madagascar</i>	0.069391	-0.0010610	0	-0.97482	-5.1596
<i>Mali</i>	0.029478	0.00013361	0	-1.1460	-6.0124
<i>Mozambique</i>	0.14545	-0.0044997	0	-0.86254	-4.6168
<i>Niger</i>	0.049068	-0.00016783	0	0.75917	-4.0135
<i>Nigeria</i>	0.026087	0.00090885	0	-0.92881	-5.2057
<i>Rwanda</i>	-0.042240	0.0042375	0	-1.1501	-6.2020
<i>Senegal</i>	0.030528	0.00064533	0	-1.0706	-5.6245

Tanzania	0.18847	0.0067622	0	-1.0506	-5.5933
Chad	0.078421	-0.0019904	0	-0.92763	-4.7619
Kenya	0.053818	0.00091536	1	-1.0563	--5.5464
Botswana	-0.75216	0.032988	1	-0.98387	-7.5128
Burkina Faso	0.017611	0.00090670	1	-1.0860	-5.6424
Burundi	-0.0017704	0.0031936	1	0.94630	-4.8743

Where;

$D(Y_{it}-Y_{itu})$ is the difference of per capital income of each SSA countries and the developed countries average per capital income

Y_{it} is the developed countries average per capital income

Y_{itu} is per capital income of each SSA countries

C is the constant terms

Lag is the lag length of $(Y_{it}-Y_{itu})$ included in the analysis

α is the coefficient of $(Y_{it}-Y_{itu})_{t-1}$

Values in parenthesis denotes t statistics

For lag 3 Critical values used in ADF test: 5%=-3.58, 1%=-4.323

For lag 2 Critical values used in ADF test: 5%=-3.573, 1%=-4.308

For lag1 Critical values used in ADF test: 5%=-3.567, 1%=-4.295

For lag 0 Critical values used in ADF test: 5%=3.5234, 1%=-4.277

As displayed in the above table, the ADF unit root test provides strong evidence suggesting the non stationary of the logarithm differences of real GDP per capita for all countries under the study. This implies that the real GDP per capita between the developed and each of these African countries diverged along time. But the time series approach simply depicts whether countries are approaching to the given average value or not. Social, economical, political, demographical and geographical factors play a prominent role to explain growth in Africa. So to examine factors that affect growth in Africa the use of additional method is inevitable.

4.4.2 Conditional income convergence

In the usual macro economic tradition growth is a function of labour, capital and technical factor of production. But this specification lacks robustness for Africa. Recent studies indicate that there are many factors that contribute to the growth process of Africa. So to examine the income convergence in sub-Saharan Africa, macro economic variables and other related growth factors should be incorporated.

The solow model lacks robustness as growth cannot only be explained by saving rate, depreciation, and population growth in Africa. Many scholars like Ndulu and Oconel (2000) and Savids(1995) incorporated macro economic variables to explain growth . They incorporate these variables indicated the inability of the solow growth model to explain growth in Africa. These scholars included public expenditure, openness, financial development, foreign direct investment, inflation e.t.c to augment the Solow model. The mechanisms through which the effect of these variables affects the growth process in Africa are depicted below

If there is excess money expansion in the economy its impact may be producing inflation as there is no any financial asset that individuals will hold so that its impact may be negative on the growth rate of African countries

The effect of inflation exerts its influence on growth via investment. Inflation is related to high macro economic uncertainty. Openness shows a significant effect on growth. Sachs and Warner index of openness is the most widely used method of measuring openness. Most African countries are at zero.

The literature on foreign direct investment suggests that it can have either a positive effect or negative effect on growth. The positive effect might arise through productivity gains that are expected to occur through technology spillovers and the introduction of

new methods as well as processes that could be learnt, and used to modernize the national economy, and spur productivity growth. On the other hand, the negative effects could arise due to unfair competition if multinationals use their technological and scale advantages over domestic firms to extend their monopolistic power into the domestic market. In that case, foreign direct investment would crowd-out domestic investment. Even though FDI targets to countries that have high natural resources it positively contributed to the growth process in Africa. But it only concentrated to few countries, which have good natural resource endowments (Ndulu, 2000).

Government expenditure may affect growth either positively or negatively depending on different cases. Government spending may be financed by distortionary taxes that tend to reduce growth. The net effect of the government expenditure on growth therefore depends on the supply side contribution of the spending. Public expenditure may bring positive outcome to the growth process if the investment, that it makes, goes in the desired channel

The share of manufactured goods to total export is an indirect measure of the effect of resource endowment on the structure of export.

IM, Pesaran, and Shin panel unit root test is better than Levin test. So we have used this method to test the panel unit root. On top of that the Larsson et al panel cointegration test reveals the presence of 2 panel cointegration vectors (for the detail see appendices 6 and 7)

The first-differenced GMM estimator has been found to have poor finite sample properties in terms of bias subsequent first-differences. Hence the instruments available for the first-differenced equations are weak (for the detail see Blundell and Bond, 1998). Blundell and Bond have shown that the first-differenced GMM estimator could be

subject to a large downward bias. This is particularly severe when the time period being considered for each unit is small. As a result, Blundell and Bond (1998) have suggested a system GMM estimator that simply considers lagged differences as instruments for an additional levels equation.

The system GMM econometrics result (for the detail see model 3.6) shows us that inflation has negative impact on the economy of the Sub-Saharan Africa countries. Population growth affects growth negatively in sub-Saharan Africa countries. The exclusion of resource rich countries from the regression equation show us that the impact of foreign direct investment is insignificant

Table 5.6 System GMM estimation of conditional income convergence

<i>The dependent variable is($\ln Y_{it} - \ln Y_{it-1}$)</i>			
<i>Variables</i>	<i>Coefficient</i>	<i>t-value</i>	<i>t-prob</i>
<i>Lnyit-1</i>	-0.0655443	-3.32	0.001
<i>SAVING</i>	0.00386035	3.39	0.001
<i>Popgr</i>	-0.0177746	-1.73	0.107
<i>m/GDP</i>	-0.000562827	-0.479	0.632
<i>ILLITRT</i>	0.000415291	0.408	0.683
<i>OPENESS</i>	0.00550233	0.217	0.828
<i>inflation</i>	-0.00278100	-1.65	0.100
<i>lnfix-1</i>	0.0150203	1.89	0.059
<i>FDI</i>	0.002614	1.41	0.114
<i>exp share</i>	0.00361776	1.52	0.102
<i>Constant</i>	0.272950	1.66	0.098

Wald (joint): $\chi^2(9) = 25.86 [0.002] **$

Wald (dummy): $\chi^2(1) = 2.746 [0.097]$

Sargan test: $\chi^2(1042) = 188.0 [1.000]$

AR (1) test: $N(0, 1) = 1.565 [0.118]$

AR (2) test: $N(0, 1) = 1.210 [0.226]$

Where;

lnY_{it} is the percapita income of country *I* at time *t*

Lnyit-1 is the percapita income of country *I* at time *t-1*

ILLITRT is the illiteracy rate of each SSA countries

Popgr is population growth of each SSA countries

M/GDP is the share of M (money) to GDP of each SSA countries

Lnfix-1 is the investment made last year by each SSA countries

FDI is the foreign direct investment made by each country in SSA

Exp share is the share of export to GDP

All the necessary tests assure the correctness of the model.

The wald test for the joint significant of all variables is rejected. This affirms that the variables included to the model explained the dependent variables. The Sargent test of overall identification restriction for the validity of the moment condition used in the GMM is accepted that implies the moment restriction used in the model is valid. The autocorrelation tests accepts the null hypothesis which testifies the non existence of autocorrelation

The negative lag per capita income shows the occurrence of conditional income convergence. From the above econometrics out come it is possible to conclude that saving, export share, and the previous year investment affects the growth process positively. Inflation and population growth affects the growth rates of Africa negatively. Openness and FDI remained poor to explain the growth rate of Africa. This analysis accepts the second hypothesis.

Chapter Six

6.1 Conclusion

From the findings it is revealed that the economies of the south creates additional demand for the north economies as the south economies cannot produce the important capital goods in their home economy. The reliance of these economies on agriculture and primary commodities agitates the problem of terms of trade deterioration. The increase in income in the north failed to affect the price of raw materials at the globe level. So the structure of the economy is the determinate factor for the existence of terms of trade deterioration. The increase in income in the south affects the terms of trade in two ways. First, the increase income in the south emanates from the increase in the agricultural sector which in turn affects the global supply of primary commodities. The increase in supply of primary commodities reduces the price as these commodities are homogenous and income inelastic. Second, the economies of the south heavily rely on the north for their production of goods and services, as the economies of the south cannot produce these items in the domestic. So when there is an increase in income in the north it increases the demand for industrial commodities and capital goods, as these goods are very fundamental for the performance of their economy.

In the reverse, the increase in income in the north cannot induce an increase in the price of agricultural commodities. This is because agricultural commodities are income inelastic in their nature. On top of that the economies of the north are so dynamic that they produce various kinds of industrial outputs. Here, the variety hypothesis works for industrial commodities thus the increase in income in the north favors the price of manufactured outputs.

Economic growth in Africa lacks sustainability. This calls many scholars to look for the causes of the poor growth. Policy variables, institutional factors, the structure of the economy e.t.c have been listed as the cause for poor growth performance

In the finding, it is shown that FDI, literacy rate and openness, which supposed to affect the economic growth positively, insignificantly affects growth in Africa. Since liberalization many African countries cannot dynamite their economies and remained agriculturalists. FDI inflows also depends on other factors hence it failed to impact the growth performance positively in this region as this region (SSA) lacks the necessary preconditions for FDI to inflow. Saving, previous year investment and export share of manufacturing commodities positively affect economic growth of the region. The two hypothesis are accepted since the econometric results and the quantitative analysis affirm them

6.2 Possible Recommendations

Sub-Saharan Africa countries have to achieve Structural transformation in the long run to come out from the trap of terms of trade deterioration. In the short run, these countries should pave the ground for structural transformation. Policies should target to facilitate and enhance the industrial sector as it is the only promising sector in the future to converge the north and to do away with the problem of terms of trade deterioration. To converge the economies of the south, the industrial sector should growth fast with dynamism and its share to the total economy should be large.

So as to achieve structural transformation in the long run countries should switch their resources to supplement the industrial sector. The experience of South East Asian countries shows that the industrial sector works hand in hand with the research and

development sector in updating and regenerating the manufacturing items. Strong research and development institutions are required in Sub Saharan Africa countries, which strongly assist the industrial sector in the upbringing of new industrial outputs and the method of production. Besides, countries should accumulate skilled manpower that can assist the industrial sector because the industrial sector cannot be sustainable and operate efficiently without adequate and well-trained human capital.

In the short run countries cannot change the structure of their economies. To build up their industrial sector these economies can first commence from the production of the most demanded industrial output in the domestic. Once they have started production they can produce the intermediate input that lets them produce the most demanded manufacturing commodities, in the domestic that they can acquire the necessary skill for regenerating it .So through this line up it is possible to change the structure of the economy.

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Appendix 1

Terms used in the analysis

Lnsouth = income in the south

Lnynorth = income in the north

manu north = price of manufactured products produced by the north

worldi = world interest rate

priceofn allpc = price of all primary products except oil

beverageln = price of beverage

Metal = price of metal

lnoil = price of oil

percapitalincome = pre capital income in the south

exposhare = export share out of total GDP

Popgrowth = population growth in the south

Invest = previous year investment

m/GDP = the ratio of M2 to total GDP

FDI = foreign direct investment

The **south** in the analysis includes the following sub Saharan Africa countries

Borkinafasoo, Botswana, Burundi, Cameroon, central Africa, Chad, republic of Cong, Ethiopia, Ivory cost Kenya, Madagascar, Mali, Mozambique, Niger Nigeria, Rwanda, Tanzania

The **north** in the analysis includes the following developed countries:

Australia, Austria, Belgium, Canada, Denmark, Finland, Ireland, Italy, Netherlands, Newzerland, Norway, united kingdom, united states of America, France, Germany, Japan, Switzerland,

Appendix 2

Data specification

Price of oil, price of primary commodities, price of beverage, price of manufacture products and agricultural raw materials are collected from UNCTAD database

Income of the south and income of the north are calculated from the IFS database and are the sum of the countries included in the study. Here it is assumed that these countries are one empire.

Precipitate income of the south is calculated as the weighted average of each country.

Population growth, export share, FDI and saving (both are in percentage) are obtained from the World Bank database. M/GDP is collected from the IFS database.

Appendix 3

Unit root tests for time series variables

Dickey Fuller test (ADF)

Variables	t-value (firstdifferenci ng)	t values (Level)	Rema rk
lnsouth	5.9707	1.4047	I(1)
lnynorth	5.0119	1.2061	I(1)
manu north	3.9146	2.9293	I(1)
worldi	4.7166	1.7378	I(1)
priceofn allpc	5.1887	2.8791	I(1)
beverageln	4.3359	2.5763	I(1)
Price agriagri	5.8069	2.3478	I(1)
metal	-5.2954	2.8921	I(1)
lnoil	-4.2467	2.9279	I(1)

Critical values used in ADF test: 5%=-3.567, 1%=-4.295

Appendix 4

PP unit root test

Variables	Level	Difference
lnsouth	0.2182	0.0001
lnynorth	0.6381	0.0000
manu north	0.1123	0.0101
worldi	0.5843	0.0013
priceofn allpc	0.1101	0.0043
beverageln	0.2318	0.0002
Price agriagri	0.1196	0.0008
metal	0.1768	0.0008
lnoil	0.1310	0.0001

The values in the table indicate probabilities .so after first differencing all variables becomes stationary as opposed to the level which shows that all variables are non-stationary.

Appendix 5

Co integration test for manufactured products in the north

(1) co integration analysis, 4 to 33

eigenvalue loglik for rank

10.33925 0

0.81948 36.01761 1

0.77817 58.60525 2

0.59041 71.99413 3

0.53447 83.46285 4

0.43625 92.06013 5

0.16029 94.68053 6

0.024744 95.05635 7

H0:rank<= Trace test value

0	169.43 [0.000] **
1	118.08 [0.000] **
2	72.902 [0.026] *
3	46.124 [0.071]
4	23.187 [0.245]
5	5.9924 [0.699]
6	0.75165 [0.386]

Price in the north *lnsouth,lnnorth,lnoil,,lnmetal,lnagri wage*

co integration test for all primary commodities except oil , 3 to 33

I(1) eigenvalue loglik for rank

	-43.29490	0
0.52892	-31.62762	1
0.45120	-22.32720	2
0.16495	-19.53311	3
0.098246	-17.93020	4

H0:rank<= Trace test pvalue

0	50.729 [0.025] *
1	27.395 [0.094]
2	8.7940 [0.392]
3	3.2058 [0.073]

priceofn allpc, lnsouth, lnnorht, worldi

Co integration test for beverage

I(1) cointegration analysis, 4 to 33

eigenvalue loglik for rank

-67.93297 0

0.50173 -57.48390 1

0.38338 -50.23129 2

0.17876 -47.27714 3

0.11463 -45.45085 4

H0:rank<= Trace test pvalue

0 44.964 [0.040]*

1 24.066 [0.204]

2 9.5609 [0.322]

3 3.6526 [0.056]

price of beverage , lnsouth, lnnorht, worldi

Co integration test for raw materials

I(1) cointegration analysis, 3 to 33

eigenvalue loglik for rank

-41.23658 0

0.55934 -28.53465 1

0.40642 -20.44999 2

0.23146 -16.36934 3

0.086659 -14.96432 4

H0:rank<= Trace test pvalue

0 52.545 [0.016] *

- 1 27.141 [0.100]
- 2 10.971 [0.217]
- 3 2.8100 [0.094]

Price of raw materails , Insouth, Innorht, worldi

Appendix 6

Panel unit root tests

IM, Pesaran and shin (IPS) test

Variable	Statistics	Probability	Statistics	Probability
percapitalincome	1.68866	0.145	15.28	0.000
inflation	-6.64	0.213	-19.26	0.000
exposhare	-2.61566	0.1045	-16.25	0.000
Saving	2.5969	0.1047	-15.1211	0.0000
Illiteracy rate	3.325	0.999	-20.19	0.000
Popgrowth	2.594	0.1320	14.85	0.000
invest	-3.21	0.880	14.555	0.000
m/GDP	5.1717	0.4710	22.6215	0.000
FDI	4.221	0.321	21.3912	0.001

The values in the table indicate probabilities .so after first differencing all variables becomes stationary as opposed to the level which shows that all variables are non-stationary.

Appendix 7

The panel co integration test

$$-LR \left\{ \frac{H(r)}{H(9)} \right\}$$

Ho	borkina	botswana	brundi	c.africa	cameroon	congo	ethiopia	I cost	kenya
0	205.02	182.53	201.12	196.82	190.07	156.7	192	256	244.81
1	150.16	126.6	136.89	120.48	124.82	101.91	126	156	137.37
2	106.67	75.232	87.785	76.007	77.454	56.193	77.223	89	91.623
3	66.059	43.593	60.94	50.021	50.052	31.265	57.453	55	54.585
4	44.046	20.865	37.956	31.038	28.49	16.019	34.1223	39	31.94
5	22.8	9.8008	19.017	15.867	14.309	6.34	21.567	21	15.837
6	8.3599	3.5034	6.8367	6.007	5.3387	2.56	12.4658	11	5.6977
7	0.0705	0.012701	0.46605	0.84738	0.0035	0	4.578	3.44	0.67301
8	0.004	0.00087	0.11263	0.12312	0	0	1.3267	0	0

$$-LR \left\{ \frac{H(r)}{H(9)} \right\}$$

Ho	mali	madaga	moza	niger	nigria	Rwanda
0	194.29	213.19	189.67	191.14	212.98	284.9
1	127.54	139.1	123.03	125.09	142.01	193.42
2	81.739	89.016	86.723	84.423	98.421	116.26
3	47.772	44.447	56.525	54.3976	62.572	66.048
4	30.224	29.727	35.141	35.706	38.947	34.344
5	17.528	17.413	18.459	17.2	18.559	16.85
6	7.4318	7.5733	8.1505	4.9993	8.8496	7.5129
7	0.64038	2.0898	3.0413	0.067744	0.95839	2.2248
8	0	0.1	0.1234	0	0.1006	0.2631

Tanzania	LR bar	k=p-r	E(zK)	var(Zk)	$\gamma_{LR} \left\{ \frac{H(r)}{H(9)} \right\}$
189.44	204.4865	9	149.4	233	14.86684
138.64	134.8447	8	117.5	184	5.266354
96.292	86.85624	7	89.36	140	2.2456
65.093	54.26439	6	64.96	103	-4.335714
39.755	32.85114	5	44.39	71.3	-5.635945
24.075	17.1094	4	27.73	45.3	-6.508129
11.218	7.190482	3	14.96	24.7	-6.437252
0.33619	1.151632	2	6.086	10.5	-6.26814
0	0.126731	1	1.137	2.21	-2.800716

P total number of variables, r =number of ranks,

Critical values for the standard normal distribution (two tailed Z test) 1%=2.57,5%=1.96

I declare that this thesis is my original work and has not been presented
by any other university, and that all source of materials used for the thesis
are acknowledged.

Solomon Tsehan
Gini

My Advisor:

Prof. Estiphaw
August 9/2006.