ADDIS ABABA UNIVERSITY

SCHOOL OF ECONOMICS

DETERMINANTS OF AGRICULTURAL EXPORT IN SUB-SAHARAN AFRICA: EVIDENCE FROM PANEL STUDY

BY

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A project submitted to the School of Economics of Addis Ababa University in partial fulfillment of the requirements of the Degree of Master of Arts in Economics (Applied Trade Policy Analysis)

Approved by:

______________________________ _________________

Advisor **Signature**

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Table of Contents

Page

Acknowledgments …. ……… …… .. … . . . . … . . . . ……......i

Table of Contents.. …… …… …… . ……. …….……. . . ………………................. ….ii

List of Tables ….. ….. … . . . . ………… . ….. ….. . …. ….. …………………...iv

List of Annexes…………………………………………………………………………v

Abstract …. …… …… …. … . . . . …… ….. ……. .. . . …………….. vi

Chapter One: Introduction

Chapter Two: Literature review

2.1 Overview of Importance of Agriculture in SSA……………………………….…..............5

2.2 Supply side Factors Affecting Agricultural Export in SSA ………………………………… 7

2.3. Demand side Factors Affecting Agricultural Export in SSA………………………...15

Chapter Three: Model Specification, Estimation Results and Discussion

3.1 Model Specification……………………………………………………………......22

3.2. Data and Explanation of Variables………………….. ………………………………25

3.2.1. Data Sources……………………………………………………….................25

3.2.2. Explanation of Variables……………………………………………..................25

3.3. Model Estimation Results and Discussion……………………………………………31

3.3.1. Model Estimation Issues………………………………………………………..31

3.3.2. Results and Discussion…………………………………………….........35

Chapter Four: 4. Conclusion and Policy Implications

4.1. Conclusion……………….………………. ……………….. ………….. ……………..39

4.2. Policy Implications………………………………………………………….......40

References ....………….. ………………. ……………….. ………….. …………………43

Annexes …………….. ……………………….. …..……………….. ………. 51

List of Tables

Page

Table 1: Fixed -Effects Regression Results……………………………………………36

List of Annexes

Page

ANNEX 1: List of Countries in the Sample.. …. … . . ….. . . . . . . … . . . . . … . . . ………51

ANNEX 2: Normality Test of Explanatory Variables … ……. . ……… . ………….......52

ANNEX 3: Correlation Coefficient Test……………………..…54

ANNEX 4: Hausman Specification Test … ….. ……… …… …… …… ….. …. ……...55

ANNEX 5: Test for Endogenity…………………………………………………….......56

ANNEX 6: Test for Heteroskedasticity …. …… ….. ....….....57

ANNEX 7: Test for Autocorrelation …. .. ….. . . ………… … …… ….. …. ……….…58

ANNEX 8: Panel Unit Root Test…………………………………………………….....60

ANNEX 9: Fixed-Effects Regression Results……………………………………………62

Abstract

Despite the critical importance of agriculture in SSA countries; there are constraints behind between, and beyond the border that directly and indirectly affects agricultural export performance of these countries. This paper attempts to explain theoretically and assess empirically the demand and the supply side factors affecting agricultural export of SSA countries. Specifically, the study focuses on analyzing the relative importance of the two major factors in determining the countries agricultural export performance. Panel data set with fixed effects estimation technique is used to address the question. The data set covers 47 SSA countries over the periods 2000-2008.The estimation result shows that on the supply side, factors such as real GDP, real GDP (lagged) of exporting country and lagged agricultural input use positively and significantly affects agricultural export of the SSA countries. The study also indicates that on the demand side the effect of per capita GDP of US, the major trading partner of SSA countries, is positive and significant. Moreover, the effect of US import tariff imposed on agricultural products from SSA countries is negative and significant. Therefore, the overall result reiterates that both supply side and demand side factors are equally important in determining agricultural export performance of SSA countries.

I .Introduction

It is not difficult to find statements lamenting Africa's purportedly poor export performance. For example, the recent Commission for Africa study suggests that:

"….The last three decades has seen stagnation in Africa. The composition of Africa's exports has essentially remained unchanged, and has contributed to a collapse in Africa's share of world trade…Africa will not be able to achieve the Millennium Development Goals, nor set itself on a sustainable path to growth and poverty reduction, without increased trade." Commission for Africa (2005), as cited in Prizzon and Mold (2010), pp: 2.

The United Nation Millennium Development Goals of reducing poverty by half, between 1990 and 2015, the proportion of people whose income is less than one dollar a day has energized the school of thought calling for Africa to redefine the importance of agricultural development. Wood (2002) argues that because it is land abundant, Africa will always have larger primary sector and smaller manufacturing sector than the land scarce regions of Asia and Europe.

According to Cleaver (1985) agriculture is important in SSA contributing from 20% - 60% of GDP depending on the country; an average of 80% employment and 50-90% of export. Much of the industry, trade, etc. depends on agriculture.

The importance of agriculture in SSA has not been stressed enough given that it is central to economic growth and most of the economic activities depend on it. Africa's exports remain dominated by primary commodities, and the share of agriculture in SSA's total exports has declined sharply in the last 40 years. Only a few SSA countries have achieved significant diversification of their exports. Despite those trends, agriculture remains the main export-revenue source for many SSA countries and the largest income generator for their population (WB, 2007).

The region's share of global agricultural export has declined gradually from almost 10% four decades ago to around 3% today. On the import side, the opposite pattern emerges as Sub -Saharan Africa is the only developing-country region that has seen its share of world agricultural imports increase rather than decrease (Baccetta, 2007; WB, 2007; and Christiansen, 2005).

The cause of poor export performance in agricultural sector in SSA has been attributed to poor domestic policies as well as restrictive policies by developed countries. Furthermore, the ability of the region to increase exports (its export supply response) is constrained by structural rigidities in production capacity, infrastructure and institutional barriers to trade costs) followed by overvalued exchange rate and anti agricultural industrial policies (Biggs, 2007; Kandiero and Randa; 2004; Alemayehu,1999).

Agricultural markets are among the most heavily distorted in the world. The agricultural protection applied by industrial countries to SSA exports is higher than applied to other developing countries (Kandiero and Randa; 2004).

According to IMF and WB (2002) if greater market access is granted by industrial countries to Africa's product, real incomes in SSA would increase by USD 6 per person and reduces the number of people living in poverty by as much as 13% by the year 2015. Moreover, Ghura and Grennes (1994) as cited in Daniel et.al (2002) find that the impact of 1% increase in OECD real income growth results in primary export demanded by

1.6% implying that a world recession has potential to disrupt economic growth, thus lowering economic growth in SSA.

SSA'S share in the European markets has declined despite nearly three decades of trade preference extended to SSA under several ACP-EC agreements and response of SSA's agricultural exports to AGOA's commercial incentives were not significantly different from zero(Bedassa and Bichaka ,2007).

Agriculture is partly dependent on imported inputs, fertilizers, pesticides, equipments. Balance of payment crisis have caused reduced imports of inputs and equipment, perhaps causing a reduction in agricultural production and export of SSA (Cleaver1985) ;Moreover, the high susceptibility of most African economies to trade and current account deficit arises from world share, declining terms of trade, excessive export turning volatility and falling export revenues are reasons for poor export performance of the region in general and SSA's in particular(Ignacio, 2007; and Ackah and Morrrissey,2005).

So far, there has been a divergence of opinions as to what really undermines Africa's exports in global trade. While a school of thought believes that it is the trade restrictions that hindered Africa's exports to developed countries and some developing countries, thereby reducing the income level and employment rate, another argued that even if Africa's exports are allowed free access to the developed countries' markets, the continent lacks the ability to produce to meet the demand due to Africa's supply constraints (Kareem, 2009).

Identifying and assessing the major constraints that significantly determines the overall agricultural export performance in SSA will give some useful guidance to policy makers in designing sound macroeconomic policies to improve the sectors' export performance and can be used as a base for detailed study on individual country agricultural export constraints to take remedial measures and ultimately to achieve overall economic growth.

The main objective of this paper is to explain theoretically and assess empirically both the demand and supply side factors affecting SSA countries agricultural export. Specifically, the study attempts to investigate the relative importance of the two major factors in determining the countries agricultural export performance.

The study uses an econometric model of panel data regression with a fixed –effects estimation technique as a method of data analysis .The cross sectional time series data set of 47 SSA countries over the period 2000-2008 is used to address the above issues. The methodology relates the dependent variable, total agricultural export (in million USD), with the selected supply and demand side explanatory variables.

The remainder of the paper is organized as follows: Chapter two reviews related theoretical and empirical literatures regarding the subject. In Chapter three, model specification, data sources, variables explanation, estimation results and discussion are presented. The last chapter consists of conclusion and policy implications of the study.

II. Literature Review

2.1. Overview of Importance of Agriculture in SSA

Based on the trade theory of comparative advantage, Africa continues to produce and export its raw materials or primary goods, where it is said to have the comparative advantage. But the comparative advantage theory is has been disappointing as African countries have been forced into the role of exporting raw material and other primary commodities with little or no development impact. Most of Sub-Saharan African countries depend almost on primary commodities for their foreign exchange earnings. African merchandise exports did not rise significantly for the period 1980 to 2006 particularly when South Africa and Nigeria are not included (Amin et al, 2007).

Capitalizing upon agriculture's potential to drive development in Sub-Saharan Africa (SSA) is both critically important and urgent for enhancing aggregate economic growth and improving the welfare of hundreds of millions of extremely poor people. Agriculture employs 62% of the population of SSA (excluding South Africa) and generates 27% of GDP of these countries, with the majority of the poor living in rural areas (FAO, 2006; World Bank; 2006b as cited in Staatz and Dembélé, 2007). More than 215 million people, nearly a third of the population, are malnourished, and almost half live on less than a dollar a day. SSA is the only region of the world where poverty is still strongly a rural phenomenon—and undernourishment have been increasing over the past 20 years and where those living on less than $1/day have become poorer. This weak economic performance is closely linked to slow productivity growth in the agricultural sector, as the agricultural sector is the key determinant of overall economic growth (World Bank, 2005c as cited Staatz and Dembélé, 2007).

The performance of the sector over the last three decades suggests that the sector has not been able to serve its potential role as engine of growth in the sub-region. Rather than stimulating economic growth, the agricultural sector had dragged it down in many African countries (Oyejide et.al, 2000). A close look at agricultural production and exports trends explains this conclusion. Put simply, various indices of agricultural production and exports revealed downward trends, until fairly recently. Over the past 30-40 years SSA's share in worlds export has been declining and along with it the standard of living of most Africans .This outcome is the result of combination several factors: the structure of international trade; the composition of international trade; the composition of SSA trade; low productivity as a result of poor governance ;poor trade and economic policies applied by SSA countries over the past 20 years ;poor infrastructure in SSA countries- which is related to the high cost of doing the business in SSA; the decline in demand for key export produced by SSA ;the substantial erosion of market share of SSA countries; market access and constraint; and agricultural policies in developed countries. At the same time, more than any other developing region, SSA remains heavily dependent on export of primary commodities –some of whose price have been steadily decline (Cleaver and Donovan, 1995; Maunduna, 2005).

The dismal trend in the agricultural export of SSA has been attributed to poor domestic policies and capacity constraints (supply side/internal factors)as well as restrictive policies in developed countries (demand side Factor) (Bacchetta,2007; Redding and Venables,2003; Kandiero and Randa, 2004; Love and Turner,2001).

2.2 Supply Side Factors Affecting Agricultural Export in SSA

The ability of a country to increase exports (its export supply response) is constrained by structural rigidities in production capacity. Macro environment; poor infrastructure; access to inputs (like fertilizer and credit to increase production); access to information about the market price, standards; and structural and quality of institutional arrangements and excessive tax on agriculture are among the major supply side constraints that hinder agricultural export of SSA. (Ackah and Morrissey, 2005)

Supply conditions are fundamental in defining the export potential of the economy and, for a given level of access to international markets, countries with better supply conditions are expected to export more (Kandiero and Randa; 2004; Taylor 2007).Moreover, Fugazza (2004) as cited in Beshir (2010) analyzed the major determinants of export performance in 84 countries by employing an econometric model of bilateral trade flows using gravity techniques. The result shows that, while trade barrier continue to be concern, supply-side conditions have often been the most important constraint on export performance in various regions particularly in Africa, despite generalized deepening of international trade integration.

According to Schiff and Valdes(1992) as cited in Kandiero and Randa (2004) among all developing country regions SSA countries imposed the highest level of taxation (both implicit and explicit) on agriculture ranging from 46-59 percent. The direct tax on agriculture in these countries is similar to the implicit tax resulting from industrial countries protection and macroeconomic policies. Herman (1997) did similar study that focused on individual crops and found significant policy biases against agriculture, which were more excessive for export crops such as coffee than food crops. The removal of subsidies in recent years has caused prices to increase, reducing fertilizer usage among many small farmers. In some SSA countries, the imposition of import control on fertilizer resulted in higher prices of fertilizers have led many farmers to sharply reduce the amount of fertilizer usage in production in an effort to cut costs. The median SSA fertilizer usage is below the global median (26.6 kg per hectare) (Kandiero and Randa, 2004).

Wang and Winters (1998) as cited in Frazer and Biesebroeck (2007) in summarizing a set of World Bank technical papers, finds that "the evidence suggests that it is African countries' own trade policies and not those of their partners that must be changed in order to promote growth.

Infrastructure and trade facilitation services problems abound in low-income countries and the high costs and deficient service flows from these non-tradable factors of production often cause serious problems for export competitiveness. Trade requires official paperwork, transport, port handling, and customs inspections, and the high costs, excessive documentation and procedures, and time delays involved in these services have been shown to be one of the most critical impediments to export growth and diversification in many countries (Sachs and Warner, 1995 as cited in Biggs, 2007).

According to Mbekeani (2007) Weak infrastructure is a major impediment to trade, competitiveness and sustainable development in most SSA countries, particularly land-locked and small island countries. Although many countries have benefited greatly from policies aimed at fuller integration into the world economy, lagging countries are found in all regions, though regional aggregates suggest that Sub Saharan Africa has been the least successful. The high transport costs of imports of African countries inflate the prices of capital goods and intermediate inputs, thereby increasing the cost of domestic agricultural and industrial production. Notably, the high transit costs faced by African exports have become a far more restrictive barrier to trade than tariffs in major markets. Clarke (2005) as cited in Bacchetta (2007) argues that improving the quality of domestic transportation infrastructure and the reliability of transportation services might also improve exports despite the weak support he finds for his assertion in his econometric work.

Limão and Venables (2000) finds that the relatively low level of African trade flows "is largely due to poor infrastructure .The researchers also reiterated a significant impact of transport costs on trade, finding that the median landlocked country has only 30 percent of the trade volume of the median coastal economy and that improving the standard of infrastructure of the most badly affected countries stands to have a large expansionary effect on their trade. An empirical study by Babatunde (2009) reveals that being land locked country in SSA can adversely affect the performance of merchandise export.

Kym (1999) as cited in Kandiero and Randa (2004**)** who argue that poor infrastructure has a negative impact on rural prosperity as it affects fertilizer and other in the put uses, raises producer price elasticity and hinders market integration. Kandiero and Randa (2004) find that a 10 % increase in infrastructure leads to a 2 % increase in agricultural exports share.

The other major factor that affects export supply is real exchange rate. Creating more competitive macroeconomic framework through currency devaluation and establishment of Export Processing Zone by the government of SSA countries will encourage their export. Agbeyegba et al. (2004) argues that overvaluation of exchange rate has a direct effect by suppressing import and export bases measured in domestic currency terms .Overvaluation also have indirect effects by reducing the incentive to produce goods for export, encouraging capital flight and currency substitution

,weakening the balance of payments and encouraging trade restrictions. He concludes that in heavier indebted countries like SSA, the effect of devaluation is largely an empirical question. Fugazzza (2004) empirically analyses the effect of real depreciation on export performance by taking sample SSA countries with in the period 1988-1999 and proves that for all periods on average a 1 percent real exchange rate depreciation could increase export by 6 to 10 percent. In low income countries undervaluation (overvaluation) of the currency can bolster (undermine) export competitiveness.

Love and Turner (2001) also empirically investigates the impact of real exchange rate policy on export in SSA by using panel data methodology over the period 1975-1995 and real exchange rate as a measure of international competitiveness and concludes that appreciation of real exchange rate has detrimental effect on export performance of the region. According to the literature on SSA, the degree of success of trade policy reform in changing the trade orientation of the country is dependent up on exchange rate reform and consistent macroeconomic policies (Schatz and Tarr, 2000 as cited in Love and Turner, 2001).

A study by Were et al (2002) as cited in Beshir (2010) examine the determinants of Kenya's export volume by disaggregating total export of goods and services in to three categories: traditional agricultural exports(tea and coffee) and other export of goods and services using an error correction model .For each of the three categories of exports, they specified an empirical model along the standard trade models that incorporate real exchange rate(proxy for relative price) and found that supply response for real exchange rate depreciation is significant.

An empirical study by Kandiero and Randa (2004) shows that a10 percent depreciation of the real effective exchange rate will lead to about a 2 percent increase in SSA agricultural export shares. A deliberate and a conscious policy decision to depreciate any SSA's currency in an environment of low inflation will make that country's exports, not only agricultural, to be more competitive in the world market.

Institutional quality is another major supply side constraint for agricultural export of the region. The impact of institutional quality on export of primary commodities is likely differing from its effect on manufactured exports. Endowment of natural resources may create natural rents that are usually controlled by administration and generate corrupt competition over their distribution as Ades and di Tella (1999) as cited in Meon and Sekkat,(2006) suggests. In such context, export of primary products may be positively rather than negatively associated with lack of institutional quality. The existence of weak and inefficient institutions could be a limiting factor in the ability of firms to take the advantage of new trading opportunities in low-income developing countries this is because entrepreneurs are likely to face difficulties moving in to non- traditional exports if there exists ill-defined property rights, have problems in enforcing contracts, lacked access to adequate financing and if they have problems in meeting health and safety standard in foreign markets (Babatunde, 2009; Biggs, 2007).The measure of institutional quality (risk of expropriation) has a positive and statistically significant effect on export performance, consistent with an important role for the protection of property rights in determining countries ability to export (Redding and Venables,2003). Apart from the direct effect, institutions may also indirectly affect trade through their impact on other variables that determine trade flows like investment and productivity (Méon and Sekkat, 2006).

According to Carmingani and Chowdhury (2007) the key to the SSA specific curse appears to lie in the interaction between institutions and primary commodities (i.e.

institutional constraints in the region were found to be the major constraining factors for poor performance of export of primary commodities).

Foreign Direct Investment(FDI) can play a significant role in promoting economic development in low-income countries by serving as a mechanism through which superior technology and managerial know-how are transferred to such countries and to facilitate exporting activities generated by the FDI flows(Oyejide and Ademola,2007).

A study by Staatz and Dembélé (2007) indicates that agriculture's capacity to contribute to growth and poverty alleviation in Africa has been greatly constrained in the past by underinvestment and miss-investment, in both physical and human capital, resulting in a huge cost to Africans in terms of foregone well-being. The underinvestment is reflected in high rates of return to key contributors to agricultural growth such as agricultural research and locally managed irrigation systems .If the motive is to tap export markets by taking advantage of the country's comparative advantage, then FDI may contribute to export growth. Thus, whether FDI contributes to export growth or not depends on the nature of the policy regime.

Helleiner's (2002) as cited in Bacchetta (2007) studies African countries in work also show that FDI has not as yet made a particularly important contribution to African non-traditional export expansion. Oyejide (2007) investigated the critical of African investment codes which place heavy reliance on fiscal and other incentives which may be largely ineffective in attracting FDI and are at the same time quite costly in terms of lost revenue.

Apart from the above supply side factors the size of importing and exporting countries and degree of openness of the countries determines the export of primary commodities.

The size of the exporting and the importing countries are basic determinants in explaining exports. Generally countries are expected to trade more as they increase in size. The size of the economy can either be measured by the two variables of population or the GDPs. The GDP of the domestic country is believed to reflect the capacity to supply exporting goods.

Babatunde (2009) empirically evaluates the effect of productive capacity (proxy by GDP of SSA countries) on its export by using both random and fixed effect regression of export supply model. The result reveals that GDP has highly significant positive impact on export volumes and export volumes appear to be lower when manufacturing share in GDP is higher.

According to Kristjánsdóttir (2008) when the export and recipient country variable coefficients are considered specifically, what is noteworthy is that the recipient country coefficients are estimated to be significant. The positive significant coefficient of the recipient country GDP implies increased demand for exports as trading country economic size increases i.e. exports increase with per capita income of the recipient country. While the export country population is also expected to have positive effects on exports, since the export country is expected to be able to supply more as the population grows in size. His empirical study indicates that1% increase in recipient country GDP can be expected to raise exports by about 3.56%, given everything else equal. The study indirectly shows that Africa's marginalization in world trade is primarily due to the continent's lagging performance in terms of output growth.

Traditionally, economists have argued that more open economies grow faster. This idea was largely based on the argument that openness improves resource allocation. However, realizing that in models of international trade, opening up generates a static improvement in output but does not generate additional growth, economists looked for other arguments. Theoretical models and macroeconomic, mainly cross-sectional, empirical evidence so far failed to provide a definite and positive answer to the question of the linkage between trade and growth (Bacchetta, 2007).

According to Rodrik (1997) high levels of trade restrictions have been an important obstacle to exports, and their reduction can be expected to result in significantly improved trade performance in the region. The removal of export restrictions, dismantling of marketing boards, relaxation of quantitative restrictions on imports, and lowering of import tariffs will sharply increase traditional and non-traditional exports. Country size (as measured by population) and per capita income are two very strong determinants of openness in the economy. The study also indicates that too much focus on “outward orientation” and “openness” can even be counterproductive if it diverts policymakers’ attention away from the fundamentals of long-term growth, human resources, physical infrastructure; macroeconomic stability and treats trade rather than per capita income as a yardstick of success.

The estimated coefficient on SSA regarding openness is small (and positive) and statistically in significant. Above all, in many Sub-Saharan countries more open trade policies can be expected to improve incomes in the rural sector, where poverty is concentrated. To what extent this expectation has been borne out in practice and is likely to be borne out in future cases of reform is a question that deserves further study i.e. the effect of openness on exports of LDCs is ambiguous.

Moreover, concentration of SSA countries on few primary and similar commodities negatively affects the export performance of the region and makes the region’s export products less competitive in the international market. A study by Morrissey and Mold

(2010) indicates that the basic problem is not that Africa trades too *little,* or that the trade regime is excessively closed– rather that it is trading the wrong kind of products: primary commodities with low value added, low prices and a very low elasticity of demand on world markets. The study also shows that SSA countries have been particularly vulnerable to the problems associated with the 'fallacy of composition' – the idea that if a number of developing countries simultaneously try to increase exports in a similar range of product categories, then they may all end up losing through insufficient foreign demand and depressed international prices.

2.3. Demand Side Factors Affecting Agricultural Export in SSA

On the demand side anti export biases against the commodities of SSA countries in terms of tariff , Non Tariff and technical barriers determines the degree of market access and hence volume of export in region. Tariffs and other price-based border measures are restrictions that are imposed in order to inhibit the access of certain commodities and also for raising of revenue. They include import duties, export duties, tariff quotas, levies and charges, and other border duties while Non-tariff border measures are restrictions involve non-price measures, such as, quantitative restrictions (import quotas, direct prohibitions, domestic content requirements, licensing); contingency measures (antidumping, countervailing, and safeguard measure); technical barriers to trade (TBT) (technical regulations, standards, testing and certification procedures); sanitary and phytosanitary measures (SPS) (for food, animal and plant health and safety) (Kareem,2009).

According to (Biggs, 2007) the world trade system has become more development-friendly in the 1990s, but it is still unwelcoming to the exports of low- income countries. Tariffs and quota arrangements of developed countries especially for agricultural products undermine incentives in low-income countries to move in to higher productivity, nontraditional export.

Paiva (2008) empirically analyses the effect of demand side policies on export of agricultural products of SSA by using the data set that covers bilateral trade in agricultural goods for 152 countries over the periods1990-1993 and 1999-2002.The estimation support claims that protectionism and distortive subsidies to agriculture remain widespread among industrialized nations, which are shown to import fewer and export more agricultural products than expected given other economic, political and geographic determinants of trade. Besides importing fewer agricultural goods than predicted, rich countries tend to import a larger share of agricultural product goods from other rich countries.

The Organization of Economic Cooperation and Development (OECD), which is mainly a collection of countries that are developed, have its share of support in its different sectors. In this aspect the agricultural sector remains the greatest beneficiary of the support. From 1986 to 2005 the annual production support estimate amounted to USD 254 billion for the whole of OECD member countries .This amount is approximately 36 percent of the average annual production for the same period. Out of this production support estimate 70 percent of it is market price support for producers. The average producer support estimate accounted for 42 percent of the total value of production from 1986-1989.It then declined to 36 percent in the 90s and further to 34 percent from 2000-2005. However, the amount of producer support estimates remain more than one third of the value of production implying the support will significantly affect the market price of agricultural products in the world market (Gibbs, 2007).

Tokarik (2005) has assessed the impact of removing agricultural support from OECD using both partial and general equilibrium analysis. In the partial equilibrium analysis the study shows the impact of removing two types of supports; market price support and complete liberalization. As it is expected the removal of support results in the increase in international prices of commodities. Result from the general equilibrium analysis reveals that multilateral liberalization by both the OECD and developing countries would increase the global income by USD 128 billion or 0.4 percent of world GDP.

Despite most-favored nation (MFN) status and in some instances preferential tariffs, many products of trade interest to African countries continue to be subject to tariffs in excess of 100 percent in developed countries. Kandiero and Randa (2004) find that agricultural support to OECD farmers and standards and technical barriers have a statistically significant negative impact on SSA agricultural export share. A 10 % reduction on the tariff that the OECD levies on SSA agricultural exports will increase SSA exports share by 11 %. This is a very important result as it supports the argument that SSA agricultural exports are very sensitive to industrialized countries' tariff rates and any reduction in the tariff rates will significantly increase Africa's exports competitiveness in the foreign markets. Their finding also shows that reduction in agricultural support to OECD farmers by 10 % will increase the African share of exports to those markets by about 6 %. Moreover, the researchers find some evidence that a relaxation of standards and technical barriers will lead to an increase in agricultural exports share. Their empirical assessment indicates a 10 % reduction of standards and technical barriers will increase African export share by about 20 %.

Using the World Bank Technical Barriers to Trade database consisting of data of 619 firms from 17 developing countries from five regions described in Wilson and Otsuki (2004) as cited in Ignacio (2007) examine the impact of standards and technical regulations on a firm's export propensity (measured with overall market share) and market diversification (measured with number of export markets). The variables which most affect adversely a firm's propensity to export are testing procedures (reduced exports by 9 %), difficulty in getting information (18 %) and greater inspection time (3 %).Another finding implies that varying standards across different markets cause diseconomy of scale and reduce the likelihood of firms entering more than three markets.

Apart from the Non-Tariff Barriers(NTB) imposed by OECD countries, the tariff barriers levied by major trading partners of SSA region such as EU, USA, Japan and China on agricultural exports hinders the move towards achieving better export performance and hence economic growth of the region. In the EU, agricultural imports face higher tariffs than non-agricultural products. The simple average MFN applied tariff ratio for agriculture is 15.1% as against the applied 4% for non-agriculture in 2006. Also, non-agricultural goods imports accounted for over 94% of the total imports in EU, leaving agriculture with less than 6%. Similarly, 90% of Japan's imports were non-agricultural commodities with little tariffs imposed, compared to that of agriculture where the tariffs are at peak in the same period. However, United States of America had the lowest tariffs imposed on agricultural products with an average of less than 6%. Despite the seemingly reduction in agricultural products tariffs in the United States, agriculture accounts for a very low percentage of their imports, and this is less than 5%.Further, analysis shows that China imposed about 16% simple average MFN applied tariff rate on agricultural commodities that Africa has comparative advantage in and 9% on non-agricultural goods in 2006(Kareem,2009).

A study undertaken by IMF and WB (2001), shows that tariff peaks and escalation in sensitive products (textiles and clothing, agriculture, food products, wood products, and pulp and paper) disproportionately affect the products exported by developing countries and which inhibit the diversification of exports toward higher value-added products. So, developing countries potentially have a lot to gain from global trade reform .Recent estimates are that developing country income would be some 0.8 percent higher by 2015 than it otherwise would be if all merchandise trade barriers and agricultural subsidies were removed between 2005 and 2010, with about two-thirds of the total gain coming from agricultural trade and subsidy reform (WB, 2007).

The exported commodities from the SSA countries fall under different market access programs: Most-Favored Nation (MFN), the Generalized System of Preferences (GSP); GSP for Least Developing Countries (GSP-LDC), and the AGOA program. The GSP program is important because it grants preferences to a wide range of qualifying developing countries around the world- the rule for eligibility is typically set by an income threshold. Romalis, (2003) as cited in Frazer and Biesebroeck (2007) finds that GDP growth rate and trade volume of countries most affected by the establishment of the GSP increased significantly.

AGOA provides preferential access to U.S. markets for eligible products from designated countries of Sub-Saharan Africa (SSA) as well as improved access to U.S. credit and technical expertise. The program also establishes a high-level dialogue on trade and investment between the U.S .and SSA countries via a U.S.-Sub-Saharan Africa Trade and Economic Forum.

The success of the program in promoting export growth in the region depends on how compatible the commodities are under AGOA with the export profiles of countries in the region and how responsive countries are in taking advantage of the opportunities. This in turn depends on the AGOA program incentives and the flexibility in the economic structures in different countries to transmit the incentives to producers of exported commodities (Shapouri and Trueblood, 2003; Frazer and Biesebroeck, 2007).

Gbadebo.O, (2007) as cited in Beshir (2010) modeled Africa's agricultural exports to the United States. In doing so, he used a dynamic econometric model-Vector autoregressive Analysis- which helps to look at both the short-run and long- run effects of income and price changes. The overall result for the estimated demand functions for agricultural commodities covered by the study suggests that there is a statistically significant demand response to income changes in the US. For the combined commodity exports of the region, the trade weighted average income elasticity of export demand by the US is equal to -3.5 in the short-run and -5.7 in the long –run. The results also demonstrated the in elastic nature of price responses in the US demand for the SSA agricultural exports. The relative price (export price per US domestic price) movements affect significantly the trade flow of agricultural commodities, implying that exporter's market share has been influenced by price competitiveness. The short-run relative price elasticity of demand range from -0.4 to -0.6, and the long –run elasticity from -1.2 to -7.5.Finally, the author concluded that, trade policy measures in the form of tariff and non-tariff barriers are not very significant in changing the quantity of SSA agricultural exports to US.

All the above reviewed literatures reiterated that the dismal trend of SSA countries agricultural export over a long period of time is mainly caused by two major important factors: supply side and demand side factors. The studies in common shows that the low GDP per capita growth ; poor physical infrastructural development and trade facilitation services; overvalued exchange rate; and Africa's dependence over few varieties of primary commodities which are price inelastic predominantly deteriorates the trade performance of African countries . The export of Africa in general and agricultural export of SSA countries in particular, according to the studies, lags behind the rest of the world because of these constraining factors. Moreover, the market access condition which has been determined by the trade policy of the major trading partners of Africa erodes the trade performance of the region.

The reviewed literatures theoretically and empirically supports the claim that protectionism and distortive trade policies on agricultural export of SSA countries remain widespread among industrialized nations, which are shown to import fewer agricultural products. One can learn from the above studies that the long lasting problem of SSA countries agricultural export is related to not only the domestic or supply side factors but also the market access condition and trade policy of the trading partners. Therefore, identifying the most important factors that significantly determines the agricultural export of SSA countries to take remedial policy measures requires further investigation. These studies mainly focus on analyzing the relative importance of supply and demand side factors to come up with clear empirical finding indicating the factor which is crucial in determining the regions' agricultural export performance.

III. Model Specification, Estimation Results and Discussion

3.1. Model specification

Some of the studies (Mold &Morrissey,2006 on the determinant of export performance in SSA assumes that exports are determined by supply side variables, such as domestic prices (official or market determined), the growth of GDP, index of variable cost and capacity utilization, fewer studies have focused on the demand side constraints of exports in SSA ,such as income and prices in competitor countries .This gap in literature seems to have arisen because the typical developing country is assumed to be small and face an infinitely elastic demand for its exports, so that changes in foreign demand can influence exports only through changes in world prices.

Furthermore, the study have ignored the role of other supply side factors such as natural barriers and institutions, domestic infrastructure, exchange rate over valuation in explaining SSA export performance .Ignoring such factors and other supply and demand factors yield in conclusive results.

A study by Babantude (2009) try to address issue by using a system of equations from the demand and supply side determinants of exports in SSA, but this study also includes Real income of importing country without considering other major demand side constraints and policy variables .The supply side variables included in this study are statistically in significant which indicates that factors external to SSA countries are the most important determinants of their major export commodities.

In modeling determinants of the value of total agricultural export in SSA, A study by Kandiero and Randa (2004) attempts to inculcate the supply and demand side factors but this study also overlooks some of the variables that can significantly affect the volume of trade flow between SSA and its major trading partners. I then extended the model by including basic determinants of agricultural export in SSA to achieve in - depth export analysis with the extensions. The extended or modified model includes explanatory variables which are over looked in the model specified by Kandiero and Randa (2004).

Real GDP of the exporting country which shows the total potential supply capacity of the country; Per capital GDP of the major trading partners /importing countries to evaluate the effect of level of development/import demand of SSA major trading partners on agricultural export of the region; Institutional quality is incorporated to see the effect of institutional setup of a particular country in terms of trade freedom, property right , investment procedure , quality and control of corruption on the total agricultural export; Openness can give an indication of the degree to which an economy is open to trade ; this variable is included in the model to capture the effect of country's trade integration with the ROW on total agricultural export; FDI in flow as percentage of GDP is included to analyze its effect on SSA's total agricultural export ; and landlockedness dummy is also included in the extended model.

This study uses panel data estimation, so that variations over both the cross –section and time series dimensions are fully utilized. By ignoring temporal variation, cross-sectional estimation throws away information concerning the changes which have occurred in policy in the individual countries over the period in question. Panel estimation exploits information fully, and so offers important efficiency gains. If country – specific characteristics are correlated with the explanatory variables random effects model will result in inconsistent results. Fixed effects model is preferred in such cases. The general form of linear panel regression model is specified as:

$TAE_{it} = \alpha_i + \beta X_{it'} + u_{it}$ $i=1, 2,\ldots\ldots,N$ $t=1,2,\ldots\ldots,T.$

Where, $u_{it} = \mu_{it} + \nu_{it}$

The vector β is a constant vector of parameters that is of primary interest; i and t denotes cross section units (countries in this study) and time period respectively. μ_{it} denotes the unobservable individual specific effects which are time invariant and account for any individual-specific effects not included in X, ν_{it} is the usual error component which is assumed to be IID~$(0,\sigma^2)$ **(**Baltagi,2005**).**

TAE_{it} represents Total Agricultural Export of SSA country i at period t (in million USD).

X_{it} represents a vector of (logs of) the following explanatory variables

$RGDPE_{it}$= Real GDP of the exporting countries at time t.

$GDPCAP_{jt}$= GDP Per Capita of major trading partners j(US and EU) at time t.

$REER_{it}$=Real Effective Exchange Rate SSA countries at time t.

$INST_{it}$=is an index of quality of SSA countries institution at time t

$INFRA_{it}$= Internal Infrastructure of SSA countries at time t

$OPENN_{it}$= Openneness (measured by the ratio of Export +Import/GDP) at time t

FDI_{it}=FDI inflow as %GDP to SSA countries at time t

$DIVERSE_{jt}$= Diversification Index of country i at time t

FTP_{jt}=Trade policy Index of major trading partners, proxide by import tariff imposed on agricultural commodities from SSA by (US and EU) at time t.

INPUTS=refers to agricultural input use (will be proxide by fertilizer Consumption per hectare)

LANDLOCK dummy= takes value 0 if the country is land locked 1 otherwise

3.2. Data and Explanation of Variables

3.2.1. Data Source

The full panel includes data for 47 SSA countries over the period 2000-2008. The data used in this study is secondary data collected from various sources. The main data sources were World Development Indicator (2009), Penn World Tables data base and Africa Development Indicator (2010) .Data on FDI as percentage of GDP and foreign trade policy were from World Investment Report and Index of overall Economic Freedom created by Heritage foundation respectively. We also use the UNCTAD data base to get data on Diversification Index.

3.2.2. Explanation of Variables

The dependent Variable is the total agricultural export of each SSA country for the period 2000-2008 measured in million USD.

i. Real GDP of the exporting country ($RGDP_{it}$): The size of the exporting and importing countries which is represented by GDP or population of the countries is basic determinant in explaining exports. The GDP of the domestic economy is believed to reflect the capacity to supply exporting goods. A high level of GDP indicates a high level of production in exporting country and can be interpreted as a proxy for the range of product varieties available, which increases the availability of exports. We therefore, expect the coefficient of exporting countries GDP, $b_{1,}$ to be positive.

ii. GDP Per Capita of the importing country ($GDPCAP_{jt}$): The importer's GDP represents potential demand for imports or the effect of the level of development of importing countries on agricultural export of SSA region. A high level of per capital GDP/income in the importing country suggests high imports. The variable is expected to have a positive sign, referring that higher per capita GDP of major trading partners/importing countries leads to higher import demand which enhances total agricultural export of SSA countries. Therefore, the coefficient of the exporting country per capita GDP,b_2, is expected to be positive.

iii. Real Effective Exchange Rate ($REER_{it}$): It is a trade –weighted geometric average of the level of consumer prices in home country relative to that in its trading partners. We use the real effective exchange rate to capture appropriate incentives for exports, which may trigger supply response. The CPI-based REER index, for country $_i$, is defined by the IMF as:

$$REER_i = \underset{j \neq i}{\pi} \left(\frac{e_i p_i}{e_j p_j} \right)^{w_{ij}}$$

Where e_i= index of nominal exchange rate of country i in US dollar

e_j= index of nominal exchange rate of country j in US dollar

p_i =index of consumer prices of country i

p_j=index of consumer prices of country j

w_{ij}= trade weight assigned to partner j by country i

Trade weights reflect relative importance of bilateral trade as well as competition in the third market. The evolution of the real exchange rate determines the competitiveness of a country's commodities in the international market, thus profitability. By nature of its construction, an increase in the REER index represents real appreciation since e is calculated in terms US dollars per unit of local currency. The real appreciation would make Africa's agricultural exports less competitive in the world market and hence decreases total agricultural exports. The decrease in the REER index represents real depreciation which would make Africa's agricultural exports more competitive in the world market and hence, total agricultural export increases. We, therefore, expect the coefficient of REER, $b_{3,}$ to be negative.

iv. Infrastructure ($INFRA_{it}$): Lack of infrastructure reduces the return to trade and economic activity and hinders growth prospects of a given economy. Infrastructure conditions can be a deciding factor in market access and cost competitiveness, especially in landlocked countries where geography and poor transport infrastructure are often distinct competitive disadvantages. According to World Bank internal physical infrastructural facilities of a given country can be proxy by indexes such as percentage of paved roads out of the total road; number of fixed and mobile telephone subscribers (per 1000 people) ; number of internet subscribers (per 1000 people) and freight of air transport (in mill ton-km). In this study infrastructure in each country is measured by an index constructed by taking the mean over the two variables; number of fixed and mobile telephone subscribers(per1000 people) and number of internet subscribers(per 1000 people). The higher rating shows availability of better internal infrastructural facility; which leads to reduction in cost of exporting; and hence increases the total agricultural export. Therefore the sign of the variable infrastructure, b4, is expected to be positive.

v. Openness ($OPENN_{it}$): The simple measure of trade policy reform is the ratio of export (X) plus import (M) to GDP, often referred to as measure of openness or trade dependence index but more appropriately considered as a trade volume measure. As a country with a less restrictive trade policy is more open to trade, it could be expected to have a larger trade volume relative to countries with restrictive trade policies. The trade openness of a nation show how much country is participating in the international trade. The more open a country is to the international world, better export promotion policies will be conducted leading increment of total agricultural export. We therefore, expect the coefficient of exporting countries GDP, $b_{5,}$ to be positive.

vi. Institutional Quality ($INST_{it}$): Building the institutions and capacity of exporting firms is central to competitiveness. Evidence from successful exporting countries indicates that good institutions have large elements of indeterminacy and characteristics specific to individual countries. Institutional quality, according to World Bank, is reflected by variables such as rule of law, property right, investment procedure, financial freedom, and freedom from corruption. The rank out of 100 is given for each index. The average value of the indices' in each period is used to represent institutional quality in SSA countries. A country with better institutional set up will export more. We therefore expect the coefficient of, b_6, to be positive.

vii. FDI in flow as %GDP (FDI_{it}): Following the liberalization processes that began in early 1990s, SSA countries opened their markets and have been encouraging foreign investment in abroad range of sectors including agriculture (Temu, 2005). FDI is supposed to be one of the major determinants of export performance in developing countries since it helps to diversify the export structure. Therefore, the expected sign for the coefficient of FDI, $b_{7,}$ is positive implying that increase in flow of FDI enhances the volume of agricultural export.

viii. Export Diversification Index ($DIVERS_{it}$): Greater diversification of the productive structure would imply, ceteris paribus, more higher-value added activities especially for those SSA countries dedicated to the export of agricultural commodities, and adds more to the volume of exports. The expectation here is that more diversified economies should expect a stronger export performance. Therefore, the sign of the coefficient, $b_{9,}$ is expected to be positive. The data for DIVERS is taken from the Hirschman index of diversification (Calculated from UNCTAD data).

ix. Foreign Trade Policy (FTP_{it}): The trade policy of the major trading partners/importing countries is the major determinant factor for the export of developing countries. The import tariff and other price-based border measures imposed by importing countries on agricultural commodities from SSA combined with trade-distorting agricultural support schemes given by OECD countries to encourage domestic agricultural production results in restricted market access for Africa's agricultural exports. A reduction or removal of tariff and Non Tariff Barriers (NTB) imposed by importing countries would reduce the price of agricultural exports in those foreign markets, thus making them competitive. FTP, in this study, is proxy by import tariff (%) imposed by US and EU on agricultural commodities from SSA. Therefore, the coefficient of the variable FTP, b_9, is expected to be negative.

x. Agricultural Inputs ($INPUT_{it}$): The level of agricultural input, which is proxide by fertilizer consumption per hectare of arable land, in this study, is an important determinant factor for the volume of the agricultural export in sub-Saharan Africa. The higher the fertilizer consumption per hectare of arable land the higher will be the level of agricultural production and hence the total agricultural export. Then we expect the coefficient of this variable, b_{10}, to be positive.

xi. Landlockdness ($LANDLOCK_{it}$): The essence of the variable is to capture if being a land locked economy can adversely affect export growth. The dummy variable takes the value of zero if the country is a land locked country one otherwise as classified by UNCTAD(2004).The dummy variable reveals being a land locked country adds significantly to the cost of trading internationally or can adversely affect the performance of merchandise export. Therefore, the sign of the variable LANDLOCK, $b_{11,}$ is expected to be positive referring that the volume of agricultural export is low if the country is land locked.

3.3. Model Estimation Results and Discussion

3.3.1. Model Estimation Issues

While estimating and selecting the model that best fits the data, we should be careful about the estimation procedures and diagnostics so as to get robust results. Thus, we first undertake the possible econometric tests and deal the bias.

a) Distributional Tests

One of the important assumptions in statistical analysis is whether variables for the selected model is obtained from the normally distributed population or not. The most commonly used methods to carry out distributional test are: Skewness/Kurtosis tests for Normality and Shapiro-Wilk W test for normal data and Shapiro-Wilk W test for normal data. The result of Skewness /Kurtosis tests for Normality (ANNEX 2) shows that the calculated p value for all variables in the specified model are close to zero and hence we reject the null hypothesis of normality, which states that variables are not normally distributed, at one percent significance level i.e. the variables are normally distributed . Shapiro-Wilk W test for normal data and Shapiro-Wilk W test for normal data(ANNEX 2) also shows that the p value of each variable is close to zero indicates the variables in the specified model are drawn from normally distributed population. When we evaluate the normality of the variables at levels and log transformed ones, the result confirms that the log transformed variables becomes best approximation for normal distribution.

b) Hausman Specification Test

The specification test devised by Hausman (1978) is used to test for orthogonality of the random effects and the regressor's and choose between the random effects and fixed effects model. The test is based on the idea that under the hypothesis of no correlation, both OLS in the fixed effects model and GLS are consistent, but OLS is inefficient, whereas under the alternative, OLS is consistent, but GLS is not. Therefore, under the null hypothesis, the two estimates should not differ systematically (Greene, 2003). He further explains the Hausman's essential result as follows: "The covariance of an efficient estimator with its difference from an in efficient estimator is zero." In this study the Hausman specification test is used to choose between the fixed effects and the random effects model. Under Hausman specification test the null hypothesis is difference in coefficients is not systematic while the alternative hypothesis is there is a systematic difference in coefficients.

The resulting test statistics of the Hausman specification test (ANNEX 4) shows the p-value is zero implying that we fail to accept the null hypothesis and hence fixed effects is appropriate for this model.

c) Test for Endogeneity

Since one of the explanatory variables, real GDP of exporting country, and the dependent variable, total agricultural export, are intrinsically linked via national income accounting identities endogeneity problem is expected. The presence of endogeneity problem in the model results in inconsistent and biased estimates. In this study a Durbin-WU-Hausman test for endogeneity is under taken in order to check the existence of endogeneity between total agricultural export and real GDP of the exporting countries in the model. The test statistics (ANNEX 5) shows that we fail to reject the null hypothesis of regressor's exogeneity in the model at one and five percent significance levels.

d) Heteroskedasticity test

Assuming homoskedastic disturbances when heteroskedasticity is present will still result in consistent estimates of the regression coefficients, but these estimates will not be efficient. The loss of efficiency leads to biased standard error and hence the inferences from this estimate become invalid (Baltagi, 2005). In this study the Breush and Pagan (1980) test for heteroskedasticity is used. Under this test the null hypothesis is the error term is homoskedastic while the alternative is heteroskedasticity of the error term. The simplest variant of the Brush-Pagan test can be computed by multiplying R^2 of an auxiliary regression obtained from regressing the square of the residual on the explanatory variables by N(T-1).The resulting test statistics will have chi- square distribution with J degrees of freedom where J represents the number of explanatory variables used in auxiliary regression. The test result (ANNEX 6) shows that the test statistics is 3808.368. Since the test statistics is greater than the tabulated value we reject the null hypothesis of homoskedasticity of the error term.

e) Test for Autocorrelation

When the covariance between two or more consecutive error terms is correlated we say that the error term is subject to autocorrelation (Veerbek, 2000). If there is autocorrelation in the data the estimates become in efficient and standard errors are estimated in the wrong way.

In this study Wooldridge test for autocorrelation in panel data and the Durbin-Watson (DW) test statistics were used to test the presence of autocorrelation in the model. The null and alternative hypotheses of Wooldridge test for autocorrelation in panel data are no first-order autocorrelation and the null hypothesis is not true respectively. The resulting test statistics (ANNEX 7) shows that the p-value is zero, so we fail to accept the null hypothesis implying that the data have first-order autocorrelation. The Durbin-Watson statistics (ANNEX 7) is also found to be 0.00031 indicating that there is positive autocorrelation in the model to be estimated.

f) Test for Multicollinearity

High correlations between explanatory variables may result in multicollinearity problem. If there is multicollinearity in the model, the estimated coefficients possess large standard errors (in relation to the coefficient themselves), which means the coefficients cannot be estimated with great precision or accuracy (Gujarati, 2004).To alleviate this problem one or more of the correlated variables must be dropped from the model(Veerbek,2000). In this study to check for the presence of Multicollinearity in the model we have used the variance covariance matrix presented in the (ANNEX 3).The result indicates that the correlation coefficient between the explanatory variables is less than 0.5 except the high correlation coefficients between EU-agricultural import tariff with EU and US-per capita GDP and US-agricultural import tariff with per capita GDP of EU. Dropping EU-agricultural import tariff and EU Per capita GDP variables from the model is used as a remedial measure to correct this multicollinearity problem.

g) Panel Unit Root Test

Testing for unit roots in panel data models is necessary to apply appropriate estimation technique accordingly. In this study Levin, Lin and Chu (LLC) test is used to check the stationarity of the variables in the model. LLC suggested a test for unit root for panel data model with fixed effects, individual deterministic trends and heterogeneous serially correlated errors. LLC suggests a more powerful panel unit root test than performing individual unit root tests for each cross section and the test requires strongly balanced data. The null hypothesis is that each individual time series contains a unit root against the alternative that each time series is stationary (Baltagi, 2005).The resulting LLC test statistics (ANNEX 8) shows that we reject the null hypothesis of the variables non Stationarity or presence of panel unit root. In this study the Stationarity of variables such as FDI in flow as percentage of GDP, diversification index, and agricultural input use is not tested due to the absence of strongly balanced data.

3.3.2. Results and Discussion

After analyzing sin various econometric issues that ought to be taken into consideration, the estimation technique which results in consistent and unbiased estimates is selected. In this study the fixed effects estimation technique is preferred as the estimation technique yield efficient and consistent results.

Turning to the actual results in Table 1 of all supply side variables real GDP and real GDP (lagged) of exporting countries and lagged value of agricultural inputs do have positive and statistically significant coefficients. Agricultural export may not respond immediately and fully to changes real GDP and use of factor inputs. Therefore, a one year lag of these two variables is used in estimating the model to analyze their direct effect. When the variable, real GDP (lagged) of exporting countries, is included in the model it might be collinear with real GDP, but this may not be considered as a problem as long as it leads to reliable estimates with their expected sign.

Table 1: Regression Results under Fixed Effects Estimation Technique

Dependent Variable- Log of Total Agricultural Export, 2000-2008

Independent Variables	***Coefficient***	***t-ratio***	***p-value***
Ln ($RGDP_{it}$)	*1.358*	*3.56 ** *	*0.001*
Ln ($RGDP_{it\_1}$)	*0.046*	*3.52 ** *	*0.001*
Ln ($GDPCAPUS_{jt}$)	*2.796*	*2.02 ** *	*0.049*
Ln (FDIPERGDPit)	*0.013*	*0.47*	*0.641*
Ln ($REER_{it}$)	*-0.014*	*-0.60*	*0.554*
Ln ($OPEN_{it}$)	*0.023*	*0.31*	*0.760*
Ln ($US\text{-}TARIFF_{jt}$)	*-0.410*	*-1.88*** *	*0.067*
Ln ($DIVER_{it}$)	*0.040*	*0.37*	*0.713*
Ln (INPUTit_1)	*0.011*	*1.83 *** *	*0.074*
Ln ($INSTQ_{it}$)	*0.055*	*0.43*	*0.671*
Number of observations = 227			
R^2 *Within = 0.376*			
R^2 *Between = 0.761*			
R^2 *Overall = 0.422*			
Prob > F = 0.000			

*Significant at 1%, ** Significant at 5%, and ***Significant at 10%

From the estimation results in table 1 a 1% increase in exporting country's real GDP will lead to about a 1.3% increase in total agricultural export supply. The result also shows that coefficient of real GDP (lagged) is positive and statistically significant. As the estimated result indicates a1% increase in real GDP (lagged), results in a 0.04 % increase in the current total agricultural export. This result suggests that total agricultural export of a country at a point in time depends on not only real GDP of the country at that time but also the previous year's real GDP.

Turning to the impact of agricultural input use (which in this paper is captured by fertilizer consumption per hectare of arable land), we find some interesting result. The result suggests that a1 %increase in the use of agricultural inputs in the previous period leads to a 0.006% increase in current total agricultural export. This result reiterates the importance of the use of agricultural inputs to enhance agricultural productivity and production of high value agricultural products, and hence increase total agricultural export of SSA countries. This positive relationship is also found in (Kandiero and Randa; 2004**).** Because of the fixed effects, the dummy variable, landlockedness, had to be omitted from the specification.

As the estimated result indicates the sign of the coefficient of FDI inflow as percentage of GDP is positive but statistically insignificant. This result supports the argument that FDI takes a longer time to impact on exports than other variables or FDI inflow to SSA countries have been driven by market seeking motives than exporting which has little contribution on total agricultural export supply to the international market.

The sign of the coefficient of real effective exchange rate is negative as expected. The insignificance of this variable reiterates that depreciating real effective exchange rate does not enhance the competitiveness of the agricultural export of SSA countries in the international market. Therefore, depreciation of exchange rate is little to do with improving SSA countries agricultural export. Moreover, the insignificant coefficient of institutional quality indicates that institutions affect trade through their impact on other variables (investment and productivity) that determines trade flows. Therefore, the effect of institutions on a sector where endowments determine comparative advantage (i.e. agricultural sector) is not considerable as compared to its effect on other sectors.

As far as the major external/demand side determinants is concerned ,the estimation result indicates that the per capita GDP of US and import tariff imposed by US on agricultural commodities from SSA countries significantly affects agricultural export of the region.

The result shows that a 1% increase in the per capita GDP of US, the major trading partner of SSA countries, increases the demand for agricultural products from SSA by 2.8 %(See Table 1). The effect of import tariff imposed by US on agricultural products from SSA is negative and statistically significant which is in line with the theory. The estimated result indicates that a 1% increase in US tariff imposed on agricultural imports results in a 0.4 % decrease in SSA countries agricultural export to US. This result indirectly questions the effectiveness of unilateral trade policy concession known as African Growth and Opportunity Act (AGOA) on U.S. imports from eligible Sub-Saharan African (SSA) countries in promoting the agricultural export of the eligible SSA countries. This finding is in line with the argument that in the US- SSA trade under AGOA trade policy concession is dominated by manufacturing, textile and petroleum products of which SSA countries do not have a comparative advantage.

IV. Conclusion and Policy Implications

4.1. Conclusion

The central question investigated in this paper is whether the supply side or the external/demand side factors significantly determine the agricultural export performance of SSA countries. To address this question we use the panel data consisting of 47 SSA countries over the period 2000-2008. The study uses secondary data collected mainly from WDI (2009), ADI (2010) and other sources. In this study total agricultural export (in million USD) is used as dependent variable and selected supply and demand side factors as independent/explanatory variables. Having discussed the various econometric issues that ought to be taken into consideration, the fixed effects model estimation results are preferred as the estimation technique yield consistent and efficient results.

The empirical result obtained in this study indicates that the among the supply side factors, real GDP, real GDP(lagged) and lagged agricultural inputs are found to be statistically significant with their respective expected sign. The significant coefficient of real GDP, and real GDP(lagged) shows that high production capacity at a point in time and in the previous periods determines the export potential utilization and total supply of agricultural export for SSA countries.

Moreover, the positive and significant coefficient of lagged agricultural input use indicates the higher the use of agricultural input in one period may result in high agricultural production and more products will be exported in the following periods. The result also revealed that real effective exchange rate affects agricultural export of

SSA positively but the insignificant coefficient indicates that depreciating the real exchange is little to do with enhancing agricultural export of SSA countries.

Regarding the demand side factors only per capita GDP of US, the major trading partner of SSA countries, positively and significantly affects the agricultural export of the region. This is in line with our expectation that the potential demand of trading partners will have positive effect on agricultural export of SSA countries. Moreover, the effect of agricultural import tariff imposed by US on SSA countries is found to be negative and significant which is in line with the prior expectation and the theory. This empirical finding suggests that exclusive market access provision of US for products from SSA countries under the unilateral trade policy concession known as African Growth and Opportunity Act (AGOA) does not enhance agricultural export of SSA countries.

Lastly, the empirical investigation in this study reiterates that both the supply and demand side factors are equally important in determining the total agricultural export of SSA countries. This study also finds that the contribution of foreign trade policy to the poor performance of SSA countries agricultural export is found to be significant.

4.2. Policy Implications

The strong relationship between better export performance and economic growth suggests that countries should identify the important factors that directly and indirectly determine their export performance. The two major determinants of agricultural export, supply capacity and demand side factors/foreign market access conditions, are investigated in this study.

The finding indicates that policy makers should give equal emphasis for demand and supply side determinants of agricultural export as long as the foreign market access condition indirectly affects the export potential utilization of SSA countries. The positive and significant coefficients of the production capacity, denoted by real GDP and real GDP(lagged) ,suggests that macroeconomic policy reforms aimed at improving the growth of real GDP enhances the total export supply of SSA countries to the rest of the world .

Moreover, the significant coefficient of lagged agricultural input use (proxy by fertilizer consumption per hectare of arable land) reveals that lowering domestic trade barriers and subsidizing the import of modern intermediate agricultural inputs at a point in time will stimulate productivity and export in the following periods.

The finding also suggests that governments and policy makers in SSA countries should undertake policy reforms to create conducive environment in order to attract export-oriented FDI inflows to agricultural sector of which Africa has a comparative advantage.

Turning to the demand side factors the empirical result reveals that the income elasticity of demand for SSA agricultural products is high in market of major trading partners such as US. This shows that SSA countries should take this advantage by producing price responsive and internationally competitive agricultural products.

Above all, the negative and significant coefficient of US agricultural import tariff imposed on agricultural commodities from SSA countries questions the potential benefit of unilateral policies such as AGOA. This trade concession package provides low market restriction for non- agricultural commodities which results in resource reallocation in favor of non agricultural export sectors .Under such circumstances, the share of agricultural export will decline. Therefore, preferential market access given to the SSA countries should focus on agricultural sectors of which these countries have huge potential and comparative advantage.

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ANNEXES

ANNEX 1: List of Countries in the Sample

Angola	Eritrea	Nambia
Benin	Ethiopia	Niger
Botswana	Gabon	Nigeria
Burkina Faso	Gambia	Rwanda
Burundi	Ghana	Sao Tome and Principe
Cameron	Guinea	Senegal
Cape Verde	Guinea Bissau	Seychelles
Central Africa Republic	Kenya	Sierra Leone
Chad	Lesotho	South Africa
Comoros	Liberia	Sudan
Congo	Madagascar	Swaziland
Cote d'Ivoire	Malawi	Tanzania
Democratic Republic of Congo	Mali	Togo
Djibouti	Mauritania	Uganda
Equatorial Guinea	Mauritius	Zambia
	Mozambique	Zimbabwe

ANNEX2. Normality test for Explanatory Variables

Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	joint adj chi2(2)	joint Prob>chi2
taeit	423	0.0000	0.0000	.	0.0000
rgdp	423	0.0000	0.0000	.	0.0000
gdpcapit_us_	423	0.0000	0.0005	65.35	0.0000
gdpcapit_eu_	423	0.1591	0.0000	.	0.0000
reer	423	0.0000	0.0000	.	0.0000
infrasit	423	0.0000	0.0000	.	0.0000
openn	423	0.0000	0.0000	.	0.0000
inst	423	0.0389	0.2030	5.89	0.0525
fdipergdp	423	0.0000	0.0000	.	0.0000
us_tariff	376	0.0000	0.0001	56.32	0.0000
eu_tariff	423	0.0000	0.0000	.	0.0000
landlock	423	0.0000	0.0000	.	.
diverit	422	0.0000	0.0000	.	0.0000
inputs	420	0.0000	0.0000	.	0.0000
taet_1	423	0.0000	0.0000	.	0.0000

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
taeit	423	0.52876	136.396	11.727	0.00000
rgdp	423	0.32092	196.552	12.598	0.00000
gdpcapit_us_	423	0.85187	42.874	8.966	0.00000
gdpcapit_eu_	423	0.95077	14.250	6.338	0.00000
reer	423	0.02422	282.430	13.463	0.00000
infrasit	423	0.63227	106.436	11.135	0.00000
openn	423	0.88430	33.490	8.376	0.00000
inst	423	0.98730	3.676	3.106	0.00095
fdipergdp	423	0.57991	121.589	11.452	0.00000
us_tariff	376	0.99235	1.991	1.634	0.05110
eu_tariff	423	0.71229	83.274	10.550	0.00000
landlock	423	0.99695	0.882	-0.299	0.61755
taet_1	423	0.52451	137.626	11.748	0.00000
diverit	422	0.67748	93.151	10.816	0.00000
inputs	420	0.02486	280.449	13.442	0.00000

Shapiro-Francia W' test for normal data

Variable	Obs	W'	V'	z	Prob>z
lntaet	423	0.97924	6.411	3.989	0.00003
lnrgdpi	423	0.86038	43.127	7.776	0.00001
lngdpcapusi	423	0.87198	39.544	7.610	0.00001
lngdpcapeui	423	0.95341	14.391	5.632	0.00001
lnreeri	423	0.90509	29.315	7.033	0.00001
lninfrai	423	0.99284	2.212	1.742	0.04076
lnopeni	423	0.97691	7.133	4.209	0.00001
lninst	423	0.87828	37.597	7.513	0.00001
lnus_tariffi	376	1.00000	-0.000	.	0.00001
lneu_tariffi	423	0.90487	29.384	7.037	0.00001
lnfdipergdpi	402	0.85113	43.938	7.801	0.00001
lndiveri	422	0.97178	8.699	4.615	0.00001
lninputsi	377	0.67954	89.328	9.121	0.00001
landlock	423	1.00000	-0.000	.	0.00001

ANNEX 3: Correlation Coefficient Test

```
. corr lntaet lnrgdpi  lngdpcapusi lngdpcapeui lninfrai lnreeri lnopeni lninst lnfdipergdp lnus_tariffi lneu_tariffi  landlock lndiv
> eri lninputsi
(obs=318)
```

	lntaet	lnrgdpi	lngdp~si	lngdp~ui	lninfrai	lnreeri	lnopeni	lninst	lnfdip~i	lnus_t~i	lneu_t~i	landlock	lndiveri
lntaet	1.0000												
lnrgdpi	0.6406	1.0000											
lngdpcapusi	0.0529	0.0063	1.0000										
lngdpcapeui	0.0881	0.0183	0.6997	1.0000									
lninfrai	0.1212	0.0424	0.4594	0.5776	1.0000								
lnreeri	-0.1536	-0.3152	0.0502	0.0586	-0.2082	1.0000							
lnopeni	-0.2518	-0.2375	0.1090	0.1552	0.5026	-0.2238	1.0000						
lninst	0.2890	0.3239	0.0725	0.0639	0.3571	-0.1976	0.1055	1.0000					
lnfdipergdpi	-0.1368	-0.0081	0.0550	0.1518	0.1777	-0.0621	0.4016	-0.0491	1.0000				
lnus_tariffi	-0.0657	-0.0127	-0.1993	-0.7922	-0.4107	-0.0434	-0.1202	-0.0314	-0.1358	1.0000			
lneu_tariffi	0.0695	0.0102	0.7472	0.7156	0.4495	0.0525	0.1115	0.0731	0.0814	-0.2375	1.0000		
landlock	-0.0978	0.0099	0.0054	-0.0023	0.2153	0.0184	0.2680	-0.1819	0.1414	0.0103	0.0001	1.0000	
lndiveri	0.2087	0.1751	0.0762	0.0846	0.2842	-0.1446	0.1478	0.1490	-0.0161	-0.0676	0.0519	0.2437	1.0000
lninputsi	0.2406	0.1795	-0.1073	-0.1079	0.1930	-0.1954	0.1523	0.2425	0.0290	0.0675	-0.0979	0.0347	0.3383

	lninpu~i
lninputsi	1.0000

ANNEX 4: Hausman Specification Test

```
. hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference          S.E.
-------------+----------------------------------------------------------------
     lnrgdpi |    .0348374     .1083605       -.0735231        .0067423
 lngdpcapusi |    4.072927     3.854378        .2185488               .
     lnreeri |   -.0846599    -.0731104       -.0115496        .0060178
     lnopeni |    .0100125      -.04177        .0517825               .
lnus_tariffi |   -.9610931    -.9287945       -.0322986               .
lnfdipergdpi |     .029582     .0216926        .0078895               .
    lndiveri |   -.0209533     .0440973       -.0650506        .0223252
   lninputsi |   -.0016887     .0009934       -.0026821               .
     lninstq |    .0885952     .0690024        .0195927        .0054575
    landlock |    .5774662     .1013775        .4760887        .2271755
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                           =      115.33
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

ANNEX 5: Durbin-WU-Hausman Endogenity Test

```
. ivregress 2sls lntaet lngdpcapusi lnreeri lnopeni lnus_tariffi lnfdipergdpi lndiveri lninputsi lninst landlock (lnrgdp= dl.lnrgdp)

Instrumental variables (2SLS) regression          Number of obs =     236
                                                  Wald chi2(10) =  109.71
                                                  Prob > chi2   =  0.0000
                                                  R-squared     =  0.3718
                                                  Root MSE      =  1.5816

------------------------------------------------------------------------------
      lntaet |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lnrgdpi |    .132978   .2777186     0.48   0.632    -.4113405    .6772965
 lngdpcapusi |   7.460294   6.014591     1.24   0.215    -4.328087    19.24868
     lnreeri |  -.0429376   .0865456    -0.50   0.620    -.2125639    .1266886
     lnopeni |  -1.340327   .5473209    -2.45   0.014    -2.413057   -.2675979
lnus_tariffi |  -1.307486   .6192307    -2.11   0.035    -2.521156   -.0938162
lnfdipergdpi |  -.0337547   .0758013    -0.45   0.656    -.1823224    .1148131
    lndiveri |   .2296836   .1394798     1.65   0.100    -.0436917     .503059
   lninputsi |   .2528531   .0672653     3.76   0.000     .1210154    .3846907
      lninst |   1.038195   .6534451     1.59   0.112     -.242534    2.318924
    landlock |   .0866633   .2877555     0.30   0.763    -.4773271    .6506537
       _cons |   -54.3404   61.65616    -0.88   0.378    -175.1843    66.50345
------------------------------------------------------------------------------
Instrumented:  lnrgdpi
Instruments:   lngdpcapusi lnreeri lnopeni lnus_tariffi lnfdipergdpi
               lndiveri lninputsi lninst landlock LD.lnrgdpi

.
end of do-file

. do "C:\Users\uae\AppData\Local\Temp\STD00000000.tmp"

. estat endogenous

  Tests of endogeneity
  Ho: variables are exogenous

  Durbin (score) chi2(1)          =  3.99152  (p = 0.0457)
  Wu-Hausman F(1,224)             =  3.85374  (p = 0.0509)
```

ANNEX 6: Heteroskedasticity Test

```
. reg ei2 lnrgdpi lngdpcapusi lngdpcapeui lnreeri lninfrai lnopeni  lninst  lnfdipergdpi lnus_tariffi lneu_tariffi lndiveri lninputs
> i landlock
```

Source	SS	df	MS
Model	62870.9185	13	4836.2245
Residual	15.3850485	304	.050608712
Total	62886.3036	317	198.379507

Number of obs =	318
F(13, 304) =	95561.11
Prob > F =	0.0000
R-squared =	0.9998
Adj R-squared =	0.9997
Root MSE =	.22496

ei2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnrgdpi	3.867917	.0087112	444.02	0.000	3.850775	3.885059
lngdpcapusi	-94.78393	1.092159	-86.79	0.000	-96.93308	-92.63478
lngdpcapeui	426.5996	2.01619	211.59	0.000	422.6321	430.567
lnreeri	-2.722581	.0059912	-454.43	0.000	-2.734371	-2.710792
lninfrai	-.2376191	.0152576	-15.57	0.000	-.2676429	-.2075953
lnopeni	-1.52724	.0356338	-42.86	0.000	-1.59736	-1.45712
lninst	-6.017925	.0483137	-124.56	0.000	-6.112996	-5.922853
lnfdipergdpi	.0880073	.0082747	10.64	0.000	.0717243	.1042903
lnus_tariffi	31.72205	.3193156	99.34	0.000	31.09371	32.3504
lneu_tariffi	-6.071711	.0572804	-106.00	0.000	-6.184427	-5.958994
lndiveri	3.050204	.0150595	202.54	0.000	3.020569	3.079838
lninputsi	.0695139	.0055935	12.43	0.000	.0585069	.0805208
landlock	.0167325	.0308263	0.54	0.588	-.0439274	.0773925
_cons	-3066.375	13.90565	-220.51	0.000	-3093.739	-3039.012

H0: Homoskastic residuals

Ha: Heteroskedasticity

Test statistic: R^2 (N (T-1)) =0.998(318(13-1))

=3804.368

Tabulated value $\chi^2_{13,\, 0.950}$= 22.36

As the test statistic is greater than the tabulated value we reject the null hypothesis of homoskedasticity.

ANNEX 7: Test for Autocorrelation

*xttest3

. Xtserial lntaet lnrgdpi lngdpcapusi lngdpcapeui lnreeri lninfrai lnopeni lnus tariffi lneu tariffi landlock lndiveri lninputsi

> l1lntaet

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

F (1, 7) = 114.560

Prob > F = 0.0000

The null is no serial correlation. Above since p<0.05 we reject the null and conclude the data have first-order autocorrelation

Variable	Obs	Mean	Std. Dev	Min	Max
eidif	**414**	**.1034 31**	**.304002**	**1.55e-06**	**2.590119**

. Sum eidif

. Sum ei2

Variable	Obs	Mean	Std. Dev	Min	Max
ei2	**419**	**330.380**	**14.7909**	**299.5635**	**384.544**

$$DW_P = \frac{\sum \sum [\hat{e}it - \hat{e}i,t-1]}{\sum \sum \hat{e}it2}$$

DWp =0.00031

The Durbin-Watson statistics shows that there is positive autocorrelation.

ANNEX 8: Panel Unit -Root or Stationarity Test

```
. xtunitroot llc lntaet, trend

Levin-Lin-Chu unit-root test for lntaet
---------------------------------------
Ho: Panels contain unit roots               Number of panels  =     47
Ha: Panels are stationary                   Number of periods =      9

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 6.00 lags average (chosen by LLC)
------------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------------
 Unadjusted t       -25.8225
 Adjusted t*        -18.0503        0.0000
------------------------------------------------------------------------------

. xtunitroot llc  laglnrgdpi, trend
(47 missing values generated)

Levin-Lin-Chu unit-root test for laglnrgdpi
-------------------------------------------
Ho: Panels contain unit roots               Number of panels  =     47
Ha: Panels are stationary                   Number of periods =      8

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 6.00 lags average (chosen by LLC)
------------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------------
 Unadjusted t       -48.1900
 Adjusted t*        -43.4274        0.0000
------------------------------------------------------------------------------

. xtunitroot llc   lnrgdpi, trend

Levin-Lin-Chu unit-root test for lnrgdpi
----------------------------------------
Ho: Panels contain unit roots               Number of panels  =     47
Ha: Panels are stationary                   Number of periods =      9

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 6.00 lags average (chosen by LLC)
------------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------------
 Unadjusted t       -37.4566
 Adjusted t*        -26.5537        0.0000
------------------------------------------------------------------------------
```

```
. xtunitroot llc   lngdpcapusi

Levin-Lin-Chu unit-root test for lngdpcapusi
--------------------------------------------
Ho: Panels contain unit roots               Number of panels  =     47
Ha: Panels are stationary                   Number of periods =      9

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 6.00 lags average (chosen by LLC)
------------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------------
 Unadjusted t       -14.9636
 Adjusted t*         -4.2387       0.0000
------------------------------------------------------------------------------

. xtunitroot llc   lnreeri ,trend

Levin-Lin-Chu unit-root test for lnreeri
----------------------------------------
Ho: Panels contain unit roots               Number of panels  =     47
Ha: Panels are stationary                   Number of periods =      9

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 6.00 lags average (chosen by LLC)
------------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------------
 Unadjusted t       -18.2173
 Adjusted t*        -10.9310       0.0000
------------------------------------------------------------------------------

. xtunitroot llc   lnopeni ,trend

Levin-Lin-Chu unit-root test for lnopeni
----------------------------------------
Ho: Panels contain unit roots               Number of panels  =     47
Ha: Panels are stationary                   Number of periods =      9

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 6.00 lags average (chosen by LLC)
------------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------------
 Unadjusted t       -29.1493
 Adjusted t*        -23.5545       0.0000
------------------------------------------------------------------------------

. xtunitroot llc   lninst ,trend

Levin-Lin-Chu unit-root test for lninst
---------------------------------------
Ho: Panels contain unit roots               Number of panels  =     47
Ha: Panels are stationary                   Number of periods =      9

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 6.00 lags average (chosen by LLC)
------------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------------
 Unadjusted t       -18.4804
 Adjusted t*        -14.3536       0.0000
------------------------------------------------------------------------------

.
```

ANNEX 9: Fixed –effects (Within) Regression Results

```
. xtreg lntaet  lnrgdpi  laglnrgdpi lngdpcapusi lnreeri lnopeni lnus_tariffi lnfdipergdpi lndiveri   laglninputsi  l
> ,fe robust
note: landlock omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =       277
Group variable: country                         Number of groups   =        45

R-sq:  within  = 0.3769                         Obs per group: min =         1
       between = 0.3761                                        avg =       6.2
       overall = 0.4222                                        max =         7

                                                F(10,44)           =     15.31
corr(u_i, Xb)  = -0.6783                        Prob > F           =    0.0000

                                (Std. Err. adjusted for 45 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      lntaet |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lnrgdpi |   1.358364    .381856     3.56   0.001     .5887844    2.127945
  laglnrgdpi |   .0458777   .0130201     3.52   0.001     .0196373     .072118
 lngdpcapusi |   2.796269   1.382096     2.02   0.049     .0108376      5.5817
     lnreeri |  -.0145309   .0243609    -0.60   0.554    -.0636271    .0345654
     lnopeni |   .0234873   .0764674     0.31   0.760    -.1306226    .1775971
lnus_tariffi |   -.410115   .2185885    -1.88   0.067    -.8506511    .0304211
lnfdipergdpi |   .0129037   .0274984     0.47   0.641    -.0425157    .0683231
    lndiveri |   .0400046   .1080326     0.37   0.713    -.1777208    .2577301
laglninputsi |   .0110301   .0060226     1.83   0.074    -.0011077    .0231679
     lninstq |    .054606   .1278849     0.43   0.671     -.203129    .3123409
    landlock |  (omitted)
       _cons |  -39.47003   13.77576    -2.87   0.006    -67.23325   -11.70681
-------------+----------------------------------------------------------------
     sigma_u |  2.0704235
     sigma_e |  .34452576
         rho |  .97305595   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Declaration

I, the undersigned, declare that this project is original work and has not been presented for a degree in any other university, and that all sorts of materials used for the project have been duly acknowledged.

Declared by:

Name ________________________________

Signature _____________________________

Date _________________________________

Confirmed by:

Name ________________________________

Signature _____________________________

Date _________________________________

Place and date of submission ____