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# THE IMPACT OF THE AFRICAN GROWTH AND OPPORTUNITY ACT (AGOA): AN EMPIRICAL ANALYSIS OF SUB-SAHARAN AFRICAN AGRICULTURAL EXPORTS

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By

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# THE IMPACT OF THE AFRICAN GROWTH AND OPPORTUNITY ACT (AGOA): AN EMPIRICAL ANALYSIS OF SUB-SAHARAN AFRICAN AGRICULTURAL EXPORTS

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The African Growth and Opportunities Act (AGOA) which was signed into law in 2000 as part of U.S. trade legislation has the objectives of increasing trade and investment between the U.S. and eligible Sub-Saharan African (SSA) countries, by reducing or eliminating tariffs applied to African exports of different products. This Act represents a promising approach to economic growth and development in SSA through international trade.

This thesis examines the impact of AGOA on African agricultural exports. The study uses the gravity trade model framework and panel data depicting annual agricultural trade from 35 eligible SSA countries to the United States over years both before and after AGOA's implementation (1990-2011). There is wide variation in trade flows and the economic characteristics of the panel data obtained from the 35 SSA countries include numerous observations of zero trade flows. As the gravity equation is generally estimated in logarithms which are not defined for zero values, alternative statistical estimation methods, the Heckman model and the Poission family of regression modeling techniques, were used to test whether the inclusion of the zero values would change the parameter estimates significantly. The study differs from previous empirical analyses of AGOA which did not attempt to account for zero trade flows. In addition,

most of these studies were based on data from the early years of AGOA while this study includes more recent data and is based on a longer time period.

The statistical results indicate that the AGOA trade preferences do not have a statistically significant impact on SSA agricultural exports, although some of the model results indicate that AGOA may have a positive effect on SSA agricultural exports to the United States. Results from some of the models indicate that an increase in per capita GDP in the SSA countries decreases agricultural exports to the United States. Likewise, currency appreciation of the SSA countries decreases the agricultural trade flows. A tariff rate quota and the exclusion of some agricultural products from the legslation still limit AGOA's broader positive economic impact. Further liberalization, reform and extension of AGOA for a longer time, investment to improve trade facilitation services, agricultural productivity and processing to meet high quality standards, and adoption of a comprehensive development assistance policy are needed if the African countries are to realize sustained economic growth and development.

*Keywords: AGOA, Agriculture, SSA, United States, Gravity Mode1*

Dedication

To Kassu

and

To Mom & Dad

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The help, mercy and incomparable kindness of almighty God who governs the whole of my being deserve a deep in my measure words of thanks.

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## List of abbreviations

AGOA African Growth and Opportunity Act
ATPA Andean Trade Preferences Act
CBI Caribbean Basin Initiative
CBTPA Caribbean Basin Trade Partnership Act
EU European Union
FDI Foreign Direct Investment
GATT General Agreement on Tariffs and Trade
GDP Gross Domestic Product
GSP Generalized System of Preferences
LDC Least Developed Country
MDGs Millennium Development Goals
MFN Most Favored Nation
NB Negative Binomial
OLS Ordinary Least Squares
PPML Poisson Pseudo Maximum Likelihood
ROC Republic of Congo
SSA Sub Saharan Africa
UNCTAD United Nations Conference on Trade and Development
USAID United States Agency for International Development
USITC United States International Trade Commission
USTR United States Trade Representative
WTO World Trade Organisation
ZIP Zero-inflated Poisson
ZINB Zero-inflated Negative Binomial

# CHAPTER 1: Introduction

## 1.1 Background

The historical pattern of Africa's economic growth provides insight to help understand its current economic situation and policy options. During the period immediately after independence from 1960 to 1973, economic growth was quite strong in many of Sub-Sahara African (SSA) countries (Jones and Williams, 2012). However, the next two decades were a period of stagnation or decline for many African countries. Most policy analysts and development economists point to political instability, poor governance, difficult geographic conditions, and the effects of colonialism as causes of Africa's slow growth (Jones and Williams, 2012). According to Vivian and Williams (2012) slow economic growth and stagnation have also contributed to slow accumulation of both human and physical capital. In SSA the slow economic growth is also due to lack of appropriate economic policies. (Haykin, 1997)

Since about 2000, however, African economic growth has begun to increase. Arieff et al. (2009) suggest that this improved economic performance can be explained in part by higher commodity prices brought about by growing global commodity demand. Increased imports of mineral and petroleum resources by emerging countries in Asia have played a particularly significant role in recent African economic growth (Arieff et al., 2009). In addition to commodity exports, Arieff et al. (2009) also point to increased foreign direct investment as a stimulus for growth noting that private investment flows may have increased greatly since 2000.

The World Bank (2010) report mentioned that "recent growth of SSA countries has also been supported by policy reforms, since many African governments have been trying to improve economic governance through micro and macro economic policy

reforms'' (World Bank, 2010). There has also been increased public investment in major economic sectors such as agriculture and services. In addition to the policy reforms made, international debt relief programs also contributed to the better economic growth trends in some African countries. The report shows that the number of armed conflicts in Africa has also declined which makes countries such as Ethiopia, Eritrea, Rwanda, Sudan, Uganda and the region as a whole more attractive for foreign investments (World Bank, 2010).

However, the positive economic growth trend observed does not appear to have had a great impact on the poverty aliviation and on the achievement of the Millennium Development Goals (MDGs). According to the World Bank (2011), progress on MDGs has been the slowest in SSA. Based on a similar report, ''the number of people living on less than $1.25 per day since 1981 has increased around 50% in this region. The number of poor people who live in poverty has also nearly doubled (from 200 million in 1981 to 380 million in 2005 in absolute terms)'' (World Bank (2011). But the percentage of the population living in extreme and moderate poverty has decreased slightly over time. SSA economic development is constrained by many structural factors which include limited communications services and infrastructure, high levels of corruption, high dependency on foreign aid to balance budgets and provide basic services, high ratios of foreign debt to national income; lack of technological investment in high potential sectors such as agriculture; the burden of diseases and high population growth (World Bank, 2009).

International trade has played an important role in the economic development of African countries as in other regions of the world. Trade provides more economic opportunities for people. Consumers in the trading countries can have more product

choices, lower prices, new technology and access to innovations (Froning Denise H., 2000). Producers can also offer their goods and services to more consumers. Opening up markets increases the prospects for countries which leads to more income opportunities, the improvement of living standards and economic growth. (Froning Denise H., 2000).

Even though there are many economic reforms made to facilitate trade, growth and development are limited in many SSA countries by policy choices that restrict trade. ''Africa is the world's second most trade-restrictive region after South Asia.'' (Arieff et al. (2010). Examples of this trade restrictiveness include import licensing procedures, higher import and export duties/tarrifs, and other trade related border measures. For example, according to the IMF Trade Restrictiveness Index of 2010 SSA has an average tariff of 19.2 % compared to 13.8% in most Asian countries-excluding the fast growing, 7.2% in the fast-growing Asian countries and 5.4% for industrialized countries. The region, on average, also shows "the worst rankings in business environment, governance, logistics, and other trade facilitation indicators" (World Bank, 2010). In SSA countries, trade accounts for about a third of GDP (World Bank, 2010). However, the exports of many SSA countries are still dominated by primary commodities particularly agricultural products, oil and minerals, so that higher commodity prices are very important for its trade and economic growth (World Bank, 2011).

In recent years, SSA trade growth prospects have been good because of strong commodity demand and also increasing diversification of trading partners. Based on a World Bank report, in 2011 much of the increased growth of export revenues was due to higher commodity prices. Export values in the region increased about 38 percent in 2011

as compared to 2010 (World Bank 2012). Hence, with primary commodities dominating many SSA exports, most countries are benefiting from the improved terms of trade.

Due to low levels of regional integration, deficient infrastructure, lack of improved communication services and other trade barriers, SSA has lower rates of intraregional trade and most of its trade is with countries outside of the continent. For instance, SSA's 2009/10 top 10 trade partners are China, the United States, France, India, Germany, the Netherlands, the U.K, South Africa, Japan, and Spain (International Trade Administration, 2010; see Appendix FigureA1.1). Since 2008, China has been the leading trade partner of Sub-Saharan African overtaking the place of U.S. In 2009, China accounted for 14.6 percent of the region's 2009 imports and 12.6 percent of its exports (IMF Regional Economic Outlook, 2010). According to the World Bank (2010), trade between China and most of Sub-Saharan Africa has been growing by an average of 30 percent a year over the past decade.

U.S. imports from SSA represent only about 2% of U.S. total trade (Jones and Williams, 2012). Similarly, U.S. investment in SSA represents a very small percentage of total U.S. foreign investment. A World Bank report indicated that ''U.S. trade and investment in Sub-Saharan Africa have comprised only 1 to 2 percent of U.S. totals'' (World Bank, 2006). However, recent World Trade Organization data shows that there is an improvement and an increase of African total merchandise trade (imports plus exports) with the United States from $59.54 billion in 2009 to $89.47 billion in 2011 (WTO International Trade Statistics, 2012).

Many African countries lack market access and face competition in the world market. Many studies indicated that most of African countries are higly dependent on

single primary commodity exports and price volatility in the world market has also been a major issues (UN, 2012 and WTO, 2011). Therefore, reducing international trade obstacles has become an important objective. In this regard, The African Growth and Opportunities Act (AGOA), a preferential trade agreement, may enhance access for African goods to the U.S. market.

## What is AGOA?

In May 2000, AGOA was implemented as part of U.S. trade legislation and signed into law by President Clinton as Title 1 of The Trade and Development Act (AGOA, 2013a). The main purpose of this act is to increase trade and investment between the U.S. and eligible SSA countries, to enable the opening of U.S. markets by reducing and eliminating tariffs for African exports of different products, to promote economic development and reform in SSA, and to support increased access and investment opportunities in SSA. AGOA was first set to expire in 2008, but in 2004 it was extended to 2015 (AGOA, 2013a). Initially, 34 SSA countries were included in the list of beneficiaries. Now, of the 48 Sub-Saharan Africa (SSA) countries 41 are eligible for AGOA trade preferences. The full list of AGOA eligible countries is shown in Appendix FigureA1.2.

Every year the United States authorizes which SSA countries are eligible for AGOA. Some of the eligibility criteria were to improve human rights and follow open market economic policies, eligibility for the World Trade Organization (WTO) Generalized system of Preferences (GSP), and protection of internationally recognized worker rights (AGOA, 2013b). Based on this there is an evaluation of the Sub-Saharan African countries to determine which countries should remain eligible on an annual basis.

Eligibility has also fluctuated with changes in the local political environment. For instance, in December of 2009 Guinea, Madagascar, and Niger were all suspended from the list of eligible countries because of poor governance and lack of progress towards democracy. However, by October of 2011 eligibility was restored to Guinea and Niger since they showed improvement.

AGOA covers more than 6000 product items including steel items, automotive components, handbags, gloves, footwear, apparel, iron and many types of food products (USTR, 2012). Under AGOA benefits, four main sectors such as energy-related products, textiles and apparel, transportation equipment, and minerals and metals account for over 90% of exports (AGOA 2013b). Even though the percentage of exports qualifying for AGOA benefits from the above-mentioned sectors is very high, important SSA agricultural exports are not covered by the trade preferences.

Jones, 2009, Schneidman and Lewis, 2012 mentioned that ‘’the majority of tariff reduction under the program is for nonagricultural commodities such as oil, petroleum, minerals, precious stones, textiles, and apparel.’’ 86% of U.S. imports from Africa consist of petroleum and minerals while agricultural goods imported from the eligible AGOA countries account for less than 2% of total U.S. agricultural imports (WTO and FAS/USDA). This indicates that the eligible agricultural products covered by the policy are less numerous than the nonagricultural products. However, agriculture is an important economic sector in many African countries and can play a significant role in overall growth and development in SSA. The limitation on AGOA eligibility for important SSA commodities raises an important question concerning the impact of this program on SSA's trade and development.

## 1.2 Statement of problem

AGOA as a preferential trade agreement that would give market opportunity is expected to have a positive impact on the growth of SSA exports. Based on the introductory AGOA discussion above the number of agricultural product lines covered by the act, however, is quite limited as compared to other commodities such as energy, minerals, textiles and apparel. Most analysis appears to find a small but positive relationship between AGOA and SSA agricultural exports although the relationship is not always statistically significant. The limited number of agricultural products that are eligible for AGOA preferences is one explanation for these results. In addition, most studies were based on data from the early years of the act (Nouve K 2003, Asmah E 2005/2006). The purpose of this research study is therefore to estimate the effects of AGOA on SSA agricultural exports using more recent and extended time period data.

## 1.3 Objectives

The primary objective of this study is to develop a precise estimate of the impact of AGOA on SSA trade. To carry out this objective, a gravity model is estimated based on panel data covering the period 1990 to 2011. This period includes years prior to the adoption of AGOA (1990-1999) as well as years when AGOA was in effect (2000-2011). 35 SSA countries are included in the panel data set used for the model estimation.

The second objective of the study is to use the results of the statistical analysis to evaluate the impact of AGOA on agricultural exports from the SSA countries to the United States. The model estimates will be used in conjunction with information on the

way AGOA is structured to identify the limitations of this program and to draw out the policy implications of the research.

## 1.4 Organization

The thesis is organized in five sections. The next chapter presents related literature about different trade preferences given to developing and Least Developed Countries (LDCs), shares of SSA agricultural exports in the U.S market, and literatures related to AGOA and its impact on SSA agriculture exports. In the third chapter, methods are described. The fourth chapter includes discussion of descriptive statistics, data sources and the results of the econometric estimation. The last chapter summarizes the results and the policy implications of the analysis.

# CHAPTER 2: Literature Review

It has been twelve years since AGOA was signed into law. It was first due to expire in 2008, but the legislation was extended until 2015 (AGOA, 2011). In general, the volume of AGOA exports has increased 500 percent, from $8.15 billion in 2001 to $53.8 billion in 2011, and non-energy AGOA exports have increased 275 percent, from $1.2 billion to $4.5 billion according to AGOA information website (AGOA, 2013b).

This chapter addresses three categories of literature related to the study. The first section presents different types of trade preferences given to developing and least developed countries such as the Generalized System of Preferences (GSP), and extended or special trade preference programs such as AGOA. The second part highlights the shares of SSA agricultural exports in the U.S market. The last part focuses on previous literature related to AGOA and its impact on SSA agricultural exports. In addition, it explains the gaps identified in the existing empirical literature and the contribution of this study.

## 2.1 Different trade preferences given to Developing and Least Developed Countries (LDCs)

The United States in 1974 and European Union in 1971 passed legislation establishing their General System of Preferences (GSP) rules (Jones, 2013). Over recent years the U.S. and EU have been the most important trade partners for the developing countries and LDCs, even though Canada, Japan, Australia and other countries implemented their own GSP according to the World Bank 2006.

The Generalized System of Preferences (GSP) is defined as:

"A formal system of exemption from the more general rules of the World Trade Organization (WTO-formerly, the General Agreement on Tariffs and Trade or GATT).

Specifically, it is a system of exemption from the most favored nation principle (MFN) that requires WTO member countries to treat the imports of all other WTO member countries no worse than they treat the imports of their "most favored" trading partner.'' (USTR, 2012). This means that GSP allows WTO member countries to treat developing countries differently from other trading partners offering them lower tariffs without expecting reciprocal tariff reductions from the beneficiaries (Vivian, 2013).

Under the WTO member countries agreement, the Most Favored Nation (MFN) tariff rates are the non-discriminatory favorable tariff rates that are applied to imports from the partner countries (UNCTAD, 2010). U.S. imports from WTO member countries which are excluded from preferential treatment trade agreements are subject to the MFN tariff rates. For instance, MFN tariff rates of the United States were on average slightly higher during pre-AGOA (1997-2000) than the post-AGOA period (2001-2008) (Ombuki, C. N, 2011). The USITC, 2011 report shows that between the pre and post AGOA periods, the average MFN tariff rates for all products did not significantly fall, but only a small reduction from 5.6 percent in the pre-AGOA to 4.7 percent in the post AGOA period. Agricultural product tariff rates remained almost unchanged at 5.7 percent and 5.6 percent during the same periods. The MFN tariff rates on agricultural goods prior to AGOA averaged 10.5 percent which is high relative to other import categories. Although there seems to be marginal reduction of the rates over time, the changes are not that large. Mineral fuels have very low MFN tariff rates of close to 1 percent (USITC, 2011).

Based on the income levels, the GSP program of the United States divides eligible countries into two groups as all developing and the least developed countries. The LDCs

have an additional duty-free market access of 1,750 tariff lines besides the 4,650 tariff lines that all eligible developing countries get (USTR, 2012). Since the establishment of the GSP, the other most important development is the implementation of unilateral market access policies which target particular countries. For instance, in 1984 the United States initiated the Caribbean Basin Initiative (CBI) which includes twenty-four countries in the Caribbean and Central America and the policy was modified in 1990. Another regional trade program that U.S. extends preferences to Colombia, Bolivia, Peru and Ecuador is the Andean Trade Preferences Act (ATPA). Since it was implemented after the CBI, it has similar eligibility requirements and product coverage. Another example is the Caribbean Basin Trade Partnership Act (CBTPA), passed in 2000 which extended preferences to textiles and apparel for the CBI countries (Hoekman, 2005). This extended agreement is important since it covers products such as apparel, textiles, footwear, watches, petroleum, canned tuna and other goods which were previously excluded from duty-free under the CBI program, and those product categories are very imprtant for many of the eligible countries (Hoekman, 2005).

The final U.S. program and the main focus of this study is AGOA. It offers beneficiary Sub-Saharan African countries duty free and quota-free market access for many products. As noted earlier, AGOA was originally scheduled to last for only 8-years until September 2008, but in 2004 it was extended to 2015 (AGOA, 2013a). Also, a special exemption for apparel was first extended to three years until 2007, then the garment and textile provisions on rules of origin were extended to 2012. However, all Sub-Saharan Africa LDCs are exempted from the rules of origin for a limited period of time, which helps countries such as Lesotho, Madagascar, Swaziland, Kenya, and

Mauritius to expand textile and apparel exports significantly (Asmah, 2010). Under AGOA, the rules of origin provision requires countries to source inputs only from a beneficiary SSA country or from the United States (AGOA, 2013b). But this requirement is suspended for LDCs which may utilize inputs such as fabrics and yarns from all other countries to produce garments to export. For countries that have to comply with the rules of origin provisions, at least 35% of the cost or value of inputs and the processing costs must be from local sources (AGOA.2013b). AGOA adds about 1,800 product tariff lines to the previously available duty-free benefits under the GSP program so that duty-free access to the U.S. market under both (AGOA and GSP) programs is extended to about 7,000 product tariff lines (AGOA.2013b). These include items such as textiles, apparel and footwear, wine, certain motor vehicle components, different agricultural products, minerals, chemicals, steel and others.

The expectation of preferential trade agreements like AGOA is that they would have a positive effect on total exports from developing and least developed countries (World Bank, 2009). Trade preferences can have mixed results generating both gains and losses. For instance, it is possible that the preferences will lead to trade diversion as the preference-granting country shifts its imports from a low-cost producer to a higher-cost producer receiving the preferential treatment. The welfare effects of this change, however, would fall mainly in the importing country and so may be of less concern to countries receiving preferential treatment. Preferential agreements may also add to administrative costs relating to managing the confusion from many overlapping trade agreements (Hilaire and Yang, 2003). Francois, Hoekman and Manchin (2005) and the early study of Baldwin and Murray (1977) also show that sometimes preferential

programs may have an adverse effect on the terms of trade for excluded (less preferred) countries. The possibility of trade preferences excluding sensitive sectors and the possible non-reciprocal nature of the agreements can also be added to these concerns. Jones and Hornbeck (2013) also mentioned that the main goal of all trade preference programs is to promote export growth and development in less developed countries, however, the outcomes of those preference benefits have been mixed in some ways. ''Many developing countries have used tariff preferences to enhance their competitiveness in certain industries, particularly apparel. In other countries, preferences are used to export major commodities such as petroleum and mineral products which may be less supportive of long-term economic diversification and development.'' (Jones and Hornbeck, 2013).

A key feature of all preferential trade programs, including the GSP, is that they are in effect for a certain period of time and need to be renewed periodically. Ozden and Sharma (2004) mentioned that if preferred countries do not focus on improving their product competitiveness, they may tend not to be benefited when the preference programs expire. Their results suggest that preferential arrangements such as AGOA should be viewed as transitional mechanisms for gaining comparative advantage and market share.

## 2.2 Shares of SSA countries exports in the U.S market

The United States is the second largest importer of merchandise from the SSA countries (See Figure A1.1). In 2011, the United States received 15 percent of the region's total exports (WTO, 2011). Even though, it is the second largest trade partner from the perspective of SSA countries, the United States conducts a small share of its

total trade with SSA countries. The United States imported merchandise worth $74 billion from SSA countries in 2011 which is about 3.4% of total U.S. global imports of $2.2 trillion (USITC, 2011). The United States exported goods worth $20.3 billion to the region in 2011, 1.5% of total U.S. exports of $1.3 trillion based on USITC, 2011 trade statistics. Overall, total trade (exports plus imports) between the United States and Sub-Saharan Africa grew 51% between 2009 and 2011, up from $62.4 billion in 2009 to $94.3 billion in 2011. This increase in the value of trade resulted from increases in commodity prices between 2009 and 2011 as well as growth in the quantities traded.

**Table 2.1 Top Ten U.S. Imports from sub-Saharan Africa, 2010 and 2011(in $ billions)**

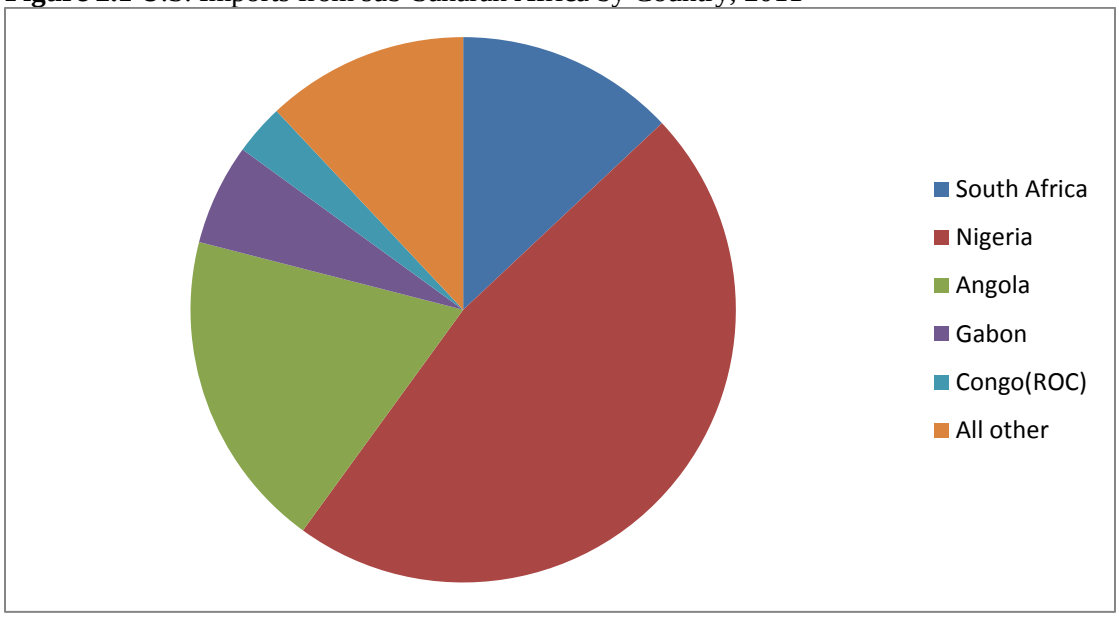
| HTS Number | 2010 | 2011 | Percentage Change 2010-2011 |
|---|---|---|---|
| 27-Mineral fuels and oil | 51.38 | 58.97 | 14.80% |
| 71-Pearls, Precious Stones, Precious Metals, etc., Coin | 3.95 | 4.33 | 9.80% |
| 87-Vehicles, Except Railway or Tramway, and Parts | 1.61 | 2.16 | 34.10% |
| 18-Cocoa and cocoa preparations | 1.04 | 1.27 | 22.60% |
| 29-Organic chemicals | 1.22 | 1.16 | -4.70% |
| 72-Iron and steel | 0.76 | 0.89 | 16.70% |
| 26-Ores, slag, and ash | 0.67 | 0.79 | 17.70% |
| 62-Articles of apparel and clothing accessories, not knitted or crocheted | 0.40 | 0.46 | 14.70% |
| 84-Nuclear Reactors, Boilers, Machinery and Parts | 0.36 | 0.46 | 26.30% |
| 61-Articles of apparel and clothing accessories, knitted or crocheted | 0.39 | 0.44 | 14.30% |
| **Subtotal** | 61.77 | 70.94 | 14.80% |
| All Other | 2.58 | 3.08 | 19.40% |
| **Total** | 64.35 | 74.02 | 15.00% |

**Source:** Table 5 in ''U.S. Trade and Investment Relations with sub-Saharan Africa and the African Growth and Opportunity Act,'' by Vivian C. Jones and B. Williams, 2012 from U.S. International Trade Commission Trade Dataweb, http://www.usitc.gov.

The main U.S. import is mineral fuels and oil which accounted for about 73% of the US imports from SSA in 2011 (USDC, 2011). Nigeria, South Africa, Angola, Gabon, Chad and Congo (ROC) are the major exporters of the first three listed product categories from table 2.1 (i.e Mineral fuels and oil, Pearls, Precious Stones and Metals, Vehicles and

Parts). A large proportion of U.S. trade with sub-Saharan Africa is with a small number of countries. About 79% of U.S. imports from the region in 2011 were from Nigeria (47%), Angola (19%), and South Africa (13%) (see Figure 2.1). The only agricultural product in the top 10 products imported is cocoa and cocoa preparations. African cocoa exports increased significantly reaching $1.2 billion in 2011, up 22 percent from 2010. Côte d'Ivoire, Ghana, Cameroon, Nigeria and Togo are the leading producers and exporters of cocoa in Africa.

**Figure 2.1** U.S. Imports from sub-Saharan Africa by Country, 2011




**Source:** Figure 3 in ‘’U.S. Trade and Investment Relations with sub-Saharan Africa and the African Growth and Opportunity Act,’’ by Vivian C. Jones and B. Williams, 2012 from U.S. International Trade Commission Trade Dataweb, http://www.usitc.gov.

The top U.S. export market in SSA was South Africa at $7.2 billion; made up largely of machinery, mineral fuels and oil, gold powder, vehicles and parts (USTR,2011). Other important markets include Nigeria ($4.8 billion; mostly minerals and oil, machinery, vehicles and its parts and cereals), Angola ($1.5 billion; mostly machinery, aircraft parts, poultry, iron/steel), Ghana ($1.1 billion; mostly machinery, vehicles and parts, mineral fuels, cereals), and Ethiopia ($689 million; mostly cereals, aircraft and parts, machinery) (USTR,2011).

Even though the United State imports primary commodities such as coffee, tea, cocoa, sugar, rubber and others, most U.S. agricultural imports are high-value products. For instance in 2012, the US imported $24 billion in intermediate and $62 billion in consumer-oriented agricultural products which is higher than $17 billion in bulk (FAS/USDA, 2012). NAFTA partners Canada and Mexico and the EU are the leading agricultural import suppliers, and they provide more than 50% of total U.S. agricultural imports (Charles et.al, 2011). Other important suppliers of agricultural products to the United States include Australia, Brazil, Colombia, Indonesia, and New Zealand (Charles et al. 2011).

The major agricultural commodity exports from SSA are primary commodities such as cocoa, coffee, cotton, peanut oil, palm oil, sugar and tobacco (Charles et al. 2011). However, agricultural products account for only about 2 percent of the products exported from SSA countries to the United States under the AGOA preferences (USITC, 2010). Products such as sugar, coffee, peanuts, cotton, dairy, beef, tobacco, and processed agricultural goods such as canned fruits are not covered by the AGOA tariff and quota reductions (AGOA, 2013a). Those agricultural products are important export commodities in many African countries and their exclusion from the AGOA trade barrier reductions lessens the impact of this program.

Condon and Stern (2011), and Charles and Carol (2011) stated that a large amount of U.S. agricultural imports from Sub-Saharan African countries covered by the Most-Favored-Nation system (MFN) under the WTO agreement, and the Generalized System of Preferences (GSP); therefore some already have lower tariff rates and duty-free access. AGOA countries' total agricultural exports to the United States are reported to be

between $1.2 billion to $1.4 billion per year (Asmah, 2010). MFN system covered about $1 billion out of the stated amount, and the remainder is under AGOA and GSP (Asmah, 2010).

The AGOA countries with the largest agricultural exports to the United States in 2012 were South Africa (21% of total AGOA agricultural exports to the United States), Ghana (17% of the total), Malawi (13%), Liberia (12%), Kenya (9%), Ethiopia (8%), and Nigeria (5%) (See Figure A2.1). In most cases, exports from these countries were dominated by a single commodity. Thus 85% of Ghana's agricultural exports to the United States were made up of cocoa and cocoa products, while almost all of Liberia's exports consisted of rubber and related products. Coffee made up 74% of Ethiopia's exports to the United States (FAS/USDA, 2013). Exports from South Africa and Kenya were somewhat more diversified but still concentrated in a limited number of commodities (coffee, tea and tree nuts in Kenya, and wine, fresh fruits and vegetables and tree nuts in South Africa).

## 2.3 Previous literatures on AGOA and its impact on SSA agriculture exports

Since 2000 several studies have tried to assess the extent to which AGOA can directly explain the increase in exports from SSA to US. Many studies of the impacts of AGOA on African exports have focused on aggregate merchandise trade without reference to specific sectors (Mattoo, Roy and Subramanian, 2002). In addition, most empirical evaluations were done only for the years up to 2006, and have been dominated by analysis of the textile and apparel sectors (Olarreaga and Özden, 2005; Lall, 2003; Collier and Venables, 2007; Fayissa & Tadesse 2007; Mueller 2008; Condon & Stern, 2011). For instance, Brenton and Hoppe (2006) and Office of the United States Trade

Representative (2010 and 2011)- review the trade data on SSA exports to the United States and all find evidence of overall significant and increasing exports under AGOA. Both studies also show that AGOA exports are dominated by petroleum products and apparel.

In contrast, Mueller (2008) and Seyoum (2007) used gravity models and find that AGOA has had no significant impact on overall exports from SSA to the United States. Mueller (2008) employed two models to assess different aspects of AGOA. The first measures the general effect of AGOA on trade by testing the impact of AGOA on total U.S. imports (excluding oil) from AGOA-eligible countries from 2000 to 2004. The second model tests the impact of AGOA on apparel imports. The result of the first model shows a negative but statistically insignificant impact on non-oil trade for eligible countries. In addition, he found the effect of AGOA on apparel exports was not statistically different from zero. Seyoum (2007) also uses a gravity equation with a similar specification finding that AGOA has had a marginally positive but not statistically significant impact on total SSA exports to the U.S. up to 2004.

On the other hand studies such as Olarreaga and Özden (2005), Frazer and Van Biesebroeck (2007) and Condon and Stern (2011) show a positive impact of AGOA on overall SSA exports, especially apparel. Collier and Venables (2007), Fayissa and Tadesse (2007) also use gravity models to look at the impact of AGOA on apparel exports. They find a positive and very significant impact of AGOA on SSA apparel exports.

Only a few empirical studies have examined the effects of AGOA on agricultural trade between SSA and the United States. Nouve (2003) suggests that analysis of the

impact of AGOA has been limited to certain products and studies of its impacts on agricultural trade appear to be relatively few. Nouve and Staatz (2003) did an empirical analysis of U.S. agricultural trade with 46 SSA countries using the gravity model and panel data from 2000 to 2003. Their objective was to estimate the impact of AGOA using the gravity trade model with some indicator of the presence or absence of AGOA. This estimation was used to explain US-SSA agricultural trade for the full sample of 46 eligible countries, also 27 countries that have historically exported large amounts of agricultural products to the United States, and the eight leading agricultural trading partners of the United States were sampled separetly in the model. Their results show that the impact of AGOA on SSA agricultural exports to the United States was not statistically significant, even though the response was positive as expected. The authors concluded that AGOA has had no observable impact on agricultural trade because it is still in a relatively early stage. This indicates that research based on a longer period may be needed to develop more precise estimates of AGOA's effects.

On the other hand recent data from the USITC (2011) show that SSA agricultural exports to the United States remain low. This may be due to the fact that African exports are generally concentrated in a few primary commodities, and this lack of diversification has been attributed to poor investments in agricultural productivity and processing. In addition, the limited volume of agricultural trade may be due to non-tariff barriers related to sanitary issues and other technical barriers to trade (Lionel and Anne, 2007).

Frazer and Van Biesebroeck (2007) also conduct an in-depth study of AGOA with more extensive data coverage. They used a variation of the traditional gravity model, using a "triple difference-in-differences estimation method" to assess the impact of

AGOA over the period 2000-2006. They found that AGOA has had a strong and large impact on U.S. apparel imports from SSA countries. "AGOA liberalizes only an additional 26 agricultural tariff lines, which is equivalent in number to less than 2 percent of the total number of agricultural lines and less than 12 percent of the remaining dutiable lines''(Frazer and Van Biesebroeck, 2007). They also mentioned, "There are over 200 agricultural tariff lines with no preference under AGOA, amounting to 17 percent of the total number of dutiable agricultural tariff lines in the U.S. schedule. Of these lines more than 150 relate to the over quota rates for products subject to tariff rate quotas." In their analysis, they found that AGOA does not have a statistically significant impact but there is a positive relationship between AGOA and SSA agricultural exports to the United States.

Thus, there are very few empirical studies of the impact of AGOA on agricultural trade. In addition, the studies mentioned above covered only the early years following the adoption of AGOA. According to the available studies, agriculture has not benefited greatly from the AGOA provisions although there appears to be a positive relationship between AGOA and SSA agricultural exports to the United States. In some other studies (Mattoo, Roy and Subramanian, 2002, Frazer and Van Biesebroeck 2007, Lionel and Anne, 2007) the impact of AGOA on agricultural exports is less clear because the analysts focused on aggregate merchandise exports with no sector specific elements. Empirical studies that did focus on agriculture such as Nouve and Staatz (2003) relied on only the early years of the act up to 2003. The purpose of this research study, therefore, is to use currently available data covering an extended time period to determine precisely

whether the previous results continue to be valid or whether AGOA has had greater effects that are only now beginning to show up.

# CHAPTER 3: Method

## 3.1 The Traditional Gravity Model of Trade

The method used in this study to analyze the impact of AGOA is the gravity model of trade. This model has been used extensively to explain bilateral trade flows. It allows the analyst to test whether various factors such as the presence of a regional agreement or preferential trade arrangements have a statistically significant impact on trade flows. The traditional gravity model draws on an analogy with Newton's Law of Gravitation which explains the gravitational attraction between objects as a function of their mass and the distance between them**.** Tinbergen (1962) was the first to use this method using economic weight as measured by GDP and distance between two countries to account for the bilateral trade flows between the two countries. A historical review of how the gravity equation is used in international trade can be found in Anderson (1979, 2011) and Brakman and van Bergeijk (2010). Initially, the gravity equation was an ad hoc specification with little link to particular theoretical models. Anderson (1979, 2011), Anderson and van Wincoop (2003) and others have derived the gravity equation from theoretical models (see Feenstra, 2004).

The basic empirical model for trade between two countries ( $i$ and $j$ ) takes the form of equation 1. Goods supplied at origin $i$ are attracted to destination $j$ according to the economic weights of the two countries as measured by GDP (*Yi* and *Yj*), but the potential flow is reduced by the distance between them $D_{ij}$ . A simple form of the gravity equation is:

$$T_{ij} = G\frac{Y_i^{\beta_1} Y_j^{\beta_2} Z_{ij}^{\beta_3}}{D_{ij}^{\beta_4}} \qquad (1)$$

Where $T_{ij}$ is the trade flow from $i$ to $j$ and $Y$ is the respective economic mass of the importing and exporting countries (as measured by GDP). An alternative for the economic mass that is often used in gravity models is per capita GDP and some analysts have included both GDP and GDP per capita. $D_{ij}$ is the physical distance between country $i$ and $j$ [1], and $Z_{ij}$ represents other characteristics affecting bilateral trade such as common language, common border, colonial ties, regional trade agreements, or trade barriers. $G$ is a constant intercept.

The traditional gravity equation is usually rewritten in a log-linear form to estimate the vector of $\beta$;

$$\ln T_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 Z_{ij} - \beta_4 D_{ij} + \varepsilon_{ij} \quad (2)$$

$\beta_0$ is a constant intercept common to all trading countries and $\varepsilon_{ij}$ is an error term. A shortcoming of this specification is that it suffers from omitted variable bias. Anderson and Van Wincoop (2003), among others, develop a more realistic gravity model in which prices in the two countries differ as a result of border effects, including transportation costs, trade barriers and other costs of doing business. With different prices, the simple gravity equation is no longer appropriate. Anderson and Van Wincoop (2003) derive a theoretically consistent gravity model that includes price indices which they refer to as "multilateral resistance variables" (p. 176). These variables depend on the level of the trade barriers between a given country and all of its trading partners. Their incorporation into the gravity equation raises some problems in the statistical estimation of the relationships. Feenstra (2004) suggests that such problems can be overcome by using

[1] Note: j and u are used interchangeably to represent US

panel data to estimate the equation with fixed effects. Country-specific fixed effects can be thought to capture the impact of the unobserved multilateral resistance variables.

The model can be presented in a log-linear specification:

$$\ln T_{ijt} = \beta_0 + \alpha_t + \alpha_{ij} + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 Z_{ij} - \beta_4 D_{ij} + \varepsilon_{ijt} \quad (3)$$

Where $\alpha_{ij}$ represents a fixed effect for country pairs that is common to all years and which captures country heterogeneity, and $\alpha_t$ is a time fixed effect common to all countries, but specific to each year $t$. Gravity models with fixed effects have also been used by different researchers such as Millimet and Osang (2004) to estimate the effects of borders on trade; Glick and Rose (2001) and Pakko and Wall (2001) to estimate the trade effects of currency unions; by Wall (2000) and by Egger (2002) to calculate trade potentials; and by Wall (1999) to estimate the costs of protection.

The statistical model for this study is designed to evaluate unilateral trade flows from SSA countries to the United States and to explore the impact of AGOA as a preferential trade agreement using panel data for the AGOA-eligible countries in SSA over the period 1990 to 2011. The model can be presented in a log-linear specification as follows:

$$\ln AGX_{iut} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{ut} + \beta_3 \ln VAD_{it} + \beta_4 \ln AgL_{it} + \beta_5 EX_{it} + \beta_5 AGOA_{it} + \varepsilon_{iut} \quad (4)$$

$i = 1,2,.....N$, representing exporting SSA countries, $u = 1$ representing the importing country, the United States and $t = 1,2,.....T$, representing the pre and post AGOA years. $AGX_{iut}$ represents the value of aggregate agricultural commodity exports of SSA countries measured in U.S. dollars at time, $t$. The export values included in the data are only for eligible commodities under the AGOA agreement (any SSA agricultural exports to the United States that are outside the list of eligible goods under AGOA are excluded).

$Y_{it}$ and $Y_{ut}$ are GDP per capita for SSA and the United States at time $t$ respectively. Since it serves as a proxy for the income level of countries, GDP per capita of countries has also been very commonly employed in place of GDP and population. Example of models with GDP per capita include Sanso, Cuairan, and Sanz (1993), Bergstrand (1989), Cheng and Wall (1999), Buch and Piazolo (2001), Fukao et al. (2003), Porojan (2001), Eichengreen and Irwin (1998) and others.

$VAD_{it}$ is the value added of agriculture in SSA country $i$ at time $t$ and $AgL_{it}$ percentage of agricultural land measured from total arable land of country $i$. $EX_{it}$ represents the exchange rate of country $i$ (i.e. real exchange rate-local currency per US dollar). These three variables are not included in most of the models estimated because they are country-specific and are expected to be accounted for by the fixed country effects. They are included in two models in an effort to ensure that the estimated coefficients are reliable. These types of variables have been used by other authors as factors that either impede or enhance bilateral trade. $AGOA$ is a dummy variable with a value of 0 for years prior to the implementation of the AGOA provisions for a given country and 1 for years following the implementation of these provisions. $\varepsilon_{ijt}$ is assumed to be normally distributed with zero mean and constant variance for all observations. It is also assumed that the disturbances are pairwise uncorrelated.

We assumed the coefficient of the distance variable is zero since the distance is fixed over time between the exporting SSA country and the United States. The gravity Eq. (4) can be estimated by nonlinear or linear ordinary least squares (OLS) with fixed effects as suggested by Anderson and van Wincoop (2003) and Feenstra (2004). An important drawback of estimating the gravity equation in its log-linear form with OLS

estimation is that it ignores trade flows with a value of zero because the natural logarithm of zero is not defined. Actually our trade flow data shows a number of zero trade values across the studied countries. The next section explores alternative modeling approaches to handle the presence of zero values.

### 3.2 Modeling Zero Trade Flow

Zero or missing observations are quite common in bilateral/unilateral trade flows particularly in agricultural commodity trade. The first approach for dealing with zero trade flows is truncating the sample by dropping the observations with zero trade. The second approach is to systematically add a small positive number (usually 0.5 or 1) to all trade observations so that the log linear transformation is defined. The third is estimating the model in levels (i.e.in linear or non-log form).

Empirical estimation of trade flows with zero values with conventional OLS leads to a selection bias created by the logarithmic transformation (Burger et.al, 2009; Flowerdew and Aitkin 1982). Since zero trade flows are usually not randomly distributed, truncating the observations might lead to biased and inefficient estimates (Burger et.al, 2009; Heckman, 1979; Xiong and Beghin, 2011). Systematically adding a small positive number by itself is problematic since there is no theoretical or empirical justification for such a procedure, and it can distort the estimates (Linders and de Groot, 2006; Flowerdew and Aitkin, 1982; Xiong and Beghin, 2011). This study will address the problem of zero trade by implementing two alternative gravity model approaches using the Heckman selection model (Heckman 1979; Hoffmann and Kassouf 2005) and the Poisson Family specification of the trade gravity model (Santos Silva and Tenreyro, 2006; Burger et.al, 2009; Xiong and Beghin 2011).

### 3.2.1 The Heckman Selection Model

The Heckman gravity econometric model retains the log linear transformation of the model and treats zero trade values as censored observations. This approach involves estimating a Probit model in which the dependent variable is a [1,0] indicator of whether or not a given observation is non-zero. The Heckman sample gravity selection model is based on both censored variables (equation 5) and uncensored variables (equation 6):

$$\ell^*_{ij} = \theta' X_i + u_{ij} \quad (5)$$

Where $\ell^*_{ij}$ is a latent variable that shows if bilateral, in our case unilateral, trade between SSA countries, $i$ and U.S, $j$ (u) in the sample occurred. $\ell_{ij}$ is not observed but we do observe if countries trade or not, such that $\ell_{ij} = 1 \text{ if } \ell^*_{ijt} > 0$; $\ell_{ij} = 0 \text{ if } \ell^*_{ij} \leq 0$.

The outcome equation based on uncensored observations:

$$\ln T^*_{ij} = \beta' X_i + \varepsilon_{ij} \quad (6)$$

$\ln T^*_{ij}$ is the logarithm of the volume of unilateral trade as defined in equations 1 to 4. $\ln T_{ij} = \ln T^*_{ij}$ if $\ell^*_{ijt} > 0$. $u_{ij}$ is the error term associated with the selection process. $\varepsilon_{ij}$ is the error term of the outcome equation. $X_i$ is a vector of variables that affect $\ln T^*_{ij}$. The errors $u_{ij}$ and $\varepsilon_{ij}$ have a bivariate normal distribution with zero means, standard errors of $\sigma_u$ and $\sigma_\varepsilon$, (Hoffmann & Kassouf, 2005). For ease of exposition the time subscript is dropped from the equations.

The most popular way to correct for selection bias is the Heckman 2-stage least squares estimation that introduces in the specification the inverse of the "Mills ratio" (Heckman 1979). The Mills ratio is the ratio of the probability density function to the

cumulative distribution function of a distribution (see Appendix B-equation 7). The two-step procedure first estimates the bivariate selection equation using a Probit model and generates the inverse of the Mills ratio, $\lambda(\alpha_u)$. Then the main model is estimated with OLS, including a measure of the probability of being in the sample, derived from the Probit estimates. Greene (2003) and Hoffmann and Kassouf (2005) show that

$$E[T_{ij}^* \mid \ell_{ij} = 1] = \beta' X_i + \rho\sigma_\varepsilon \lambda_i(\alpha_u) \qquad (6')$$

Due to the correlation between $X_i$ and $\lambda(\alpha_u)$, OLS regression on $\ln T_{ij}^*$ without the term in $\lambda(\alpha_u)$ would produce an inconsistent estimator of $\beta$ (Hoffmann and Kassouf 2005). The empirical version of the gravity model of the selection model of equation (5) becomes:

$$\ell^*_{iu} = \theta_0 + \gamma_{iu} + \theta_1 \ln Y_{it} + \theta_2 \ln Y_{ut} + \theta_3 \ln VAD_{it} + \theta_4 \ln AgL_{it} + \theta_5 EX_{it} + \theta_5 AGOA_{it} + u_{iu} \qquad (5')$$

And the outcome-equation 6:

$$\ln T_{iu}^* = \beta_0 + \alpha_{iu} + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{ut} + \beta_3 \ln VAD_{it} + \beta_4 \ln AgL_{it} + \beta_5 EX_{it} + \beta_5 AGOA_{it} + \varepsilon_{iu} \qquad (6'')$$

The variable $\lambda(\alpha_u)$ is then included as an additional regressor, allowing the parameters of the outcome in equation (6") to be consistently estimated by the OLS method (Greene 2003; Hoffmann and Kassouf 2005). $\rho$ shows the correlation between the error terms of the selection and the outcome equation $Corr(u_{iu}, \varepsilon_{iu})$ in equation 5' and 6'.

### 3.2.2 Poisson Family Regressions

Since the Heckman gravity model adopts the log-linear specification as the conventional OLS estimation, it is still subject to heteroskedasticity. This implies that $E(\ln Y) \neq \ln E(Y)$, that is, the expected value of the logarithm of a random variable is different from the logarithm of its expected value (Santos Silva and Tenreyro 2006).

A recent study of Will Martin and Cong S. Pham noted that "The Heckman sample-selection estimators-whether in two-step or maximum likelihood-gave very poor results when estimated for a single equation with the same variables in the selection and estimation equations.'' (Will Martin and Cong S. Pham, 2013). So Santos-Silva and Tenreyro recommended the use of a Poisson Pseudo Maximum-Likelihood (PPML) estimator, using the dependent variable in level form and independent variables in log form instead of both logarithmic dependent and independent variables. They show that the PPML consistently estimates the gravity equation for trade and it is robust to different patterns of heteroskedasticity and measurement error.

The Poisson family of models originally derives from the analysis of count data- a non-negative integer which includes 0 values. Given the presence of zero trade flows and heteroskedastic error terms, the gravity model can be estimated consistently using the Poisson Pseudo Maximum Likelihood (PPML) estimation (Santos Silva and Tenreyro 2006). We follow the specification of Burger et al. (2009) to fit the PPML estimator.

The observed volume of trade, $T_{ij}$ between countries $i$ and $j$ in a period $t$ has a Poisson distribution with a conditional mean $(\mu)$ that is a function of the independent variables (equation 4). $T_{ij}$ is assumed to have a non-negative integer value so that it ensures that it is zero or positive and has the probability mass function described in Apendix-B equation 8. The Poisson model requires the equi-dispersion property, i.e., the conditional variance must be equal to the conditional mean (Cameron & Trivedi, 2010). This equi-dispersion property is commonly violated because the dependent variable of unilateral/bilateral trade flows is often over-dispersed, implying that the conditional variance exceeds the conditional mean because of the presence of greater variability-

statistical dispersion in the data set between countries. The presence of over-dispersion might result in inefficient estimation of the Poisson model. A negative binomial (NB) model is frequently employed to correct for over-dispersion (Burger et al., 2009).

The probability mass function of the negative binomial distribution is also explained in Appendix-B equation 10. A likelihood ratio test of Alpha ($\alpha$) can be used to test whether the negative binomial distribution is preferred over the Poisson distribution (Cameron and Trivedi, 2010). If $\alpha$ is approximately zero, the negative binomial regression model reduces to the Poisson regression model.

Technically PPML and NB models can handle estimation of zero trade flows but neither is suitable for handling zero trade flows if the number of observed zero values exceeds the number of zeros predicted by the PPML or NB distributions (Burger et al., 2009). Under such a situation, the Zero Inflated Poisson (ZIP) and Zero Inflated Negative Binomial (ZINB) models can be used to overcome the problems (Burger et al., 2009).

The ZIP regression consists of two parts (see Appendix-B. equation 11 and 12-probability mass functions). The first part of the zero-inflated model contains a logit (or probit) regression of the probability that there is no bilateral trade at all. The second part contains a Poisson regression (eqs.12) of the probability of each count for the group that has a non-zero probability or interaction intensity other than zero. According to Burger et al. (2009), in the presence of both over-dispersion and zero inflated problems in the study sample, a zero-inflated negative binomial (ZINB) model can be defined in a similar fashion to the ZIP model(see Appendix-B. Equations 13 and 14).

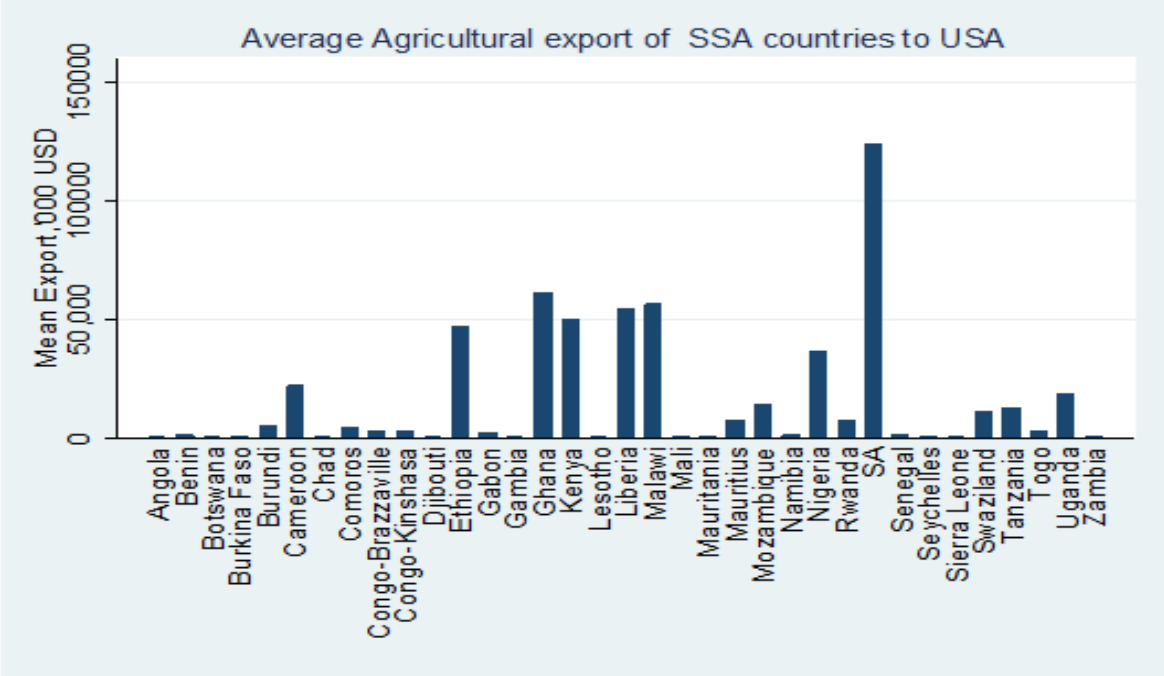
For both the zero-inflated Poisson model and the zero-inflated negative binomial regression model, the Vuong statistic (Vuong, 1989) can be employed to test whether a zero-inflated model and zero-inflated negative binomial are better than the alternatives. The likelihood ratio test of over-dispersion can also be used to test whether the negative binomial specification or the Poisson specification is more robust (Burger et.al 2009). The Vuong statistic follows a standard normal distribution with large positive values favoring the ZIP/ZINB model and large negative values favoring the PPML/NB model (Cameron & Trivedi, 2010).

# CHAPTER 4: Results and Discussions

## 4.1 Descriptive Statistics

According to Figure 4.1, the largest agricultural exporters to the United States are South Africa, Ghana, Malawi, Liberia, Kenya, Ethiopia, and Nigeria. In addition, based on data from USITC and USDA/GATS the share of agricultural exports in total exports from SSA countries to the United States between 2000 and 2011 varies widely from 0 percent for large oil exporting countries such as Angola, Nigeria and Gabon, to more than 95 percent in Liberia, 82 percent in Kenya, and 96 percent in Comoros (see Appendix Table A4.1 for details). On average, agricultural exports form a very small fraction of SSA's total exports to the United States (about 2% between 1996 to 1999) and a half percentage point lower (1.5%) over the period 2000-2011. Agricultural exports in high performing economies such as South Africa, Ghana and Mauritius, form less than 5% of their total exports to the United States (see Table A4.1). Even though the share of agriculture in total exports of South Africa and Ghana is small, these two countries remain the first and second largest exporters of agricultural products from the AGOA countries to the United States (See Figure 4.1). Some countries show significant increases in the agricultural share of exports to the United States from about 63% during the period 1996-1999 to 95.8% in 2000-2011 in Liberia, 1% to 23% in Malawi, 54% to 82% in Kenya, 7% to 38% in Uganda, and 28% to 63% in Togo. (see Table A4.1)

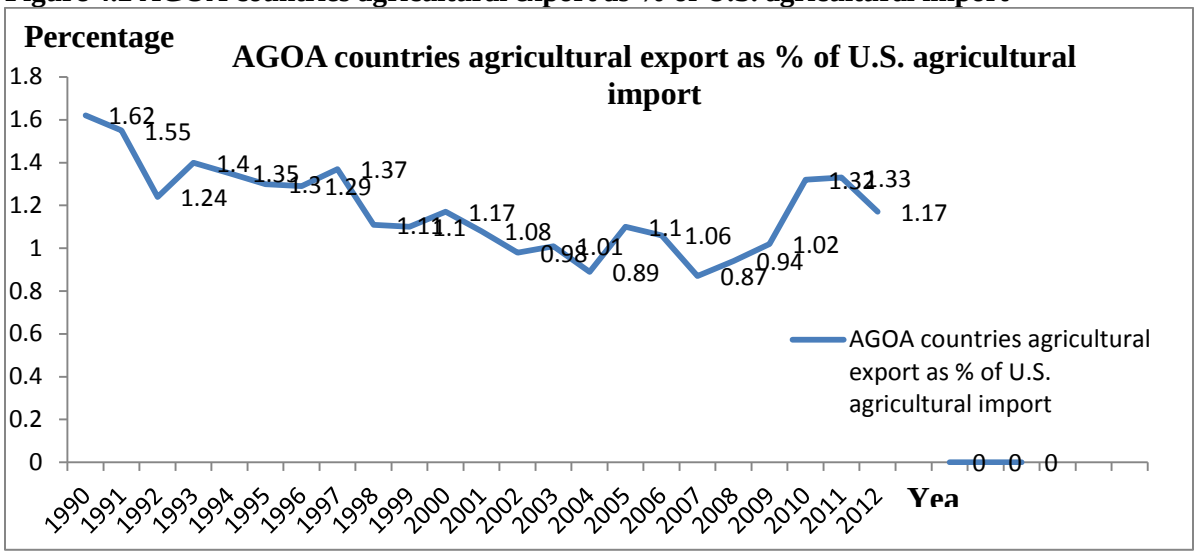
**Figure 4.1 Average Agricultural exports of SSA countries to the United States**




Source: Own calculation based on USITC agricultural import data

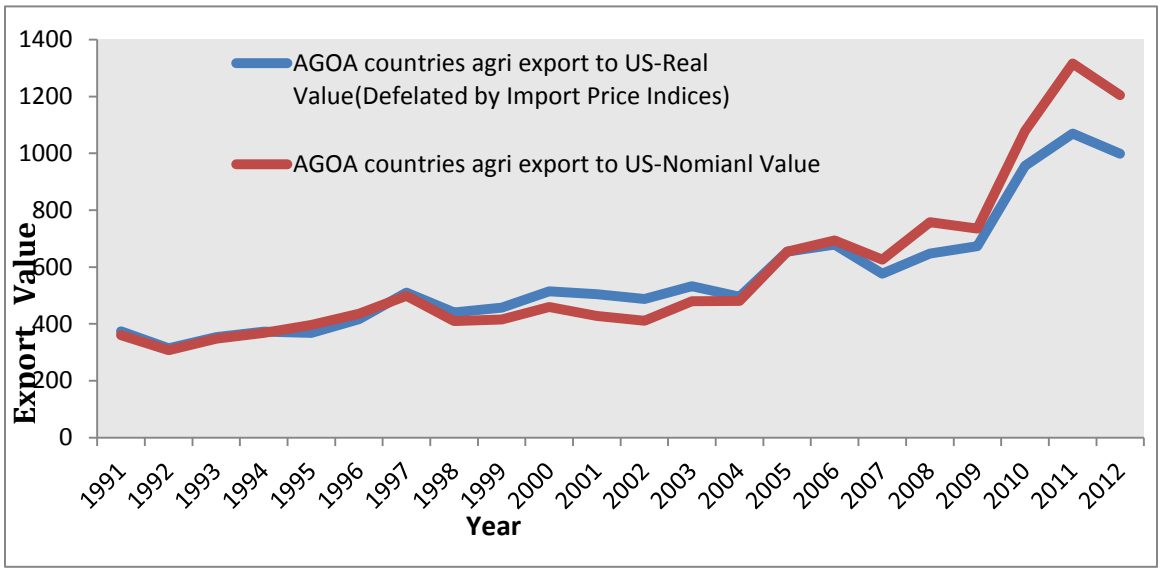
While the United States is an important market for agricultural exports from some of the AGOA countries, these countries account for a small share of total U.S. agricultural imports. According to Figure 4.2, the share of the AGOA countries in total U.S. agricultural imports was less than 2 percent over the period 1990 and 2011. On the other hand, the value of agricultural exports from the AGOA countries to the United States has grown substantially in both real and nominal terms, particularly in recent years (see Figure 4.3). The real value of AGOA agricultural exports to the U.S. since enactment of AGOA has grown by about 51 percent from $514 million in 2000 to $998 million in 2012. As Figure 4.3 shows there is also a slight decline of AGOA countries' agricultural exports from $1.1 billion in 2011 to $998 million in 2012.

**Figure 4.2 AGOA countries agricultural export as % of U.S. agricultural import**




Source: own analysis based on USITC data

**Figure 4.3 SSA countries agricultural export values in $Millions (Real and Nominal)**




**Source:** own analysis based on USITC data and U.S. Import Price Indexes from Bureau of Labor Statistics

## 4.2 Data Sources

The gravity equation was estimated using panel data on U.S. agricultural imports from 35 SSA countries. Some countries in SSA have not been eligible for AGOA throughout the period 2000 to 2011 and have been dropped from the sample. A panel of these agricultural product imports covering years prior to the adoption of AGOA (1990-1999) and years following its implementation was formed. U.S. agricultural import statistics from the individual SSA countries were obtained from United States Department of Agriculture (USDA/GATS http://www.fas.usda.gov/gats/ExpressQuery1.aspx) and U.S Department of Commerce (http://www.commerce.gov/), and also from U.S. International Trade Commission (USITC). Initially, unilateral exports from SSA country $i$ to the United States $u$ will be measured as the aggregate of all agricultural exports to the United States from that country under AGOA product categories. The U.S. import price indices were obtained from the United States Bureau of Labor Statistics, and used to deflate import values. In many studies, other factors such as exchange rates, land area, common border, common language, currency union, etc. that may influence trade flows have been included as additional variables in the traditional gravity model. This study also included some additional factors and re-estimated the model. Real exchange rates are from the International Monetary Fund (IMF), while countries' GDP per capita, and data for agricultural value added and agricultural land as a percentage of total land are from the World Bank's World Development indicators (WDI). The complete data set used for the study is included in Appendix-C.

**Table 4.1 Descriptive statistics of collected data**

| Country | Frequency | Mean Ag export, (000 $USD) | Mean GDP per capita, ($USD) |
|---|---|---|---|
| *Angola | 2 | 2.50 | 351 |
| Benin | 16 | 1106 | 335 |
| Botswana | 21 | 184 | 3243 |
| Burkina Faso | 15 | 713 | 240 |
| Burundi | 22 | 5095 | 144 |
| Cameroon | 22 | 21800 | 606 |
| Chad | 14 | 193 | 211 |
| Comoros | 22 | 4362 | 366 |
| Congo-Brazzaville | 21 | 2860 | 112 |
| Congo-Kinshasa | 22 | 2606 | 1102 |
| Djibouti | 15 | 451 | 858 |
| Ethiopia | 22 | 47115 | 143 |
| Gabon | 22 | 2081 | 4321 |
| Gambia | 13 | 42 | 596 |
| Ghana | 22 | 61054 | 277 |
| Kenya | 22 | 50008 | 430 |
| *Lesotho | 5 | 58 | 392 |
| Liberia | 22 | 54516 | 172 |
| Malawi | 22 | 56205 | 152 |
| Mali | 22 | 415 | 225 |
| *Mauritania | 7 | 64 | 511 |
| Mauritius | 22 | 7512 | 3843 |
| Mozambique | 22 | 14189 | 263 |
| Namibia | 22 | 897 | 2207 |
| Nigeria | 22 | 36278 | 413 |
| Rwanda | 22 | 7270 | 256 |
| SA | 22 | 123673 | 3238 |
| Senegal | 22 | 1368 | 502 |
| *Seychelles | 9 | 68 | 7023 |
| Sierra Leone | 22 | 449 | 220 |
| Swaziland | 22 | 10546 | 1540 |
| Tanzania | 22 | 12475 | 345 |
| Togo | 22 | 3085 | 263 |
| Uganda | 22 | 18818 | 273 |
| Zambia | 22 | 701 | 360 |
| Total | 666 | | |

Note: *Angola, Lesotho, Mauritania and Seychelles have the lowest frequency of actual trading observations, i.e., many zero agricultural trade flows to the United States.

## 4.3 Model Results and Discussion

To obtain reliable estimates of the parameters of the gravity equation, it is necessary to examine the properties of the data set assembled for the study. To check for the stationarity of the panel data, the stationarity test proposed by Fisher for unbalanced panel data was used to determine whether the time series data have unit roots (Choi, 2001). The results are shown in Table A4.2. The null hypothesis that the panel data contain unit roots is rejected. We also considered the Harris–Tzavalis stationarity test proposed by Harris and Tzavalis (1999) for panel data stationarity and obtained the same result as with the Fisher-type unit-root test.

Second, because the initial gravity equation is estimated using ordinary least squares (OLS), we also checked for the presence of heteroscedasticity[2] using White's Test for hetroscedasticity as described by White (1980). The result of the test is shown in appendix Table A4.3.The null hypothesis of homoscedasticity is rejected suggesting that there is heteroscedasticity. The robust regression estimation as described by Andersen (2008) and Radchenko (2005) can be used to correct for heteroscedasticity and this procedure was used in the estimation of the gravity equation. These regression results are presented in Table 4.2.

[2] chi2(8) = 21.58, Prob > chi2 = 0.006

**Table 4.2 Robust OLS Regression Results**

| Dependent Variable | Full sample (35 countries) | | Top 15 SSA Agricultural Exporters | |
|---|---|---|---|---|
| **SSA Countries Agricultural Exports to US (Annual in $1000)** | **(All countries)** | **(Excluding SA)** | **(All countries)** | **(Excluding SA)** |
| Independent Variables | | | | |
| SSA GDPP | 1.391** | 1.438** | 2.593** | 2.773** |
| | (4.63) | (4.77) | (9.05) | (9.94) |
| US GDPP | 0.204 | -0.199 | -0.04 | -0.94 |
| | (0.220) | (-0.21) | (-0.04) | (-0.97) |
| AGOA (Dummy) | 0.224 | 0.198 | 0.263 | 0.220 |
| | (1.08) | (0.94) | (1.23) | (1.03) |
| Constant | -9.484 | -5.562 | -4.48 | 4.03 |
| | (-0.970) | (-0.56) | (-0.45) | (0.4) |
| R-Squared | 0.808 | 0.7881 | 0.6281 | 0.6139 |

*t* statistics in parentheses *, **, and *** significant at 10%, 5% and 1% respectively
Note: All the above estimation results are without fixed effect.

Two models were estimated. The first was based on the full sample of the 35 AGOA countries with and without South Africa (SA), and the second was based on the top 15 SSA agricultural product exporters (including and excluding SA). South Africa is different from other SSA countries in terms of the size of its economy and the relatively higher incomes of its citizens. Treating South Africa differently in the two models is justified because its greater economic weight could overshadow the effects of AGOA in SSA as a whole.

The statistical results presented in Table 4.2 based on OLS show that the dummy variable reflecting the introduction of AGOA is not significantly different from zero at the 95% confidence level. Although the coefficient is not statistically significant, it is positive and suggests that AGOA may have contributed to an increase in the export of agricultural commodities in the range between 22 to 30 percent[3] compared to the pre-

[3] The elasticity of the AGOA dummy on the dependent variable, i.e., the % impact of AGOA policy on export is computed as $[\exp(\beta)-1]*100$ where $\beta$ is a coefficient on AGOA dummy variable.

AGOA years across the models (Table 4.2). The signs of the coefficient on the per capita GDP variables considered are consistent across all models, except that the sign on the U.S GDP per capita switches to negative in the first model (Table 4.2). For most variables considered, the inclusion or exclusion of South Africa and limiting the sample to the top 15 exporters does not appear to alter the signs of the coefficients.

Per capita GDP in SSA is highly significant and positively related to SSA agricultural exports. The estimated parameters for the per capita GDP variables in a gravity equation in logarithms represent the elasticity of exports of agriculture to GDP, indicating the percentage variation in exports following a 1 per cent change in per capita GDP. For example, on average a 1% increase in the per capita GDP of SSA could result in around 1.4% increase on agricultural exports to the United States (column1 and 2, Table 4.2). The percentage increase in exports doubled in the model for the top fifteen exporting SSA countries. According to the estimates of the model, an increase in an SSA country's per capita GDP will lead to a more than proportional increase in its agricultural exports to the United States. Although, the coefficient on U.S. GDP per capita is not found to be significant the sign is consistently negative. The results suggest a 1% increase in the U.S GDP per capita would result in around 0.2 to 0.9 % percent reductions in agriculture exports to the United States, except in the first full sample result shown in column-1. This result is inconsistent with the basic expectations of gravity trade models. SSA agricultural exports make up a small portion of U.S. total agricultural trade. Even though per capita U.S. GDP is the same across all the countries in year t, observed variations from year to year in U.S. GDP per capita may not have any strong effect on the demand for those exports in the U.S. markets. Second, it is possible that per capita GDP

growth in the United States may not translate into increased demand for agricultural imports, as changes in the per capita GDP are more likely to lead to increases in the consumption of non-agricultural products, which tend to be more income elastic than agricultural products. However, this result changed in the later model estimations (i.e. Poisson family of regressions).

**Table 4.2A Individual Country Effect OLS Estimation**

| | Coefficient |
|---|---|
| lnGDP per capita SSA | 1.346*** (4.45) |
| lnGDP per capita USA | 0.221 (0.24) |
| AGOA | 0.223 (1.07) |
| Benin | 3.176*** (3.52) |
| Botswana | 0.0150 (0.01) |
| Burkina Faso | 5.216***(5.69) |
| Burundi | 8.400***(9.02) |
| Cameroon | 8.127***(9.01) |
| Chad | 4.276***(4.62) |
| Comoros | 6.960***(7.84) |
| Congo (Brazzaville) | 8.079***(8.40) |
| Congo (Kinshasa) | 5.332***(5.61) |
| Djibouti | 3.068**(3.25) |
| Ethiopia | 10.88***(11.64) |
| Gabon | 2.704*(2.32) |
| Gambia | 1.215(1.31) |
| Ghana | 10.10***(11.32) |
| Kenya | 9.616***(10.81) |
| Lesotho | 2.801**(2.79) |
| Liberia | 10.00***(10.82) |
| Malawi | 11.14***(12.03) |
| Mali | 5.138***(5.71) |
| Mauritania | 1.746 (1.80) |
| Mauritius | 4.458***(3.92) |
| Mozambique | 8.844***(9.88) |
| Namibia | 2.155*(2.07) |
| Nigeria | 9.117***(10.26) |
| Rwanda | 7.803***(8.72) |
| SA | 7.516***(6.78) |
| Senegal | 4.425***(4.95) |
| Seychelles | -1.876(-1.44) |
| Sierra Leone | 5.547***(6.15) |
| Swaziland | 6.098***(6.16) |
| Tanzania | 8.316***(9.36) |
| Togo | 6.395***(7.16) |
| Uganda | 9.216***(10.32) |
| Zambia | 5.450***(6.14) |
| _cons | -9.171 (-0.96) |
| *R-squared* | 0.808 |

*t* statistics in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: Fixed effect estimation

Table 4.2A presents the estimates of the regression equation of the generalized gravity Fixed Effects model. In this model, Angola is the base exporting SSA country meaning that other country dummies are measured relative to it. Hence, the intercept of -9.17 is the actual coefficient of Angola. Keeping both GDP per capita constant and assuming there is no AGOA policy, on average almost all countries export more agricultural products to the United States compared to Angola. Likewise, Benin exports more than geographic neighbors Gabon and Gambia but much less than Ghana, Cameroon, Burkina Faso. etc. The different values of the intercept parameters suggest the presence of wide variation among the countries studied due to country-specific unobserved heterogeneity in our model. The heterogeneity might be as a result of individual country specific trade policies such as tariffs, exchange rates, or historical cultural ties. The results for the fixed effects and the OLS-robust models are similar in terms of the signs and order of magnitude of the coefficients shown in Table 4.2. The only difference among the studied countries lies in the intercepts since the slope remains unchanged.

In the next section we focus on the estimation results of the models that address the problem of zero trade flows. About 13 percent of the observations of agricultural exports in the data are zeros. To deal with the possible selection bias as a result of systematically excluding these observations, we fitted different model specifications. As described in the method section, the Heckman selection model and the Poisson family of regression estimations have been suggested by several authors as ways to deal with zero observations. The estimated results in both tables 4.2 and 4.2A-individual country effects are based on data that excludes zero observations.

### 4.3.1 Heckman and Selection Models

The Heckman solution to the gravity econometric model retains the log linear transformation of the model and treats zero trade values as censored observations in a similar way to a Probit model as described in Chapter 3. Both the selection (censored) and outcome (uncensored) equations are specified as a generalized gravity model. Table 4.3 column 2 and 4 present estimates of the selection equation (5') estimated as a Probit model while column 1 and 3 contain the estimation of outcome equation (6").

**Table 4.3 Heckman Model Results**

| | Outcome Ln(export) | Selection (Probit) | Outcome Ln(export) | Selection (Probit) |
|---|---|---|---|---|
| lnGDP per capita SSA | -0.204 | 0.090 | 0.0306 | 0.166* |
| | (-1.91) | (0.037) | (0.0858) | (0.0697) |
| lnGDP per capita USA | 2.090 | 0.272 | 0.0173 | -0.964 |
| | (2.334) | (0.827) | (1.773) | (1.217) |
| LnAgland% | - | - | 1.139*** | 0.171 |
| | | | (0.172) | (0.116) |
| LnVAD | - | - | 1.043*** | 0.358*** |
| | | | (0.0805) | (0.0518) |
| AGOA dummy | -0.359 | 0.166 | -0.394 | 0.135 |
| | (-0.523) | (0.187) | (-0.393) | (0.267) |
| _cons | -11.84 | -2.436 | -10.17 | 2.274 |
| | (-24.069) | (-8.515) | (-18.16) | (12.48) |
| $\rho$ | 0.0862 | | 0.154 | |
| | (0.0123) | | (.176) | |
| Ln($\sigma$) | 0.173 | | 0.809*** | |
| | (0.0189) | | (.0296) | |
| $\lambda$ | 0.0053 | | 0.0342 | |
| | (1.574) | | (.388) | |

*t* statistics in parentheses; $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Note: the first two columns 1 and 2 shows estimations with fixed effect. However, columns 3 and 4 takes additional variables such as Agland% and VAD to account for country specific characteristics.

The results in Table 4.3 suggest that the Heckman and selection models have not captured the effects of the gravity equation variables as none of the explanatory variables is significantly different from zero. In the right columns of Table 4.3, agricultural land as

a percentage of total land area and agricultural value added have been added to the basic gravity equation. A positive and statistically significant coefficient for percent of agricultural land (Agland%) and agricultural value added (VAD) implies that an increase in agricultural land as a percentage of total land area and VAD increases agricultural export to the U.S. While these variables add to the explanatory power of the equation, their inclusion does nothing to change the results for the AGOA dummy and other variables of interest. Per capita GDP of U.S and the AGOA dummy switched signs in the outcome and selection estimation.

Since the Inverse Mill Ratio is included in the outcome equation, the coefficients in the outcome and selection equations cannot be interpreted as the elasticities as in the case of a log-linear gravity model. The estimated parameter of the variables rather shows the marginal effect on agricultural exports. We computed the marginal effects of the explanatory variable using the STATA software command. For example, the marginal effect of per capita GDP of the United States on the export of agricultural products to the United States shows a 1.1 percent increase for a 1 percent increase in the U.S GDP per capita, among those countries that have positive trade flows, ceteris paribus (Table 4.3). However there was a 0.4 percent reduction in agricultural exports to the United States for a similar increase in per capita GDP of the SSA countries. The direction and magnitude of coefficients of variables representing per capita GDP of U.S remain similar to those found in the OLS equations. The Heckman selection equation reports factors affecting the probability that positive trade occurred between SSA and the United States. For example, the marginal effect on the probability of there being zero agricultural trade observed between SSA and the United States for every 1 percent increase in SSA per capita GDP is

0.09 percent. This means that on average for every percent increase in the SSA per capita GDP there will a 0.09 percent increase in the probability that zero trade is observed.

Overall most of the coefficients were unstable and do not show consistent signs. This might be the result of the fact that the selection bias is not statistically significant and at the same time the coefficients of ρ are small, 0.086 and 0.153 for the two simulated model as shown on Table 4.3. As described in Chapter 3, Silva and Tenrevro (2006) noted that the Heckman and selection estimation methods do not address heteroscedasticity and the normality assumptions of the error terms.

### 4.3.2 The Poisson Family of Regressions

Results of the Poisson family regressions are reported in Tables 4.4 and 4.5. Estimates of the PPML and NB models are shown in Columns 2 and 3 respectively in each table. The ZIP and ZINB model each consist of two equations that are depicted in columns 4 through 7 in both tables. The choice of a specific Poisson model specification has been done based on formal statistical tests using Akaike's Information Criterion (AIC), and the Vuong test. Silva and Tenrevo (2006) also suggested that selecting a specific Poisson model can also be done based on the consistency of the estimated variables, the economic implications of the parameter estimates and whether the data are over dispersed (i.e. the conditional variance exceeds the conditional mean). Our first test was to choose between PPML and NB. The likelihood ratio test for PPML over NB for over-dispersion favored the NB model. Likewise the subsequent AIC test to choose between the negative binomial (NB) and zero inflated indicated that the NB should be preferred over the PPML and ZIP. Finally using the Vuong test, ZIP and ZINB gave better estimation results than PPML and NB. The test results are shown at the bottom of

table 4.4 and 4.5. Furthermore, both models are robust and less sensitive to the heteroskedasticity and normality assumptions of the error terms. Overall, it can be inferred that ZINB performs the best on average, as rated by both criteria. Both table 4.4 and 4.5 show all the four results of the Poisson family regression.

**Table 4.4 Poisson family of regressions**

| | PPML | NB | ZIP | | ZINB | |
|---|---|---|---|---|---|---|
| | Export | Export | Export | Logit | Export | Logit |
| lnGDP per capita SSA | 0.0226 | 0.00504 | -0.0492*** | 0.164 | -0.0245 | 0.216 |
| | (0.27) | (0.07) | (-190.89) | (1.79) | (-0.38) | (1.72) |
| lnGDP per capita USA | 0.036* | 0.0205 | 1.24*** | 0.427 | 1.796 | 0.440 |
| | (2.47) | (1.61) | (56.36) | (0.21) | (1.82) | (0.25) |
| AGOA dummy | 0.0470 | 0.0147 | 0.0718*** | 0.275 | 0.0458 | 0.300 |
| | (0.18) | (0.04) | (5.07) | (0.59) | (0.13) | (0.45) |
| _cons | -22.06 | -18.83 | -22.30*** | -7.193 | -19.56 | -11.24 |
| | (-1.74) | (-1.08) | (-355.13) | (-0.34) | (-1.23) | (-0.37) |
| Ln(alpha) | | 1.606*** | | | | 1.303*** |
| | | (37.42) | | | | (20.87) |
| Alpha | | *4.981* | | | | 3.679 |
| | | *(.2137)* | | | | (.20194) |
| Over dispersion (α) [4] | | 1.606*** | | | 1.303*** | |
| AIC | 38103.7 | 13986 | 25785130 | | 13965 | |
| [5]Vuong test | | | | | 1.11* | |

*t* statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: Estimations are not fixed effect

The zero-inflated models generate two sets of parameter estimates (i.e the logit, and the Poisson (ZIP) and binomial (ZINB) labeled "export" in the table 4.4 and 4.5). The coefficient of the parameter estimates of the poison and the logit equations across all models consistently maintained similar signs and the order of the magnitude of these parameters also did not vary greatly (Table 4.4 and 4.5).

[4] Alpha is the variance of the multiplicative random effect and corresponds to sigma^2, it is estimated to be 1.606 and is highly significant (non-zero).Likelihood ratio test that alpha equals zero, the LR test comparing this model to a PPML model. The associated chi-squared value is 22976 with 1 df. This strongly suggests that alpha is non-zero and the negative binomial (NB) model is more appropriate than the PPML. If the alpha coefficient is zero then the model is better estimated using a PPML regression model.

[5] The Vuong test compares the zero-inflated model negative binomial ZINB with negative binomial (NB) regression model; a significant z-test indicates that the ZINB is preferred over NB.

Looking at the Poisson part of the ZIP model both in table 4.4 and 4.5, it appears that in an increase in per capita GDP of the SSA countries decreases the expected volume of trade with the U.S when holding all other variables constant. For example, a 10% increase in GDP per capita of SSA decreases the volume of trade to the U.S by 1.12% (ZIP) and 2.0% (ZINB) (Table 4.5). Likewise, a similar 10 percentage increase in GDP per capita of SSA also showed 1.02% (PPML) and 2.23% (NB) falls in trade volume to the U.S. This might be possible if an increase in per capita GDP of countries in SSA leads to higher domestic demand for agricultural goods and eventually a decrease the volume of exports from the SSA countries. This is unlikely; however, as most agricultural exports from SSA countries are export crops such as coffee, cocoa and other commodities not widely consumed in SSA.

As reported in Tables 4.2 and 4.3, U.S. per capita GDP has a positive effect on the exports of agricultural products. The volume of trade increases for a one-percent increase in U.S. per capita GDP ranges between 1.5 to 4 % (Table 4.5). In addition, the parameter estimates generated by the Poisson family models deviate more from the OLS coefficients.

**Table 4.5 Poisson family regressions model -With additional variable**

| | PPML | NB | ZIP | | ZINB | |
|---|---|---|---|---|---|---|
| | Export | Export | Export | Logit | export | Logit |
| lnGDP per capita SSA | -0.102 | -0.223** | -0.112*** | 0.0598 | -0.200** | 0.0769 |
| | (-1.32) | (-2.88) | (-419.62) | (0.64) | (-2.89) | (0.73) |
| **lnGDP per capita USA** | **3.949*** ** | **4.010*** | **4.407*** ** | 1.462 | **4.266**** | 2.438 |
| | (3.34) | (2.44) | (709.08) | (0.67) | (2.98) | (0.87) |
| LnAgland% | 0.643*** | 0.609*** | 0.603*** | -0.443* | 0.483*** | -0.496* |
| | (4.21) | (3.77) | (7.19) | (-2.43) | (3.46) | (-2.36) |
| lnExrate | -0.252*** | -0.298*** | -0.265*** | -0.148** | -0.335*** | -0.198*** |
| | (-11.82) | (-7.07) | (-22.34) | (-3.19) | (-9.16) | (-3.37) |
| lnVAD | 0.618*** | 0.735*** | 0.585** | -0.659*** | 0.646*** | -0.752*** |
| | (11.39) | (11.87) | (12.39) | (-6.95) | (11.96) | (-5.96) |
| AGOA dummy | 0.0743 | -0.00727 | -0.00191 | -0.234 | -0.0453 | -0.219 |
| | (0.30) | (-0.02) | (-1.43) | (-0.49) | (-0.14) | (-0.37) |
| _cons | -32.52** | -32.06 | -36.84*** | -15.15 | -34.11* | -25.34 |
| | (-2.67) | (-1.89) | (-574.78) | (-0.67) | (-2.30) | (-0.88) |
| lnalpha | | 1.505*** | | | 1.110*** | |
| | | (34.57) | | | (19.12) | |
| Alpha | | 4.506 | | | 3.034 | |
| | | (.1962) | | | (.1761) | |
| Log seudolikelihood | -7350490 | -6365.9 | -6485115 | | -6406.6 | |
| Over dispersion (α) [6] | | 4.506*** | | | 3.034*** | |
| AIC | 20734.83 | 13986 | 25785130 | | 12639 | |
| [7]Vuong test | | | | | 1.66 ** | |

*t* statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: The inclusion of the three variables i.e Agland%, Exrate, and VAD are taken as a substitute for the country effects.

The zero-inflated logit model identifies groups of countries in SSA that always have zero values. Hence the logit equation in the ZIP and ZINB models show factors affecting the probability of having zero trade values. With respect to the ZIP and ZINB model (Table 4.6), we find that an increase in a per capita GDP of SSA in particular affects the probability of having an agricultural trade export, which can be derived from

[6] Alpha is the variance of the multiplicative random effect and corresponds to sigma^2, it is estimated to be 4.506 and is highly significant (non-zero). The Likelihood ratio test that alpha equals zero, compares this model to a PPML model. The associated chi-squared value is 22997 with 1 degree of freedom. This strongly suggests that alpha is non-zero and the negative binomial model is more appropriate than the PPML. If the alpha coefficient is zero then the model is better estimated using a Poisson regression model.

[7] The Vuong test compares the zero-inflated model negative binomial, with an ordinary negative binomial regression model. A significant z-test indicates that the zero-inflated model is preferred.

the logit part of the model. If the per capita GDP increases by 1%, trade probability of countries belonging to the never-trading SSA country group increases by 0.06% (ZIP) and 0.08 %( ZINB). More or less similar outcomes are observed in Table 4.5. Although the per capita GDP of the SSA countries affects the probability of trading according to the ZIP and ZINB estimation results, the outcome is not statistically significant.

Overall, it can be inferred from results in Table 4.5, that a 1% increase in U.S. per capita GDP leads to a more than proportional increase in imports of eligible agricultural commodities, and this effect is statistically significant across all Poisson family models. Comparing among the Poisson family models, the regression coefficients estimated in the Poisson part of the model are similar, while some of the regression coefficients estimated by OLS, generalized fixed effect and Heckman models differ substantially from the effects under the Poisson and binomial models in Table 4.5.

Even though this study focuses on the impact of AGOA, the effects of other variables on SSA agricultural exports, such as real exchange rates (Ex-rate), agricultural land (Agland%) and value added in agriculture (AgVAD), have also been included in the Poisson family regressions.The inclusion of these variables can also be seen as a substitute for the country effects since the variables are all country-specific characteristics. Results indicate that a significant and important relationship exists between these variables and agricultural exports as shown in Table 4.5.

For instance, an important relationship exists between SSA agricultural exports and the real exchange rate. When the real exchange rate is overvalued the relative price of goods at home is higher than the relative price of goods abroad. In this case, imports increase because foreign goods are cheaper, in real terms, than domestic goods. Thus,

when a country's real exchange rate appreciates, net exports decrease and imports rise. Alternatively, when the real exchange rate depreciates, net exports increase and imports fall. As shown on Table 4.5, on average a 1% currency appreciation in SSA countries decreases agricultural exports by 0.25% (PPML), 0.30% (NB), 0.265% (ZIP) and 0.335% (ZINB).

On the other hand, on average a 10 % increase in the value added of the agricultural sector in SSA induces an increase in agricultural exports of6-7%. The proportion of total land area that is used for agriculture has a significant and positive impact on trade. On average a 10 % expansion in agricultural land as a percent of total land in SSA countries increases agricultural exports to the United States by about 6.43% (PPML), 6.09% (NB), 6.03% (ZIP) and 4.83% (ZINB). Except for PPML, the coefficient for the AGOA dummy variable is negative in the Poisson family models. The coefficient for the AGOA variable suggests that AGOA contributed to an increase in agricultural exports of about 4.81% (PPML), 1.48 % (NB), 7.4% (ZIP-here its impact also turned out to be significant), and 4.7% (ZINB) (see table 4.4). However, when other factors/variables such as exchange rate, agricultural value added and land are included in the estimation, the coefficient for the AGOA variable is insignificant across the four specifications including the ZIP model in which a statistically significant relationship was found when these variables were not included.

More generally, we compared OLS estimates (leaving the zero-valued flows out) with Heckman and Poisson models empirically. Using those models yields relatively similar results regarding the effect of AGOA. The first estimation of the robust OLS and also with fixed effects result indicates that AGOA impact was statistically insignifican. In

addition, many of the alternative specifications aimed at accounting for zero values also found AGOA to be insignificant except for the ZIP estimate and that estimate also became negative and insignificant when other variables were added. We also compared the Poisson family model estimations and concluded that ZIP and ZINB perform better based on the test statistics discussed above.

# CHAPTER 5: Conclusion

There appear to be very few empirical studies of the impact of AGOA on agricultural trade. For the most part, these studies covered only the early years following the adoption of AGOA when the program was not fully established. According to these studies, agriculture has not benefited greatly from the AGOA provisions, although there is a positive but statistically insignificant relationship between AGOA and SSA agricultural exports to the United States. Growth of the agricultural sector is an important issue for Sub-Saharan African countries since it is still a major source of employment and a key part of foreign exchange earnings for many of them. Agriculture provides more than 70 percent of employment in many Sub-Saharan African countries and about 40 percent of the region's gross domestic product (World Bank, 2010).

This study developed a gravity trade model framework to explore the impact of AGOA on SSA countries' agricultural exports using a longer time frame to determine whether AGOA has had greater effects than found in the previous studies and that are only now beginning to show up. This study is also one of the first to address the issue of zero trade flows between the AGOA countries and the United States. The economic model estimated for the study captured the development of agricultural exports to the United States from the 35 eligible countries over the period pre-AGOA (1990-99) and a post-AGOA period (2000-2011). The statistical results in both the OLS-Robust regression and from zero trade modeling (i.e. Poisson family of regressions such as PPML, NB, ZIP, ZINB) are mostly consistent with other studies in finding that the AGOA trade preferences do not have a statistically significant impact on U.S. agricultural

imports. In one model the AGOA dummy was statistically significant but that relationship disappeared when additional explanatory variables were added.

Although the coefficient for the AGOA variable is not statistically significant, the sign is generally positive suggesting that AGOA is associated with increases in agricultural exports of (about 24% in the OLS model). There were also some differences in the results when only the 15 SSA largest agricultural exporters were included in the model as opposed to the full model with all 35 countries. Overall, the results in the new zero trade flow modeling did not alter the results a great deal. Another important relationship also exists between SSA agricultural exports and the real exchange rate from the implemented regressions. When there is a currency appreciation in SSA countries relative to the U.S dollar it appears to lead to reductions in the agricultural product exports.

Even though the impact on agricultural trade may have been modest, the effects of AGOA in such sectors as energy, textiles and apparel have been found to be more significant by other analysts (Condon and Stern, 2011). As wages in China and other emerging economies increase, these countries may lose their competitive advantage in textiles and apparel products and this may lead to increased development of these industries in the lower-wage countries in SSA. AGOA may contribute to this transition and, by extension, to increased economic growth and development in SSA. Condon and Stren (2011) in their analysis suggested that the textile and apparel sector transition will be facilitated if non-restrictive rules of origin for SSA products are implemented allowing African exporters the flexibility to freely source inputs and exploit their comparative advantage in labor intensive products. However, with respect to agriculture, the impact of AGOA is likely to remain limited as long as markets for commodities such as sugar, cotton

tobacco, peanut oil, and are not fully opened to African exports.

The results of this study are not surprising given that the AGOA preferences were only applied to agricultural products that do not compete with goods produced in the United States. In many SSA countries there is also a general lack of processing of agricultural products and a high dependency on primary agricultural product exports such as coffee, tea, sugar, cocoa beans, cocoa, tobacco, and cotton. AGOA's agricultural benefits are also constrained by quotas that predate AGOA and by the exclusion of some agricultural products from the legslation. Product standards and quality measures, for example sanitary and phytosanitary restrictions which are very important for maintaining food quality, also put additional demands on exporters and can limit agricultural market access for AGOA-eligible agricultural products. In this regard the United States provides capacity-building support to African countries which is a critical part of a strategy to enable SSA countries to negotiate and implement market-opening trade agreements and to improve their capacity to benefit from increased trade. However, more support is needed in terms of a better implementation system and credible monitoring mechanisms to help countries to take advantage of the trade assistance and support and meet required quality standards for the export of processed agricultural products to the U.S. market.

The United States and other foreign aid donors continue to provide foreign aid (about $126 billion in 2012 according to the Organization for Economic Cooperation and Development, OECD) but AGOA and recent initiatives by OECD countries to provide support for the development of infrastructure and the legal framework related to trade ("aid for trade") may reflect a new approach to development that emphasizes capacity building rather than development projects. This shift in the development strategies of

governments in high-income countries could have a significant impact on trade, economic growth and development. .

The study also found that AGOA's agricultural benefits are constrained in two major ways. First, the exclusion of certain agricultural products from duty-free access and second, quotas which predate and were not amended by AGOA both limit market access for African agricultural products. Sugar, peanut oil, tobacco, dairy, beef, and processed agricultural goods such as dried garlic or canned fruits are not included in the AGOA program. Other important African agricultural exports such as vanilla, raw chocolate, coffee, tea, cotton and birdseed, are not included in either AGOA or the U.S. GSP. Tariffs on products excluded from AGOA, particularly those applied to agricultural goods remain very high in such products as cotton, tobacco, coffee, tea, peanuts, processed fruits and others.

Therefore, some of the policy recommendations are that the economic impact of AGOA can be improved if preferences are extended to more agricultural products and tariff rate quotas (TRQ) are reformed. TRQ liberalization is generally viewed as a means of increasing market access and in this case it can make AGOA more effective for agricultural products. In addition, as AGOA is set to expire in 2015, extension of the program should be considered. If AGOA could be made more effective through the reforms mentioned and extended for a longer time period, it might help SSA to diversify its main agricultural products. SSA countries also need to use the resources and support from the developed countries effectively to improve their ability to participate in international trade. Investments in infrastructure, institutional arrangements, information services, agricultural productivity and agricultural processing that meets high quality

standards are needed to improve Sub-Saharan Africa's commodity competitiveness in regional and global markets.

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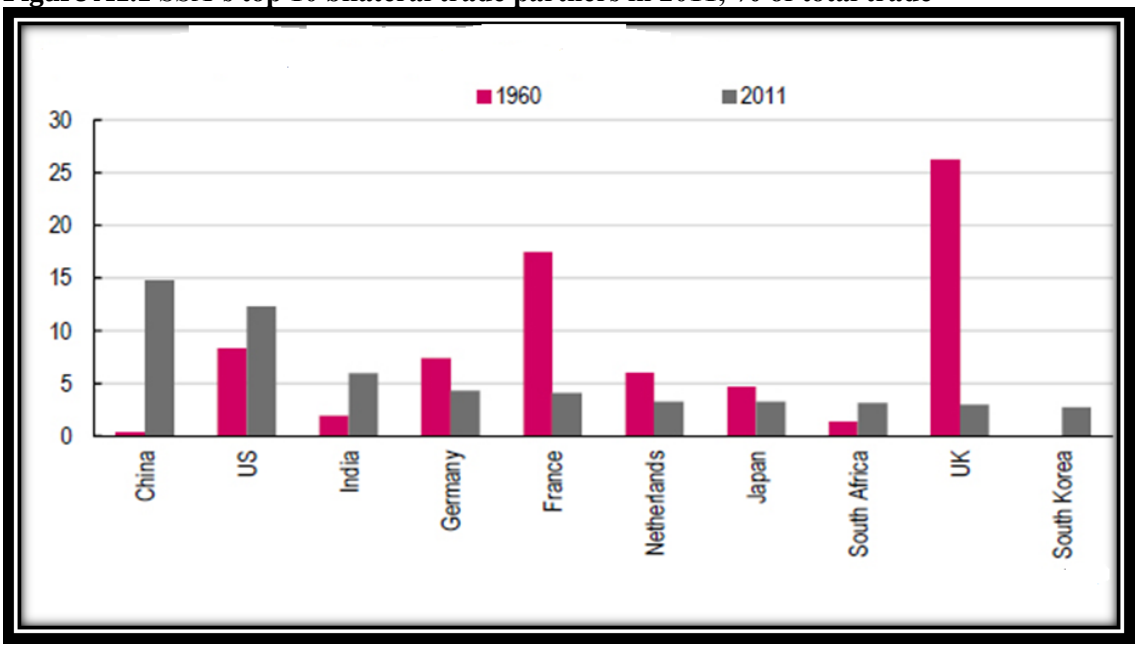
# Appendix-A

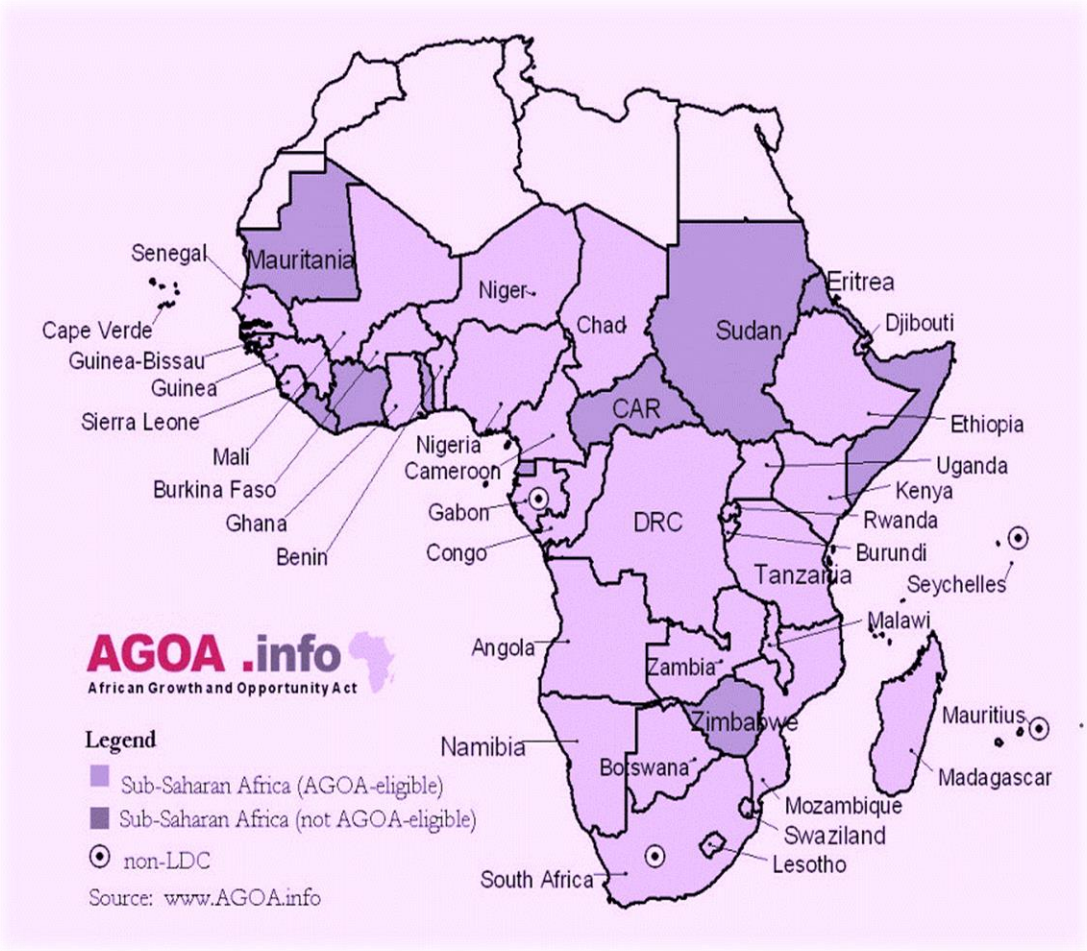
## Figures and Tables

**Figure A1.1 SSA's top 10 bilateral trade partners in 2011, % of total trade**



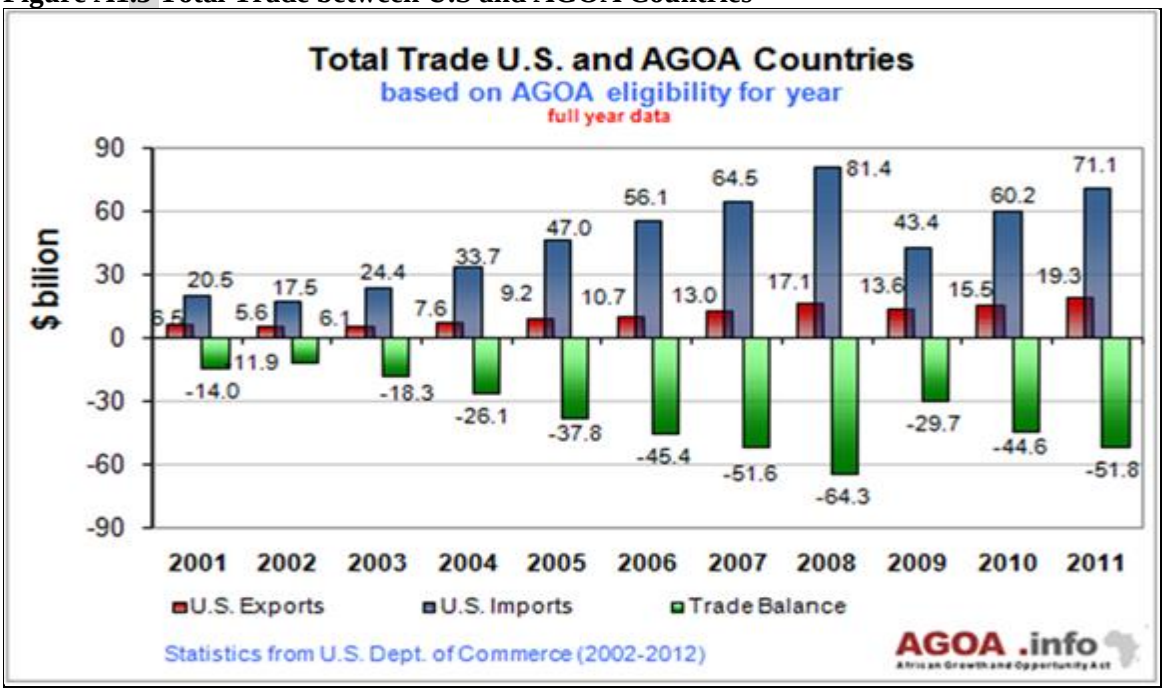

Source: Figure 2 in ''SSA bilateral trade partners'' by Cambrige African Business Network http://www.africanetwork.jbs.cam.ac.uk/ adapted from International Monetary Fund, 2011

**Figure A1.2 Map of AGOA eligible and ineligible countries**



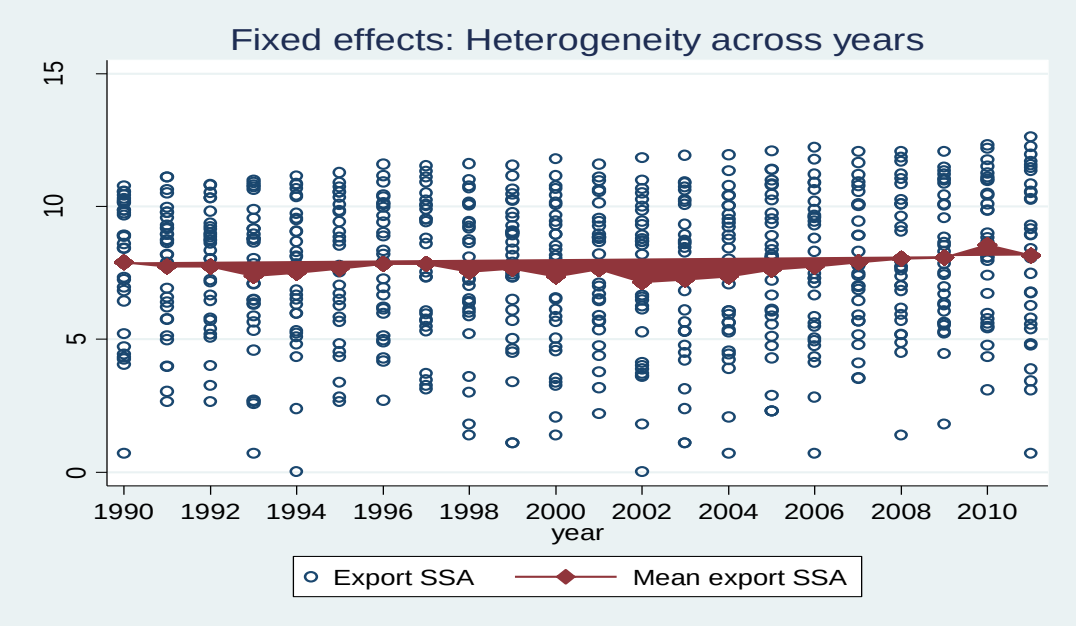

Source: Map of AGOA countries, by AGOA, http://www.agoa.info

**Figure A1.3 Total Trade between U.S and AGOA Countries**



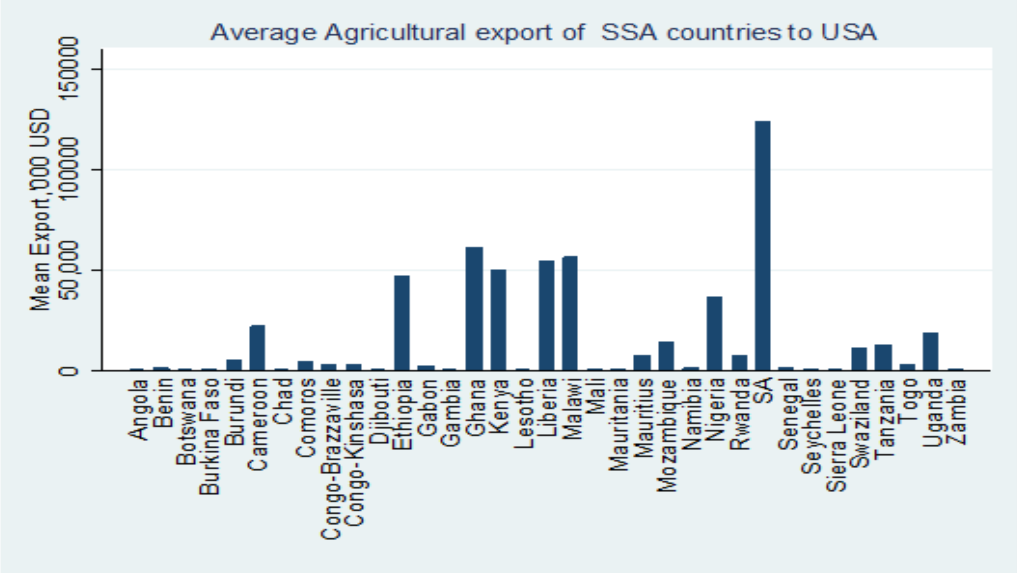

**Source:** Figure 4 in ‘’annual report of AGOA,’’ by AGOA, http://www.agoa.info

**Figure A1.4 Fixed effect-Heterogeneity across years**




Source: own analysis based on the collected data

**Figure A2.1 Average Agricultural exports of SSA countries to the United States**




Source: own analysis based on USDA/GATS data

**Table A4.1Annual Average Exports from Sub-Saharan Africa countries to the United Staes**

| Country | Agricultural Exports ($1,000) | | Non-agricultural Exports ($1,000) | | Total Exports ($1,000) | | Share of Agricultural (%) | |
|---|---|---|---|---|---|---|---|---|
| | 1996-1999 | 2000-2011 | 1996-1999 | 2000-2011 | 1996-1999 | 2000-2011 | 1996-1999 | 2000_2011 |
| Ghana | 28331.5 | 80991 | 141286.25 | 88172.17 | 678471 | 2029958 | 4.18 | 3.99 |
| SA | 421188 | 1757942 | 10652262 | 76983625 | 11073449 | 78741564 | 3.80 | 2.23 |
| Liberia | 55093 | 1100338 | 32080 | 48080 | 87173 | 1148418 | 63.20 | 95.81 |
| Ethiopia | 24720 | 187614 | 162026 | 553901 | 186746 | 741513 | 13.24 | 25.30 |
| Nigeria | 77722 | 496785 | 20676034 | 248133868 | 20753758 | 248630653 | 0.37 | 0.20 |
| Kenya | 231542 | 2712484 | 193980 | 590201 | 425524 | 3302685 | 54.41 | 82.13 |
| Cameroon | 60865 | 349711 | 190892 | 1758741 | 251758 | 2108454 | 24.18 | 16.59 |
| Malawi | 4199 | 192981 | 284044 | 629104 | 288243 | 822081 | 1.46 | 23.47 |
| Tanzania | 24876 | 208834 | 87462 | 237117 | 112338 | 445951 | 22.14 | 46.83 |
| Uganda | 6830 | 146364 | 82202 | 230215 | 89032 | 376578 | 7.67 | 38.87 |
| Rwanda | 6663 | 29273 | 13621 | 107083 | 20284 | 136356 | 32.85 | 21.47 |
| Togo | 5412 | 61923 | 13553 | 35699 | 18965 | 97625 | 28.54 | 63.43 |
| Gabon | 2893 | 26817 | 6935089 | 26406775 | 6937980 | 26433591 | 0.04 | 0.10 |
| Mozambique | 7698 | 123597 | 85446 | 122434 | 93144 | 246033 | 8.26 | 50.24 |
| Burundi | 26386 | 43609 | 3299 | 4119 | 29686 | 47726 | 88.88 | 91.37 |
| Mauritius | 48526 | 67805 | 937380 | 2757008 | 985907 | 2824813 | 4.92 | 2.40 |
| Congo(Brazzaville) | 15119 | 33062 | 1501924 | 22587213 | 1517042 | 22620277 | 1.00 | 0.15 |
| Congo (Kinshasa) | 8664 | 24960 | 932834 | 2864440 | 941496 | 2889398 | 0.92 | 0.86 |
| Swaziland | 42442 | 104732 | 94527 | 1432983 | 136970 | 1537714 | 30.99 | 6.81 |
| Comoros | 5992 | 47456 | 5359 | 1477 | 11351 | 48933 | 52.79 | 96.98 |
| Djibouti | 568 | 6151 | 80 | 24632 | 648 | 30782 | 87.65 | 19.98 |
| Burkina Faso | 2118 | 20438 | 6103 | 4477 | 8222 | 24915 | 25.76 | 82.03 |
| Zambia | 3568 | 8896 | 201494 | 321048 | 205062 | 329945 | 1.74 | 2.70 |
| Mali | 4497 | 4035 | 17047 | 60004 | 21544 | 64038 | 20.87 | 6.30 |
| Senegal | 493 | 26202 | 26180 | 152874 | 26674 | 179077 | 1.85 | 14.63 |
| Sierra Leone | 907 | 3839 | 62453 | 245895 | 63358 | 249733 | 1.43 | 1.54 |
| Chad | 832 | 927 | 23368 | 15677570 | 24200 | 15678497 | 3.44 | 0.01 |
| Benin | 19183 | 1714 | 28146 | 29532 | 47328 | 31247 | 40.53 | 5.49 |
| Namibia | 2089 | 958 | 169522 | 2187630 | 171610 | 2188591 | 1.22 | 0.04 |
| Lesotho | 0 | 148 | 362677 | 4153730 | 362677 | 4153879 | 0.00 | 0.00 |
| Gambia | 35 | 389 | 7026 | 7238 | 7061 | 7626 | 0.50 | 5.10 |
| Botswana | 83 | 663 | 88102 | 1608604 | 88186 | 1609267 | 0.09 | 0.04 |
| Angola | 0 | 27 | 10147816 | 102465612 | 10147816 | 102465639 | 0.00 | 0.00 |
| Mauritania | 0 | 59 | 6699 | 197253 | 6699 | 197311 | 0.00 | 0.03 |
| Seychelles | 610 | 32 | 11938 | 120535 | 12548 | 120567 | 4.86 | 0.03 |
| **SSA** | **1140144.5** | **7871756** | **54183951.25** | **512828889.17** | **55832950** | **522561435** | **2.04** | **1.51** |

Source: Own calculation based on trade data from the U.S. Department of Commerce and the U.S. International Trade Commission

**Table A4.2 Fisher type unit-root test and Harris-Tzavalis unit root test**

Fisher-type unit-root test for export
Based on augmented Dickey-Fuller tests
---
Ho: All panels contain unit roots Number of panels = 35
Ha: At least one panel is stationary Number of periods = 22
Augmented Dickey-Fuller regressions: 1 lag

| | | Statistic | p-value |
|---|---|---|---|
| Inverse chi-squared(70) | P | 251.32 | 0.0000 |
| Inverse normal | Z | -4.50 | 0.0000 |
| Inverse logit t(179) | L* | -6.87 | 0.0000 |
| Modified inv. chi-squared | Pm | 15.32 | 0.0000 |

Therefore, we reject the null hypothesis and conclude that the series is stationary.

**xtunitroot ht lnagexp** Harris-Tzavalis unit-root test for lnagexp
Ho: Panels contain unit roots Number of panels = 666
Ha: Panels are stationary Number of periods = 21
AR parameter: Common Asymptotics: N -> Infinity
Panel means: Included T Fixed
Time trend: Included

| | Statistic | z | p-value |
|---|---|---|---|
| Rho | 0.7534 | -21.032 | 0.0000 |

**Rho*-statistic is significant at all the usual testing levels and the null hypothesis of panel contain unit roots is rejected, therefore we conclude that panel is stationary.

**Table A4.3White's test for Heteroscedasticity**

| Source | chi2 | df | p |
|---|---|---|---|
| Heteroskedasticity | 21.58 | 8 | 0.006 |

**Table A4.4 Individual Country Effect Estimation**

| | | | | | |
|---|---|---|---|---|---|
| Model | 3811 | 37 | 103 | F( 37, 628) | =71.41 |
| Residual | 906 | 628 | 1.44 | Prob > F | =0.000 |
| Total | 4717 | 665 | 7.09 | R-squared | =0.808 |
| | | | | Adj R-squared | =0.7967 |
| | | | | Root MSE | =1.201 |

| lnexag | Coef. | Std. Err. | t | P>t | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| lnGDPC_SSA | 1.346 | 0.301 | 4.45 | 0.000 | 0.801 | 1.981 |
| lnGDPC_USA | 0.221 | 0.938 | 0.24 | 0.828 | -1.639 | 2.047 |
| AGOA | 0.223 | 0.208 | -1.07 | 0.282 | -0.185 | 0.633 |
| Benin | 3.176 | 0.901 | 3.52 | 0.000 | 1.409 | 4.950 |
| Botswana | 0.0150 | 1.104 | 0.01 | 0.939 | -2.253 | 2.085 |
| Burkina Faso | 5.216 | 0.916 | 5.69 | 0.000 | 3.436 | 7.035 |
| Burundi | 8.400 | 0.931 | 9.02 | 0.000 | 6.614 | 10.269 |
| Cameroon | 8.127 | 0.901 | 9.01 | 0.000 | 6.333 | 9.873 |
| Chad | 4.276 | 0.924 | 4.62 | 0.000 | 2.486 | 6.116 |
| Comoros | 6.960 | 0.888 | 7.84 | 0.000 | 5.215 | 8.702 |
| Congo-Brazzavill | 8.079 | 0.961 | 8.40 | 0.000 | 6.246 | 10.021 |
| Congo-Kinshasa | 5.332 | 0.949 | 5.61 | 0.000 | 3.418 | 7.145 |
| Djibouti | 3.068 | 0.938 | 3.25 | 0.001 | 1.352 | 5.035 |
| Ethiopia | 10.88 | 0.933 | 11.64 | 0.000 | 9.086 | 12.752 |
| Gabon | 2.704 | 1.160 | 2.32 | 0.026 | 0.313 | 4.868 |
| Gambia | 1.215 | 0.926 | 1.31 | 0.198 | -0.626 | 3.010 |
| Ghana | 10.10 | 0.892 | 11.32 | 0.000 | 8.363 | 11.866 |
| Kenya | 9.616 | 0.890 | 10.81 | 0.000 | 7.861 | 11.355 |
| Lesotho | 2.801 | 1.005 | 2.79 | 0.006 | 0.823 | 4.771 |
| Liberia | 10.00 | 0.924 | 10.82 | 0.000 | 8.228 | 11.856 |
| Malawi | 11.14 | 0.926 | 12.03 | 0.000 | 9.365 | 13.002 |
| Mali | 5.138 | 0.900 | 5.71 | 0.000 | 3.392 | 6.926 |
| Mauritania | 1.746 | 0.969 | 1.80 | 0.075 | -0.173 | 3.633 |
| Mauritius | 4.458 | 1.133 | 3.92 | 0.000 | 2.125 | 6.576 |
| Mozambique | 8.844 | 0.894 | 9.88 | 0.000 | 7.103 | 10.616 |
| Namibia | 2.155 | 1.040 | 2.07 | 0.047 | 0.030 | 4.116 |
| Nigeria | 9.117 | 0.889 | 10.26 | 0.000 | 7.366 | 10.856 |
| Rwanda | 7.803 | 0.895 | 8.72 | 0.000 | 6.062 | 9.576 |
| SA | 7.516 | 1.105 | 6.78 | 0.000 | 5.246 | 9.587 |
| Senegal | 4.425 | 0.893 | 4.95 | 0.000 | 2.656 | 6.164 |
| Seychelles | -1.876 | 1.302 | 1.44 | 0.123 | -4.568 | 0.544 |
| Sierra Leone | 5.547 | 0.901 | 6.15 | 0.000 | 3.800 | 7.339 |
| Swaziland | 6.098 | 0.988 | 6.16 | 0.000 | 4.091 | 7.973 |
| Tanzania | 8.316 | 0.888 | 9.36 | 0.000 | 6.574 | 10.062 |
| Togo | 6.395 | 0.893 | 7.16 | 0.000 | 4.656 | 8.163 |
| Uganda | 9.216 | 0.893 | 10.32 | 0.000 | 7.476 | 10.983 |
| Zambia | 5.450 | 0.888 | 6.14 | 0.000 | 3.706 | 7.194 |
| _cons | -9.171 | 9.742 | -0.96 | 0.331 | -28.615 | 9.647 |

**Appendix-B**

**Equations**

The two-step procedure first estimates the bivariate selection equation using a Probit model and generates the inverse of the Mills ratio.

Greene (2003) and Hoffmann and Kassouf (2005) show that $\lambda(\alpha_u)$ is the inverse Mills ratio (IMR), defined as:

$$\lambda(\alpha_u) = \frac{\phi(\ell_{ijt} = \theta' X_i + u_i / \sigma_u)}{\Phi(\ell_{ijt} = \theta' X_i + u_i / \sigma_u)} \qquad (7)$$

$T_{ij}$ is assumed to have a non-negative integer value so that it ensures that it is zero or positive and has the probability mass function;

$$\Pr[T_{ij}] = \frac{Exp(-\mu_{ij})\mu_{ij}^{T_{ij}}}{T_{ij}}, \qquad \text{where } T_{ij} = 0,1 \qquad (8)$$

The conditional mean $\mu_{ij}$ become;

$$\mu_{ij} = Exp(\alpha_0 + \beta' X_{ij} + \eta_i + \tau_i) \qquad (9)$$

$X_{ij}$ is the vector of explanatory variables defined previously and $\beta$ is the corresponding parameter vector for $X$ . $\eta_i$ and $\tau_i$ are effects specific to exporting and importing country respectively.

The probability mass function of the negative binomial distribution (NB) is defined as

$$\Pr[T_{ij}] = \frac{\Gamma(T_{ij} + \alpha^{-1})}{T_{ij}!\Gamma(\alpha^{-1})}\left(\frac{\alpha^{-1}}{\alpha^{-1} + \mu_{ij}}\right)^{\alpha^{-1}}\left(\frac{\mu_{ij}}{\alpha^{-1} + \mu_{ij}}\right)^{T_{ij}} \qquad (10)$$

$\Gamma$ is the gamma function, and $\alpha$ is a parameter that determines the degree of dispersion in predictions. According to Burger et.al (2009), the larger $\alpha$ is, the larger the degree of over dispersion in the data.

The probability mass functions of the first part and second part of the zero inflated Poisson (ZIP) model are as Eqs. (12) and (13), respectively

$$\Pr[T_{ij}] = \psi_{ij} + (1-\psi_{ij})\exp(-\mu_{ij}) \ , \quad \text{if} \quad T_{ij} = 0 \tag{11}$$

$$\Pr[T_{ij}] = (1-\psi_{ij})\frac{\exp(-\mu_{ij})\mu_{ij}^{T_{ij}}}{T_{ij}!} \ , \quad \text{if} \quad T_{ij} \succ 0 \tag{12}$$

$\psi_{ij}$ is the proportion of zero trade observations in the study sample, $0 \le \psi_{ij} \le 1$. When $\psi_{ij} = 0$, the ZIP model reduces to the Poisson model.

According to Burger et al. (2009), in the presence of both over-dispersion and zero inflated problems in the study sample, a zero-inflated negative binomial (ZINB) model can be defined in a similar fashion to the ZIP model:

$$\Pr[T_{ij}] = \psi_{ij} + (1-\psi_{ij})\left(\frac{\alpha^{-1}}{\alpha^{-1}+\mu_{ij}}\right)^{\alpha^{-1}} \ , \quad \text{if} \ \ T_{ij} = 0 \tag{13}$$

$$\Pr[T_{ij}] = (1-\psi_{ij})\frac{\Gamma(T_{ij}+\alpha^{-1})}{T_{ij}!\Gamma(\alpha^{-1})}\left(\frac{\alpha^{-1}}{\alpha^{-1}+\mu_{ij}}\right)^{\alpha^{-1}}\left(\frac{\mu_{ij}}{\alpha^{-1}+\mu_{ij}}\right)^{T_{ij}} \ , \quad \text{if} \ \ T_{ij} \succ 0 \tag{14}$$

# Appendix-C

## Table C. Research Data

| Year | country | EXP AGR.VALUE | SSA GDP per capita | US GDP per capita | Agriculture, value added (current US$) | Agricultural land (% of land area) | Real exchange rate (LCU per US$, period average) | AGOA-Dummy |
|---|---|---|---|---|---|---|---|---|
| 1990 | Ghana | 38,196 | 221 | 28298.45 | 2641154319 | 55.40 | 0.03 | 0 |
| 1990 | SA | 1,517 | 3152 | 28298.45 | 4709118543 | 79.71 | 2.59 | 0 |
| 1990 | Liberia | 26,390 | 192 | 28298.45 | 209000000 | 25.88 | 1.00 | 0 |
| 1990 | Ethiopia | 34,189 | 128 | 28298.45 | 6241685678 | 27.30 | 2.07 | 0 |
| 1990 | Nigeria | 27,524 | 359 | 28298.45 | 0.006 | 79.14 | 8.04 | 0 |
| 1990 | Kenya | 39,113 | 450 | 28298.45 | 2170018431 | 47.04 | 22.91 | 0 |
| 1990 | Cameroon | 17,511 | 665 | 28298.45 | 2675806850 | 19.40 | 272.26 | 0 |
| 1990 | Malawi | 47,770 | 133 | 28298.45 | 723774762.4 | 44.74 | 2.73 | 0 |
| 1990 | Tanzania | 7,303 | 305 | 28298.45 | 1790671137 | 38.38 | 195.06 | 0 |
| 1990 | Uganda | 15,829 | 186 | 28298.45 | 2293509208 | 59.87 | 428.85 | 0 |
| 1990 | Rwanda | 29,563 | 235 | 28298.45 | 829983280.4 | 76.17 | 83.70 | 0 |
| 1990 | Togo | 940 | 284 | 28298.45 | 549661317.6 | 58.65 | 272.26 | 0 |
| 1990 | Gabon | 7,136 | 4627 | 28298.45 | 435972645.9 | 20.01 | 272.26 | 0 |
| 1990 | Mozambique | 19,403 | 184 | 28298.45 | 840051054.9 | 60.63 | 0.93 | 0 |
| 1990 | Burundi | 7,509 | 182 | 28298.45 | 578015240.4 | 82.75 | 171.26 | 0 |
| 1990 | Mauritius | 18,868 | 2575 | 28298.45 | 288896264.7 | 55.67 | 14.86 | 0 |
| 1990 | Congo (Brazzaville) | 5,424 | 210 | 28298.45 | 2818946160 | 10.08 | 0.00 | 0 |
| 1990 | Congo (Kinshasa) | 4,506 | 1170 | 28298.45 | 359943717.8 | 30.81 | 272.26 | 0 |
| 1990 | Swaziland | 25,463 | 1320 | 28298.45 | 98915480.41 | 71.98 | 2.59 | 0 |
| 1990 | Comoros | 4,595 | 413 | 28298.45 | 103565500.2 | 68.82 | 272.26 | 0 |
| 1990 | Djibouti | 0 | 1174 | 28298.45 | 12086360.55 | 56.04 | 177.72 | 0 |
| 1990 | Burkina Faso | 0 | 167 | 28298.45 | 866816743.2 | 35.00 | 272.26 | 0 |
| 1990 | Zambia | 112 | 387 | 28298.45 | 598570217.5 | 27.99 | 30.29 | 0 |
| 1990 | Mali | 71 | 188 | 28298.45 | 1067412540 | 26.33 | 272.26 | 0 |
| 1990 | Senegal | 1,396 | 477 | 28298.45 | 1023775012 | 46.07 | 272.26 | 0 |
| 1990 | Sierra Leone | 1,048 | 255 | 28298.45 | 286029664.9 | 39.44 | 151.45 | 0 |
| 1990 | Chad | 0 | 184 | 28298.45 | 484876501.9 | 38.36 | 272.26 | 0 |
| 1990 | Benin | 181 | 296 | 28298.45 | 665663313.2 | 20.52 | 272.26 | 0 |
| 1990 | Namibia | 84 | 1831 | 28298.45 | 248133107.6 | 46.96 | 2.59 | 0 |
| 1990 | Lesotho | 75 | 308 | 28298.45 | 120409746 | 76.45 | 2.59 | 0 |
| 1990 | Gambia | 57 | 586 | 28298.45 | 77186269.77 | 63.70 | 7.88 | 0 |
| 1990 | Botswana | 627 | 2336 | 28298.45 | 171569933.9 | 45.91 | 1.86 | 0 |
| 1990 | Angola | 2 | 373 | 28298.45 | 1840474644 | 46.04 | 0.00 | 0 |
| 1990 | Mauritania | 0 | 487 | 28298.45 | 270751393.9 | 38.47 | 80.61 | 0 |
| 1990 | Seychelles | 0 | 5645 | 28298.45 | 17725645.97 | 8.70 | 5.34 | 0 |
| 1991 | Ghana | 66,572 | 226 | 27849.88 | 3005116442 | 55.90 | 0.04 | 0 |
| 1991 | SA | 6,114 | 3056 | 27849.88 | 5006672708 | 80.20 | 2.76 | 0 |
| 1991 | Liberia | 6,289 | 168 | 27849.88 | 193500000 | 25.96 | 1.00 | 0 |
| 1991 | Ethiopia | 10,822 | 115 | 27849.88 | 8181922582 | 28.20 | 2.07 | 0 |
| 1991 | Nigeria | 37,053 | 366 | 27849.88 | 0.007 | 79.42 | 9.91 | 0 |
| 1991 | Kenya | 41,831 | 442 | 27849.88 | 1982454174 | 47.22 | 27.51 | 0 |
| 1991 | Cameroon | 7,776 | 622 | 27849.88 | 3016456726 | 19.36 | 282.11 | 0 |
| 1991 | Malawi | 66,411 | 141 | 27849.88 | 873653796.4 | 45.82 | 2.80 | 0 |
| 1991 | Tanzania | 9,848 | 301 | 27849.88 | 2173720640 | 38.39 | 219.16 | 0 |
| 1991 | Uganda | 17,791 | 190 | 27849.88 | 1640022103 | 60.22 | 734.01 | 0 |
| 1991 | Rwanda | 5,658 | 237 | 27849.88 | 614248900.7 | 76.08 | 125.16 | 0 |
| 1991 | Togo | 600 | 276 | 27849.88 | 525941629.4 | 58.74 | 282.11 | 0 |
| 1991 | Gabon | 3,647 | 4753 | 27849.88 | 411900582.3 | 20.01 | 282.11 | 0 |
| 1991 | Mozambique | 21,177 | 189 | 27849.88 | 1026241908 | 60.70 | 1.43 | 0 |
| 1991 | Burundi | 7,814 | 187 | 27849.88 | 567331265.5 | 82.75 | 181.51 | 0 |
| 1991 | Mauritius | 14,352 | 2660 | 27849.88 | 284800402.3 | 55.67 | 15.65 | 0 |
| 1991 | Congo | 21 | 185 | 27849.88 | 3756615491 | 10.09 | 0.00 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (Brazzaville) | | | | | | | |
| 1991 | Congo (Kinshasa) | 3,529 | 1166 | 27849.88 | 308393723.4 | 30.81 | 282.11 | 0 |
| 1991 | Swaziland | 17,842 | 1306 | 27849.88 | 113875665.3 | 71.34 | 2.76 | 0 |
| 1991 | Comoros | 9,398 | 382 | 27849.88 | 97885706.23 | 71.51 | 282.10 | 0 |
| 1991 | Djibouti | 0 | 1086 | 27849.88 | 12884240.41 | 57.64 | 177.72 | 0 |
| 1991 | Burkina Faso | 14 | 177 | 27849.88 | 934035499.9 | 34.90 | 282.11 | 0 |
| 1991 | Zambia | 720 | 377 | 27849.88 | 534006816.9 | 28.01 | 64.64 | 0 |
| 1991 | Mali | 321 | 187 | 27849.88 | 1032190071 | 26.33 | 282.11 | 0 |
| 1991 | Senegal | 2,684 | 475 | 27849.88 | 1017502212 | 45.23 | 282.11 | 0 |
| 1991 | Sierra Leone | 169 | 260 | 27849.88 | 286604607.8 | 39.44 | 295.34 | 0 |
| 1991 | Chad | 0 | 194 | 27849.88 | 666531592.7 | 38.40 | 282.11 | 0 |
| 1991 | Benin | 146 | 300 | 27849.88 | 682152635.5 | 20.61 | 282.11 | 0 |
| 1991 | Namibia | 1,017 | 1913 | 27849.88 | 280301233.3 | 46.96 | 2.76 | 0 |
| 1991 | Lesotho | 54 | 309 | 27849.88 | 97537127.13 | 76.52 | 2.76 | 0 |
| 1991 | Gambia | 53 | 583 | 27849.88 | 125352701.5 | 64.60 | 8.73 | 0 |
| 1991 | Botswana | 495 | 2437 | 27849.88 | 172575632.8 | 45.70 | 2.02 | 0 |
| 1991 | Angola | 0 | 357 | 27849.88 | 2929674094 | 46.08 | 0.00 | 0 |
| 1991 | Mauritania | 318 | 483 | 27849.88 | 500825230.5 | 38.48 | 81.95 | 0 |
| 1991 | Seychelles | 0 | 5739 | 27849.88 | 17916666.67 | 8.70 | 5.29 | 0 |
| 1992 | Ghana | 30,162 | 228 | 28401.47 | 2873059928 | 55.90 | 0.04 | 0 |
| 1992 | SA | 49,701 | 2929 | 28401.47 | 4577817373 | 80.20 | 2.85 | 0 |
| 1992 | Liberia | 9,341 | 111 | 28401.47 | 114600000 | 25.96 | 1.00 | 0 |
| 1992 | Ethiopia | 8,081 | 101 | 28401.47 | 6937961643 | 28.90 | 2.80 | 0 |
| 1992 | Nigeria | 30,228 | 368 | 28401.47 | 0.008 | 79.42 | 17.30 | 0 |
| 1992 | Kenya | 37,508 | 424 | 28401.47 | 2034325774 | 47.22 | 32.22 | 0 |
| 1992 | Cameroon | 6,888 | 586 | 28401.47 | 3029101434 | 19.36 | 264.69 | 0 |
| 1992 | Malawi | 50,692 | 129 | 28401.47 | 628621727.2 | 45.82 | 3.60 | 0 |
| 1992 | Tanzania | 6,175 | 293 | 28401.47 | 2057055331 | 38.39 | 297.71 | 0 |
| 1992 | Uganda | 11,696 | 190 | 28401.47 | 1377378762 | 60.22 | 1133.83 | 0 |
| 1992 | Rwanda | 2,435 | 267 | 28401.47 | 674400169.3 | 76.08 | 133.94 | 0 |
| 1992 | Togo | 639 | 260 | 28401.47 | 596992341.1 | 58.74 | 264.69 | 0 |
| 1992 | Gabon | 3,093 | 4459 | 28401.47 | 461449881.2 | 20.01 | 264.69 | 0 |
| 1992 | Mozambique | 18,507 | 174 | 28401.47 | 657113528.8 | 60.70 | 2.52 | 0 |
| 1992 | Burundi | 6,331 | 185 | 28401.47 | 519907053.9 | 82.75 | 208.30 | 0 |
| 1992 | Mauritius | 1,405 | 2796 | 28401.47 | 322834348.5 | 55.67 | 15.56 | 0 |
| 1992 | Congo (Brazzaville) | 3,048 | 159 | 28401.47 | 4022689463 | 10.09 | 0.00 | 0 |
| 1992 | Congo (Kinshasa) | 5,595 | 1165 | 28401.47 | 338129098.6 | 30.81 | 264.69 | 0 |
| 1992 | Swaziland | 7,480 | 1318 | 28401.47 | 99255577.78 | 71.34 | 2.85 | 0 |
| 1992 | Comoros | 10,261 | 404 | 28401.47 | 105172263.8 | 71.51 | 264.69 | 0 |
| 1992 | Djibouti | 0 | 1063 | 28401.47 | 13838545.23 | 57.64 | 177.72 | 0 |
| 1992 | Burkina Faso | 0 | 173 | 28401.47 | 645416025.7 | 34.90 | 264.69 | 0 |
| 1992 | Zambia | 304 | 361 | 28401.47 | 676905864.2 | 28.01 | 172.21 | 0 |
| 1992 | Mali | 223 | 198 | 28401.47 | 1247998128 | 26.33 | 264.69 | 0 |
| 1992 | Senegal | 1,304 | 467 | 28401.47 | 999161542.6 | 45.23 | 264.69 | 0 |
| 1992 | Sierra Leone | 781 | 211 | 28401.47 | 244052863.4 | 39.44 | 499.44 | 0 |
| 1992 | Chad | 179 | 203 | 28401.47 | 645935609 | 38.40 | 264.69 | 0 |
| 1992 | Benin | 158 | 301 | 28401.47 | 584678550.4 | 20.61 | 264.69 | 0 |
| 1992 | Namibia | 4,266 | 1986 | 28401.47 | 234571078.5 | 46.96 | 2.85 | 0 |
| 1992 | Lesotho | 14 | 326 | 28401.47 | 122475455.9 | 76.52 | 2.85 | 0 |
| 1992 | Gambia | 0 | 584 | 28401.47 | 123749472.4 | 64.60 | 8.90 | 0 |
| 1992 | Botswana | 330 | 2438 | 28401.47 | 192096799.8 | 45.70 | 2.11 | 0 |
| 1992 | Angola | 0 | 322 | 28401.47 | 585919300.2 | 46.08 | 0.00 | 0 |
| 1992 | Mauritania | 55 | 478 | 28401.47 | 507187422.1 | 38.48 | 87.03 | 0 |
| 1992 | Seychelles | 26 | 6073 | 28401.47 | 16595080.05 | 8.70 | 5.12 | 0 |
| 1993 | Ghana | 54,728 | 233 | 28834.56 | 2204368462 | 55.90 | 0.06 | 0 |
| 1993 | SA | 59,247 | 2903 | 28834.56 | 4983258266 | 80.61 | 3.27 | 0 |
| 1993 | Liberia | 648 | 75 | 28834.56 | 81200000 | 25.96 | 1.00 | 0 |
| 1993 | Ethiopia | 19,698 | 111 | 28834.56 | 4684682825 | 29.80 | 5.00 | 0 |
| 1993 | Nigeria | 45,748 | 367 | 28834.56 | 0.009 | 79.56 | 22.07 | 0 |
| 1993 | Kenya | 41,887 | 412 | 28834.56 | 1541939726 | 47.57 | 58.00 | 0 |
| 1993 | Cameroon | 7,833 | 552 | 28834.56 | 2629412649 | 19.38 | 283.16 | 0 |
| 1993 | Malawi | 49,484 | 141 | 28834.56 | 927293859.2 | 45.29 | 4.40 | 0 |
| 1993 | Tanzania | 5,770 | 287 | 28834.56 | 1908508733 | 38.38 | 405.27 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1993 | Uganda | 9,451 | 199 | 28834.56 | 1554985263 | 60.32 | 1195.02 | 0 |
| 1993 | Rwanda | 576 | 265 | 28834.56 | 665092083.3 | 74.46 | 144.24 | 0 |
| 1993 | Togo | 286 | 217 | 28834.56 | 544510533.1 | 58.74 | 283.16 | 0 |
| 1993 | Gabon | 552 | 4489 | 28834.56 | 371494358.1 | 20.03 | 283.16 | 0 |
| 1993 | Mozambique | 6,534 | 182 | 28834.56 | 749101028.7 | 60.72 | 3.87 | 0 |
| 1993 | Burundi | 1,174 | 171 | 28834.56 | 442751235.6 | 83.14 | 242.78 | 0 |
| 1993 | Mauritius | 13,987 | 2904 | 28834.56 | 298629986.7 | 55.67 | 17.65 | 0 |
| 1993 | Congo (Brazzaville) | 3,073 | 132 | 28834.56 | 5494093943 | 10.10 | 0.00 | 0 |
| 1993 | Congo (Kinshasa) | 2,549 | 1124 | 28834.56 | 215855742.9 | 30.82 | 283.16 | 0 |
| 1993 | Swaziland | 6,480 | 1332 | 28834.56 | 120531629.6 | 71.10 | 3.27 | 0 |
| 1993 | Comoros | 9,543 | 406 | 28834.56 | 103082997.1 | 71.51 | 283.16 | 0 |
| 1993 | Djibouti | 0 | 977 | 28834.56 | 14605477.7 | 59.15 | 177.72 | 0 |
| 1993 | Burkina Faso | 0 | 174 | 28834.56 | 704993567.3 | 34.81 | 283.16 | 0 |
| 1993 | Zambia | 671 | 377 | 28834.56 | 997723633.8 | 28.34 | 452.76 | 0 |
| 1993 | Mali | 99 | 189 | 28834.56 | 1127464980 | 26.42 | 283.16 | 0 |
| 1993 | Senegal | 207 | 459 | 28834.56 | 1059236400 | 45.55 | 283.16 | 0 |
| 1993 | Sierra Leone | 355 | 216 | 28834.56 | 309850220.3 | 39.30 | 567.46 | 0 |
| 1993 | Chad | 15 | 166 | 28834.56 | 459070008.9 | 38.41 | 283.16 | 0 |
| 1993 | Benin | 2 | 301 | 28834.56 | 711052745.6 | 20.75 | 283.16 | 0 |
| 1993 | Namibia | 6,339 | 1889 | 28834.56 | 241145108.8 | 46.96 | 3.27 | 0 |
| 1993 | Lesotho | 0 | 331 | 28834.56 | 126254594.3 | 76.94 | 3.27 | 0 |
| 1993 | Gambia | 0 | 584 | 28834.56 | 129915607.5 | 61.20 | 9.11 | 0 |
| 1993 | Botswana | 1,226 | 2417 | 28834.56 | 188087450.9 | 45.61 | 2.42 | 0 |
| 1993 | Angola | 0 | 235 | 28834.56 | 610895700.6 | 46.12 | 0.00 | 0 |
| 1993 | Mauritania | 13 | 493 | 28834.56 | 434456898.7 | 38.50 | 120.81 | 0 |
| 1993 | Seychelles | 14 | 6356 | 28834.56 | 19781801.9 | 8.70 | 5.18 | 0 |
| 1994 | Ghana | 13,271 | 234 | 29655.07 | 2058215181 | 56.25 | 0.10 | 0 |
| 1994 | SA | 69,674 | 2934 | 29655.07 | 5703506185 | 81.02 | 3.55 | 0 |
| 1994 | Liberia | 952 | 58 | 29655.07 | 69300000 | 25.96 | 1.00 | 0 |
| 1994 | Ethiopia | 31,789 | 111 | 29655.07 | 4002165076 | 30.54 | 5.47 | 0 |
| 1994 | Nigeria | 43,100 | 359 | 29655.07 | 0.003 | 79.69 | 22.00 | 0 |
| 1994 | Kenya | 50,691 | 411 | 29655.07 | 2009727465 | 47.16 | 56.05 | 0 |
| 1994 | Cameroon | 8,730 | 525 | 29655.07 | 2062794063 | 19.38 | 555.20 | 0 |
| 1994 | Malawi | 52,644 | 126 | 29655.07 | 264028843.9 | 45.29 | 8.74 | 0 |
| 1994 | Tanzania | 4,073 | 282 | 29655.07 | 1875834152 | 38.38 | 509.63 | 0 |
| 1994 | Uganda | 34,395 | 205 | 29655.07 | 1842375740 | 60.47 | 979.45 | 0 |
| 1994 | Rwanda | 163 | 140 | 29655.07 | 375000008.1 | 70.13 | 140.70 | 0 |
| 1994 | Togo | 186 | 244 | 29655.07 | 343160715.4 | 60.67 | 555.20 | 0 |
| 1994 | Gabon | 779 | 4514 | 29655.07 | 380778479.8 | 20.03 | 555.20 | 0 |
| 1994 | Mozambique | 14,105 | 187 | 29655.07 | 700799013.8 | 60.72 | 6.04 | 0 |
| 1994 | Burundi | 3,258 | 162 | 29655.07 | 376786470.5 | 83.14 | 252.66 | 0 |
| 1994 | Mauritius | 8,627 | 2982 | 29655.07 | 308351935 | 55.67 | 17.96 | 0 |
| 1994 | Congo (Brazzaville) | 11 | 122 | 29655.07 | 3291077565 | 10.10 | 0.01 | 0 |
| 1994 | Congo (Kinshasa) | 2,560 | 1034 | 29655.07 | 182491252 | 30.83 | 555.20 | 0 |
| 1994 | Swaziland | 17,196 | 1338 | 29655.07 | 162198448.9 | 71.05 | 3.55 | 0 |
| 1994 | Comoros | 5,975 | 376 | 29655.07 | 69877719.47 | 71.51 | 416.40 | 0 |
| 1994 | Djibouti | 1 | 953 | 29655.07 | 15715644.8 | 60.44 | 177.72 | 0 |
| 1994 | Burkina Faso | 0 | 171 | 29655.07 | 624461273.2 | 34.72 | 555.20 | 0 |
| 1994 | Zambia | 548 | 336 | 29655.07 | 451443460.5 | 28.52 | 669.37 | 0 |
| 1994 | Mali | 393 | 185 | 29655.07 | 746838949.8 | 27.15 | 555.20 | 0 |
| 1994 | Senegal | 122 | 446 | 29655.07 | 669953780 | 45.54 | 555.20 | 0 |
| 1994 | Sierra Leone | 206 | 214 | 29655.07 | 341010738 | 39.25 | 586.74 | 0 |
| 1994 | Chad | 675 | 177 | 29655.07 | 439118990.1 | 38.44 | 555.20 | 0 |
| 1994 | Benin | 77 | 304 | 29655.07 | 500712499 | 20.97 | 555.20 | 0 |
| 1994 | Namibia | 3,432 | 1970 | 29655.07 | 371465794.4 | 47.01 | 3.55 | 0 |
| 1994 | Lesotho | 0 | 343 | 29655.07 | 128048432.8 | 76.88 | 3.55 | 0 |
| 1994 | Gambia | 0 | 569 | 29655.07 | 143556215 | 61.10 | 9.58 | 0 |
| 1994 | Botswana | 395 | 2439 | 29655.07 | 177097896.7 | 45.79 | 2.68 | 0 |
| 1994 | Angola | 0 | 235 | 29655.07 | 269800959.5 | 46.12 | 0.00 | 0 |
| 1994 | Mauritania | 0 | 464 | 29655.07 | 446077292 | 38.51 | 123.58 | 0 |
| 1994 | Seychelles | 0 | 6202 | 29655.07 | 20118811.88 | 8.70 | 5.06 | 0 |
| 1995 | Ghana | 55,200 | 237 | 30050.99 | 2506799193 | 56.69 | 0.12 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1995 | SA | 79,525 | 2960 | 30050.99 | 5325764406 | 81.52 | 3.63 | 0 |
| 1995 | Liberia | 294 | 55 | 30050.99 | 110300000 | 25.96 | 1.00 | 0 |
| 1995 | Ethiopia | 30,722 | 114 | 30050.99 | 4185708796 | 30.47 | 6.16 | 0 |
| 1995 | Nigeria | 38,307 | 359 | 30050.99 | 0.004 | 79.82 | 21.90 | 0 |
| 1995 | Kenya | 46,094 | 416 | 30050.99 | 2383670956 | 47.85 | 51.43 | 0 |
| 1995 | Cameroon | 18,841 | 528 | 30050.99 | 1918648334 | 19.38 | 499.15 | 0 |
| 1995 | Malawi | 38,325 | 146 | 30050.99 | 375415974.3 | 43.17 | 15.28 | 0 |
| 1995 | Tanzania | 6,876 | 283 | 30050.99 | 2293922689 | 38.38 | 574.76 | 0 |
| 1995 | Uganda | 12,546 | 222 | 30050.99 | 2607120432 | 60.57 | 968.92 | 0 |
| 1995 | Rwanda | 832 | 191 | 30050.99 | 569161298.7 | 60.19 | 262.18 | 0 |
| 1995 | Togo | 527 | 256 | 30050.99 | 494460274.2 | 60.67 | 499.15 | 0 |
| 1995 | Gabon | 666 | 4601 | 30050.99 | 398278327 | 20.03 | 499.15 | 0 |
| 1995 | Mozambique | 23,941 | 186 | 30050.99 | 759614205.6 | 60.78 | 9.02 | 0 |
| 1995 | Burundi | 18,094 | 147 | 30050.99 | 420406953.9 | 83.14 | 249.76 | 0 |
| 1995 | Mauritius | 6,024 | 3083 | 30050.99 | 371635509.6 | 55.17 | 17.39 | 0 |
| 1995 | Congo (Brazzaville) | 0 | 119 | 30050.99 | 3191026267 | 10.10 | 0.07 | 0 |
| 1995 | Congo (Kinshasa) | 5,107 | 1046 | 30050.99 | 221176696.7 | 30.80 | 499.15 | 0 |
| 1995 | Swaziland | 8,656 | 1375 | 30050.99 | 171247151.1 | 71.05 | 3.63 | 0 |
| 1995 | Comoros | 1,898 | 380 | 30050.99 | 94826572.38 | 71.51 | 374.36 | 0 |
| 1995 | Djibouti | 0 | 900 | 30050.99 | 14106380.78 | 60.44 | 177.72 | 0 |
| 1995 | Burkina Faso | 0 | 176 | 30050.99 | 790407168.8 | 34.47 | 499.15 | 0 |
| 1995 | Zambia | 345 | 318 | 30050.99 | 563585153.8 | 28.89 | 864.12 | 0 |
| 1995 | Mali | 94 | 192 | 30050.99 | 1082368050 | 28.88 | 499.15 | 0 |
| 1995 | Senegal | 126 | 457 | 30050.99 | 923952005.7 | 45.61 | 499.15 | 0 |
| 1995 | Sierra Leone | 2,409 | 197 | 30050.99 | 347917108.1 | 39.23 | 755.22 | 0 |
| 1995 | Chad | 77 | 174 | 30050.99 | 506919041.4 | 38.45 | 499.15 | 0 |
| 1995 | Benin | 17 | 308 | 30050.99 | 683808264.9 | 21.70 | 499.15 | 0 |
| 1995 | Namibia | 1,129 | 1992 | 30050.99 | 375783859.5 | 47.07 | 3.63 | 0 |
| 1995 | Lesotho | 0 | 343 | 30050.99 | 142542042.1 | 76.71 | 3.63 | 0 |
| 1995 | Gambia | 14 | 558 | 30050.99 | 167879655.2 | 63.00 | 9.54 | 0 |
| 1995 | Botswana | 29 | 2483 | 30050.99 | 193321653.2 | 45.87 | 2.77 | 0 |
| 1995 | Angola | 0 | 252 | 30050.99 | 368504825.8 | 46.12 | 0.00 | 0 |
| 1995 | Mauritania | 0 | 496 | 30050.99 | 483116002.4 | 38.55 | 129.77 | 0 |
| 1995 | Seychelles | 0 | 6038 | 30050.99 | 21209687.16 | 8.70 | 4.76 | 0 |
| 1996 | Ghana | 31,655 | 242 | 30827.99 | 2700749921 | 57.57 | 0.16 | 0 |
| 1996 | SA | 108,984 | 3020 | 30827.99 | 5517114002 | 81.95 | 4.30 | 0 |
| 1996 | Liberia | 148 | 58 | 30827.99 | 149800000 | 25.96 | 1.00 | 0 |
| 1996 | Ethiopia | 24,143 | 124 | 30827.99 | 4506600227 | 30.50 | 6.35 | 0 |
| 1996 | Nigeria | 33,921 | 366 | 30827.99 | 0.006 | 79.97 | 21.88 | 0 |
| 1996 | Kenya | 55,220 | 422 | 30827.99 | 3311712187 | 47.82 | 57.11 | 0 |
| 1996 | Cameroon | 21,196 | 541 | 30827.99 | 2128435199 | 19.38 | 511.55 | 0 |
| 1996 | Malawi | 70,670 | 153 | 30827.99 | 716654668 | 45.40 | 15.31 | 0 |
| 1996 | Tanzania | 4,252 | 288 | 30827.99 | 2859209853 | 38.38 | 579.98 | 0 |
| 1996 | Uganda | 15,661 | 235 | 30827.99 | 2480528662 | 60.67 | 1046.08 | 0 |
| 1996 | Rwanda | 7,234 | 207 | 30827.99 | 652314045.6 | 60.19 | 306.82 | 0 |
| 1996 | Togo | 777 | 271 | 30827.99 | 598446593.8 | 60.67 | 511.55 | 0 |
| 1996 | Gabon | 1,424 | 4636 | 30827.99 | 403868670.7 | 20.03 | 511.55 | 0 |
| 1996 | Mozambique | 25,283 | 194 | 30827.99 | 979650492 | 60.89 | 11.29 | 0 |
| 1996 | Burundi | 501 | 134 | 30827.99 | 463898280.7 | 83.53 | 302.75 | 0 |
| 1996 | Mauritius | 12,279 | 3222 | 30827.99 | 400765174.7 | 55.17 | 17.95 | 0 |
| 1996 | Congo (Brazzaville) | 2,545 | 115 | 30827.99 | 1919700276 | 10.01 | 0.50 | 0 |
| 1996 | Congo (Kinshasa) | 2,758 | 1061 | 30827.99 | 228324592.1 | 30.81 | 511.55 | 0 |
| 1996 | Swaziland | 8,291 | 1397 | 30827.99 | 193402351.1 | 71.05 | 4.30 | 0 |
| 1996 | Comoros | 2,449 | 366 | 30827.99 | 94252725.85 | 72.58 | 383.66 | 0 |
| 1996 | Djibouti | 0 | 839 | 30827.99 | 15091070.3 | 62.60 | 177.72 | 0 |
| 1996 | Burkina Faso | 3,648 | 190 | 30827.99 | 940970383.4 | 34.54 | 511.55 | 0 |
| 1996 | Zambia | 465 | 331 | 30827.99 | 506449718.2 | 28.87 | 1207.90 | 0 |
| 1996 | Mali | 1,032 | 192 | 30827.99 | 1221499341 | 29.03 | 511.55 | 0 |
| 1996 | Senegal | 135 | 454 | 30827.99 | 902280619.1 | 45.08 | 511.55 | 0 |
| 1996 | Sierra Leone | 391 | 207 | 30827.99 | 425771695.4 | 39.23 | 920.73 | 0 |
| 1996 | Chad | 66 | 172 | 30827.99 | 603527595.2 | 38.48 | 511.55 | 0 |
| 1996 | Benin | 0 | 315 | 30827.99 | 831603810.2 | 22.78 | 511.55 | 0 |

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|---|---|---|---|---|---|---|---|---|
| 1996 | Namibia | 169 | 1995 | 30827.99 | 372149364.9 | 47.15 | 4.30 | 0 |
| 1996 | Lesotho | 0 | 352 | 30827.99 | 143428711.5 | 76.55 | 4.30 | 0 |
| 1996 | Gambia | 0 | 555 | 30827.99 | 152224073.7 | 64.40 | 9.80 | 0 |
| 1996 | Botswana | 15 | 2560 | 30827.99 | 179002793.2 | 45.78 | 3.32 | 0 |
| 1996 | Angola | 0 | 272 | 30827.99 | 528873555.8 | 46.12 | 0.13 | 0 |
| 1996 | Mauritania | 0 | 510 | 30827.99 | 476053402.1 | 38.58 | 137.22 | 0 |
| 1996 | Seychelles | 74 | 6242 | 30827.99 | 19597651.23 | 8.70 | 4.97 | 0 |
| 1997 | Ghana | 12,395 | 246 | 31831.46 | 2465865128 | 58.45 | 0.20 | 0 |
| 1997 | SA | 102,366 | 3030 | 31831.46 | 5455774719 | 82.09 | 4.61 | 0 |
| 1997 | Liberia | 1,515 | 112 | 31831.46 | 227700000 | 25.96 | 1.00 | 0 |
| 1997 | Ethiopia | 66,005 | 125 | 31831.46 | 4655889587 | 30.50 | 6.71 | 0 |
| 1997 | Nigeria | 23,951 | 367 | 31831.46 | 0.008 | 78.13 | 21.89 | 0 |
| 1997 | Kenya | 55,477 | 413 | 31831.46 | 3632271591 | 46.48 | 58.73 | 0 |
| 1997 | Cameroon | 19,742 | 556 | 31831.46 | 2249475638 | 19.38 | 583.67 | 0 |
| 1997 | Malawi | 82,444 | 155 | 31831.46 | 807240736.4 | 46.46 | 16.44 | 0 |
| 1997 | Tanzania | 5,425 | 291 | 31831.46 | 3273467321 | 38.38 | 612.12 | 0 |
| 1997 | Uganda | 37,039 | 239 | 31831.46 | 2389867336 | 60.92 | 1083.01 | 0 |
| 1997 | Rwanda | 2,540 | 217 | 31831.46 | 850993780 | 62.63 | 301.53 | 0 |
| 1997 | Togo | 315 | 300 | 31831.46 | 632443178.7 | 62.51 | 583.67 | 0 |
| 1997 | Gabon | 385 | 4773 | 31831.46 | 384464237.2 | 20.03 | 583.67 | 0 |
| 1997 | Mozambique | 28,227 | 208 | 31831.46 | 1159721212 | 61.02 | 11.54 | 0 |
| 1997 | Burundi | 13,729 | 131 | 31831.46 | 445863488 | 83.72 | 352.35 | 0 |
| 1997 | Mauritius | 13,611 | 3363 | 31831.46 | 347930892.7 | 55.17 | 21.06 | 0 |
| 1997 | Congo (Brazzaville) | 6,723 | 106 | 31831.46 | 2893149297 | 10.01 | 1.31 | 0 |
| 1997 | Congo (Kinshasa) | 1,881 | 1025 | 31831.46 | 212277713.8 | 30.81 | 583.67 | 0 |
| 1997 | Swaziland | 22,588 | 1409 | 31831.46 | 186774623 | 71.05 | 4.61 | 0 |
| 1997 | Comoros | 1,543 | 371 | 31831.46 | 86735014.55 | 73.66 | 437.75 | 0 |
| 1997 | Djibouti | 0 | 806 | 31831.46 | 15417424.54 | 63.89 | 177.72 | 0 |
| 1997 | Burkina Faso | 0 | 197 | 31831.46 | 825812797.1 | 34.90 | 583.67 | 0 |
| 1997 | Zambia | 242 | 333 | 31831.46 | 642642701.3 | 29.41 | 1314.50 | 0 |
| 1997 | Mali | 41 | 200 | 31831.46 | 983590101.4 | 30.04 | 583.67 | 0 |
| 1997 | Senegal | 32 | 457 | 31831.46 | 824397284.7 | 44.93 | 583.67 | 0 |
| 1997 | Sierra Leone | 203 | 172 | 31831.46 | 487998981.2 | 39.23 | 981.48 | 0 |
| 1997 | Chad | 0 | 177 | 31831.46 | 592305385.6 | 38.52 | 583.67 | 0 |
| 1997 | Benin | 0 | 325 | 31831.46 | 808333479.6 | 24.50 | 583.67 | 0 |
| 1997 | Namibia | 299 | 2019 | 31831.46 | 353518540.3 | 47.15 | 4.61 | 0 |
| 1997 | Lesotho | 0 | 357 | 31831.46 | 139453131 | 76.61 | 4.61 | 0 |
| 1997 | Gambia | 26 | 566 | 31831.46 | 165390496.3 | 64.90 | 10.20 | 0 |
| 1997 | Botswana | 23 | 2757 | 31831.46 | 176842476 | 45.78 | 3.65 | 0 |
| 1997 | Angola | 0 | 286 | 31831.46 | 401442360.2 | 46.12 | 0.23 | 0 |
| 1997 | Mauritania | 0 | 476 | 31831.46 | 426043616.9 | 38.57 | 151.85 | 0 |
| 1997 | Seychelles | 434 | 6907 | 31831.46 | 19656443.3 | 8.70 | 5.03 | 0 |
| 1998 | Ghana | 25,649 | 252 | 32847.35 | 2694601576 | 59.89 | 0.23 | 0 |
| 1998 | SA | 111,025 | 2975 | 32847.35 | 4600704051 | 82.05 | 5.53 | 0 |
| 1998 | Liberia | 24,812 | 135 | 32847.35 | 282799997.5 | 26.16 | 41.51 | 0 |
| 1998 | Ethiopia | 44,398 | 117 | 32847.35 | 3842657988 | 30.49 | 7.12 | 0 |
| 1998 | Nigeria | 12,606 | 366 | 32847.35 | 0.009 | 76.79 | 21.89 | 0 |
| 1998 | Kenya | 47,888 | 416 | 32847.35 | 3910367802 | 46.73 | 60.37 | 0 |
| 1998 | Cameroon | 9,699 | 570 | 32847.35 | 2253380747 | 19.38 | 589.95 | 0 |
| 1998 | Malawi | 60,010 | 157 | 32847.35 | 563521909.8 | 46.99 | 31.07 | 0 |
| 1998 | Tanzania | 5,742 | 294 | 32847.35 | 2941714848 | 38.39 | 664.67 | 0 |
| 1998 | Uganda | 12,116 | 244 | 32847.35 | 2518761104 | 60.92 | 1240.31 | 0 |
| 1998 | Rwanda | 1,840 | 214 | 32847.35 | 905498677.4 | 64.65 | 312.31 | 0 |
| 1998 | Togo | 619 | 283 | 32847.35 | 554995548.2 | 63.43 | 589.95 | 0 |
| 1998 | Gabon | 416 | 4815 | 32847.35 | 314771491.5 | 20.03 | 589.95 | 0 |
| 1998 | Mozambique | 23,288 | 225 | 32847.35 | 1170465615 | 61.21 | 11.87 | 0 |
| 1998 | Burundi | 6,274 | 137 | 32847.35 | 376536126.7 | 84.11 | 447.77 | 0 |
| 1998 | Mauritius | 10,381 | 3530 | 32847.35 | 338896725.6 | 55.17 | 23.99 | 0 |
| 1998 | Congo (Brazzaville) | 1,431 | 102 | 32847.35 | 2890247931 | 9.97 | 1.61 | 0 |
| 1998 | Congo (Kinshasa) | 1,902 | 1033 | 32847.35 | 213576779.4 | 30.85 | 589.95 | 0 |
| 1998 | Swaziland | 3,293 | 1443 | 32847.35 | 173853115.3 | 71.10 | 5.53 | 0 |
| 1998 | Comoros | 590 | 366 | 32847.35 | 88159613.58 | 74.73 | 442.46 | 0 |

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|---|---|---|---|---|---|---|---|---|
| 1998 | Djibouti | 465 | 780 | 32847.35 | 15878821.92 | 64.75 | 177.72 | 0 |
| 1998 | Burkina Faso | 0 | 205 | 32847.35 | 1025575115 | 35.82 | 589.95 | 0 |
| 1998 | Zambia | 1,114 | 318 | 32847.35 | 605700139.8 | 29.56 | 1862.07 | 0 |
| 1998 | Mali | 353 | 206 | 32847.35 | 1086922095 | 30.86 | 589.95 | 0 |
| 1998 | Senegal | 36 | 472 | 32847.35 | 870188340.2 | 44.95 | 589.95 | 0 |
| 1998 | Sierra Leone | 182 | 169 | 32847.35 | 399409695.6 | 39.22 | 1563.62 | 0 |
| 1998 | Chad | 674 | 183 | 32847.35 | 680500549.1 | 38.54 | 589.95 | 0 |
| 1998 | Benin | 1,947 | 331 | 32847.35 | 891937598.9 | 26.13 | 589.95 | 0 |
| 1998 | Namibia | 1,377 | 2027 | 32847.35 | 332472065.5 | 47.15 | 5.53 | 0 |
| 1998 | Lesotho | 0 | 370 | 32847.35 | 134931267.8 | 76.71 | 5.53 | 0 |
| 1998 | Gambia | 6 | 569 | 32847.35 | 161364512 | 66.40 | 10.64 | 0 |
| 1998 | Botswana | 20 | 2986 | 32847.35 | 158966234.4 | 45.70 | 4.23 | 0 |
| 1998 | Angola | 0 | 297 | 32847.35 | 118243906.8 | 46.12 | 0.39 | 0 |
| 1998 | Mauritania | 0 | 483 | 32847.35 | 432819037.4 | 38.57 | 188.48 | 0 |
| 1998 | Seychelles | 4 | 7343 | 32847.35 | 16000937.51 | 8.70 | 5.26 | 0 |
| 1999 | Ghana | 42,518 | 257 | 34053.36 | 2761257847 | 61.66 | 0.27 | 0 |
| 1999 | SA | 105,658 | 2972 | 34053.36 | 4284977194 | 82.08 | 6.11 | 0 |
| 1999 | Liberia | 28,618 | 155 | 34053.36 | 336599998.6 | 26.58 | 41.90 | 0 |
| 1999 | Ethiopia | 27,524 | 120 | 34053.36 | 3431302716 | 30.51 | 7.94 | 0 |
| 1999 | Nigeria | 7,591 | 361 | 34053.36 | 0.008 | 78.77 | 92.34 | 0 |
| 1999 | Kenya | 35,437 | 415 | 34053.36 | 3706839531 | 46.49 | 70.33 | 0 |
| 1999 | Cameroon | 10,650 | 582 | 34053.36 | 2366747833 | 19.38 | 615.70 | 0 |
| 1999 | Malawi | 70,908 | 157 | 34053.36 | 610917858.4 | 48.58 | 44.09 | 0 |
| 1999 | Tanzania | 8,736 | 301 | 34053.36 | 3113249745 | 38.38 | 744.76 | 0 |
| 1999 | Uganda | 17,394 | 256 | 34053.36 | 2086658940 | 61.27 | 1454.83 | 0 |
| 1999 | Rwanda | 2,007 | 211 | 34053.36 | 680474783.8 | 65.46 | 333.94 | 0 |
| 1999 | Togo | 1,521 | 280 | 34053.36 | 582102493.6 | 64.90 | 615.70 | 0 |
| 1999 | Gabon | 668 | 4280 | 34053.36 | 340101177.9 | 20.03 | 615.70 | 0 |
| 1999 | Mozambique | 8,322 | 237 | 34053.36 | 1116070112 | 61.34 | 12.78 | 0 |
| 1999 | Burundi | 5,861 | 134 | 34053.36 | 327915395 | 87.85 | 563.56 | 0 |
| 1999 | Mauritius | 3,457 | 3576 | 34053.36 | 227475899.1 | 54.68 | 25.19 | 0 |
| 1999 | Congo (Brazzaville) | 4,420 | 95 | 34053.36 | 2467105880 | 9.97 | 4.02 | 0 |
| 1999 | Congo (Kinshasa) | 1,934 | 980 | 34053.36 | 196686975.4 | 30.86 | 615.70 | 0 |
| 1999 | Swaziland | 8,295 | 1484 | 34053.36 | 172119817.4 | 71.10 | 6.11 | 0 |
| 1999 | Comoros | 1,718 | 363 | 34053.36 | 91146203.13 | 75.81 | 461.77 | 0 |
| 1999 | Djibouti | 103 | 771 | 34053.36 | 16357099.69 | 64.75 | 177.72 | 0 |
| 1999 | Burkina Faso | 2,455 | 214 | 34053.36 | 921926198.2 | 36.37 | 615.70 | 0 |
| 1999 | Zambia | 1,540 | 316 | 34053.36 | 676058296.4 | 29.63 | 2388.02 | 0 |
| 1999 | Mali | 2,684 | 214 | 34053.36 | 1065202532 | 30.86 | 615.70 | 0 |
| 1999 | Senegal | 301 | 489 | 34053.36 | 858993925 | 45.00 | 615.70 | 0 |
| 1999 | Sierra Leone | 153 | 152 | 34053.36 | 400739940.1 | 39.22 | 1804.20 | 0 |
| 1999 | Chad | 92 | 176 | 34053.36 | 585086241.7 | 38.56 | 615.70 | 0 |
| 1999 | Benin | 14,722 | 337 | 34053.36 | 903524388 | 27.57 | 615.70 | 0 |
| 1999 | Namibia | 449 | 2040 | 34053.36 | 339171713.9 | 47.15 | 6.11 | 0 |
| 1999 | Lesotho | 0 | 365 | 34053.36 | 136176134.2 | 76.71 | 6.11 | 0 |
| 1999 | Gambia | 3 | 589 | 34053.36 | 195633539.1 | 64.50 | 11.40 | 0 |
| 1999 | Botswana | 3 | 3078 | 34053.36 | 158247462.1 | 45.58 | 4.62 | 0 |
| 1999 | Angola | 0 | 299 | 34053.36 | 107573850.8 | 46.12 | 2.79 | 0 |
| 1999 | Mauritania | 0 | 506 | 34053.36 | 475509972.6 | 38.57 | 209.51 | 0 |
| 1999 | Seychelles | 30 | 7335 | 34053.36 | 19316510 | 8.70 | 5.34 | 0 |
| 2000 | Ghana | 70,651 | 260 | 35081.92 | 1757526698 | 62.32 | 0.54 | 1 |
| 2000 | SA | 132,929 | 3020 | 35081.92 | 3955573469 | 82.04 | 6.94 | 1 |
| 2000 | Liberia | 43,437 | 186 | 35081.92 | 402479815.5 | 26.68 | 40.95 | 0 |
| 2000 | Ethiopia | 26,099 | 124 | 35081.92 | 3781428274 | 30.68 | 8.22 | 1 |
| 2000 | Nigeria | 4,291 | 372 | 35081.92 | 0.06 | 78.83 | 101.70 | 1 |
| 2000 | Kenya | 34,066 | 407 | 35081.92 | 3649202801 | 47.22 | 76.18 | 1 |
| 2000 | Cameroon | 11,198 | 592 | 35081.92 | 1900966236 | 19.38 | 711.98 | 1 |
| 2000 | Malawi | 48,036 | 155 | 35081.92 | 621749129.1 | 49.59 | 59.54 | 1 |
| 2000 | Tanzania | 7,859 | 308 | 35081.92 | 3189117740 | 38.38 | 800.41 | 1 |
| 2000 | Uganda | 15,764 | 256 | 35081.92 | 1703706836 | 61.37 | 1644.48 | 1 |
| 2000 | Rwanda | 2,301 | 214 | 35081.92 | 645166449 | 67.33 | 389.70 | 1 |
| 2000 | Togo | 710 | 270 | 35081.92 | 454814065.8 | 66.74 | 711.98 | 0 |
| 2000 | Gabon | 347 | 4103 | 35081.92 | 314898133.6 | 20.03 | 711.98 | 1 |
| 2000 | Mozambique | 23,865 | 233 | 35081.92 | 887158000.3 | 61.28 | 15.23 | 1 |

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|---|---|---|---|---|---|---|---|---|
| 2000 | Burundi | 7,755 | 131 | 35081.92 | 352765288 | 87.89 | 720.67 | 0 |
| 2000 | Mauritius | 5,020 | 3861 | 35081.92 | 279181402.4 | 54.68 | 26.25 | 1 |
| 2000 | Congo (Brazzaville) | 3,108 | 87 | 35081.92 | 2125671014 | 9.92 | 21.83 | 1 |
| 2000 | Congo (Kinshasa) | 1,973 | 1027 | 35081.92 | 170792208.1 | 30.88 | 711.98 | 0 |
| 2000 | Swaziland | 12,678 | 1508 | 35081.92 | 152752160.1 | 71.10 | 6.94 | 1 |
| 2000 | Comoros | 3,482 | 359 | 35081.92 | 98029665.95 | 76.88 | 533.98 | 1 |
| 2000 | Djibouti | 26 | 753 | 35081.92 | 17060454.31 | 66.91 | 177.72 | 1 |
| 2000 | Burkina Faso | 1,839 | 212 | 35081.92 | 717117054.4 | 36.55 | 711.98 | 0 |
| 2000 | Zambia | 686 | 319 | 35081.92 | 643632328.3 | 30.14 | 3110.84 | 1 |
| 2000 | Mali | 459 | 214 | 35081.92 | 937526335 | 30.86 | 711.98 | 1 |
| 2000 | Senegal | 112 | 492 | 35081.92 | 789029586.1 | 45.26 | 711.98 | 1 |
| 2000 | Sierra Leone | 290 | 153 | 35081.92 | 349823144.2 | 39.15 | 2092.13 | 0 |
| 2000 | Chad | 97 | 168 | 35081.92 | 563786297.3 | 38.56 | 711.98 | 1 |
| 2000 | Benin | 34 | 346 | 35081.92 | 823759136.7 | 28.11 | 711.98 | 1 |
| 2000 | Namibia | 156 | 2062 | 35081.92 | 420893371.8 | 47.15 | 6.94 | 1 |
| 2000 | Lesotho | 0 | 380 | 35081.92 | 86222632.31 | 76.71 | 6.94 | 1 |
| 2000 | Gambia | 0 | 604 | 35081.92 | 192066658.3 | 67.50 | 12.79 | 0 |
| 2000 | Botswana | 29 | 3204 | 35081.92 | 146015158.8 | 45.60 | 5.10 | 1 |
| 2000 | Angola | 0 | 298 | 35081.92 | 235408131.5 | 46.04 | 10.04 | 0 |
| 2000 | Mauritania | 4 | 490 | 35081.92 | 444577758.6 | 38.57 | 238.92 | 0 |
| 2000 | Seychelles | 8 | 7579 | 35081.92 | 18446392.94 | 8.70 | 5.71 | 1 |
| 2001 | Ghana | 57,741 | 264 | 35116.22 | 1873056456 | 63.42 | 0.72 | 1 |
| 2001 | SA | 108,197 | 3040 | 35116.22 | 3785261323 | 82.04 | 8.61 | 1 |
| 2001 | Liberia | 41,172 | 220 | 35116.22 | 398735740.1 | 26.89 | 48.58 | 0 |
| 2001 | Ethiopia | 25,527 | 131 | 35116.22 | 3554772761 | 30.66 | 8.46 | 1 |
| 2001 | Nigeria | 7,768 | 374 | 35116.22 | 0.09 | 78.89 | 111.23 | 1 |
| 2001 | Kenya | 39,091 | 411 | 35116.22 | 3616502613 | 46.86 | 78.56 | 1 |
| 2001 | Cameroon | 5,901 | 605 | 35116.22 | 1969453931 | 19.38 | 733.04 | 1 |
| 2001 | Malawi | 66,574 | 144 | 35116.22 | 605627825.4 | 50.06 | 72.20 | 1 |
| 2001 | Tanzania | 6,980 | 318 | 35116.22 | 3183267757 | 38.38 | 876.41 | 1 |
| 2001 | Uganda | 12,436 | 261 | 35116.22 | 1626594385 | 62.62 | 1755.66 | 1 |
| 2001 | Rwanda | 3,668 | 223 | 35116.22 | 625261055.1 | 67.69 | 442.99 | 1 |
| 2001 | Togo | 674 | 258 | 35116.22 | 502545971.3 | 66.74 | 733.04 | 0 |
| 2001 | Gabon | 638 | 4098 | 35116.22 | 300257077.7 | 20.03 | 733.04 | 1 |
| 2001 | Mozambique | 6,497 | 254 | 35116.22 | 816856572.2 | 61.23 | 20.70 | 1 |
| 2001 | Burundi | 2,395 | 131 | 35116.22 | 331402897.9 | 88.40 | 830.35 | 0 |
| 2001 | Mauritius | 13,975 | 3917 | 35116.22 | 295089861.3 | 54.68 | 29.13 | 1 |
| 2001 | Congo (Brazzaville) | 1,228 | 83 | 35116.22 | 2756007000 | 9.92 | 206.74 | 1 |
| 2001 | Congo (Kinshasa) | 1,082 | 1040 | 35116.22 | 162065156 | 30.86 | 733.04 | 0 |
| 2001 | Swaziland | 6,872 | 1524 | 35116.22 | 116261639.6 | 71.10 | 8.61 | 1 |
| 2001 | Comoros | 10,395 | 361 | 35116.22 | 109977259.1 | 77.96 | 549.78 | 1 |
| 2001 | Djibouti | 116 | 750 | 35116.22 | 17881398.37 | 69.07 | 177.72 | 1 |
| 2001 | Burkina Faso | 79 | 220 | 35116.22 | 970693291.3 | 36.92 | 733.04 | 0 |
| 2001 | Zambia | 809 | 327 | 35116.22 | 715063622.8 | 30.26 | 3610.94 | 1 |
| 2001 | Mali | 303 | 233 | 35116.22 | 919185856.2 | 31.70 | 733.04 | 1 |
| 2001 | Senegal | 6,748 | 501 | 35116.22 | 797211886.8 | 45.47 | 733.04 | 1 |
| 2001 | Sierra Leone | 213 | 175 | 35116.22 | 354501422.3 | 39.23 | 1986.15 | 0 |
| 2001 | Chad | 360 | 182 | 35116.22 | 688787776 | 38.56 | 733.04 | 1 |
| 2001 | Benin | 9 | 352 | 35116.22 | 842655243.9 | 28.88 | 733.04 | 1 |
| 2001 | Namibia | 43 | 2042 | 35116.22 | 344174700.9 | 47.15 | 8.61 | 1 |
| 2001 | Lesotho | 0 | 391 | 35116.22 | 84908533.67 | 76.88 | 8.61 | 1 |
| 2001 | Gambia | 294 | 620 | 35116.22 | 174778497.1 | 68.00 | 15.69 | 0 |
| 2001 | Botswana | 24 | 3268 | 35116.22 | 132217032.8 | 45.79 | 5.84 | 1 |
| 2001 | Angola | 0 | 298 | 35116.22 | 369332039.3 | 45.96 | 22.06 | 0 |
| 2001 | Mauritania | 0 | 485 | 35116.22 | 435181170.6 | 38.57 | 255.63 | 0 |
| 2001 | Seychelles | 0 | 7400 | 35116.22 | 18667861.72 | 8.70 | 5.86 | 1 |
| 2002 | Ghana | 28,469 | 269 | 35427.91 | 2167318239 | 63.77 | 0.79 | 1 |
| 2002 | SA | 136,651 | 3108 | 35427.91 | 4196287170 | 82.04 | 10.54 | 1 |
| 2002 | Liberia | 43,452 | 284 | 35427.91 | 429199771.4 | 26.89 | 61.75 | 0 |
| 2002 | Ethiopia | 22,180 | 129 | 35427.91 | 3137359517 | 31.41 | 8.57 | 1 |
| 2002 | Nigeria | 12,696 | 371 | 35427.91 | 27841385053 | 78.94 | 120.58 | 1 |
| 2002 | Kenya | 36,720 | 403 | 35427.91 | 3399211653 | 47.16 | 78.75 | 1 |

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|---|---|---|---|---|---|---|---|---|
| 2002 | Cameroon | 18,733 | 615 | 35427.91 | 2224746307 | 19.38 | 696.99 | 1 |
| 2002 | Malawi | 59,226 | 142 | 35427.91 | 919783799.7 | 51.12 | 76.69 | 1 |
| 2002 | Tanzania | 5,938 | 332 | 35427.91 | 3270668640 | 38.50 | 966.58 | 1 |
| 2002 | Uganda | 11,055 | 275 | 35427.91 | 1447849222 | 63.12 | 1797.55 | 1 |
| 2002 | Rwanda | 1,921 | 246 | 35427.91 | 593648788.9 | 70.90 | 475.37 | 1 |
| 2002 | Togo | 725 | 250 | 35427.91 | 563186499.3 | 64.72 | 696.99 | 0 |
| 2002 | Gabon | 512 | 4000 | 35427.91 | 300148551.9 | 20.03 | 696.99 | 1 |
| 2002 | Mozambique | 6,560 | 269 | 35427.91 | 1068027806 | 61.36 | 23.68 | 1 |
| 2002 | Burundi | 649 | 134 | 35427.91 | 310381692.3 | 89.84 | 930.75 | 0 |
| 2002 | Mauritius | 6,083 | 3966 | 35427.91 | 263978687.1 | 54.68 | 29.96 | 1 |
| 2002 | Congo (Brazzaville) | 3,602 | 83 | 35427.91 | 2775201924 | 9.90 | 346.69 | 1 |
| 2002 | Congo (Kinshasa) | 1,409 | 1063 | 35427.91 | 189099326.7 | 30.86 | 696.99 | 0 |
| 2002 | Swaziland | 7,473 | 1549 | 35427.91 | 104130534.3 | 71.16 | 10.54 | 1 |
| 2002 | Comoros | 5,191 | 366 | 35427.91 | 125962532.6 | 79.03 | 522.74 | 1 |
| 2002 | Djibouti | 38 | 754 | 35427.91 | 18534669.51 | 72.52 | 177.72 | 1 |
| 2002 | Burkina Faso | 55 | 224 | 35427.91 | 1071739233 | 38.74 | 696.99 | 0 |
| 2002 | Zambia | 783 | 330 | 35427.91 | 738285365.5 | 30.34 | 4398.60 | 1 |
| 2002 | Mali | 36 | 236 | 35427.91 | 1079729453 | 32.24 | 696.99 | 1 |
| 2002 | Senegal | 197 | 491 | 35427.91 | 726419074.9 | 45.76 | 696.99 | 1 |
| 2002 | Sierra Leone | 466 | 213 | 35427.91 | 419876131.5 | 41.78 | 2099.03 | 1 |
| 2002 | Chad | 49 | 190 | 35427.91 | 753462872.8 | 38.62 | 696.99 | 1 |
| 2002 | Benin | 1 | 357 | 35427.91 | 947789781.8 | 29.52 | 696.99 | 1 |
| 2002 | Namibia | 62 | 2100 | 35427.91 | 336305853.3 | 47.15 | 10.54 | 1 |
| 2002 | Lesotho | 0 | 391 | 35427.91 | 61626329.25 | 76.88 | 10.54 | 1 |
| 2002 | Gambia | 6 | 582 | 35427.91 | 139498873.6 | 71.70 | 19.92 | 0 |
| 2002 | Botswana | 41 | 3516 | 35427.91 | 118627976.7 | 45.53 | 6.33 | 1 |
| 2002 | Angola | 0 | 330 | 35427.91 | 523808374.9 | 45.96 | 43.53 | 0 |
| 2002 | Mauritania | 0 | 474 | 35427.91 | 434133222.1 | 38.53 | 271.74 | 1 |
| 2002 | Seychelles | 0 | 7266 | 35427.91 | 20925547.45 | 8.70 | 5.48 | 1 |
| 2003 | Ghana | 11,236 | 276 | 36021.31 | 2789408754 | 64.30 | 0.87 | 1 |
| 2003 | SA | 151,540 | 3159 | 36021.31 | 5240623202 | 82.04 | 7.56 | 1 |
| 2003 | Liberia | 55,722 | 188 | 36021.31 | 300518722.3 | 26.89 | 59.38 | 0 |
| 2003 | Ethiopia | 26,927 | 123 | 36021.31 | 3323193063 | 30.60 | 8.60 | 1 |
| 2003 | Nigeria | 46,070 | 399 | 36021.31 | 28049168695 | 81.03 | 129.22 | 1 |
| 2003 | Kenya | 40,773 | 404 | 36021.31 | 3846023703 | 47.12 | 75.94 | 1 |
| 2003 | Cameroon | 24,081 | 626 | 36021.31 | 2742772091 | 19.38 | 581.20 | 1 |
| 2003 | Malawi | 53,200 | 146 | 36021.31 | 799927334.3 | 51.12 | 97.43 | 1 |
| 2003 | Tanzania | 6,169 | 346 | 36021.31 | 3531656274 | 38.72 | 1038.42 | 1 |
| 2003 | Uganda | 28,660 | 283 | 36021.31 | 1552935590 | 64.12 | 1963.72 | 1 |
| 2003 | Rwanda | 1,767 | 245 | 36021.31 | 706214972 | 74.99 | 537.65 | 1 |
| 2003 | Togo | 284 | 256 | 36021.31 | 599109159.3 | 64.26 | 581.20 | 0 |
| 2003 | Gabon | 90 | 4015 | 36021.31 | 367515286.7 | 20.03 | 581.20 | 1 |
| 2003 | Mozambique | 5,496 | 278 | 36021.31 | 1182898083 | 61.93 | 23.78 | 1 |
| 2003 | Burundi | 5,811 | 129 | 36021.31 | 310845932.2 | 91.16 | 1082.62 | 0 |
| 2003 | Mauritius | 1,666 | 4069 | 36021.31 | 307815616.5 | 52.22 | 27.90 | 1 |
| 2003 | Congo (Brazzaville) | 4,698 | 85 | 36021.31 | 2838099490 | 9.90 | 405.40 | 1 |
| 2003 | Congo (Kinshasa) | 1,978 | 1047 | 36021.31 | 219373591.1 | 30.86 | 581.20 | 1 |
| 2003 | Swaziland | 7,619 | 1581 | 36021.31 | 141903536.8 | 71.16 | 7.56 | 1 |
| 2003 | Comoros | 3,973 | 365 | 36021.31 | 164010481.4 | 79.03 | 435.90 | 1 |
| 2003 | Djibouti | 117 | 764 | 36021.31 | 19466467.1 | 73.38 | 177.72 | 1 |
| 2003 | Burkina Faso | 449 | 235 | 36021.31 | 1427628662 | 39.11 | 581.20 | 0 |
| 2003 | Zambia | 933 | 339 | 36021.31 | 896754004.3 | 30.42 | 4733.27 | 1 |
| 2003 | Mali | 68 | 245 | 36021.31 | 1561385977 | 32.48 | 581.20 | 1 |
| 2003 | Senegal | 205 | 510 | 36021.31 | 1056920239 | 45.71 | 581.20 | 1 |
| 2003 | Sierra Leone | 203 | 221 | 36021.31 | 437608075.3 | 44.76 | 2347.94 | 1 |
| 2003 | Chad | 0 | 210 | 36021.31 | 883561247 | 38.62 | 581.20 | 1 |
| 2003 | Benin | 3 | 359 | 36021.31 | 1141603579 | 30.42 | 581.20 | 1 |
| 2003 | Namibia | 199 | 2151 | 36021.31 | 503571428.6 | 47.15 | 7.56 | 1 |
| 2003 | Lesotho | 0 | 404 | 36021.31 | 88700015.63 | 75.89 | 7.56 | 1 |
| 2003 | Gambia | 0 | 604 | 36021.31 | 130274522.3 | 62.50 | 28.53 | 1 |
| 2003 | Botswana | 23 | 3692 | 36021.31 | 190835853.6 | 45.61 | 4.95 | 1 |
| 2003 | Angola | 3 | 329 | 36021.31 | 1038286468 | 46.03 | 74.61 | 1 |

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| 2003 | Mauritania | 11 | 488 | 36021.31 | 538311219.3 | 38.48 | 263.03 | 0 |
| 2003 | Seychelles | 0 | 6913 | 36021.31 | 21171144.48 | 8.70 | 5.40 | 1 |
| 2004 | Ghana | 22,847 | 285 | 36931.39 | 3370714114 | 65.20 | 0.90 | 1 |
| 2004 | SA | 156,022 | 3264 | 36931.39 | 6113294093 | 82.04 | 6.46 | 1 |
| 2004 | Liberia | 83,729 | 176 | 36931.39 | 308778023.9 | 26.89 | 54.91 | 0 |
| 2004 | Ethiopia | 34,088 | 137 | 36931.39 | 4051658892 | 31.61 | 8.64 | 1 |
| 2004 | Nigeria | 13,639 | 431 | 36931.39 | 29376301511 | 81.14 | 132.89 | 1 |
| 2004 | Kenya | 48,148 | 413 | 36931.39 | 4012409342 | 47.22 | 79.17 | 1 |
| 2004 | Cameroon | 22,469 | 635 | 36931.39 | 2991653229 | 19.38 | 528.28 | 1 |
| 2004 | Malawi | 32,930 | 149 | 36931.39 | 831799564.4 | 51.12 | 108.90 | 1 |
| 2004 | Tanzania | 6,380 | 363 | 36931.39 | 3968907551 | 39.20 | 1089.33 | 1 |
| 2004 | Uganda | 12,011 | 293 | 36931.39 | 1720704590 | 65.62 | 1810.30 | 1 |
| 2004 | Rwanda | 4,544 | 258 | 36931.39 | 805439130.5 | 76.21 | 577.45 | 1 |
| 2004 | Togo | 96 | 256 | 36931.39 | 701866234.4 | 63.80 | 528.28 | 0 |
| 2004 | Gabon | 433 | 3988 | 36931.39 | 404516647.5 | 20.03 | 528.28 | 1 |
| 2004 | Mozambique | 7,431 | 292 | 36931.39 | 1411723705 | 61.99 | 22.58 | 1 |
| 2004 | Burundi | 196 | 131 | 36931.39 | 367107678.2 | 90.73 | 1100.90 | 0 |
| 2004 | Mauritius | 9,978 | 4266 | 36931.39 | 357470952.7 | 52.22 | 27.50 | 1 |
| 2004 | Congo (Brazzaville) | 3,042 | 88 | 36931.39 | 3191432439 | 9.90 | 399.48 | 1 |
| 2004 | Congo (Kinshasa) | 1,656 | 1058 | 36931.39 | 256111850.3 | 30.86 | 528.28 | 1 |
| 2004 | Swaziland | 430 | 1625 | 36931.39 | 167766499.7 | 71.16 | 6.46 | 1 |
| 2004 | Comoros | 16,350 | 355 | 36931.39 | 184599964.2 | 79.03 | 396.21 | 1 |
| 2004 | Djibouti | 278 | 779 | 36931.39 | 20976699.43 | 73.38 | 177.72 | 1 |
| 2004 | Burkina Faso | 214 | 239 | 36931.39 | 1564677662 | 39.84 | 528.28 | 1 |
| 2004 | Zambia | 1,503 | 349 | 36931.39 | 1165161597 | 30.82 | 4778.88 | 1 |
| 2004 | Mali | 1,185 | 243 | 36931.39 | 1625800310 | 33.33 | 528.28 | 1 |
| 2004 | Senegal | 85 | 526 | 36931.39 | 1115865586 | 45.09 | 528.28 | 1 |
| 2004 | Sierra Leone | 374 | 227 | 36931.39 | 466952948.6 | 45.66 | 2701.30 | 1 |
| 2004 | Chad | 282 | 271 | 36931.39 | 1010903309 | 38.78 | 528.28 | 1 |
| 2004 | Benin | 69 | 358 | 36931.39 | 1298541999 | 31.34 | 528.28 | 1 |
| 2004 | Namibia | 50 | 2373 | 36931.39 | 590635882.9 | 47.15 | 6.46 | 1 |
| 2004 | Lesotho | 0 | 409 | 36931.39 | 108673903.6 | 75.89 | 6.46 | 1 |
| 2004 | Gambia | 8 | 628 | 36931.39 | 155396605.3 | 62.00 | 30.03 | 1 |
| 2004 | Botswana | 2 | 3866 | 36931.39 | 192534820.8 | 45.52 | 4.69 | 1 |
| 2004 | Angola | 0 | 353 | 36931.39 | 1635136224 | 46.19 | 83.54 | 1 |
| 2004 | Mauritania | 0 | 502 | 36931.39 | 598166037.7 | 38.48 | | 0 |
| 2004 | Seychelles | 0 | 6740 | 36931.39 | 20994000 | 8.70 | 5.50 | 1 |
| 2005 | Ghana | 34,928 | 294 | 37718.01 | 4019413581 | 66.36 | 0.91 | 1 |
| 2005 | SA | 176,722 | 3398 | 37718.01 | 5881438737 | 81.99 | 6.36 | 1 |
| 2005 | Liberia | 89,394 | 187 | 37718.01 | 363184571.3 | 26.94 | 57.10 | 0 |
| 2005 | Ethiopia | 49,445 | 149 | 37718.01 | 5280111003 | 33.10 | 8.67 | 1 |
| 2005 | Nigeria | 59,048 | 443 | 37718.01 | 36360484598 | 81.80 | 131.27 | 1 |
| 2005 | Kenya | 51,573 | 427 | 37718.01 | 4541367802 | 47.43 | 75.55 | 1 |
| 2005 | Cameroon | 28,157 | 635 | 37718.01 | 3157536664 | 19.38 | 527.47 | 1 |
| 2005 | Malawi | 88,367 | 149 | 37718.01 | 818625329.2 | 52.72 | 118.42 | 1 |
| 2005 | Tanzania | 11,753 | 380 | 37718.01 | 4106648630 | 39.23 | 1128.93 | 1 |
| 2005 | Uganda | 13,769 | 301 | 37718.01 | 2316256272 | 66.37 | 1780.67 | 1 |
| 2005 | Rwanda | 5,180 | 275 | 37718.01 | 990995989.8 | 76.21 | 557.82 | 1 |
| 2005 | Togo | 3,257 | 253 | 37718.01 | 833551729.7 | 63.52 | 527.47 | 0 |
| 2005 | Gabon | 352 | 4029 | 37718.01 | 423532687.3 | 19.95 | 527.47 | 1 |
| 2005 | Mozambique | 7,358 | 312 | 37718.01 | 1609727780 | 62.12 | 23.06 | 1 |
| 2005 | Burundi | 4,308 | 128 | 37718.01 | 456369385.5 | 91.32 | 1081.58 | 0 |
| 2005 | Mauritius | 3,232 | 4284 | 37718.01 | 331920051.7 | 51.23 | 29.50 | 1 |
| 2005 | Congo (Brazzaville) | 3,568 | 92 | 37718.01 | 3385739156 | 9.90 | 473.91 | 1 |
| 2005 | Congo (Kinshasa) | 3,221 | 1112 | 37718.01 | 276604382.6 | 30.86 | 527.47 | 1 |
| 2005 | Swaziland | 17,148 | 1663 | 37718.01 | 179122690.4 | 71.16 | 6.36 | 1 |
| 2005 | Comoros | 1,393 | 360 | 37718.01 | 197447399.8 | 79.57 | 395.60 | 1 |
| 2005 | Djibouti | 777 | 789 | 37718.01 | 22280428.31 | 73.38 | 177.72 | 1 |
| 2005 | Burkina Faso | 258 | 252 | 37718.01 | 1792455039 | 39.84 | 527.47 | 1 |
| 2005 | Zambia | 461 | 359 | 37718.01 | 1506355480 | 30.80 | 4463.50 | 1 |
| 2005 | Mali | 73 | 250 | 37718.01 | 1787890358 | 32.57 | 527.47 | 1 |
| 2005 | Senegal | 164 | 541 | 37718.01 | 1259476676 | 45.38 | 527.47 | 1 |

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| 2005 | Sierra Leone | 430 | 234 | 37718.01 | 608019527 | 48.28 | 2889.59 | 1 |
| 2005 | Chad | 10 | 308 | 37718.01 | 628282177.2 | 38.78 | 527.47 | 1 |
| 2005 | Benin | 0 | 357 | 37718.01 | 1380557683 | 32.25 | 527.47 | 1 |
| 2005 | Namibia | 116 | 2391 | 37718.01 | 753734864 | 47.15 | 6.36 | 1 |
| 2005 | Lesotho | 0 | 417 | 37718.01 | 113376753.4 | 76.22 | 6.36 | 1 |
| 2005 | Gambia | 0 | 604 | 37718.01 | 168937808.7 | 64.00 | 28.58 | 1 |
| 2005 | Botswana | 10 | 3880 | 37718.01 | 179604277.8 | 45.57 | 5.11 | 1 |
| 2005 | Angola | 0 | 404 | 37718.01 | 2599588173 | 46.19 | 87.16 | 1 |
| 2005 | Mauritania | 10 | 532 | 37718.01 | 615403252.6 | 38.48 | 265.53 | 1 |
| 2005 | Seychelles | 18 | 7209 | 37718.01 | 21678545.45 | 8.70 | 5.50 | 1 |
| 2006 | Ghana | 74,583 | 306 | 38349.40 | 5908657893 | 66.36 | 0.92 | 1 |
| 2006 | SA | 204,265 | 3548 | 38349.40 | 6697285788 | 81.99 | 6.77 | 1 |
| 2006 | Liberia | 129,223 | 197 | 38349.40 | 385483777.6 | 26.94 | 58.01 | 1 |
| 2006 | Ethiopia | 54,922 | 162 | 38349.40 | 6717296076 | 33.69 | 8.70 | 1 |
| 2006 | Nigeria | 19,688 | 459 | 38349.40 | 46173027719 | 83.99 | 128.65 | 1 |
| 2006 | Kenya | 55,027 | 442 | 38349.40 | 5359188973 | 47.44 | 72.10 | 1 |
| 2006 | Cameroon | 27,004 | 641 | 38349.40 | 3473770046 | 19.38 | 522.89 | 1 |
| 2006 | Malawi | 41,129 | 148 | 38349.40 | 895282179.3 | 52.72 | 136.01 | 1 |
| 2006 | Tanzania | 14,930 | 394 | 38349.40 | 3953998009 | 39.23 | 1251.90 | 1 |
| 2006 | Uganda | 10,856 | 323 | 38349.40 | 2398015545 | 66.37 | 1831.45 | 1 |
| 2006 | Rwanda | 6,644 | 291 | 38349.40 | 1195799465 | 76.21 | 551.71 | 1 |
| 2006 | Togo | 274 | 257 | 38349.40 | 790449563.3 | 63.34 | 522.89 | 1 |
| 2006 | Gabon | 1,476 | 4000 | 38349.40 | 471609608.7 | 19.95 | 522.89 | 1 |
| 2006 | Mozambique | 12,718 | 324 | 38349.40 | 1805230738 | 61.99 | 25.40 | 1 |
| 2006 | Burundi | 1,774 | 131 | 38349.40 | 494692505.3 | 89.02 | 1028.68 | 1 |
| 2006 | Mauritius | 4,067 | 4420 | 38349.40 | 319484676.9 | 51.23 | 31.71 | 1 |
| 2006 | Congo (Brazzaville) | 239 | 95 | 38349.40 | 4016823737 | 9.90 | 468.28 | 1 |
| 2006 | Congo (Kinshasa) | 1,253 | 1150 | 38349.40 | 306182880.6 | 30.87 | 522.89 | 1 |
| 2006 | Swaziland | 15,774 | 1716 | 38349.40 | 170064481.8 | 71.16 | 6.77 | 1 |
| 2006 | Comoros | 1,466 | 355 | 38349.40 | 182143980 | 79.57 | 392.17 | 1 |
| 2006 | Djibouti | 788 | 812 | 38349.40 | 24044429.19 | 73.38 | 177.72 | 1 |
| 2006 | Burkina Faso | 62 | 261 | 38349.40 | 1893343497 | 39.88 | 522.89 | 1 |
| 2006 | Zambia | 350 | 372 | 38349.40 | 2164886821 | 30.62 | 3603.07 | 1 |
| 2006 | Mali | 115 | 255 | 38349.40 | 1998170839 | 33.06 | 522.89 | 1 |
| 2006 | Senegal | 14,393 | 539 | 38349.40 | 1229071163 | 45.84 | 522.89 | 1 |
| 2006 | Sierra Leone | 141 | 243 | 38349.40 | 692179647 | 50.61 | 2961.91 | 1 |
| 2006 | Chad | 0 | 300 | 38349.40 | 647554935.1 | 39.10 | 522.89 | 1 |
| 2006 | Benin | 17 | 361 | 38349.40 | 0.04 | 31.82 | 522.89 | 1 |
| 2006 | Namibia | 77 | 2513 | 38349.40 | 771491875.9 | 47.15 | 6.77 | 1 |
| 2006 | Lesotho | 0 | 430 | 38349.40 | 104702776.7 | 76.65 | 6.77 | 1 |
| 2006 | Gambia | 2 | 594 | 38349.40 | 142910036.3 | 63.50 | 28.07 | 1 |
| 2006 | Botswana | 156 | 4025 | 38349.40 | 199129986.1 | 45.60 | 5.84 | 1 |
| 2006 | Angola | 0 | 473 | 38349.40 | 3355868860 | 46.19 | 80.37 | 1 |
| 2006 | Mauritania | 0 | 616 | 38349.40 | 651217423.7 | 38.48 | 268.60 | 1 |
| 2006 | Seychelles | 0 | 7722 | 38349.40 | 23243654.55 | 8.70 | 5.52 | 1 |
| 2007 | Ghana | 55,546 | 318 | 38710.89 | 6757354890 | 67.24 | 0.94 | 1 |
| 2007 | SA | 175,254 | 3704 | 38710.89 | 8568754067 | 81.83 | 7.05 | 1 |
| 2007 | Liberia | 114,476 | 217 | 38710.89 | 484785891.7 | 26.99 | 61.27 | 1 |
| 2007 | Ethiopia | 72,871 | 176 | 38710.89 | 8241265320 | 34.22 | 8.97 | 1 |
| 2007 | Nigeria | 23,075 | 476 | 38710.89 | 53715677157 | 85.64 | 125.81 | 1 |
| 2007 | Kenya | 48,802 | 461 | 38710.89 | 6004132219 | 47.53 | 67.32 | 1 |
| 2007 | Cameroon | 23,995 | 648 | 38710.89 | 3923240342 | 19.38 | 479.27 | 1 |
| 2007 | Malawi | 39,278 | 158 | 38710.89 | 1057218981 | 52.72 | 139.96 | 1 |
| 2007 | Tanzania | 24,521 | 411 | 38710.89 | 4570509364 | 39.29 | 1245.04 | 1 |
| 2007 | Uganda | 12,819 | 339 | 38710.89 | 2654664362 | 66.87 | 1723.49 | 1 |
| 2007 | Rwanda | 7,485 | 305 | 38710.89 | 1332479326 | 76.00 | 546.96 | 1 |
| 2007 | Togo | 4,060 | 258 | 38710.89 | 903993371.6 | 63.34 | 479.27 | 1 |
| 2007 | Gabon | 1,780 | 4143 | 38710.89 | 560741030.3 | 19.95 | 479.27 | 1 |
| 2007 | Mozambique | 2,344 | 339 | 38710.89 | 2043009296 | 62.37 | 25.84 | 1 |
| 2007 | Burundi | 1,067 | 133 | 38710.89 | 459036798.9 | 86.45 | 1081.87 | 1 |
| 2007 | Mauritius | 2,668 | 4651 | 38710.89 | 308271541.1 | 50.74 | 31.31 | 1 |
| 2007 | Congo (Brazzaville) | 1,620 | 98 | 38710.89 | 4386475315 | 9.90 | 516.75 | 1 |
| 2007 | Congo | 2,543 | 1101 | 38710.89 | 363263231.1 | 30.88 | 479.27 | 1 |

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| | (Kinshasa) | | | | | | | |
| 2007 | Swaziland | 7,428 | 1773 | 38710.89 | 181296497.8 | 71.16 | 7.05 | 1 |
| 2007 | Comoros | 298 | 347 | 38710.89 | 210825126.2 | 80.65 | 359.45 | 1 |
| 2007 | Djibouti | 967 | 837 | 38710.89 | 28809200.94 | 73.38 | 177.72 | 1 |
| 2007 | Burkina Faso | 121 | 263 | 38710.89 | 0.5 | 40.42 | 479.27 | 1 |
| 2007 | Zambia | 1,121 | 385 | 38710.89 | 2283443355 | 31.00 | 4002.52 | 1 |
| 2007 | Mali | 297 | 258 | 38710.89 | 2289906105 | 33.12 | 479.27 | 1 |
| 2007 | Senegal | 367 | 551 | 38710.89 | 1356970776 | 44.87 | 479.27 | 1 |
| 2007 | Sierra Leone | 644 | 251 | 38710.89 | 792012482.1 | 53.30 | 2985.19 | 1 |
| 2007 | Chad | 0 | 292 | 38710.89 | 698077726.7 | 39.18 | 479.27 | 1 |
| 2007 | Benin | 0 | 366 | 38710.89 | 0.66 | 30.15 | 479.27 | 1 |
| 2007 | Namibia | 175 | 2599 | 38710.89 | 762411347.5 | 47.15 | 7.05 | 1 |
| 2007 | Lesotho | 0 | 446 | 38710.89 | 112130457.4 | 75.99 | 7.05 | 1 |
| 2007 | Gambia | 35 | 598 | 38710.89 | 163463244.6 | 64.00 | 24.87 | 1 |
| 2007 | Botswana | 60 | 4161 | 38710.89 | 243010448.7 | 45.60 | 6.14 | 1 |
| 2007 | Angola | 0 | 563 | 38710.89 | 4857375989 | 46.19 | 76.71 | 1 |
| 2007 | Mauritania | 34 | 610 | 38710.89 | 792817366.2 | 38.48 | 258.59 | 1 |
| 2007 | Seychelles | 0 | 8420 | 38710.89 | 21837373.55 | 8.70 | 6.70 | 1 |
| 2008 | Ghana | 24,269 | 336 | 38208.76 | 8389592179 | 68.12 | 1.06 | 1 |
| 2008 | SA | 175,440 | 3796 | 38208.76 | 7942165143 | 81.83 | 8.26 | 1 |
| 2008 | Liberia | 141,014 | 228 | 38208.76 | 571750964.3 | 26.99 | 63.21 | 1 |
| 2008 | Ethiopia | 120,845 | 191 | 38208.76 | 10584432481 | 35.08 | 9.60 | 1 |
| 2008 | Nigeria | 75,008 | 492 | 38208.76 | 0.77 | 85.64 | 118.55 | 1 |
| 2008 | Kenya | 63,189 | 456 | 38208.76 | 6941825513 | 47.62 | 69.18 | 1 |
| 2008 | Cameroon | 24,505 | 650 | 38208.76 | 0.88 | 19.38 | 447.81 | 1 |
| 2008 | Malawi | 52,091 | 166 | 38208.76 | 1194663452 | 52.74 | 140.52 | 1 |
| 2008 | Tanzania | 28,745 | 429 | 38208.76 | 5576367160 | 39.34 | 1196.31 | 1 |
| 2008 | Uganda | 15,074 | 357 | 38208.76 | 3088025343 | 67.62 | 1720.44 | 1 |
| 2008 | Rwanda | 10,188 | 329 | 38208.76 | 1525890275 | 77.62 | 546.85 | 1 |
| 2008 | Togo | 8,787 | 258 | 38208.76 | 1287766747 | 62.88 | 447.81 | 1 |
| 2008 | Gabon | 2,833 | 4161 | 38208.76 | 589920109.3 | 19.95 | 447.81 | 1 |
| 2008 | Mozambique | 2,209 | 354 | 38208.76 | 2767280000 | 62.37 | 24.30 | 1 |
| 2008 | Burundi | 2,795 | 136 | 38208.76 | 525504799 | 85.28 | 1185.69 | 1 |
| 2008 | Mauritius | 473 | 4876 | 38208.76 | 349417132.4 | 49.75 | 28.45 | 1 |
| 2008 | Congo (Brazzaville) | 2,298 | 101 | 38208.76 | 4924861186 | 9.90 | 559.29 | 1 |
| 2008 | Congo (Kinshasa) | 1,595 | 1131 | 38208.76 | 436050201.5 | 30.89 | 447.81 | 1 |
| 2008 | Swaziland | 2,042 | 1795 | 38208.76 | 176680854.8 | 71.16 | 8.26 | 1 |
| 2008 | Comoros | 930 | 341 | 38208.76 | 242864494.3 | 80.65 | 335.85 | 1 |
| 2008 | Djibouti | 1,117 | 869 | 38208.76 | 0.99 | 73.38 | 177.72 | 1 |
| 2008 | Burkina Faso | 131 | 270 | 38208.76 | 0.66 | 41.15 | 447.81 | 1 |
| 2008 | Zambia | 1,116 | 396 | 38208.76 | 2900366034 | 30.92 | 3745.66 | 1 |
| 2008 | Mali | 376 | 263 | 38208.76 | 0.77 | 33.23 | 447.81 | 1 |
| 2008 | Senegal | 303 | 556 | 38208.76 | 1912222648 | 44.87 | 447.81 | 1 |
| 2008 | Sierra Leone | 174 | 259 | 38208.76 | 935589149.4 | 46.65 | 2981.51 | 1 |
| 2008 | Chad | 4 | 283 | 38208.76 | 792857142.9 | 39.02 | 447.81 | 1 |
| 2008 | Benin | 0 | 374 | 38208.76 | 0.23 | 30.19 | 447.81 | 1 |
| 2008 | Namibia | 92 | 2636 | 38208.76 | 773509452.3 | 47.14 | 8.26 | 1 |
| 2008 | Lesotho | 0 | 466 | 38208.76 | 120079068.2 | 76.71 | 8.26 | 1 |
| 2008 | Gambia | 0 | 615 | 38208.76 | 243366519.9 | 63.50 | 22.19 | 1 |
| 2008 | Botswana | 180 | 4223 | 38208.76 | 257468420.1 | 45.62 | 6.83 | 1 |
| 2008 | Angola | 0 | 623 | 38208.76 | 5288578926 | 46.27 | 75.03 | 1 |
| 2008 | Mauritania | 0 | 616 | 38208.76 | 617079820.6 | 38.48 | 238.20 | 1 |
| 2008 | Seychelles | 0 | 8152 | 38208.76 | 19402470.74 | 6.52 | 9.46 | 1 |
| 2009 | Ghana | 95,999 | 342 | 36539.23 | 8051414158 | 68.12 | 1.41 | 1 |
| 2009 | SA | 174,841 | 3698 | 36539.23 | 7794611731 | 81.83 | 8.47 | 1 |
| 2009 | Liberia | 74,879 | 247 | 36539.23 | 670397388.2 | 27.10 | 68.29 | 1 |
| 2009 | Ethiopia | 84,735 | 203 | 36539.23 | 13638374868 | 34.51 | 11.78 | 1 |
| 2009 | Nigeria | 63,323 | 514 | 36539.23 | 0.44 | 85.09 | 148.90 | 1 |
| 2009 | Kenya | 59,168 | 457 | 36539.23 | 7306739453 | 47.79 | 77.35 | 1 |
| 2009 | Cameroon | 23,353 | 648 | 36539.23 | 0.66 | 19.49 | 472.19 | 1 |
| 2009 | Malawi | 53,994 | 175 | 36539.23 | 1469678438 | 58.04 | 141.17 | 1 |
| 2009 | Tanzania | 33,924 | 442 | 36539.23 | 5563024573 | 39.46 | 1320.31 | 1 |
| 2009 | Uganda | 24,326 | 371 | 36539.23 | 3658318895 | 68.88 | 2030.49 | 1 |
| 2009 | Rwanda | 14,455 | 339 | 36539.23 | 1781401912 | 81.07 | 568.28 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| 2009 | Togo | 5,742 | | 261 | 36539.23 | 1041001502 | 62.60 | 472.19 | 1 |
| 2009 | Gabon | 1,868 | | 4028 | 36539.23 | 586747077.8 | 19.95 | 472.19 | 1 |
| 2009 | Mozambique | 5,059 | | 368 | 36539.23 | 2757779039 | 62.37 | 27.52 | 1 |
| 2009 | Burundi | 4,036 | | 137 | 36539.23 | 586985475.5 | 85.28 | 1230.18 | 1 |
| 2009 | Mauritius | 435 | | 4998 | 36539.23 | 306650264.8 | 48.28 | 31.96 | 1 |
| 2009 | Congo (Brazzaville) | 2,566 | | 101 | 36539.23 | 5123322744 | 9.90 | 809.79 | 1 |
| 2009 | Congo (Kinshasa) | 1,676 | | 1183 | 36539.23 | 432274976.1 | 30.89 | 472.19 | 1 |
| 2009 | Swaziland | 6,996 | | 1796 | 36539.23 | 187380346.5 | 71.16 | 8.47 | 1 |
| 2009 | Comoros | 1,072 | | 338 | 36539.23 | 247909606 | 80.65 | 354.14 | 1 |
| 2009 | Djibouti | 272 | | 895 | 36539.23 | 0.99 | 73.38 | 177.72 | 1 |
| 2009 | Burkina Faso | 280 | | 270 | 36539.23 | 0.33 | 45.18 | 472.19 | 1 |
| 2009 | Zambia | 813 | | 410 | 36539.23 | 2667675380 | 31.06 | 5046.11 | 1 |
| 2009 | Mali | 251 | | 266 | 36539.23 | 0.88 | 33.19 | 472.19 | 1 |
| 2009 | Senegal | 537 | | 553 | 36539.23 | 1996129634 | 48.32 | 472.19 | 1 |
| 2009 | Sierra Leone | 579 | | 261 | 36539.23 | 926666020.4 | 47.67 | 3385.65 | 1 |
| 2009 | Chad | 0 | | 273 | 36539.23 | 0.55 | 39.10 | 472.19 | 1 |
| 2009 | Benin | 202 | | 377 | 36539.23 | 0.66 | 30.69 | 472.19 | 1 |
| 2009 | Namibia | 86 | | 2575 | 36539.23 | 791715836.7 | 47.14 | 8.47 | 1 |
| 2009 | Lesotho | 0 | | 474 | 36539.23 | 120962876.4 | 77.80 | 8.47 | 1 |
| 2009 | Gambia | 0 | | 637 | 36539.23 | 236136740.4 | 65.50 | 26.64 | 1 |
| 2009 | Botswana | 184 | | 3965 | 36539.23 | 325067119.4 | 45.62 | 7.16 | 1 |
| 2009 | Angola | 0 | | 620 | 36539.23 | 6647787631 | 46.27 | 79.33 | 1 |
| 2009 | Mauritania | 0 | | 593 | 36539.23 | 558906990.6 | 38.48 | 262.37 | 1 |
| 2009 | Seychelles | 6 | | 8162 | 36539.23 | 15367611.62 | 6.52 | 13.61 | 1 |
| 2010 | Ghana | 196,547 | | 360 | 37329.62 | 9021505564 | 69.44 | 1.43 | 1 |
| 2010 | SA | 224,729 | | 3753 | 37329.62 | 8132931950 | 79.87 | 7.32 | 1 |
| 2010 | Liberia | 126,781 | | 264 | 37329.62 | 740739321.7 | 27.30 | 71.40 | 1 |
| 2010 | Ethiopia | 101,297 | | 219 | 37329.62 | 11497054809 | 34.99 | 14.41 | 1 |
| 2010 | Nigeria | 66,215 | | 541 | 37329.62 | 0.788 | 83.66 | 150.30 | 1 |
| 2010 | Kenya | 77,630 | | 471 | 37329.62 | 7076002758 | 48.23 | 79.23 | 1 |
| 2010 | Cameroon | 57,856 | | 653 | 37329.62 | 0.77 | 20.30 | 495.28 | 1 |
| 2010 | Malawi | 61,143 | | 181 | 37329.62 | 1483088018 | 59.18 | 150.49 | 1 |
| 2010 | Tanzania | 24,184 | | 459 | 37329.62 | 5848274419 | 39.45 | 1409.27 | 1 |
| 2010 | Uganda | 35,910 | | 380 | 37329.62 | 3870911286 | 70.37 | 2177.56 | 1 |
| 2010 | Rwanda | 19,377 | | 353 | 37329.62 | 1813490672 | 77.82 | 583.13 | 1 |
| 2010 | Togo | 8,114 | | 266 | 37329.62 | 984642571.3 | 68.02 | 495.28 | 1 |
| 2010 | Gabon | 5,859 | | 4214 | 37329.62 | 538312024.5 | 20.02 | 495.28 | 1 |
| 2010 | Mozambique | 34,277 | | 384 | 37329.62 | 2647168387 | 62.81 | 33.96 | 1 |
| 2010 | Burundi | 3,310 | | 138 | 37329.62 | 657220126.1 | 88.39 | 1230.75 | 1 |
| 2010 | Mauritius | 6,834 | | 5181 | 37329.62 | 314339652.7 | 44.83 | 30.78 | 1 |
| 2010 | Congo (Brazzaville) | 2,901 | | 106 | 37329.62 | 5824472945 | 11.36 | 905.91 | 1 |
| 2010 | Congo (Kinshasa) | 3,210 | | 1254 | 37329.62 | 459949909.9 | 30.92 | 495.28 | 1 |
| 2010 | Swaziland | 18,792 | | 1811 | 37329.62 | 219516025.7 | 71.05 | 7.32 | 1 |
| 2010 | Comoros | 1,660 | | 336 | 37329.62 | 0.21 | 83.29 | 371.46 | 1 |
| 2010 | Djibouti | 825 | .. | | 37329.62 | 0.23 | 73.42 | 177.72 | 1 |
| 2010 | Burkina Faso | 227 | | 283 | 37329.62 | 0.233 | 44.09 | 495.28 | 1 |
| 2010 | Zambia | 269 | | 435 | 37329.62 | 3260748131 | 31.93 | 4797.14 | 1 |
| 2010 | Mali | 322 | | 273 | 37329.62 | 0.211 | 33.62 | 495.28 | 1 |
| 2010 | Senegal | 390 | | 560 | 37329.62 | 2017612569 | 49.37 | 495.28 | 1 |
| 2010 | Sierra Leone | 238 | | 268 | 37329.62 | 896496179.9 | 47.96 | 3978.09 | 1 |
| 2010 | Chad | 0 | | 300 | 37329.62 | 0.211 | 39.33 | 495.28 | 1 |
| 2010 | Benin | 0 | | 377 | 37329.62 | 0.55 | 30.06 | 495.28 | 1 |
| 2010 | Namibia | 76 | | 2696 | 37329.62 | 853068395.2 | 47.14 | 7.32 | 1 |
| 2010 | Lesotho | 117 | | 496 | 37329.62 | 166912027.3 | 76.61 | 7.32 | 1 |
| 2010 | Gambia | 22 | | 660 | 37329.62 | 275573960.6 | 60.77 | 28.01 | 1 |
| 2010 | Botswana | 0 | | 4190 | 37329.62 | 351094055 | 45.63 | 6.79 | 1 |
| 2010 | Angola | 0 | | 623 | 37329.62 | 7958065084 | 46.83 | 91.91 | 1 |
| 2010 | Mauritania | 0 | | 609 | 37329.62 | 572438587 | 38.53 | 275.89 | 1 |
| 2010 | Seychelles | 0 | | 8788 | 37329.62 | 0.66 | 6.52 | 12.07 | 1 |
| 2011 | Ghana | 300,026 | | 403 | 37691.03 | 9362701326 | 69.88 | 1.51 | 1 |
| 2011 | SA | 210,402 | | 3825 | 37691.03 | 8811849011 | 79.44 | 7.26 | 1 |
| 2011 | Liberia | 157,056 | | 279 | 37691.03 | 820603670.4 | 27.30 | 72.23 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| 2011 | Ethiopia | 120,215 | | 230 | 37691.03 | 13023532329 | 35.68 | 16.90 | 1 |
| 2011 | Nigeria | 107,265 | | 566 | 37691.03 | 0.33 | 83.66 | 154.74 | 1 |
| 2011 | Kenya | 94,839 | | 478 | 37691.03 | 8346408890 | 48.23 | 88.81 | 1 |
| 2011 | Cameroon | 83,488 | | 666 | 37691.03 | 0.44 | 20.30 | 471.87 | 1 |
| 2011 | Malawi | 51,176 | | 183 | 37691.03 | 1539529294 | 59.18 | 156.52 | 1 |
| 2011 | Tanzania | 38,872 | | 474 | 37691.03 | 5997770355 | 39.45 | 1572.12 | 1 |
| 2011 | Uganda | 37,396 | | 393 | 37691.03 | 3612363810 | 70.37 | 2522.75 | 1 |
| 2011 | Rwanda | 29,553 | | 371 | 37691.03 | 2036564747 | 77.82 | 600.31 | 1 |
| 2011 | Togo | 28,732 | | 273 | 37691.03 | 1155386059 | 68.39 | 471.87 | 1 |
| 2011 | Gabon | 10,819 | | 4334 | 37691.03 | 649859365.9 | 20.02 | 471.87 | 1 |
| 2011 | Mozambique | 9,560 | | 402 | 37691.03 | 3546476361 | 62.81 | 29.07 | 1 |
| 2011 | Burundi | 7,442 | | 141 | 37691.03 | 757276285.2 | 86.44 | 1261.07 | 1 |
| 2011 | Mauritius | 7,851 | | 5371 | 37691.03 | 363827922.6 | 43.84 | 28.71 | 1 |
| 2011 | Congo (Brazzaville) | 4,494 | | 110 | 37691.03 | 6829703127 | 11.36 | 919.49 | 1 |
| 2011 | Congo (Kinshasa) | 3,422 | | 1266 | 37691.03 | 488035237.6 | 30.92 | 471.87 | 1 |
| 2011 | Swaziland | 3,168 | | 1814 | 37691.03 | 233523064.5 | 71.05 | 7.26 | 1 |
| 2011 | Comoros | 1,775 | | 335 | 37691.03 | 0.567 | 83.29 | 353.90 | 1 |
| 2011 | Djibouti | 880 | .. | | 37691.03 | 0.435 | 73.42 | 177.72 | 1 |
| 2011 | Burkina Faso | 864 | | 286 | 37691.03 | 0.9867 | 43.00 | 471.87 | 1 |
| 2011 | Zambia | 527 | | 444 | 37691.03 | 3718101773 | 31.52 | 4860.67 | 1 |
| 2011 | Mali | 328 | | 272 | 37691.03 | 0.25423 | 34.11 | 471.87 | 1 |
| 2011 | Senegal | 260 | | 560 | 37691.03 | 1937231257 | 49.37 | 471.87 | 1 |
| 2011 | Sierra Leone | 220 | | 278 | 37691.03 | 958698653.8 | 47.96 | 4349.16 | 1 |
| 2011 | Chad | 125 | | 301 | 37691.03 | 0.2436 | 39.65 | 471.87 | 1 |
| 2011 | Benin | 118 | | 378 | 37691.03 | 0.657 | 30.42 | 471.87 | 1 |
| 2011 | Namibia | 49 | | 2749 | 37691.03 | 933362560.3 | 47.14 | 7.26 | 1 |
| 2011 | Lesotho | 31 | | 519 | 37691.03 | 167811296.9 | 76.15 | 7.26 | 1 |
| 2011 | Gambia | 22 | | 615 | 37691.03 | 169646324.2 | 60.77 | 29.46 | 1 |
| 2011 | Botswana | 2 | | 4378 | 37691.03 | 415765128.5 | 45.63 | 6.84 | 1 |
| 2011 | Angola | 0 | | 630 | 37691.03 | 9692096799 | 46.83 | 93.93 | 1 |
| 2011 | Mauritania | 0 | | 623 | 37691.03 | 613182612.3 | 38.53 | 281.12 | 1 |
| 2011 | Seychelles | 0 | | 9279 | 37691.03 | 0.436745 | 6.52 | 12.38 | 1 |