THE IMPACT OF THE AFRICAN GROWTH AND OPPORTUNITY ACT ON SUB-SAHARA AFRICAN VALUE-ADDED AGRICULTURAL EXPORTS

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Title

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MASTER OF SCIENCE

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ABSTRACT

This thesis evaluates value added exports of agricultural products from Sub-Sahara African (SSA) countries to the United States of America (U.S.A.). First, the impact of the African Growth and Opportunities Act (AGOA) on SSA's domestic value-added exports is assessed by using a sectoral structural gravity model. The study then evaluates the AGOA's effect on the extensive margin and intensive margin of US-SSA value added trade using a Helpman, Melitz, and Rubinstein (2008) (HMR) two-step procedure model. The empirical results show that AGOA has had an insignificant impact on SSA's agricultural domestic value-added exports to the U.S.A. In addition, being an AGOA recipient does not seem to affect a recipient's decision to export domestic value-added agricultural products and has had an insignificant impact on the volume of agricultural domestic value-added exports to the U.S.A.

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CHAPTER ONE. INTRODUCTION

1.1. Background

The trade relationship between the United States of America (U.S.A.) and Sub-Sahara African (SSA) countries can be traced back to the early 1960s. In 1960, the U.S.A. was the second-largest export destination, after Europe, for the SSA's exports and accounted for 9% of the total African exports. This share expanded rapidly in the 1970s, reaching a peak of about 27% in 1982 (Gayi, Nkurunziza & Halle, 2008). Due, in part, to the emergence of new export destinations, such as China and India, in the early 1990s, the share of SSA's exports to the U.S.A. declined to about 15% (Gayi et al., 2008). In the late 1970s and early 1980s, SSA countries initiated several domestic policy reforms which were later paired with trade liberalization in agriculture during the late 1980s (McKay, Morrissey, & Vaillant, 1997; Zamfir, 2016). Following these reforms, agricultural raw products as well as food-and-beverage products accounted for more than half of the export earnings for 39 of 47 SSA countries (Morrissey & Filatotchev, 2000).

The African Growth and Opportunity Act (AGOA) is a trade policy that emerged from the long-standing US-SSA trade relationship and with a mutual recognition about the need to expand and to deepen this trade relationship. Through the AGOA, the U.S.A. offers tariff reductions or duty-free preferences to certain products which originate from eligible SSA countries. The preferential-tariff treatment only applies to the SSA's exports of AGOA-eligible products, not to the U.S.A.'s exports to SSA countries. That is, under the AGOA, SSA countries are not required to lower their own trade barriers for the U.S.A.'s exports. Thirty-four SSA countries were eligible to receive AGOA benefits when it was initiated in 2000. Now, 38 of the 49 SSA countries receive AGOA preferences (United States International Trade Commission [USITC], 2017).

Based on the AGOA beneficiary data used in this research, SSA countries show a significant rate of churning in and out of AGOA preferences, owing to the momentary suspension or termination of AGOA benefits as well as recipient graduation from the program (USITC, 2017). The momentary suspension or termination of AGOA benefits along with recipient graduation have unintended consequences on the regional integration of the production process (Moyo & Page, 2010; Schneidman, 2012; Tuigong & Kipkurgat, 2015). For instance, in the product-eligibility context, removing an AGOA recipient from receiving the preferential benefits implies that the intermediate inputs are no longer AGOA eligible (Edwards & Lawrence, 2014; Tuigong & Kipkurgat, 2015). The ineligibility of the intermediate products hinders the production of final products for export in an AGOA recipient country that depends on intermediate inputs originating from the suspended or graduated recipient country (Herz & Wagner, 2011; Tuigong & Kipkurgat, 2015). On the other hand, the termination of AGOA preferential treatment may favor intermediate products that are wholly sourced in a single recipient country (Balié, Del Prete, Magrini, Montalbano, & Nenci, 2017; Allard, Kriljenko, Gonzalez-Garcia, Kitsios, & Treviño, 2016; Moyo & Page, 2010). Contextually, the literature has associated country graduation and suspension to program failure (Mueller, 2008; Naumann, 2015, 2016; Tuigong & Kipkurgat, 2015; Williams, 2015). In general, the AGOA is expected to generate extra income earnings from expanded exports to the U.S.A. which, in turn, are expected to accelerate economic growth in the SSA region (AGOA.info, 2017; Limão, 2016; Páez, Karingi, Kimenyi, & Mekalia, 2010; Williams, 2015). Despite the general expectation, the impact of the AGOA program on SSA's trade flows to the U.S.A. differs among the extant literature. In addition, the mechanism through which AGOA has increased SSA's exports to the U.S.A. remains largely untested.

A handful of studies examined the AGOA's effect on the SSA's exports to the U.S.A. by using total merchandise exports. For example, Zappile (2011) found no evidence that the AGOA benefits the SSA's merchandise exports. In Cooke (2011), the increase in the SSA's overall exports to the U.S.A. ranged between 38.3% and 57.8%. Some researchers looked into the AGOA's influence on specific economic sectors, such as textiles and apparel, and agriculture, for the entire SSA region (Condon & Stern, 2011; Collier & Venables, 2007; Tadesse and Fayissa, (2008); Frazer & Van Biesebroeck, 2010). In Frazer and Van Biesebroeck (2010), the SSA's apparel exports to the U.S.A. increased by 42%, on average, but the effects were only positive for 14 beneficiaries. A few studies focused on assessing the AGOA's influence on specific economic sectors of a specific region or country. For example, Rolfe and Woodward (2005) assessed the AGOA's effect on Kenya's garment sector. The authors speculated that, although the export volume increased under AGOA, it did not necessarily increase the sector's competitiveness. The authors pointed out that Kenyan apparel products were generally sold at a lower per unit price to the U.S.A. compared to similar products from China and elsewhere.

Empirical studies about the AGOA's influence on the SSA's agricultural exports included Frazer and Van Biesebroeck (2010); Ianchovichina, Mattoo, and Olarreaga (2001; Nouve and Staatz (2003); and Zenebe, Wamisho, and Peterson (2013). In Frazer and Van Biesebroeck's (2010) study, the SSA's agricultural exports to the U.S.A. increased by 8%, on average, and two-thirds of the AGOA recipients experienced a significant positive increase for agricultural exports. In Ianchovichina et al., (2001), the SSA's agriculture accounted for 42% of non-oil products. In Nouve and Staatz (2003) and Zenebe et al. (2013), the impact of the AGOA on SSA's agricultural exports to the U.S.A. was statistically insignificant.

Assessing the AGOA in the aforementioned studies was often limited to using total-merchandise (gross exports) data. Estimating the impact of AGOA by using aggregated data may not capture the effect of the trade policies which are negotiated and applied at the sector level (Piermartini & Yotov, 2016). Further, several researchers concluded that evaluating trade policies by using gross trade flows produces misleading results because of double-counting problems (Johnson, 2014; Koopman, Wang, & Wei, 2008; Maurer & Degain, 2012; Xing & Detert, 2010; Xu, 2012). They pointed out that trade flows for intermediate goods within the value-added trade are not always reflected in conventional measures of international trade (Ahmad, 2013; Baldwin & Lopez-Gonzalez, 2013, 2015; Koopman, Wang, & Wei, 2014).

To address the two aforementioned problems, (a) masking the sector-level AGOA impacts when using aggregated merchandise data and (b) the double-counting problem associated with the utilizing gross trade flows (traditional trade statistics), this research adopts a value-added trade-assessment method to re-evaluate the AGOA program. Thus, the value addition that originates from the domestic sources of the AGOA recipients is specifically considered. Furthermore, if the AGOA has increased the recipients' value-added exports to the U.S.A., this study also examines the mechanisms which have led to more value-added exports. Furthermore, this research takes a detailed approach by considering the sector-level, value-added panel data for 189 countries from 1990-2013. Considering the AGOA's uneven influence across sectors, this study also provides a detailed assessment about the program's effect on five economically important sectors for the SSA region. The five sectors are agriculture; mining and quarrying; food and beverages; textiles and apparel; and petroleum, chemical and non-metallic mineral products.

Following the Koopman et al. (2014) framework, four different measures of value-added trade are computed using the Eora multi-region input-output tables. (Readers are referred to

Section 3.5 for a detailed description about constructing these metrics.) The computed value-added trade measures and trade indicators are (a) domestic value-added exports by sector, (b) domestic value-added to gross exports ratio by sector, (c) overall domestic value-added exports for the full economy (aggregate of domestic value-added exports in all sectors), (d) the overall domestic value-added to gross exports ratio (measures the aggregate domestic value-added content in gross exports or total merchandise exports), and (e) gross exports or total merchandise exports. The following section discusses the importance of the five chosen sectors to the SSA countries.

1.2. Motivation for Research

Evident by its high contribution to the gross domestic product (GDP) in many SSA countries, the agriculture sector is still the most important economic sector for the SSA region (International Monetary Fund [IMF], 2013). Since 1990, the contribution of the agriculture value-added sector to GDP in the SSA region has been above 15% and remains higher than the contribution from manufacturing (Figures A1, A2, and A3 in Appendix) (World Bank, 2017). Besides agricultural products, SSA countries export other products, such as textiles and apparels, non-oil petroleum products, processed food and beverages, and minerals. In 2016, the leading SSA's export categories under the AGOA were petroleum-related products ($30.1 billion), transportation equipment ($2.1 billion), minerals and metal products ($865.5 million), textiles and apparel products ($815.3 million), agricultural products ($520.8 million), and chemical-related products ($428.8 million) (AGOA.info, 2017; Office of the United States Trade Representative [OUSTR], 2017). Further, the Office of the USTR's estimates suggest that the SSA's non-oil exports to the U.S.A. under the AGOA nearly tripled from $1.4 billion in 2001 to $4.1 billion in 2015 (OUSTR, 2016). Most countries in the SSA region are actively engaged in agricultural exports; in 2017 alone, 28 of the 38 AGOA recipients exported agricultural products while 4 exported petroleum-related products to the U.S.A. (AGOA.info, 2017).

In 2016, the leading exporters of agricultural products were Cote d'Ivoire, South Africa, Ghana, Madagascar, Ethiopia, and Kenya (AGOA.info, 2017).[1] Given the relative importance of these five sectors in many SSA countries, more domestic value-added exports are also expected for these sectors. The following subsections provide more detailed and comparative trends for the domestic value-added content that originates from each of the five sectors.

1.2.1. Domestic Value-Added Exports by Sector

Figure A4 in Appendix illustrates the differences in the SSA's domestic value-added exports to the U.S.A. for the five economically important sectors from 1990-2013. The SSA's overall domestic value-added exports and gross exports to the U.S.A. are also shown for comparison. As illustrated in Figure A4, the trends for both the overall, domestic value-added exports and gross exports increase continually during the sampling period, except during the global financial crisis of 2008-2009. The increase for the domestic value-added exports and gross exports can partly be explained by generally high level of prices for primary commodities during 2003-2011 (United Nations Development Programme (UNDP), 2016). Although the trend is uneven and the rate of increase for the SSA's domestic value-added exports differs across sectors, exports start increasing for all cases after the AGOA program was initiated. For example, the domestic value-added exports in the mining and quarrying sector are noticeably higher than in all other sectors; the exports in this sector have increased from \$5 billion in 1990 to \$20 billion in 2013.

[1] Agoa.info, 2017 In 2016, leading exporters of agricultural products were Cote d'Ivoire (\$989 million), South Africa (\$285 million), Ghana (\$245 million), Madagascar (\$237 million), Ethiopia (\$139 million), and Kenya (\$122 million).

1.2.2. Domestic Value-Added to Gross Exports Ratio by Sector

Figure A5 illustrates the trend for the share of the SSA's domestic value-added content in gross exports to the U.S.A. for the period from 1990-2013. The domestic value-added to gross exports ratio is shown separately for each sector. The overall domestic value-added content in gross exports (overall VAX Ratio) for the entire economy is also shown for comparison. As illustrated in the figure, the overall domestic value-added content in gross exports is mostly increasing. A clear and rapid increase can be seen for 2000-2008; later, the trend stabilizes. This trend is generally true for all the sectors, except textiles and apparel where the domestic value-added content for exports has declined since 2007. In other sectors where the VAX ratio is growing, growth in VAX ratio is gradual in agricultural (0.65 in 2001 to 0.75 in 2013) and food and beverage sector. A very high domestic value-added to gross exports ratio is seen for the mining and quarrying sector as well as the petroleum and chemical sector. The ratio hovers around 0.99 for the former sector, and between 0.82 and 0.9 for the latter sector over the entire sampling period.

1.2.3. Overall Domestic Value-Added Exports and Gross Exports for SSA Countries

Figure A6 in Appendix depicts the trend for the SSA's overall domestic value-added exports and overall gross exports from 1990-2013. As shown in the figure, the two trends follow the same pattern and are increasing; there is a rapid increase for exports following the AGOA's enactment until 2008. After a brief decline in 2009, there seems to be an impressive recovery for the two trends. Overall, both gross exports and domestic value-added exports have increased from $50 billion and $40 billion in 1990 to $340 billion and $290 billion in 2013, respectively. The difference between the gross exports and domestic value-added exports increases over time, from about $10 billion in 1990 to about $60 billion in 2013. This increase in the difference might suggest that the share of foreign value-added content in the SSA's gross exports has been increasing over time.

Figure A7 in Appendix depicts the trend in gross exports and domestic value-added exports which originate from all other countries (including the SSA countries) that are AGOA non-recipients from 1990-2013. It can be inferred from the figure that there is an increase for both gross exports and domestic value-added exports overall. As in the case of the SSA's exports, the trends for the non-recipients' exports rapidly increase after the AGOA's enactment and follow the same pattern. Furthermore, the difference between the gross exports and domestic value-added exports widens over time, from about $100 billion in 1990 to about $600 billion in 2013. Based on Figure A8 in Appendix, the export trends for the Rest of the World (ROW) are increasing over time and follow the same pattern. Also, there seems to be little or no difference between the size of gross exports and domestic value-added exports from the non-recipients plus other countries group and the Rest of the World group, even though the two groups are unique Notwithstanding different export values, the trends for the domestic value-added exports and gross exports which originate from all three sets of exporters follow a surprisingly similar pattern.

1.2.4. Set of Recipient Exporters

Figure 9 in Appendix depicts the variation for a set of AGOA recipients that were engaged in exporting to the U.S.A. between 1990 and 2013. Some countries in the SSA region do not participate in the program; further, by AGOA program design, many countries outside the SSA region do not receive AGOA preferences. Even for these countries, the decision to export to the U.S. changes over time. The variation with the number of exporters from these two groups is also shown for comparison. Further, a general trend for the number of exporters during the entire sampling period and sampling countries is also shown to put the previously mentioned trends into perspective. To capture the differences about the decision to export over time, information about zero trade flows in the data is utilized. (Readers are referred to Section 3.3, Modeling Zero Trade Flow, for a detailed description about the number of observations with zero flows.) The trend in the number of exporters in all four groups varies over time. There is an increased number of exporters overall. The number of recipients is increasing (from 34 in 2000 to 39 in 2013); on the other hand, the number of non-recipients in the SSA region is decreasing (from 49 to 7). The number of exporters from the non-recipients in the SSA plus other countries category increased between 1991 and 1992 from 165 to 185, and then stayed almost stable until 1999. However, this trend had a sharp decline the year the AGOA was enacted, and since then, the number of exporters from the non-recipients in the SSA plus other countries group has been declining gradually.

1.3. Research Objectives

The overall goal of this thesis is to re-evaluate the AGOA program and to explore whether the AGOA has promoted the SSA's value-added exports to the U.S.A. Specifically, the research objectives are as follows:

(i) to assess the impact of AGOA on the SSA's domestic value-added exports to the U.S.A.

(ii) to evaluate the mechanism through which the AGOA has increased, if any, the SSA's agricultural, domestic value-added exports to the U.S.A.

The next section presents a brief background on the AGOA amendments and a detailed description about the AGOA preferences.

1.4. The African Growth and Opportunity Act's Legislation

The U.S. Congress has passed various amendments to the original terms and conditions of the AGOA legislation since it was enacted. This subsection provides a brief background for the key features of the AGOA amendments from 2000-2015. The Trade Act of 2002 (AGOA II provisions) was signed as the first amendment and changed certain apparel provisions of the AGOA I. For example, the cap for fabric and yarn cumulation of regional origin was doubled from 3% to 7%. Also, the amendment expanded preferential access for knit-to-shape and hybrid apparel articles that are "wholly assembled" in an AGOA recipient's country but contain components which are sourced from the U.S.A. or from another AGOA recipient country (AGOA.info, 2017). The AGOA Acceleration Act of 2004 (AGOA III), as the second amendment, extended the waiver of the Rules of Origin for apparel exports of the lesser developed beneficiary countries, from September 2004 to September 2007. Furthermore, under the extended waiver, lesser developed beneficiary countries became eligible to utilize the third-country fabric provisions. This change implied that AGOA recipients could source fabrics which were produced in non-recipients' countries when making AGOA-compliant apparel items. In addition, the amendment gave more Congressional guidance to the administration about how to administer the bill's textile provisions. AGOA III extended the act's original expiration date from September 30, 2008, to September 30, 2015 (AGOA.info, 2017). The Africa Investment Incentive Act of 2006 (AGOA IV) was the third amendment, extending the third-country fabric provision to 2012 and the AGOA legislation to 2015. Furthermore, under the AGOA IV legislation, duty-free and quota-free treatment was extended to a wider range of eligible products which were made in eligible SSA countries but were subject to a certain cap (AGOA.info, 2017; International Trade and Administration [ITA], 2017).

The fourth amendment, AGOA V of 2012, extended the crucial third-country fabric provisions by 3 years to 2015. The intent of these four amendments was to improve the AGOA's operation and the program utilization by SSA countries, (AGOA.info, 2017; Meltzer, 2015). The Obama Administration signed the Trade Preferences Extension Act (TPEA) into law on June 29, 2015, an action which extended the AGOA for 10 years through 2025.[2] In addition, the Agricultural Technical Assistance for SSA, under Section 13 of the AGOA Acceleration Act of 2004 (19 U.S.C. 3701), was also amended in June 2015.[3] The renewed AGOA (Public Law 114–27, 114th Congress), as amended, called for implementing the World Trade Organization's (WTO) Agreement on Trade Facilitation and provided additional tools, under the Extension and Enhancement of AGOA Act of 2015, in order to support compliance with the AGOA's eligibility criteria and rules of origin (ROO).

1.5. The African Growth and Opportunity Act's Preferences

1.5.1. Country Coverage

Eligibility criteria for receiving AGOA preferences consist of two separate steps (Williams, 2015). First, a country must be an SSA country, as described in the AGOA (19 U.S.C. 3706). This list has been updated periodically by new legislation, and in 2011, the 112th Congress added South Sudan in P.L. 112-163. Second, the legislation requires the U.S. president to determine which SSA countries are eligible to receive the AGOA preferences for the following year. The country-eligibility requirements under the AGOA are criteria in (a) Section 104 of the AGOA (19 U.S.C. 3703) and (b) Section 502 of the Trade Act of 1974 (19 U.S.C. 2462) (AGOA.info, 2017; OUSTR, 2016). The eligibility criteria include setting up or making continual progress to create a market-based economy, rule of law, poverty-reduction policies, a system to combat corruption and bribery, and protection of internationally recognized workers' rights (AGOA.info, 2017). In addition, an AGOA recipient is prohibited from engaging in activities that undermine the U.S.A.'s national-

[2] Public Law 114–27—June 29, 2015, Title I—Extension of African Growth and Opportunity Act https://www.congress.gov/114/plaws/publ27/PLAW-114publ27.pdf

[3] Public Law 114–27—June 29, 2015, Title I—Extension of African Growth and Opportunity Act https://www.congress.gov/114/plaws/publ27/PLAW-114publ27.pdf

security and foreign-policy interests and from conducting activities that are in gross violation of internationally recognized human rights (AGOA.info, 2017).

According to the OUSTR (2016), failure to maintain the eligibility status leads to temporary suspension or termination of AGOA benefits. For instance, Burundi lost its eligibility on January 1, 2016, following its failure to make progress toward establishing the rule of law and political pluralism (AGOA.info, 2017; OUSTR, 2016). The OUSTR (2016) pointed out that, because Generalized System of Preferences (GSP) eligibility is a precondition for benefits under the AGOA, a country's eligibility for AGOA benefits can be terminated if a country has achieved a high-income status with a gross national income (GNI) per capita of $12,736 or higher. For example, Seychelles graduated from receiving AGOA benefits on January 1, 2017, after achieving a GNI per capita of $13,990 in 2015 (OUSTR, 2016).[4]

1.5.2. Product Coverage

Williams (2015) noted that tariff benefits and country-eligibility requirements under the AGOA are an expansion of the U.S. GSP program, a preferential trade agreement with over 120 developing countries, including the SSA countries. The AGOA offers duty-free market access to over 1,800 tariff lines that are covered under the U.S. GSP program and 7,000 added tariff lines (at the 8-digit Harmonized System Code level) from AGOA-eligible SSA countries (AGOA.info, 2017; OUSTR, 2016; Williams, 2015). The added eligible products include value-added products from the agriculture sector and the food and beverage sector, such as cocoa and processed food products (OUSTR, 2016). However, the number of product items covered by the AGOA vary over time. The number of product items that initially received AGOA preferential treatment in 2001 was 10,187, which increased to 31,965 product items in 2002 and reached a peak of 32,007 items

[4]See Table A1 in Appendix for the effective dates of the AGOA recipients' eligibility, suspension, reinstatement, and graduation.

in 2004 before a sharp decline to 12,018 product items in 2006. Since 2006, the highest number of product items that received the AGOA preferential treatment was 14,134 in 2016 (see Appendix's Figure A10) (World Integrated Trade Solution [WITS], 2017).

Although the largest portion of AGOA-eligible products covers goods that are already receiving U.S. GSP preferences, the AGOA legislation exempts recipients from the Competitive Needs Limitations (AGOA.info, 2017). AGOA recipients are exempt from export ceilings which are set for each product and country. The export ceilings prevent the extension of preferential treatment to countries which are competitive in the production of the exported item. Preferential treatment under the AGOA vary from sector to sector. For example, the AGOA program extends duty-free treatment to certain apparel and footwear products which are ineligible under the U.S. GSP. On the other hand, agricultural products that are subject to tariff-rate quotas remain ineligible for duty-free treatment under both the AGOA and the U.S. GSP (Williams, 2015). The existing AGOA framework maintains tariff-rate quotas for seven agricultural commodities of export interest for SSA countries: sugar, dairy, beef, peanuts, cotton, and tobacco (Meltzer, 2015; Skully, 2010). The product coverage under the AGOA implies that preferential tariff treatment is applied at the sectoral level (i.e., varies by sector), only to selected countries, and for products that are eligible to receive the AGOA preference benefits.

1.5.3. Rules of Origin

Products from AGOA recipients must meet certain rules of origin to qualify for preferential tariff treatment (AGOA.info, 2017). The purpose of the rules of origin is to prevent trade deflection, whereby products from non-recipients are transshipped through the recipient (with minimal processing) to avoid paying tariffs, ensuring that only eligible products from the recipients are granted preferential tariff treatment (AGOA.info, 2017). The rules of origin are based on a percentage method where the local content must be equal to or exceed a certain threshold. As a general requirement, a product which is listed as eligible for AGOA preferences must be grown, produced, or manufactured by an AGOA recipient (AGOA.info, 2017; OUSTR, 2016). The salient features of the AGOA's rules of origin for non-textiles and apparel items are as follows: (a) the product must be imported directly from an AGOA-recipient country to the U.S.A.; (b) the product must be grown, produced or manufactured by one or more AGOA recipient(s); (c) a total of up to 15% of the 35% local content value may consist of U.S.-originating parts and materials; and (d) products may incorporate materials which are sourced from one or more former AGOA recipient(s) provided that the sum for the materials' value, plus the direct costs of processing undertaken by the AGOA recipient(s), adds up to or exceeds 35% of the product's appraised value at the U.S. port of entry (AGOA.info, 2017; Williams, 2015). The salient features of the AGOA's rules of origin facilitate the regional cumulation of origin.

1.6. Thesis Outline

The thesis is organized in five chapters. Chapter 2 provides the relevant Literature Review to evaluate the AGOA's effect on the SSA's exports to the U.S.A. as well as the SSA's value-added trade and integration into the Global Value Chains (GVCs). Chapter 3 presents the study's theoretical framework, empirical econometric models, and the value-added data and construction of variables used for the empirical model. In Chapter 4, the research's empirical econometric results are discussed. Finally, Chapter 5 presents the study's conclusions and discussion.

CHAPTER TWO. LITERATURE REVIEW

This chapter addresses two categories of literature related to the study. The first section focuses on previous literature related to the AGOA's effect on the SSA's overall exports and the AGOA sectors' effect on exports from the agriculture sector, the textiles and apparel sector, and the other sectors. The second part of the chapter focuses on literature related to the SSA's value-added trade and integration into the Global Value Chains (GVCs).

2.1. Previous Literature About the AGOA's Influence on SSA Exports

Several researchers and policymakers have investigated the AGOA's influence on the SSA's exports to the U.S.A. Some studies focused on the initial and potential effect of the AGOA's rules of origin with reference to specific sectors (Brenton & Ikezuki, 2004; Mattoo, Roy & Subramanian, 2003). Mattoo et al. (2003) analyzed the influence of the AGOA's rules of origin on the SSA's apparel exports using the partial equilibrium analysis. Their findings illustrated the AGOA's positive potential effect on the SSA's exports. They predicted an overall increase for the SSA's exports, ranging between US$100 million and US$140 million. The authors noted that, with the absence of the AGOA rules of origin, the SSA's non-oil exports would have increased by about US$0.54 billion. The implication is that, despite the presence of the rules of origin in the apparel sector, the AGOA is expected to have a positive influence on SSA's apparel exports.[5]

Brenton and Ikezuki (2004) analyzed the initial and potential impact of the AGOA on the SSA's exports to the U.S.A. using raw trade data and AGOA provisions. Their study's focus was on the scope and product coverage with the AGOA preferences. Their objective was to examine the extent to which AGOA preferences were beneficial to individual recipients and the program's key constraints. The authors noted that, in 2002, apparel exports from the 9 least-developed

[5]This study does not focus on the AGOA rules of origin's effect on the SSA's exports to the U.S.A. but on the result of being an AGOA-preference recipient on the SSA's exports to the U.S.A.

countries which received full AGOA apparel benefits increased by 80% and accounted for 93% of the US$437 million total-export value. Also, in 2002, apparel exports from the non-least-developed countries that were eligible for the special rule of origin accounted for 60% of the US$342 million total-export value. Last, in 2002, petroleum exports from non-least-developed countries without apparel benefits accounted for 85% of the US$7.9 billion total-export value. Although their analysis defined the AGOA's potential effect on the SSA's petroleum and apparel exports to the U.S.A., the AGOA's potential influence on the SSA's agricultural exports to the U.S.A. was unexplained (Condon & Stern, 2011)

Many studies about the AGOA's effect on the SSA's exports focused on the act's effect on the SSA's overall (total) exports (Cook & Jones, 2015; Cooke, 2011; Didia, Nica, & Yu, 2015; Tadesse and Fayissa, (2008); Frazer & Van Biesebroeck, 2007; Gil-Pareja, Llorca-Vivero, & Martínez-Serrano, 2010; Lederman & Özden, 2004; Mueller, 2008; Nouve, 2005; Seyoum, 2007; Zappile, 2011). Cook and Jones (2015), Cooke (2011), Didia et al. (2015), Tadesse and Fayissa (2008), Frazer and Van Biesebroeck (2010), and Nouve (2005) found that the AGOA has had a positive and significant effect on the SSA's overall exports to the U.S.A.

Lederman and Özden (2004) estimated a gravity model using disaggregated trade data at the 2-digit Harmonized System Code level. The authors employed the product-program utilization rate as the AGOA instrument and found that AGOA participation led to a 5% increase in overall exports for the average beneficiary country. Nouve (2005) estimated the AGOA's effect on the SSA's overall aggregate merchandise exports to the U.S.A. until 2004 by using dynamic panel-data analysis. Based on his findings, the AGOA had a strong, positive effect on the SSA's overall aggregate merchandise exports to the U.S.A. Nouve concluded that apparel exports under the AGOA had a negative effect on the SSA's overall aggregate merchandise exports to the U.S.A. In addition, Nouve pointed out that evaluating the AGOA's effect by focusing exclusively on apparel exports may be misleading because gains in this sector could potentially come at the cost of other sectors. However, Nouve's (2005) analysis had a limited exploration of certain AGOA conditions, such as the product coverage and rules of origin as explanatory variables (see Condon & Stern, 2011).

Tadesse and Fayissa (2008) analyzed the AGOA's influence on the SSA's overall exports across 99 different product categories. The authors' estimates indicated that AGOA had a positive and significant effect on 14 of the 32 product categories presented as well as a negative and significant effect on 3 product categories. However, the analysis did not provide a full specification about the products and exporters which have benefited the most from the AGOA. Frazer and Van Biesebroeck (2010) used a triple-difference estimation regression to assess the AGOA's influence on the SSA's overall exports for the period from 2000-2006. The authors found that the AGOA had a positive effect on the SSA's overall exports to the U.S.A. Based on the estimates, the AGOA led to an 8% increase, which is equivalent to US$439 million, for non-oil exports from all AGOA recipients during 2000-2006.

Cooke (2011) estimated the AGOA's effect at the HS-6 level for selected HS chapters from 1996-2009 using triple difference-in-difference regression. The author noted that the AGOA led to a positive increase in the SSA's overall exports to the U.S.A. Cooke's results suggested that the increase in the SSA's exports varied from 38.3% to 57.8%. He concluded that the AGOA's effects were small and were greater for the apparel exports than for the non-apparel exports. Cook and Jones (2015) analyzed the impact of AGOA on the SSA's export diversification. Their empirical results suggested that the AGOA had a positive effect on the SSA's overall exports to the U.S.A. In addition, they noted that apparel exports which originated from AGOA apparel-provision recipients increased as well as the non-apparel exports. Therefore, the authors concluded that the AGOA played a significant role with export diversification at the extensive margin of trade. Didia et. al (2015) examined the trade flow and composition of trade between the AGOA recipients and the U.S.A. by estimating a gravity model using U.S. import data from 36 AGOA recipients over 12 years. The finding showed that AGOA membership had a strong, positive, and significant effect on overall trade with the U.S.A. The authors noted that the impact of AGOA membership on crude-oil exports was disproportionate across Angola, Gabon, and Nigeria.

On the other hand, studies such as Seyoum (2007), Mueller (2008), Gil-Pareja et al. (2010), and Zappile (2011) showed the AGOA's insignificant impact of AGOA on the SSA's overall aggregate merchandise exports to the U.S.A. Seyoum (2007) used an Auto-Regressive Integrated Moving Average model to estimate the AGOA's effect on the SSA's total exports for the period of 2000-2004. The analysis examined whether there is a statistically significant increase for the SSA's exports with the AGOA and analyzed the AGOA's role to stimulate exports from recipients. The findings suggested that the AGOA had an insignificant impact on the SSA's overall exports to the U.S.A. On the other hand, the AGOA had a positive and statistically significant effect with stimulating exports in the apparel sector. Mueller (2008) estimated the AGOA on the SSA's overall non-oil exports from the AGOA recipients from 2000-2004 using a Prais-Winston gravity model. The results suggested that the AGOA had no significant effect on the SSA's overall non-oil exports to the U.S.A.

Gil-Pareja et al. (2010) estimated a gravity model using the direction of trade data provided at 3-year intervals and for the period of 1990-2008. Their finding suggested that AGOA membership had an insignificant effect on the SSA's overall exports. The authors concluded that SSA countries exported less to the U.S.A. under the AGOA than with the U.S. GSP scheme.

Zappile (2011) used a gravity model to assess the AGOA's effects on the SSA's overall exports to the U.S.A. The results showed that the AGOA program had an insignificant effect on the SSA's aggregate-merchandise exports and textile exports to the U.S.A.

Some studies analyze the AGOA's influence on specific economic sectors, such as the textiles and apparel sector, or the agriculture sector. These studies either focus on specific economic sectors of a particular SSA country or specific economic sectors for a particular selection of SSA countries. The textiles and apparel sector receives the most attention from researchers (Brenton & Hoppe, 2006; Collier & Venables, 2007; Cooke, 2011; Condon & Stern, 2011; Edwards & Lawrence, 2014; Tadesse & Fayissa, 2008; Frazer & Van Biesebroeck, 2010; Rolfe & Woodward, 2005; Seyoum, 2007). These studies found that the AGOA had a positive impact of AGOA on apparel exports.

Rolfe and Woodward (2005) assessed the impact of the AGOA on Kenya's garment sector. They argued that gauging the AGOA's success using export value and export growth can be misleading. Their finding suggests that the AGOA increased Kenyan apparel exports to the U.S.A. They concluded that, due, in part, to the fact that Kenyan apparel products received a lower per-unit price from U.S. importers compared to similar products from China and elsewhere, the AGOA did not enhance the competitiveness of the Kenyan apparel sector. Brenton and Hoppe (2006), Collier and Venables (2007), Seyoum (2007), and Tadesse and Fayissa (2008) analyzed the AGOA's effect on the SSA's apparel exports. Their findings suggested that the AGOA had a positive and significant effect on SSA apparel exports. For example, Brenton and Hoppe (2006) reviewed the overall trade data for SSA exports to the U.S.A and found evidence of the AGOA's positive and significant impact of the AGOA on the SSA's overall exports. The findings also indicated that the increase for overall exports as a result of the AGOA was predominantly driven by petroleum and apparel products. Furthermore, in Collier and Venables (2007), the AGOA coefficient ranged from 2.21 to 2.47 while, in Tadesse and Fayissa (2008), the AGOA coefficient was 2.774. Edwards and Lawrence (2014) demonstrated the intended and unintended consequences for the AGOA's special fabric provisions on the SSA's textile and apparel exports to the U.S.A. The authors asserted that, as expected, textile and apparel exports from the least-developed countries in the SSA region increased rapidly. Frazer and Van Biesebroeck (2010) also estimated the AGOA's effect on the SSA's apparel exports using the differences-in-differences approach. The findings indicated that the SSA's apparel exports accounted for 80% (US$348 million) of the US$439 million increase for non-oil exports from 2000-2006. The authors concluded that the AGOA had a positive and significant effect on the SSA's apparel exports to the U.S.A. Cooke's (2011) quantitative work examined the impact of AGOA at the 6-digit Harmonized System Code level for selected apparel products during 1996-2009. He employed the triple difference-in-difference regression and found that the AGOA led to a small, but statistically significant, increase for apparel exports. Condon and Stern (2011) employed systematic review procedures and techniques for 21 of 178 studies about the AGOA's effect on the SSA's exports to the U.S.A. Based on the findings from these 21 studies, the authors concluded that the AGOA had a positive and significant impact on apparel exports originating from a small number of SSA least-developed countries. In addition, there was little evidence of a positive and significant effect for the AGOA on exports originating from other sectors of the SSA least-developed countries.

Few studies have attempted to estimate the AGOA's effect on the SSA's agricultural exports to the U.S.A. Nouve and Staatz (2003) estimated a gravity model using panel data about the SSA's agricultural exports from 2000-2003. The authors estimated the AGOA's influence on total agricultural exports from (a) 46 SSA countries, (b) the 27 countries that registered significant quarterly agricultural exports greater than US$100,000 in the post-AGOA era, and (c) the top 8 SSA agricultural exporters. Based on the results, the AGOA-induced gains for agricultural exports were statistically insignificant, even though the response was positive as expected. The AGOA had no observable effect on the SSA's agricultural exports because the program was relatively new when this study was conducted.

Although Brenton and Hoppe (2006) and Frazer and Van Biesebroeck (2010) focused on the SSA's apparel exporting, they found that the AGOA had an insignificant impact on the SSA's agricultural exports. Brenton and Hoppe (2006) asserted that the AGOA's effect on the SSA's overall exports was reduced by barriers for agricultural and textile exports. The limited volume of the SSA's agricultural exports can be attributed to many factors. One factor is non-tariff barriers related to sanitary issues and other technical barriers for trade (Disdier, Fontagné, & Mimouni, 2008). Frazer and Van Biesebroeck (2010) noted that there is a positive relationship between the AGOA and the SSA's agricultural exports to the U.S.A. Brenton and Hoppe (2006) and the OUSTR (2010 and 2011) reviewed the overall trade data for SSA exports to the U.S.A and found evidence of significant increases for total exports under the AGOA. Both studies also showed that the SSA's agricultural exports were very low in volume. Zenebe et al. (2013) estimated a gravity model using panel data for 35 AGOA recipients for the period of 1990-2011 and examined the AGOA's effect on the SSA's agricultural exports. The finding suggested that AGOA preferences had an insignificant impact on the SSA's agricultural exports. However, the results showed that the AGOA may have a positive effect on the SSA's agricultural exports.

Based on the aforementioned studies, the AGOA has not played a significant role with the SSA's agricultural exports although a positive relationship exists between the AGOA and the SSA's agricultural exports. In the studies which estimated the AGOA's effect on the SSA's agricultural exports using aggregate merchandise exports with no sector-specific elements, however, the AGOA's effectiveness is less clear (see Frazer & Van Biesebroeck, 2010; Disdier, Fontagné, & Mimouni, 2008; Mattoo et al., 2003). On the other hand, empirical studies, such as Nouve and Staatz (2003), that focused on exports from the agriculture sector encountered data limitations.

2.2. Literature on the SSA's Value-Added Trade and Integrating Global Value Chains

Although the evolution of value-added trade and GVCs goes back to the last 3-4 decades, attention from the international-trade policy community is much more recent. Researchers have been interested in analyzing the relationship between international trade and GVCs, relying on an input-output table framework. Based on recent literature, many developing countries are increasingly involved with GVCs because the perception is that GVC participation generally brings economic benefits in terms of enhanced productivity, technology spillover, and greater diversification of exports. Most literature about the SSA's participation in GVCs is either qualitative or limited to analyzing the ways in which GVCs are divided among different countries in the chain (Shepherd, 2017). The common perception is that Africa, unlike other developing-country regions, has not been able to successfully integrate into the GVCs or to adopt the main changes for international trade patterns (Balié et al., 2017). For example, Ndulo (1992), Foroutan and Pritchett (1993), and Geda and Kebret (2008) argue that, despite the proliferation of regional economic communities in the SSA region, the continent has not shown success with expanding intra-regional trade; most of these regional economic communities have achieved very little (Conde, Heinrigs, & O'Sullivan, 2015).

Conde et al. (2015) assessed Africa's progress with integrating into the GVCs and found that Africa captures a small, but growing, share of global value-added trade and constitutes one of the most integrated regions for GVCs. Furthermore, the authors found that Africa's GVC participation is still dominated by forward integration. Thus, the African countries supplied inputs for another country's export production. On the other hand, backward integration grew rapidly. The implication was that African countries have been increasingly sourcing foreign inputs for their export production. The authors concluded that, overall, more than half of Africa's total exports involve backward or forward integration. Their findings and conclusions indicated that assessing the AGOA's effect on the SSA's domestic value-added exports to the U.S.A. is feasible and is needed to develop a more precise measure of the AGOA's effects.

Foster-McGregor, Kaulich, and Stehrer (2015) examined the extent of GVC participation by Africa as a region and by individual African countries using the Eora multi-region input-output (MRIO) tables. Overall, the entire African region is heavily involved with GVCs and more engaged with GVCs than many developing regions as well as developed countries, such as the U.S.A. The authors asserted that much of Africa's GVC participation is for upstream production, with African firms supplying primary intermediate inputs to firms in countries which are positioned downstream in the GVCs. The findings suggested that the composition of intermediate exports from African countries is dominated by primary products. The authors also noted that foreign value-added shares in African value chains increased by about 30% from 1995-2010. Based on that finding, intermediate exports implied domestic value-added exports. Thus, the SSA region participated in value-added trade, with domestic value-added trade accounting for more than 60% of the overall value-added share in the African value chains from 1995-2010.

Geda and Seid (2015) examined the potential for intra-Africa trade and the prospects of advancing regional economic integration through such trade. The empirical results suggested that a significant potential for intra-Africa trade exists. Based on Geda and Seid's findings, in part due to the existence of intra-Africa trade, African countries are more likely to engage in forward integration and backward integration when producing exports. Thus, the SSA region will be involved with value-added trade. Allard et al. (2015) assessed the extent of trade integration for SSA countries in the global economy as well as within the region from 1995-2013 using Eora MRIO tables. Countries such as Ethiopia, Kenya, Seychelles, South Africa, or Tanzania are integrated into the GVCs. Moreover, agriculture sectors; manufacturing sectors; agro-businesses; and, to a lesser extent, transport, tourism, and textile for these countries have benefited the most from deeper integration. The implication is that there is a need to develop a value-added trade assessment for the AGOA's effect on SSA domestic value-added exports which originate from the agriculture, manufacturing, and textile and apparel sectors.

Balié et al. (2017) used the Eora MRIO tables from 1990-2013 and analyzed the effect of bilateral import tariffs and shifts in trade regimes associated with regional trade agreements on the backward integration and forward integration of the SSA countries' agriculture and food GVCs. The finding showed that, in agriculture, the value-added demand is dominated by an external market, thus European Union countries and emerging countries, rather than regional trading partners. The implication is that distance positively affects the SSA's agricultural value-added exports. The authors pointed out that, despite the SSA region's low trade shares, its participation as a supplier of unprocessed intermediate inputs in the upstream GVCs has risen over time. The authors' findings indicate that re-evaluating the impact of the AGOA on the SSA's agricultural domestic value-added exports is needed to develop more precise estimates of the trade policy. Furthermore, it is plausible to use the domestic value-added exports to gross exports ratio as the dependent variable and assess the AGOA's effect on the US-SSA value-added trade.

Shepherd (2017) provided the first quantitative analysis of value-added trade for the SSA region using the Eora MRIO tables. He examined the linkages between trade facilitation and the SSA's participation in GVCs, using the new measures of value-added trade in in the agriculture sector and the textiles and apparel sector. Shepherd (2017) focused on the SSA's exports to the U.S.A. and the United Kingdom (UK). His first finding indicated that the value-chain connectivity in the SSA's textile and apparel sector, and the agriculture sector is quite weak by world standards. The second finding suggested that African countries trade more easily with distant markets, such as the U.S.A. and United Kingdom, than with their neighbors. In the agriculture sector, Mozambique is indirectly linked to the U.S.A. market through South Africa as the hub. On the other hand, for the textiles and apparel sector, the picture is somewhat different, with large chains predominantly connecting African countries to the U.S.A. market. This influential work clearly supports the current study's approach to assess the AGOA's effect on the SSA's domestic value-added exports from both the agriculture sector as well as the textiles and apparel sector. Moreover, the findings about the importance of distance to the US-SSA value-added trade indicates that distance is expected to positively affect the SSA domestic value-added exports to the U.S.A.

Del Prete, Giovannetti, and Marvasi (2018) investigated the north African countries' GVC participation using the Eora MRIO tables. North African countries have not been fully integrated into the global production networks. However, value-added activities, mainly in the upstream stages, have contributed a large part of the countries' trade. Based on these findings, north African countries participate in value-added trade, implying that there is a need for a value-added trade assessment about the AGOA's effect on the SSA's domestic value-added exports.

As stated, most literature about the SSA's value-added trade and participation in GVCs is either qualitative or limited to analyzing the ways in which GVCs are divided among different countries in the chain (Shepherd, 2017). Based on these studies, SSA exports are reliant on overseas export markets as the demand sources for their value-added exports. In the agriculture sector, for example, the U.S.A. and UK are the main export destinations. However, none of the studies mentioned previously has empirically analyzed the AGOA's effect on the SSA's domestic value-added exports to the U.S.A. Therefore, the purpose of this research study is to use the available disaggregated data and, subsequently, new measures of value-added trade covering an extended time period in order to precisely measure the AGOA's effects on the SSA's domestic value-added exports.

CHAPTER THREE. METHODOLOGY

3.1. The Traditional Gravity Model of Trade

The gravity model is regularly used to estimate the effect of various economic factors, including trade policies such as preferential trade arrangements, on trade. The traditional gravity model was developed in the 1960s in order to explain bilateral aggregate trade flows between trade partners (Linnemann, 1966; Pöyhönen, 1963; Tinbergen, 1962). Tinbergen (1962) used economic weight, as measured by nominal gross domestic product (GDP), and the distance between two countries in order to account for the bilateral trade flows. The basic empirical model for bilateral trade between two trade partners can be written as follows:

$$T_{ij} = \beta_0 * Y_i^{\beta_1} * Y_j^{\beta_2} * D_{ij}^{\beta_3} * G_{ij}^{\beta_4} \tag{1}$$

where T_{ij} is the trade flow from the exporting country, i, to the importing country, j; Y_i and Y_j represent the respective GDPs of the trade partners; D_{ij} describes the physical distance between countries i and j; and G_i stands for the gravitational constant which explains all other relevant bilateral factors affecting trade, such as contiguity, colonial ties, regional trade agreements, and tariff and non-tariff trade barriers. Coefficients β_{1-4} signify that the explanatory power of the independent variables differs while β_0 is a constant, scaling the measurement for units of other variables. The rationale behind equation (1) is that goods supplied at origin *i* at time *t* are attracted to destination *j* according to the economic weights of the two trade partners as measured by GDP (Y_i and Y_j), but the potential flow is reduced by the physical distance (D_{ij}) between them.

According to Anderson (1979), one shortcoming of the traditional gravity model in its early period was a lack of theoretical foundations. Anderson (1979) derived the first theoretical foundations of the gravity model based on the assumptions that (a) goods are differentiated by place of origin (Armington, 1969) and (b) consumer preferences are homothetic, identical across countries, and approximated by a constant elasticity of substitution (CES) utility function. Anderson and van Wincoop (2004) refined and popularized Anderson's (1979) theory by deriving a structural gravity model from the demand side. Also, Anderson and van Wincoop (2004), demonstrated that the structural gravity model can be derived for sectoral trade and from the demand side.

On the demand side, consumers' preferences are assumed to be homothetic; identical across countries; and given by a CES-utility function for the importing country, *j*. Following Anderson and van Wincoop (2004), the CES-utility function can be described as follows:

$$\left\{\sum_i \delta_i^{\frac{1-\vartheta}{\vartheta}} c_{ij}^{\frac{1-\vartheta}{\vartheta}}\right\}^{\frac{\vartheta}{\vartheta-1}} \tag{2}$$

where $\vartheta > 1$ is the elasticity of substitution among different varieties of goods from various countries, $\delta_i > 0$ is the distribution parameter, and c_{ij} denotes the consumption of different goods from country *i* in country *j*. Consumers in country *j* then maximize utility in equation (2), subject to the following standard budget constraint:

$$\sum_i p_{ij} c_{ij} = E_j \tag{3}$$

E_j is the total expenditure in country *j* on varieties imported from all countries, including *j*; p_{ij} is the price consumers in country *j* pay for country *i*. Prices differ across countries due to varying trade costs. Suppose that P_i is the exporter's price without the trade cost and τ_{ij} is the trade cost that country *j* has when exporting to country *i*. The exporters transfer their trade costs to importers. Solving the consumer's optimization problem in equation (3) yields country *j's* demand for country *i*'s goods.

$$X_{ij} = \left(\frac{\delta_i p_i \tau_{ij,}}{P_j}\right)^{(1-\vartheta)} E_j \tag{4}$$

where $X_{ij,}$ denotes country *i*'s exports to destination *j* and P_j is a CES consumer price index in country *j* such that

$$P_j = \left[\sum_i \left(\delta_i p_i \tau_{ij}\right)^{1-\vartheta}\right]^{\frac{1}{1-\vartheta}} \tag{5}$$

By market clearance, the output value in country *i* should be equal to the total expenditure (E_j) for the country's varieties in all world countries, including *i* itself. The market clearance can be expressed as follows:

$$Y_j = \sum_i \left(\frac{\delta_i p_i \tau_{ij}}{p_j}\right)^{1-\vartheta} E_j \tag{6}$$

Defining $Y \equiv \sum_j Y_j$ and dividing the market clearance equation (6) by Y, the terms can be rearranged to obtain

$$(\delta_i p_i)^{1-\vartheta} = \frac{\frac{Y_i}{Y}}{\sum_j \left(\frac{\tau_{ij}}{P_j}\right)^{1-\vartheta} \frac{E_j}{Y}} \tag{7}$$

As in Anderson and van Wincoop (2004), the term in the denominator of equation (7) can be defined as follows:

$$\phi_i^{1-\vartheta} \equiv \left(\frac{\tau_{ij}}{P_j}\right)^{1-\vartheta} \frac{E_j}{Y} \tag{8}$$

Now, substituting equation (8) into equation (7) yields

$$(\delta_i p_i)^{1-\vartheta} = \frac{\frac{Y_i}{Y}}{\phi_i^{1-\vartheta}} \tag{9}$$

Next, use equation (9) to substitute for the power transform, $(\delta_i p_i)^{1-\vartheta}$, in equations (7) and (8), and combine $\phi_i^{1-\vartheta}$ with the resulting expressions which correspond to equations (7) and (8). Based on the market clearance, Y_j should be equal to the total expenditure (E_j). Taking the market clearance into consideration, the structural gravity model can be expressed as follows:

$$X_{ij,t} = \frac{Y_{i,t}Y_{j,t}}{Y_t}\left(\frac{\tau_{ij,t}}{P_{j,t}\Phi_{i,t}}\right)^{1-\vartheta} \quad (10)$$

where $X_{ij,t}$ denotes the value of shipments at destination prices from country i to country j and $\tau_{ij,t} \geq 1$ stands for the bilateral trade costs, including the effects of trade policy. Although the structural gravity equation (10) can be used to estimate the effect of bilateral factors affecting trade, one challenge with incorporating the multilateral resistance terms, $P_{j,t}$ and $\phi_{ij,t}$, into the gravity equation (10) is that they are not directly observable because they are theoretical construct (Baldwin & Taglioni, 2006; Piermartini & Yotov, 2016). Olivero and Yotov (2012) and Feenstra (2004 and 2017) suggest that such problems can be overcome by using panel data to estimate a dynamic gravity-model framework with exporter-time and importer-time fixed effects. The authors noted that the exporter-time and importer-time fixed effects absorb both the observable and unobservable country-specific characteristics, such as national policies, institutions, and exchange rates, which vary across trade partners. From an empirical perspective, equation (10) can, therefore, be estimated for each sector as if the data were disaggregated, implying that the effects of trade policy should be allowed to vary by sector (Piermartini & Yotov, 2016).

3.2. Empirical Gravity Equation in the Context of Value-Added Trade

The structural gravity equation (10) has been widely used for empirical analyses of the effect of bilateral factors which affect trade at the sector level. The applicability of the structural gravity equation to value-added trade implies that domestic value-added exports can substitute both the importer's and exporter's value for total production (i.e., $Y_{i,t}$ and $Y_{j,t}$) as proxies for supply and demand. This substitution is due to the fact that domestic value-added exports are part of the value for the total production in both the exporting and importing country. Taking these considerations into account, this study uses domestic value-added exports as the proxy for supply and demand instead of utilizing the importer GDP and the importer GDP. Thus, the statistical model for this study is designed to evaluate unilateral value-added trade flows from SSA countries to the U.S.A. and to explore the AGOA's influence as a preferential trade agreement using disaggregated panel data for the SSA's AGOA-eligible countries from 1990-2013.

The structural-gravity equation (10) can be estimated by nonlinear or linear ordinary least squares (OLS) with fixed effects as suggested by Feenstra (2004 and 2017) and Olivero and Yotov (2012). However, a clear drawback with estimating the structural-gravity equation (10) in its log-linear form with the OLS estimator is that it ignores the information contained in zero trade flows because that information is dropped from the estimation sample when the trade value is transformed into logarithmic form (Eaton & Tamura, 1994; Egger, Larch, Staub, & Winkelmann, 2011; Flowerdew & Aitkin, 1982; Head & Mayer, 2014; Martin & Pham, 2008; Piermartini & Yotov, 2016; Silva & Tenreyro, 2006), leading to sample selection bias (Burger, Van Oort, & Linders, 2009; Helpman, Rubinstein, & Melitz, 2008). Because the data used for this study have zero trade values across the estimation sample (4.6%), alternative modeling approaches are employed to address this and other statistical problems. The specific procedures are described in the following section.

3.3. Modeling Zero Trade Flows, Heteroscedasticity, and Endogeneity of Trade Policy

Several solutions have been proposed to handle zero trade values in trade flows. One solution involves truncating the sample by dropping observations with zero trade values. Silva and Tenreyro (2006) argue that truncation of trade flows with zero values biases the standard log-linear OLS approach and yields inconsistent coefficient estimates. Another suggested solution is to systematically add a small positive number (0.5 or 1) to all trade values so that the log-linear transformation is defined. This approach, however, lacks a theoretical or an empirical justification (Linders & de Groot, 2006; Xiong & Beghin, 2011). The third approach is to estimate the model in levels. Estimating the zero trade flows in levels using the OLS leads to a non-constant variance which yields inconsistent estimates (Burger et al., 2009; Heckman, 1979; Xiong & Beghin, 2011).

The data for estimating the main regressions in this study have 20,889,076 observations, and 924,084 observations have zero trade flows. Thus, about 4.6% of the entire dataset has zero trade flows. In addition, Santos and Tenreyro (2011) suggest that, for structural gravity models, the Poisson pseudo-maximum-likelihood (PPML) is not affected by a large number of zeros. The trade data are usually prone to heteroscedasticity. When estimating a log-linear OLS in the presence of heteroscedasticity (due to Jensen's inequality), the estimates for the effects of trade costs and trade policy are not only biased, but also inconsistent (Shepherd, 2016; Silva & Tenreyro, 2006). To deal with this problem, Silva and Tenreyro (2006) suggest estimating the model in a multiplicative form using the PPML estimator.

Feenstra (2016) suggests that observable and unobservable characteristics which vary over time for each importer and exporter, respectively, are accounted for by the exporter-sector-time and importer-sector-time fixed effects. In addition, the multilateral resistance terms should be also accounted for by the exporter-sector-time and importer-sector-time fixed effects. The inclusion of country-sector-time fixed effects will ensure that the observable and unobservable exporter-specific and importer-specific factors that may influence trade are considered. Another challenge with obtaining reliable estimates for the effects of a trade policy within the gravity model is that the trade-policy variable is endogenous because it is possible that, with the influence of a lobbyist for example, a given country is more likely to liberalize its trade with another country which is already a significant trade partner. Baier and Bergstrand (2007) suggest using country-pair-sector fixed effects to address this endogeneity issue.

3.4. Empirical Specification

Taking all these considerations into account, this study addresses the presence of zero trade flows and potential heteroscedasticity by implementing the PPMLHDFE estimator Like the ppml_panel_sg, the PPMLHDFE is ideally suited for Poison PPML estimation of structural gravity models(Correia, Guimarães, & Zylkin, 2018a).[6] The standard errors for all estimations are clustered by country-pair and sector to address the correlation-pattern problem between country pairs in the error term which result from repeated observations of country pairs over time (Bertrand, Duflo, & Mullainathan, 2004).

The first benchmark-estimating equation includes the log of distance. This implies that, whenever the log of distance is part of the equation, country-pair fixed effects are not included. The equation is expressed as follows:

$$X_{ij,st} = \exp\Big[\beta_0 + \xi_{i,st} + \lambda_{j,st} + \beta_1 lndistw_{ij} + \beta_2 lnExpo_{pop} + \beta_3 lnImpo_{pop} + \beta_4 contiguity_{ij} + \beta_5 common_{lang_{ij}} + \beta_6 colony_{ij} + \beta_7 Onein_{WTO_{ij,t}} + \beta_8 Bothin_{WTO_{ij,t}} + \beta_9 PTA_{dummy_{ij,t}} + \beta_{10} RTA_{dummy_{ij,t}} + \beta_{11} AGOA_{ij,t}\Big] + \varepsilon_{ij,st} \quad (11)$$

where $X_{ij,st}$ denotes three dependent variables: (a) gross exports ($EXGR_{ij,st}$), (b) domestic value-added exports ($DVAExp_{ij,st}$), and (c) the domestic value-added exports to gross exports ratio ($VAX_{ij,st}$,). These dependent variables are described further in the subsection about calculating dependent variables. The subscript *i* and *j* denote the exporter and importer, respectively; *s* denotes sector; *t* denotes time; $\xi_{i,st}$ denotes the exporter-sector-time fixed effects; and $\lambda_{j,st}$ stands for importer-sector-time fixed effects. The $\xi_{i,st}$ and $\lambda_{j,st}$ ensure that the theoretical restrictions implied by the structural gravity model are satisfied. The independent variables include the standard

[6]PPMLHDFE is a fast and flexible Poisson estimation with high-dimensional fixed effects. I wish to thank Thomas Zylkin for his immense feedback and for sharing the PPMLHDFE package.

gravity-model variables and trade-policy variables. The standard gravity-model variables are defined as follows: $lndistw_{ij}$ is the log of weighted geographical distance (capital to capital) between the exporter and importer. $lnExpo_{pop}$ and $lnImpo_{pop}$ denote the log of the population size for the exporting country and importing country, respectively. $contiguity_{ij}$ is a dummy variable that has a value of 1 if the exporter and importer share a border. ${common_{lang}}_{ij}$ is a dummy variable that takes a value of 1 if the exporter and importer share a common language. $colony_{ij}$ is a dummy variable that has a value of 1 if the exporter ever colonized the importer or vice versa.

The trade-policy variables are defined as follows: ${Onein_{WTO}}_{ij,t}$ takes a value of 1 if either an exporter or importer in a country pair is a WTO member at time *t*. This variable captures the effect of a WTO membership on trade flows for a country pair that has one country in the WTO. ${Bothin_{WTO}}_{ij,t}$ is a dummy variable which has a value of 1 if both countries in a pair are WTO members at time *t*. This dummy variable captures the influence of a WTO membership on trade flows for a given country pair where both countries are WTO members. ${RTA_{dummy}}_{ij,t}$ takes a value of 1 if both countries in a country pair are in a common regional trade agreement at time *t*. This dummy variable is constructed to identify the effects of a regional trade agreement (RTA) on trade flows for a given country pair. ${PTA_{dummy}}_{ij,t}$ has a value of 1 if the exporter in a country pair received preferential-trade-agreement benefits from the pair's importer at time *t*. It is generally assumed that one of the U.S.' preferential trade programs, the Generalized System of Preferences (GSP), should offer larger benefits to its recipients because it covers more products than the AGOA. The $AGOA_{ij,t}$ variable is constructed to identify the impact of AGOA on exports which originate from an AGOA recipient and go to the U.S.A. $AGOA_{ij,t}$ takes a value of 1 if the exporter is an SSA country that received AGOA preference benefits from the U.S.A. (the importer) at time t. Finally, $\varepsilon_{ij,st}$ is a normally distributed error term that has a zero mean and a constant variance.

Agnosteva, Anderson, and Yotov (2014) and Egger and Nigai (2015) note that country-pair fixed effects absorb all time-invariant covariates, including bilateral distance, implying that, whenever distance is excluded from the equation, country-pair fixed effects are included. Thus, the second benchmark-estimating equation is expressed as follows:

$$X_{ij,st} = \exp\Big[\beta_0 + \xi_{i,st} + \lambda_{j,st} + \varphi_{ij,s} + \beta_1 lnExpo_{pop} + \beta_2 lnImpo_{pop} + \beta_3 contiguity_{ij} + \beta_4 common_{lang_{ij}} + \beta_5 colony_{ij} + \beta_6 Onein_{WTO_{ij,t}} + \beta_7 Bothin_{WTO_{ij,t}} + \beta_8 PTA_{dummy_{ij,t}} + \beta_9 RTA_{dummy_{ij,t}} + \beta_{10} AGOA_{ij,t}\Big] + \varepsilon_{ij,st} \quad (12)$$

where $\varphi_{ij,s}$ denotes country-pair-sector fixed effects and absorbs all time-invariant pair characteristics that may be correlated with the likelihood of forming trade agreements such as the AGOA. The model, equations (11) and (12), are used to estimate the AGOA's effect on the SSA's overall gross exports, domestic value-added exports and domestic value-added exports to gross export ratio.

The benchmark model, equations (11) and (12), are then extended by introducing the interaction terms between the policy variable of interest ($AGOA_{ij,t}$) and the five sectors defined in the previous sections. The extended model specifications, (13) and (14), are estimated to identify the sector-specific AGOA average effects on SSA exports which originate from the aforementioned five sectors during 2001-2013. The extended model specifications are expressed as follows:

$$X_{ij,st} = \exp\Big[\beta_0 + \xi_{i,st} + \lambda_{j,st} + \beta_1 lndistw_{ij} + \beta_2 lnExpo_{pop} + \beta_3 lnImpo_{pop} + \beta_4 contiguity_{ij} + \beta_5 common_{lang_{ij}} + \beta_6 colony_{ij} + \beta_7 Onein_{WTO_{ij,t}} + \beta_8 Bothin_{WTO_{ij,t}} + \beta_9 PTA_{dummy_{ij,t}} + \beta_{10} RTA_{dummy_{ij,t}} + \beta_{11} AGOA_{ij,t} + \beta_{12} AGOA_{ij,t} * Agriculture + \beta_{13} AGOA_{ij,t} * Mining_Q + \beta_{14} AGOA_{ij,t} * Textiles_{App} + \beta_{15} AGOA_{ij,t} * Food_{Bev} + \beta_{16} AGOA_{ij,t} * Petroleum\Big] + \varepsilon_{ij,st} \tag{13}$$

$$X_{ij,st} = \exp\Big[\beta_0 + \xi_{i,st} + \lambda_{j,st} + \varphi_{ij,s} + \beta_1 lnExpo_{pop} + \beta_2 lnImpo_{pop} + \beta_3 contiguity_{ij} + \beta_4 common_{lang_{ij}} + \beta_5 colony_{ij} + \beta_6 Onein_{WTO_{ij,t}} + \beta_7 Bothin_{WTO_{ij,t}} + \beta_8 PTA_{dummy_{ij,t}} + \beta_9 RTA_{dummy_{ij,t}} + \beta_{10} AGOA_{ij,t} + \beta_{11} AGOA_{ij,t} * Agriculture + \beta_{12} AGOA_{ij,t} * Mining_Q + \beta_{13} AGOA_{ij,t} * Textiles_{App} + \beta_{14} AGOA_{ij,t} * Food_{Bev} + \beta_{15} AGOA_{ij,t} * Petroleum\Big] + \varepsilon_{ij,st} \tag{14}$$

where the $AGOA_{ij,t} * Agriculture$ interaction variable identifies the average change in the AGOA recipients' agricultural exports. The $AGOA_{ij,t} * Mining_Q$ interaction variable captures the average change for the AGOA recipients' mining and quarrying exports. The $AGOA_{ij,t} * Textiles_{App}$ interaction variable identifies the average change for the AGOA recipients' textile and apparel exports. The $AGOA_{ij,t} * Food_{Bev}$ interaction variable captures the AGOA's average effect on the SSA's food-and-beverage trade flows. The $AGOA_{ij,t} * Petroleum$ interaction variable identifies the average change for the AGOA's recipients' petroleum, chemical and non-chemical mineral trade flows. The coefficients for these five interaction variables are of primary interest.

Although SSA exports receive AGOA preferential treatment in addition to the most favored nation (MFN) tariff rates and preferential treatment through other preferential trade agreements PTAs, this study only focuses on the sector-specific AGOA effects on trade flows. Thus, this study does not estimate the sector-specific effect of a WTO membership and PTA membership on exports from the five sectors discussed in the previous sections.

As mentioned previously, through the AGOA, the U.S.A. offers preferential tariff treatment for certain products which originate from eligible SSA countries. This treatment only applies to U.S. imports of AGOA-eligible products from designated SSA countries. That is, receiving AGOA preferential tariff treatment reduces the trade cost in favor of the SSA's exports, which is expected to stimulate export growth. Therefore, the AGOA is expected to have a positive impact on SSA exports from the AGOA recipients. Hence, a positive estimated coefficient for $AGOA_{ij,t}$ indicates that the AGOA recipients exported more to the U.S.A. than non-recipients. On the other hand, a negative estimated coefficient for $AGOA_{ij,t}$ indicates that AGOA recipients exported less to the U.S.A. than non-recipients.

Through PTAs, developed countries only grant preferential tariff treatments to certain eligible products which originate from least-developed and developing countries (WTO, 2018a). Preferential tariff treatment implies a reduced trade cost in favor of exports from PTA recipients, allowing them to export more to the PTA provider. The presence of a PTA for a country pair is then expected to have a positive effect on the PTA recipients' exports. Therefore, a positive estimated coefficient for ${PTA_{dummy}}_{ij,t}$ implies that the PTA recipients exported more than the non-recipients. On the other hand, a negative estimated coefficient for ${PTA_{dummy}}_{ij,t}$ indicates that PTA recipients exported less than the non-recipients.

According to WTO (2018a), the WTO confers three specific benefits to its members. First, the WTO grants each member MFN status. WTO members are expected to grant preferential trade benefits to all trade partners without discrimination regarding the MFN tariff rates. Second, WTO membership for both trading partners means that members have lower trade barriers with each other. Reducing trade barriers, such as tariffs, import quotas, and regulations, allows members' products to access larger markets. Third, around two-thirds of the WTO members are developing countries. Although their membership gives them immediate access to developed markets at a lower tariff rate, they are not bound to remove reciprocal tariffs in their markets until later (Subramanian & Wei, 2007; WTO, 2018a). Based on these specific benefits, a WTO membership is expected to have a positive effect on a country pair's trade flows. Therefore, a positive coefficient for ${Onein_{WTO}}_{ij,t}$ indicates that a pair of countries with one in the WTO traded more than a pair of countries with neither one in the WTO. On the other hand, a negative coefficient for ${Onein_{WTO}}_{ij,t}$ indicates that a pair of countries with one in the WTO traded less than a pair of countries with neither one in the WTO. A positive coefficient for ${Bothin_{WTO}}_{ij,t}$ indicates that a pair of countries which are both in the WTO traded more than a pair of countries outside the WTO. Also, a negative coefficient for ${Bothin_{WTO}}_{ij,t}$ indicates that a pair of countries which are both in the WTO traded less than a pair of countries outside the WTO. The control group for estimating the WTO membership's effect is that neither country is in the WTO (or both are outside the WTO) for both dummy variables.

What all RTAs have in common is that they are reciprocal PTAs for two or more partners. In addition, non-discrimination among trading partners is a core principle for an RTA. This core principle encourages members to lower trade barriers, such as tariffs, import quotas, and non-tariff barriers, which allows members to trade more (WTO, 2018b). The presence of an RTA for trading partners is expected to have a positive effect on their trade flows. Therefore, a positive coefficient for ${RTA_{dummy}}_{ij,t}$ indicates that trading partners in a common RTA traded more than trading partners which were not in a common RTA. In contract, a negative coefficient for ${RTA_{dummy}}_{ij,t}$ indicates that trading partners in a common RTA traded less than trading partners which were not in a common RTA.

3.5. Empirical Specification for Extensive and Intensive Margin Analysis

According to the "new-new" trade theories based on firm heterogeneity for productivity and the fixed cost of exporting, reduced trade costs are expected to lead to increased trade for two margins: the extensive margin and the intensive margin (Melitz, 2003). This section addresses the empirical specification for the study's second objective: to evaluate the AGOA's effect on the extensive and intensive margins of the US-SSA value-added trade. This assessment is only applied to the SSA's agricultural, domestic value-added exports. In this case, the dependent variable is a dummy variable which indicates whether there is trade in the agricultural, domestic value-added exports. That is, this dependent variable is converted into a zero-one variable where it takes a value of 1 when there is trade in agricultural, domestic value-added exports for a given country pair during the given year.

Previous empirical work about analyzing extensive and intensive margins of trade defines the two margins differently (Krugman, 1980; Chaney, 2008; Amurgo-Pacheco & Pierola, 2008; Berthou & Fontagné, 2008; Dennis & Shepherd, 2007; Eaton, Kortum, & Kramarz, 2004; Felbermayr & Kohler, 2006; Helpman, Melitz and Rubinstein, 2008; Hillberry & Hummels, 2008; Hummels & Klenow, 2005; Melitz, 2003; Silva, Tenreyro, & Wei, 2014). Helpman et al. (2008) define the two margins as the number of sectors traded (extensive margin) and the volume of trade per sector (intensive margin). Silva et al. (2014) point out that the extensive and intensive margins can been defined at different aggregation levels. In the dataset used with this study, not all country pairs trade in all 26 sectors for all 24 years. When compared to other studies in the literature, this study analyzes the intensive and extensive margins using value-added trade data at the sector level. (See Martínez-Zarzoso, Vidovic, and Voicu (2014) for a similar approach.) This study employs the Helpman-Melitz-Rubinstein (HMR) two-step procedure to estimate the two trade margins. The

HMR two-step procedure accounts for firm heterogeneity due to productivity differences and selection bias that result from eliminating zero trade flows in a panel-data framework (Helpman et al., 2008).

In the first part of the HMR two-step procedure, the Probit model is estimated to generate the inverse of the Mills ratio which is then used in the second step (Heckman, 1979; Helpman et al., 2008). The probit model, which is a conditional random-effects model by default, is estimated using an xtprobit estimator.[7] Therefore, the first step is to estimate the conditional probability of exporting. In this case, the probability that country i exports domestic value-added products to country j is determined. The estimated probability is then used to estimate the AGOA's effects on the intensive margin of value-added trade.

The HMR model requires adding an identification variable to the equation in the first step, which influences the probability of exporting but not the volume, to comply with the exclusion restriction. Helpman et al. (2008) point out that trade barriers which affect fixed costs of exporting, but not variable trade costs, are valid exclusion restrictions and should only be included for the first-step (Probit specification). The authors' view is that the exclusion variable cannot be correlated with the second-step equation's error term but must be correlated with the dependent variable. Finding a valid exclusion restriction for the extensive margin is difficult because both the fixed and variable costs affect the extensive margin. Therefore, this study follows Helpman et al. (2008) and uses common religion as an exclusion variable that can affect the trade's fixed cost but not the trade's variable cost. The equation for the first step can be expressed as follows:

[7]According to Stata 15 Manual, "xtprobit fits the random-effects and population-averaged probit models. There is no command for a conditional fixed-effects model because there is no sufficient statistic that allows the fixed effects to be conditioned from the likelihood. Unconditional fixed-effects probit models may be fit with the probit command with indicator variables for the panels. However, unconditional fixed-effects estimates are biased."

$$X_{ij,st} = \text{PR}\Big[\beta_0 + \beta_1 lndistw_{ij} + \beta_2 lnExpo_{pop} + \beta_3 lnImpo_{pop} + \beta_4 contiguity_{ij} + \beta_5 common_{lang_{ij}} + \beta_6 colony_{ij} + \beta_7 comreligion_{ij} + \beta_8 Onein_{WTO_{ij,t}} + \beta_9 Bothin_{WTO_{ij,t}} + \beta_{10} PTA_{dummy_{ij,t}} + \beta_{11} RTA_{dummy_{ij,t}} + \beta_{12} AGOA_{ij,t}\Big] + \varepsilon_{ij,st} \quad (15)$$

where X_{ij} is the agricultural domestic value-added exports ($Agriculture_{DVA_{ij,t}}$). The dummy variable, $comreligion_{ij}$, takes a value of 1 if a given country pair's exporter and importer share a common religion. The other five standard gravity-equation explanatory variables and five trade-policy dummy variables have the same definitions as in equation (11).

The second step of the HMR two-step procedure uses the predicted values (Mills ratio) from the first step in order to estimate a non-linear gravity equation using a PPMLHDFE. The second step omits the exclusion variable and explores the variables which affect the intensive margin of trade, that is, the volume of agricultural, domestic value-added exports from country *i* to country *j*. In this second step, the sample-selection bias is controlled through the Mills ratio, and the omitted variable bias in the estimates is controlled by including additional variables which account for the selection of countries in the export markets. The exporter-sector-time fixed effects and importer-sector-time fixed effects are also included. The equation for the second step can, therefore, be expressed as follows:

$$X_{ij,st} = \exp\Big[\beta_0 + \xi_{i,st} + \lambda_{j,st} + \beta_1 lndstw_{ij} + \beta_2 lnExpo_{pop} + \beta_3 lnImpo_{pop} + \beta_4 contiguity_{ij} + \beta_5 common_{lang_{ij}} + \beta_6 colony_{ij} + \beta_7 Onein_{WTO_{ij,t}} + \beta_8 Bothin_{WTO_{ij,t}} + \beta_9 PTA_{dummy_{ij,t}} + \beta_{10} RTA_{dummy_{ij,t}} + \beta_{11} AGOA_{ij,t} + invmills\Big] + \varepsilon_{ij,st} \quad (16)$$

where $X_{ij,t}$ is the domestic value-added exports and $invmills$ is the inverse mills ratio which was computed in step one. Predictions about the direction of effects for individual variables are similar for both steps, yet the interpretation is different to the extent that the first step explains the influence on the probability that a certain country and sector is going to export (the extensive margin) while the second step explains the increased bilateral trade volume for countries and sectors which were already exporting before the liberalization took place (the intensive margin).

3.5.1. Testing for Multicollinearity of the Structural Gravity Specification

The variance inflation factor (VIF) was used to detect possible linear dependencies following Mansfield and Helms (1982). The mean VIF is 1.45, which is below the rule-of-thumb threshold of 10. In addition, individual explanatory variables also had VIFs below 10. Hence, the specifications do not suffer from the adverse effects of multicollinearity. VIF results are given in Appendix's Table A5.

3.6. Data and Sources

This study uses the value-added trade statistics derived from the Eora global multi-region input-output (MRIO) tables Full version for 1990-2013 (Lenzen, Moran, Kanemoto, & Geschke, 2013). The Eora database disaggregates trade-flow data into 26 sectors. In most cases, that is for 120 of the 189 countries in the sample, the sector classification conforms to the United Nations Statistics Division's (UNSD) International Standard Industrial Classification (ISIC) Revision 3. (See Lenzen et al. (2013) for a more detailed description about the Eora database's structure). The sectors for the remaining 69 countries are then reclassified to match the ISIC Revision 3 correspondence (see Table A2 in Appendix).[8]

The Eora multi-region input-output tables have several advantages compared to input-output tables which are available from other sources. First, the Eora MRIO is more complete in country coverage; it brings together raw data from a variety of primary data sources, including national input-output tables from the UNSD, the United Nations Commodity Trade Statistics Database (UN Comtrade), the United Nations Service Trade Statistics Database, Eurostat, the

[8] The classification procedures which were applied to the finalized data are available in a ReadMe file.

Institute of Developing Economies (IDE)-Japan External Trade Organization, the Organization for Economic Co-operation and Development (OECD), and numerous national agencies (Lenzen, Kanemoto, Moran, & Geschke, 2012; Lenzen et al., 2013). Second, value-added trade statistics for 189 countries are available for 1990-2013 with minimal missing cases (Lenzen et al., 2012, 2013). Third, the Eora multi-region input-output tables cover 46 of the 49 SSA countries (see Table A3 in Appendix). Guinea-Bissau, Comoros, and Equatorial Guinea are the three SSA countries that have received AGOA preferences but are not included in the Eora multi-region input-output tables. Given its many advantages, the Eora database many successful research applications; some recent applications can be found in Foster-McGregor et al. (2015); IMF (2015a, 2015b, 2016a); Cerdeiro (2016); Caliendo, Feenstra, Romalis, and Taylor (2015); Feenstra (2017); Aslam, Novta, and Rodrigues-Bastos (2017); and Shepherd (2017).

The other available input-output (IO) tables are less complete when compared to the Eora database. For example, the Global Trade Analysis Project's (GTAP) current version covers 140 countries but is far less complete in product classification and coverage (Purdue University, 2016). Currently, the GTAP database includes a total of 57 commodities. The most updated version of the OECD-WTO database covers 61 economies for the years 1995, 2000, 2005, and 2008-2011 (World Input Output Database [WIOD], 2016). This database classifies products into 34 sectors, arguably better disaggregation compared to the OECD-WTO database. The World Input Output Database, which was developed and managed by the European Commission, covers 43 OECD countries and classifies products into 56 sectors; the database is available for 2000-2014 (WIOD, 2016).

The data for the gravity-model variables, such as distance, contiguity, common language, and area, are accessed from the Centre d'Études Prospectives et d'Informations Internationales

(CEPII, 2017) database for 1990-2013 (Head, Mayer, & Ries, 2010; Mayer & Zignago, 2011). Data about WTO membership are accessed from the WTO website (WTO, 2017). The data for AGOA recipients is retrieved from the United States International Trade Commission's (USITC, 2017) Interactive Tariff and Trade DataWeb ().[9] Although the AGOA was enacted on October 2, 2000, the first full year of its use was 2001. Hence, this study considers 2001 as the official beginning for the AGOA program. This study considers any official suspension, graduation, and termination of countries from the AGOA program. The study also accounts for any re-entry into the program following a suspension. The data about country participation in the PTA and membership in RTAs are retrieved from Sharma (2017). The PTA database considers all the unilateral and non-reciprocal trade agreements that were effective during the sampling period. Like the AGOA database, the PTA database accounts for any suspension, graduation, termination, and re-entry from or to the program. The RTA database is complete for all deep (e.g., Custom Unions and Common Market) and shallow trade agreements.

3.7. Calculating the Dependent Variables

Three metrics, gross exports, domestic value-added exports, and the domestic value-added to gross export ratio, are used as the dependent variables for this research. These variables are computed for full economy and for five sectors. Recall that the five sectors of interest for this research are agriculture; mining and quarrying; textiles and apparel; food and beverages; and petroleum, chemical and non-metallic mineral products. The approach developed by Koopman et al. (2014) is followed for computing these metrics.

[9]Accessing this portal requires registering a user account. Therefore, the completion of a brief user-registration form is required.

3.7.1. Gross Exports

Country i's gross exports ($EXGR_{ij,t}$) to country j are derived by horizontal summation of the exports for intermediate goods and services, and the exports of final demand goods and services across all sectors. This computation excludes intermediate goods and services, and the final demand which are used for domestic production and consumption activities. That is,

$$EXGR_{ij,t} = \sum_s EXGR_{ij,st} \quad (17)$$

$$EXGR_{ij,st} = \sum_j EXGR_{ij,st} = \sum_j (EXGR_{INT\,ij,st} + EXGR_{FNL\,ij,st}) \quad (18)$$

where $EXGR_{ij,st}$ is country i's total gross exports for a given sector, s, to country j in year t; $EXGR_{INT\,ij,st}$ represents the gross exports for intermediate goods and services from domestic industry s in country i to country j; and $EXGR_{FNL\,ij,st}$ is the gross exports of final-demand goods and services to all other counties excluding itself. A three-country, four-sector sample of the Eora IO table, showing the detailed decomposition of products into the (a) intermediate goods demand (T or Z) block, (b) final demand (FD) block, and (c) value-added (VA) or primary input block, is shown in Appendix's Figure A11.

3.7.2. Domestic Value-Added Exports

The domestic value-added content in exports ($DVAExp_{ij,t}$) for country i is the value of the gross exports less the gross imports. It measures the amount of domestic value-added exports generated by country i. It is computed as follows:

$$EXGR_{ij,t} - IMGR_{ij,t} = DVAExp_{ij,t} \quad (19)$$

where $IMGR_{ij,t}$ is the total gross imports for country j which originate from country i in year t.

Domestic value-added exports at the sector level are computed by considering any value addition that is generated by the exporting sector during its production processes as well as any added value which comes from upstream domestic suppliers that is embodied in the exports. More precisely, the domestic value-added exports are derived using intermediate goods and is net exports. That is,

$$DVAExp_{ij,st} = V_c B_{c,i} EXGR_{ij,st} \tag{20}$$

where $V_C = [v_{c1} \dots v_{ck}]$ is a 1 x K row vector with domestic value-added shares of output for each sector s. $B_{c,i}$ is a $K\ x\ K$ diagonal block matrix of B standing for the total domestic gross output required for a one-unit increase of country i's demand. $EXGR_{ij,st}$ is a $K\ x\ 1$ vector with all entries equal to zero except the one corresponding to sector s. $DVAExp_{ij,st}$ stands for the domestic value-added exports for exporter i's sector *s* in the gravity-model estimation.

3.7.3. Domestic Value-Added Exports to Gross Exports Ratio

The domestic value-added exports to gross exports ratio ($VAX_{ij,t}$) for country *i* is given by dividing the domestic value-added exports to country *j* by its gross exports to country *j*, and it measures the share of the domestic value-added exports' content which is embodied in the gross exports. It is computed as follows:

$$VAX_{ij,t} = \frac{DVAExp_{ij,t}}{EXGR_{ij,t}} \tag{21}$$

The domestic value-added exports to gross exports ratio ($VAX_{ij,st}$) at the sector level is obtained by dividing the domestic value-added exports at a sector level ($DVAExp_{ij,st}$) by the gross exports at a sector level ($EXGR_{ij,st}$). That is, equation (20) is divided by equation (19). The summary statistics of the complete dataset used for this study are provided in Appendix's Table A4.

CHAPTER FOUR. RESULTS AND DISCUSSION

This chapter presents the empirical results for the two objectives of this study. In the first section, the AGOA's effect on domestic value-added exports is examined. The second section examines the mechanism by which the AGOA has affected agricultural, domestic value-added exports for the intended beneficiary countries. More precisely, the extensive and intensive margins of agricultural, domestic value-added exports for the AGOA recipient countries are examined.

4.1. Econometric Results and Discussion

In this section, the AGOA's effect on domestic value-added exports is examined. As a starting point, results based on aggregated trade flows (gross exports, domestic value-added exports, and the domestic value-added exports to gross exports ratio) are discussed. Then, there is a discussion about the AGOA's influence on the three aggregated trade flows at a sector level for each of the five economically important sectors which were described in Section 1.1.

4.1.1. Assessing the AGOA's Effect on the SSA's Domestic Value-Added Exports

The AGOA's effect on the SSA's domestic value-added exports to the U.S.A. is first assessed using all 26 sectors in the dataset. The assessment is then applied to the SSA's exports which originate from the agriculture sector; the textiles and apparel sector; the food and beverages sector; the mining and quarrying sector; and the petroleum, chemical and non-chemical mineral products sector. Recall that these five sectors are chosen based on their importance to the AGOA recipients' domestic value-added exports. Also, recall that the three metrics, gross exports, domestic value-added exports, and the domestic value-added exports to gross exports ratio, are used in this study to capture different trade-flow trends. For example, gross exports capture the trend for the trade flows of final products and intermediate products combined. Domestic value-added exports only pertain to exporting intermediate products which are wholly produced and sourced in a recipient country. Finally, the domestic value-added exports to gross exports ratio is the share/content of domestic value-added exports in the gross exports. These metrics are used as three dependent variables for the rest of the analysis in this subsection. The results based on domestic value-added exports and the domestic value-added exports to gross exports ratio are of primary interest while the findings based on gross exports simplify the comparison of this research's results to the previous literature.

4.1.2. AGOA's Effects on Overall Trade Flows

Table A6 in Appendix presents the results from estimating specifications (11) and (12). Columns 1, 2, and 3 contain regression results from specification (11) based on gross exports, domestic value-added exports, and the domestic value-added exports to gross exports ratio, respectively. All three columns incorporate the logarithm of distance and country-sector-time fixed effects. Results from specification (12) are presented in columns 4, 5, and 6; these results are based on gross exports, domestic value-added exports, and the domestic value-added exports to gross exports ratio, respectively.

In column 1, the standard gravity equation's independent variables, such as distance, the exporter's population size, contiguity, colonial relationship, and common language, take the expected sign and are statistically significant at the 1% level. The gross-export flows decrease with distance and the exporter's population size while sharing a border or a common language; having colonial ties increases the gross-export flows between partners, ceteris paribus. The importer's population size has an insignificant effect on gross-export flows. All else equal, the estimated coefficient for $lndistw_{ij}$ suggests that a 1% increase in distance between trading partners tends to reduce gross-export flows by about 0.82%. The estimated coefficient for the exporter's population size variable ($lnExpo\_pop$) indicates that a 1% increase for the exporter's population size is accompanied by about a 0.17% decrease in gross-export flows, ceteris paribus. On the other hand, gross-export flows for a country pair that shares a common border are, on average, about 48.6% higher than gross-export flows of a country pair that does not share a common border. [($e^{0.396}$ -1) × 100].[10] The existence of a common language, along with a colonial relationship, encourages trade between trading partners. The estimated coefficient for ${common_{lang}}_{ij}$ shows that gross-export flows for a country pair that share a common language are, on average, about 23.6% more than gross-export flows of a country pair that does not share a common language. Also, the coefficient for the colony variable indicates that gross-export flows between trading partners that were in a colonial relationship at one time are, on average, about 19.6% more than the flows for countries which were not in such a relationship.

Looking at the trade-policy variables in column 1, the estimated coefficients for ${Onein_{WTO}}_{ij,t}$, ${Bothin_{WTO}}_{ij,t}$, and ${RTA_{dummy}}_{ij,t}$ take a positive sign and are statistically significant at the 1% level. All else equal, if one country in a pair is not a WTO member, the pair's gross-export flows are, on average, about 60.6% more than pairs that are either involved with reciprocal liberalization through the WTO or are not WTO members. This effect increases almost fivefold if both countries in a pair are WTO members and are obliged to engage in reciprocating trade-liberalization benefits. The coefficient for ${Bothin_{WTO}}_{ij,t}$ suggests that such pairs' gross-export flows are, on average, about 331% more than pairs that are either involved with non-reciprocal liberalization through the WTO or are not WTO members. All else equal, gross-export flows for a country pair that belongs to a common regional trade agreement are, on average, about 29.8% more than pairs that are not part of a trade agreement. The estimated coefficient for

[10]The percentage effect of the explanatory variables on trade flows for all estimations is computed as [exp(β)-1] *100, where β is the estimated coefficient for the given explanatory variable.

$PTA_{dummy_{ij,t}}$ takes a negative sign and is insignificant. Several studies which evaluate PTA programs suggest that the increased number of PTAs in the past decade might have reduced the preferential margins for the intended beneficiaries (Francois, Hoekman, & Manchin, 2006; Fugazza & Nicita, 2013; Herz & Wagner, 2011; Sharma, Grant, & Boys, 2015. Perhaps, the PTA variable in this study is picking up this effect.

Turning to the policy variable of interest, $AGOA_{ij,t}$ in column 1, the estimated coefficient takes a negative sign and is statistically insignificant. The insignificance of the AGOA variable is consistent with Mueller (2008), Seyoum (2007), Gil-Pareja et al. (2010), and Zappile (2011) who found that the AGOA had an insignificant effect on the SSA's overall exports to the U.S.A. On the other hand, this finding contradicts Brenton and Ikezuki (2004), Nouve (2005), and Cooke (2011) who discovered that the AGOA had a strong and positive influence on the SSA's overall exports to the U.S.A. Although the econometric specifications in these studies were standard for those time periods, by the current standard, the empirical approach might not have fully captured the structural variables that the new-new trade theory suggests. Moreover, these studies' timeframes might not have been sufficient to capture whether changes in the SSA's exports can be attributed to AGOA membership. More precisely, the effect of the temporary suspension and graduation of AGOA recipients from the AGOA program. For example, Cote d'Ivoire, one of the leading SSA exporters of agricultural products, gained AGOA membership in 2002, was suspended from receiving AGOA preferential benefits in 2005, and then reinstated in 2011.

Column 2 presents the results from assessing the AGOA's effect on the SSA's overall domestic value-added exports. The estimated coefficients for all standard gravity-equation explanatory variables and trade-policy variables resemble column 1 in sign and statistical (non) significance. Their magnitudes are slightly different from the ones in column 1. The domestic value-added export flows decrease with distance and the exporter's population size while sharing a border or a common language; having colonial ties increases the domestic value-added export flows between partners, ceteris paribus. The results suggest that a 1% increase in distance between a country pair and the exporter's population size decreases the domestic value-added export by 0.82% and 0.18%, respectively.

The coefficient-for-sharing a-common-border variable suggests that domestic value-added export flows for a country pair that shares a common border are, on average, about 48% higher than a pair without a common border [($e^{0.392}$ -1) × 100].[11] The coefficient for ${common_{lang}}_{ij}$ indicates that domestic value-added export flows for a country pair that shares a common language are, on average, about 22.5% more than pairs without a common language. The estimated coefficient for the colonial-ties variable indicates that domestic value-added export flows for trading partners that were in a colonial relationship at one time are, on average, about 22.9% higher than countries without such a relationship. All else equal, if one trading partner is not a WTO member, the domestic value-added export flows for the pair are, on average, about 57.3% more than pairs where both countries or neither country is in the WTO. Again, as with the gross exports, the WTO's positive average effect increases almost fivefold if both countries are WTO members and are obliged to engage in reciprocating trade-liberalization benefits. The domestic value-added export flows for such pairs are, on average, about 311.6% more than pairs that are either involved with non-reciprocal liberalization through the WTO or are not WTO members.

The coefficient for ${RTA_{dummy}}_{ij,t}$ indicates that, if trading partners belong to a common regional trade agreement, the domestic value-added export flows for such pairs is, on average,

[11]The percentage effect of the explanatory variables on trade flows for all estimations is computed as [exp(β)-1 *100], where β is the estimated coefficient for the given explanatory variable.

about 31.8% more than pairs which are not part of trade agreements. The estimated coefficients for both the AGOA variable and the PTA variable follow a similar (negative) sign as in column 1 and remain statistically insignificant at conventional levels.

Column 3 reports the results for the AGOA's effects on trade flows using the domestic value-added exports to gross exports ratio as the dependent variable. The coefficients for almost all of the standard gravity-equation independent variables and five trade-policy variables are statistically significant at the 1% level. The exception is the estimated coefficient for the variable about the exporter's population size (that, in this case, is statistically insignificant). In almost all cases, the explanatory variables negatively affect the domestic value-added exports to gross exports ratio. The exceptions are the effect of distance and the policy variable of interest, AGOA (that, in this case, is positive and statistically significant). As shown in column 3 of Table A6, a 1% increase in the distance between countries in a pair tends to increase the share of the domestic value-added exports in gross exports by a about 0.02%. On the other hand, a 1% increase for importer's population size is accompanied by about a 0.002% decrease in the domestic value-added exports to gross exports ratio, ceteris paribus. The estimated coefficient for $contiguity_{ij}$ indicates that the domestic value-added content in gross exports of a country pair that shares a common border is, on average, about 1.8% less than a pair without a common border [($e^{0.0183}$ -1) × 100].[12]

It can be inferred from column 3 of Table A6 that the existence of a common language decreases the share of the domestic value-added exports in gross exports, as does a colonial relationship. The results show that the domestic value-added exports to gross exports ratio for country pairs that share a common language or have colonial ties is, on average, about 1.6% and

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[12]The percentage effect of the explanatory variables on trade flows for all estimations is computed as [exp(β)-1 *100], where β is the estimated coefficient for the given explanatory variable.

2.2%, respectively, less than for pairs without these attributes. All else equal, if one nation in a country pair is a WTO member, the domestic value-added exports to gross exports ratio is, on average, about 1.1% less compared to a country pair with neither or both countries in the WTO. The coefficient for ${Bothin_{WTO}}_{ij,t}$ suggests that, if both countries in a pair are WTO members, the domestic value-added exports to gross exports ratio is, on average, about 3.4% less than the ratio for a pair outside the WTO or a pair with one country in the WTO. The domestic value-added exports to gross exports ratio of trading partners in a common RTA is, on average, about 1.1% less than the ratio for pairs that are not in a common RTA. The result for the PTA variable suggests that being a PTA recipient leads to an average decrease of the domestic value-added exports to gross exports ratio of about 2% compared to non-recipients.

As expected, the estimated coefficient for the policy variable of interest, AGOA, is positive and statistically significant at the 1% level. The result suggests that being an AGOA recipient leads to an average increase for the content of the domestic value-added exports to gross exports ratio of about 2.9% compared to non-recipients. Recall that the domestic value-added exports to gross exports ratio measures the share of the content of domestic value-added exports which are embodied in gross exports. Given the dominance of forward integration in the SSA's GVC participation, thus the SSA region exports more raw intermediate products for the other country's export production (Conde et al., 2015; Foster-McGregor et al., 2015; IMF, 2015a), this result is no surprise.

Columns 4, 5, and 6 incorporate country-pair-sector fixed effects, hence excluding the log of distance. The estimated coefficients for the standard gravity-equation explanatory variables remain nearly unaltered from the ones in columns 1-3 with three exceptions: $lnImpo_{pop}$, ${common_{lang}}_{ij}$, and $colony_{ij}$. The dummy variable for the importer's population size that was statistically insignificant now reaches statistical significance at the 1% level. The coefficient for a common language that was positive and statistically significant at the 1% level is now negative and statistically significant at the 5% level. Finally, the dummy variable for colonial relationship that was statistically significant at the 1% level is now statistically significant at the 5% level.

In column 4, the gross-export flows decrease with the exporter's population size, the importer's population size, and sharing a common language while sharing a border or having a colonial relationship increases the trade between partners, ceteris paribus. The results suggest that a 1% increase for the exporter's and importer's population size tends to reduce the gross-export flows by about 0.008% and 0.0004%, respectively. The coefficient for contiguity variable, on the other hand, remains positive. The result implies that, after considering the country-pair-sector fixed effects, the gross-export flows for a country pair that shares a common border are, on average, about 20.4% higher than for countries without a common border [($e^{0.186}$ -1) × 100].[13] The existence of a common language between trading partners discourages trade. Based on this result, gross-export flows for country pairs that share a common language are, on average, about 4.7% less than for countries without a common language. The coefficient for the colony variable indicates that gross-export flows for trading partners that were in a colonial relationship at one time are, on average, about 4.7% more than countries which were not in such a relationship.

Based on the results reported in column 4, including country-pair-sector fixed effects in the model results in a negative average influence of WTO membership on gross-export flows while being in a common RTA, a PTA recipient, or an AGOA recipient has an insignificant effect on gross-export flows, ceteris paribus. The estimated coefficients for $Onein_{WTO_{ij,t}}$ suggest that, if

[13]The percentage effect of the explanatory variables on the trade flows for all estimations is computed as [exp(β)-1] *100, where β is the estimated coefficient for the given explanatory variable.

one country in a pair is not a WTO member, gross-export flows for such pairs are, on average, about 14.8% less than for trading partners that are either both in or outside the WTO. As for pairs where both countries are in the WTO, the gross-export flows are, on average, about 17.1% less than for pairs that have either one country in the WTO or both countries outside the WTO. This negative average effect significantly dwarfs the positive influence seen for gross-export flows in column 1. The estimated coefficients for the RTA, PTA, and AGOA variables in column 1 do not change in a significant way. In particular, their signs and statistical significance remain unaltered with one exception: ${RTA_{dummy}}_{ij,t}$ is now statistically insignificant at conventional levels. After considering the country-pair-sector fixed effects, the implication of the estimated coefficient on the policy variable of interest, $AGOA_{ij,t}$, remains consistent with Mueller (2008), Seyoum (2007), Gil-Pareja et al. (2010), and Zappile (2011). Thus, the result remains contradictory with Brenton and Ikezuki (2004) and Nouve (2005).

Column 5 presents the results from assessing the AGOA's effect on the SSA's overall domestic value-added exports with country-pair-sector fixed effects included. In almost all cases, the estimated coefficients for the standard gravity-equation independent variables and trade-policy variables resemble column 4 in sign and statistical (non) significance. The exception is the dummy variable for a common language which is now statistically insignificant and the dummy variable for colonial ties which is now statistically significant at the 10% level. As with gross-export flows, domestic value-added export flows decrease with either the exporter's population size or the importer's population size; sharing a common border or having colonial ties increases the domestic value-added export flows between trading partners, ceteris paribus. The results show that a 1% increase for the exporter's and importer's population size tends to decrease the domestic value-added export flows by about 0.009% and 0.001%, respectively.

The estimated coefficient for $contiguity_{ij}$ suggests that domestic value-added export flows for a country pair that shares a border is, on average, about 26.1% higher than for a pair that does not share a border [$(e^{0.392}$ -1) × 100].[14] This effect on the domestic value-added export flows is about 3.7% higher than the effect on the gross-export flows. The domestic value-added export flows between trading partners that were in a colonial relationship at one time are, on average, about 4.5% more compared to trading partners that were not in such a relationship. As we can observe, the coefficients for WTO membership variables show a negative and significant average effect on domestic value-added export flows. All else equal, if one country in a pair is not a WTO member, the domestic value-added export flows for such pairs are, on average, about 17.1% less than pairs where both countries are in or outside the WTO. The coefficient for $Bothin_{WTO\,ij,t}$ suggests that domestic value-added export flows for pairs that have both countries in the WTO are, on average, about 20.1% less than pairs that have one country in the WTO or both countries outside the WTO. Again, this negative effect significantly dwarfs the positive influence seen for the domestic value-added export flows in column 2. The estimated coefficients for the RTA variables follow a similar (positive) sign as in column 2 but are now statistically insignificant. The coefficients for the PTA and AGOA variables remain negative and statistically insignificant as in column 2.

Column 6 reports the results for the AGOA effects on trade flows using the domestic value-added exports to gross exports ratio as the dependent variable with the country-pair-sector fixed effects included. There is a slight change in the coefficients' signs, magnitudes, and significance for almost all of the standard gravity-equation independent variables and five policy variables. The

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[14] The percentage effect of the explanatory variables on trade flows for all estimations is computed as [exp(β)-1 *100], where β is the estimated coefficient for the given explanatory variable.

estimated coefficient for $lnExpo_{pop}$ remains negative but is now statistically significant at the 10% level. Also, the estimated coefficients for $lnImpo_{pop}$ and $contiguity_{ij}$ remain statistically significant at the 1% level but now take a negative sign. The dummy variable, $common_{lang_{ij}}$, is now statistically insignificant.

The estimated coefficient for $lnExpo_{pop}$implies that a 1% increase with the exporter's population size tends to reduce the share of the domestic value-added exports in gross exports by about 0.0002%, ceteris paribus. On the other hand, a 1% increase in the importer's population size tends to increase the share of the domestic value-added exports in gross exports by about 0.0003%, ceteris paribus. Contrary to the results in column 3, the estimated coefficient for the contiguity variable is positive and significant. The result suggests that the share of domestic value-added exports in gross exports for pairs that share a common border is, on average, about 0.6% more than for pairs that do not have a common border [$(e^{0.0183}$ -1) × 100].[15] The existence of a colonial tie decreases the share of the domestic value-added exports in gross exports, as in column 3. The coefficient for the colony dummy variable suggests that the share of the domestic value-added exports in gross exports of pairs with colonial ties is, on average, about 0.8% less than pairs without colonial ties.

With regards to the WTO membership variables, the estimated coefficients remain statistically significant at the 1% level but now take a positive sign. The implication is that the domestic value-added exports to gross exports ratio increases if one of the trading partners is a WTO member or if both trading partners are WTO members. The results in column 3 show that the domestic value-added exports to gross exports ratio for pairs with one country in the WTO

[15] The percentage effect of the explanatory variables on trade flows for all estimations is computed as exp(β)-1] × 100, where β is the estimated coefficient for the given explanatory variable.

increased, on average, by about 0.2% compared to pairs with neither or both countries in the WTO. The coefficient for $Bothin_{WTO_{ij,t}}$ suggests that the domestic value-added exports to gross exports ratio for pairs with both trading partners in the WTO increased, on average, by about 0.4% compared to pairs outside the WTO or with one country in the WTO.

The share of the domestic value-added exports in gross exports for trading partners that belong to a common RTA is, on average, about 0.03% less than pairs that have trading partners which are not in a common RTA. The coefficient for the PTA variable suggests that being a PTA recipient leads to an average decrease in the share of the domestic value-added exports to gross exports of about 0.2% compared to non-recipients. With respect to the policy variable of interest, $AGOA_{ij,t}$, the coefficient now takes a negative sign but remains statistically significant at the 1% level. The result suggests that being an AGOA recipient leads to an average decrease in the share of the domestic value-added exports in gross exports of about 0.7% compared to non-recipients.

4.1.3. Sector-specific AGOA Effects on Trade Flows

Table A7 in Appendix presents the structural gravity-estimation results for sector-specific AGOA effects on trade flows. The previous base regressions are augmented by including interaction terms between the policy variable of interest, $AGOA_{ij,t}$, and dummy variables for the five sectors defined in the preceding sections. For a casual interpretation, the sign, magnitude, and significance levels of the estimated coefficients for most independent variables in columns 1-6 from Table A6 remain nearly unaltered. More precisely, the effect of population size; geographical variables; historical variables; the existence of a common RTA for a country pair; and being a PTA recipient for all three trade flows, in percentage terms, remain the same as in Table A6.

The coefficient for the policy variable, $AGOA_{ij,t}$ and the five interaction terms are of primary interest in this case. When including the interaction variables to parse out the sector-level effects, the AGOA's average effect on the SSA's overall gross exports is negative and statistically significant. The estimated coefficient for $AGOA_{ij,t}$ suggests that, on average, the recipients' gross exports to the U.S.A. declined by about 66.2% compared to non-recipients.[16] The AGOA's effect on gross exports at the sector level is not very clear. For example, in agriculture; mining and quarrying; textiles and apparel; and petroleum, chemical and non-chemical mineral products, the AGOA effect is statistically insignificant. These findings contradict Seyoum (2007) and Cooke (2011) who found that the AGOA led to a positive and statistically significant effect on textile and apparel exports. On the other hand, in the food and beverages sector, there is clear negative average effect; in this sector, the recipients' gross exports are about 68.8% less compared to non-recipients.[17]

The results for the AGOA's effect on the recipients' domestic value-added exports in each of the five sectors are provided in column 2. For brevity, the following discussion focuses on sector-specific AGOA effects. As in the case of gross-export flows, the recipients' overall domestic value-added exports to the U.S.A. are less when compared to non-recipients' domestic value-added exports. The estimated coefficient for $AGOA_{ij,t}$ suggests that, on average, AGOA recipients' domestic value-added exports to the U.S.A. declined by about 47.7%.[18] However, the AGOA's effect on domestic value-added exports at the sector level is uneven. Again, as in the case of gross-export flows, being an AGOA recipient is statistically insignificant in the agriculture; mining and quarrying; textiles and apparel; and petroleum, chemical and non-chemical mineral

[16] The figure is calculated using the column 1 coefficient for $AGOA_{ij,t}$.
[17] The figure is calculated using $\exp(\beta_{11} + \beta_{14})$ -1× 100, where β_{11} and β_{14} are column 1 coefficients for $AGOA_{ij,t}$ and $AGOA_{ij,t} * Food\_Bev$.
[18] The figure is calculated using the column 2 coefficients for $AGOA_{ij,t}$.

product sectors. The impact remains negative for the food and beverages sector; in this sector, the recipients' domestic value-added exports are about 63.9% less compared to non-recipients.[19]

Column 3 reports the results for the AGOA's effect based on the recipients' domestic value-added exports to gross exports ratio for each of the five sectors. For a quick preview, the estimated coefficients for $Onein_{WTO_{ij,t}}$, $Bothin_{WTO_{ij,t}}$, $RTA_{dummy_{ij,t}}$, and $PTA_{dummy_{ij,t}}$ remain the same as in columns 1 and 2 of Table A6. The coefficient for the policy variable of interest, $AGOA_{ij,t}$, takes a positive sign and is statistically significant at the 1% level. For casual interpretation, on average, the AGOA increases the overall share of the domestic value-added exports in gross exports while the other four trade-membership dummy variables decrease the overall share of the domestic value-added exports in gross exports. The estimated coefficient suggests that, on average, the AGOA recipients' domestic value-added exports to gross exports ratio increased by about 1.6% compared to non-recipients.[20]

At the sector level, however, the AGOA's effect on the domestic value-added exports to gross exports ratio appears to be uneven. For example, in the agriculture sector, the recipients' domestic value-added exports to gross exports ratio is 8.42%[21] higher compared to non-recipients; in the food and beverages sector, the recipients' domestic value-added exports to gross exports ratio is 16.3%[22] higher compared to non-recipients; and in the petroleum, chemical and non-chemical minerals sector, the share of the domestic value-added exports in gross exports is 8.3%[23]

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[19]The figure is calculated using $\exp(\beta_{11} + \beta_{14})$ -1× 100, where β_{11} and β_{14} are column 2 coefficients for $AGOA_{ij,t}$ and $AGOA_{ij,t} * Food\_Bev$.

[20]The figure is calculated using the column 3 coefficient for $AGOA_{ij,t}$.

[21]The figure is calculated using $\exp(\beta_{11} + \beta_{12})$ -1× 100, where β_{11} and β_{12} are the column 3 coefficients for $AGOA_{ij,t}$ and $AGOA_{ij,t} * Agriculture$, respectively.

[22]The figure is calculated using $\exp(\beta_{11} + \beta_{14})$ -1× 100, where β_{11} and β_{14} are the column 3 coefficients for $AGOA_{ij,t}$ and $AGOA_{ij,t} * Food\_Bev$, respectively.

[23]The figure is calculated using $\exp(\beta_{11} + \beta_{16})$ -1× 100, where β_{11} and β_{16} are the column 3 coefficients for $AGOA_{ij,t}$ and $AGOA_{ij,t} * Petroleum$, respectively.

higher compared to non-recipients. The results for the domestic value-added exports to gross exports ratio are in line with the GVC literature. For example, Shepherd (2017) found that value chains in the agriculture sector predominantly connect SSA countries to remote countries, such as the U.S.A. Similarly, in the petroleum, chemical and non-chemical minerals sector, the result is consistent with what the extant literature speculates: the SSA countries export more raw products, even for other non-renewable-resource products (IMF, 2015a). Several studies about the AGOA's effect on recipients' exports in this sector also conclude that energy-related products accounted for 90% of the SSA exports to the U.S.A. under the AGOA from 2000-2010 (Brenton & Hoppe, 2006; Páez et al., 2010). However, the AGOA's impact on the mining and quarrying sector and the textiles and apparel sector is insignificant. The AGOA's insignificant effect on domestic value-added content for the textiles and apparel sector's gross exports does not sit well with Shepherd's (2017) recent quantitative work which found that value chains in the textiles and apparel sector predominantly connect SSA countries to the U.S.A.

Columns 4, 5, and 6 in Table A7 present structural gravity-estimation results for sector-specific AGOA effects on trade flows with country-pair-sector fixed effects included. The sign, magnitude, and significance levels of the estimated coefficients for the standard-gravity independent variables and the WTO membership variable in columns 4, 5, and 6 of Table A6 remain nearly unaltered. The sign and insignificance of the estimated coefficients on the RTAs' and PTAs' dummy variables remain nearly unaltered. Again, the effect (in percentage terms) of the importer's and exporter's population size, geographical variables, historical variables, RTAs, and PTAs on all three trade flows remain the same as in columns 4-6 of Table A6.

When looking at the coefficient for the policy variable of primary interest, $AGOA_{ij,t}$, the AGOA's average effect on the SSA's overall gross exports is positive and statistically significant.

The estimated coefficient suggests that, on average, the recipients' gross exports to the U.S.A. increased by about 4.5% compared to non-recipients.[24] The AGOA's effect on gross exports at sector level remains unclear. For example, in the agriculture; food and beverages; textiles and apparel; and petroleum, chemical and non-chemical mineral products sectors, the AGOA's impact is statistically insignificant. In the mining and quarrying sector, there is a clear negative effect. In this sector, the recipients' gross exports are about 11% less than non-recipients' gross exports.[25]

Column 5 reports the results for the AGOA's effect on the recipients' domestic value-added exports in each of the five sectors. As in the case of gross-export flows, the recipients' overall domestic value-added exports to the U.S.A. are less when compared to non-recipients' domestic value-added exports. The estimated coefficient suggests that, on average, recipients' domestic value-added exports to the U.S.A. increased by about 3%.[26] The AGOA's effect on domestic value-added exports at the sector level is also uneven. As with the case of gross-export flows, the effect of being an AGOA recipient is statistically insignificant for the agriculture; food and beverages; textiles and apparel; and petroleum, chemical and non-chemical mineral product sectors. In the mining and quarrying sector, the effect remains negative; in this sector, the recipients' domestic value-added exports are about 16% less compared to non-recipients.[27]

Column 6 reports the results for the AGOA's effect based on the recipients' domestic value-added exports to gross exports ratio for each of the five sectors. The estimated coefficients for the policy variable of interest, $AGOA_{ij,t}$, and the interaction term, $AGOA_{ij,t} * Mining_Q$, take positive and negative signs, respectively. These coefficients are statistically significant while the

[24]The figure is calculated using the column 4 coefficient for $AGOA_{ij,t}$.
[25]The figure is calculated using $\exp(\beta_{11} + \beta_{13})$ -1× 100, where β_{11} and β_{14} are column 4 coefficients for $AGOA_{ij,t}$ and $AGOA_{ij,t} * Mining\_Q$, respectively.
[26]The figure is calculated using column 5 coefficients for $AGOA_{ij,t}$.
[27]The figure is calculated using $\exp(\beta_{11} + \beta_{13})$ -1× 100, where β_{11} and β_{13} are column 5 coefficients for $AGOA_{ij,t}$ and $AGOA_{ij,t} * Mining\_Q$, respectively.

coefficients for the other four interaction terms are statistically insignificant. The coefficient for $AGOA_{ij,t}$ suggests that, on average, the recipients' domestic value-added exports to gross exports ratio decreased by about 0.6% compared to non-recipients.[28] At the sector level, the AGOA's effect on the domestic value-added exports to gross exports ratio appears to be more uneven than in column 3. For example, in the mining and quarrying sector, the recipients' domestic value-added exports to gross exports ratio is 0.2%[29] less compared to non-recipients. The AGOA's effect in the agriculture; food and beverages; textiles and apparel; and petroleum, chemical and non-chemical mineral product sectors remains statistically insignificant.

4.2. Evaluating the Extensive and Intensive Margins for Value-Added Trade

This section presents and discusses results about the extensive and intensive margins of value-added trade. This assessment is applied to the agricultural, domestic value-added exports. The results from both the extensive and intensive margin estimations are provided in Appendix's Table A8. The results show that distance, the exporter's population size, the importer's population size, sharing a border, sharing a common religion, and WTO membership (i.e., either one or both in the WTO) have had a significant and positive effect on the decision to export agricultural products. The results suggest that the one in the WTO and both in the WTO statuses have had a significant and negative effect on the probability of exporting agricultural products. In contrast, a common language has had an insignificant effect on the decision to export agricultural products. The coefficient for the policy variable of interest, $AGOA_{ij,t}$, turns out to be statistically insignificant. These results do not support the hypothesis that the AGOA creates new opportunities for domestic value-added exports from Sub-Saharan Africa to the United States.

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[28]The figure is calculated using the column 6 coefficient for $AGOA_{ij,t}$.
[29]The figure is calculated using $\exp(\beta_{11} + \beta_{13})$ -1× 100, where β_{11} and β_{13} are column 6 coefficients for $AGOA_{ij,t}$ and $AGOA_{ij,t} * Mining\_Q$, respectively.

The estimation results for the second stage, the outcome equation, are presented in column 2 of Table A8. It is important to note that, when the coefficient of the Mills ratio is positive, "positive selection" is said to have occurred; if the coefficient is negative, then "negative selection" is the result. The findings show that the Mills ratio is negative but insignificant. In general, distance, the exporter's population size, sharing a common language, sharing colonial ties, being in a common RTA, and if one country in a pair is a WTO member affect the intensive margin. All other variables are insignificant. As predicted by the structural gravity model, the distance between the AGOA recipient and the U.SA. is an important factor when explaining the volume of agricultural value-added exports which originate from an SSA country that has an AGOA membership. The estimated coefficient for the distance variable suggests that, on average, a 1% increase for the distance reduces the volume of agricultural, domestic value-added exports to the U.S.A. from AGOA recipients by 11.8%. Also, the results indicate that the exporter's population size, common language, colonial relationship, WTO membership, and RTA agreement are important factors when explaining the volume of agricultural, domestic value-added exports.

The estimated coefficients for $lnExpo_{pop}$ and $Onein_{WTO_{ij,t}}$ are negative and significant. These variables' negative effect is 28% and 79%, respectively. However, the coefficients for $common_{lang_{ij}}$, $colony_{ij}$ and $RTA_{dummy_{ij,t}}$ are positive and significant. The results indicate that sharing a common language and having a colonial relationship lead to an average increase for the volume of agricultural, domestic value-added exports by about 23% and 76%, respectively. Finally, the existence of a common RTA has led to an average increased volume of agricultural, domestic value-added exports of about 55%. However, in this particular sector, we do not have evidences to support that AGOA has increased domestic value-added exports from the SSA region to the U.S.A. Therefore, the finding does not support the assertion that the AGOA has helped deepen and strengthen the trade ties between the U.S.A. and the SSA countries universally as originally intended.

CHAPTER FIVE. SUMMARY AND CONCLUSIONS

This study contributes to the existing literature about the AGOA's effect in several ways. The few available empirical studies that examine the AGOA's impact on the SSA's agricultural trade have used aggregated data for gross exports in the agriculture sector. According to these studies, the SSA's gross exports in the agriculture sector have not benefited from the AGOA provisions since its enactment in 2000. These studies conclude that a positive, but statistically insignificant, relationship exist between the AGOA and the SSA's agricultural gross exports to the U.S.A. In those studies, however, the AGOA assessment is often limited to using aggregated trade data and gross trade flows (traditional trade statistics). As mentioned, estimating the AGOA's impact on SSA exports to the U.S.A. using aggregated merchandise data masks the sector-level AGOA effects. In addition, utilizing traditional trade statistics when assessing the AGOA's effect on the SSA's agricultural exports to the U.S.A. leads to a double-counting problem (Johnson, 2014; Koopman et al., 2008, 2014; Maurer & Degain, 2012; Xu, 2012).

This study is the first one to empirically analyze the AGOA's impact on the SSA's agricultural, domestic value-added exports using the new measures of value-added trade. The study is also the first one to empirically examine the mechanism that has led to an increase for the AGOA recipients' domestic value-added agriculture exports to the U.S.A. Considering the uneven AGOA effect across sectors, this research has a detailed assessment about the program's impacts on five economically important sectors for the SSA countries. To do this, the study has used disaggregated trade data from the Eora multi-region, input-output tables in order to compute the domestic value-added exports, the domestic value-added exports to gross exports ratio, and the gross exports for 46 SSA countries, examining the agriculture, mining and quarrying, food and beverages, textiles and apparel, and petroleum sectors, from 1990-2013. It is important to consider that AGOA preferential treatment is applied at the sectoral level (i.e., varies by sector), only for selected countries, and for products which are eligible to receive AGOA preference benefits. The disaggregated data and AGOA dummy variable used in this study are constructed to capture the (a) AGOA's sectoral effects, (b) selectivity of the AGOA membership, (c) overall relative benefits that the AGOA program offers, (d) momentary suspension or termination of preferences, and (e) recipients' graduation from receiving AGOA benefits. AGOA-membership variation is captured, both because of the time dimension and the country coverage.

The statistical results for the dependent variable, gross exports, are mostly consistent with other studies, finding that AGOA trade preferences have had a statistically insignificant effect on the SSA's overall gross exports to the U.S.A. In the base regressions, whether considering country-pair-sector fixed effects, the policy variable of interest, AGOA, is negative and statistically insignificant for both gross exports and domestic value-added exports. The AGOA variable is positive and significant for the domestic value-added exports to gross exports ratio, both before and after including the country-pair-sector fixed effects. After introducing the interaction variables and before considering the country-pair-sector fixed effects, the AGOA variable remains negative but becomes statistically significant. The AGOA variable becomes positive but remains significant after considering the country-pair-sector fixed effects. For the domestic value-added exports to gross exports ratio, the sign and significance of the AGOA variable resemble the pattern in the base regressions.

The study has provided key findings about the AGOA's effect on the SSA's domestic value-added exports and the domestic value-added exports to gross exports ratio on the one hand as well as the gross exports on the other hand. Based on the results from the base regressions, the first important finding is that the AGOA has an insignificant effect on the recipient's overall gross exports and overall domestic value-added exports. However, the insignificance impact of AGOA disappeared when estimating the sector-specific AGOA effects. Thus, the AGOA has a negative and statistically significant average influence on the recipients' overall gross exports and overall domestic value-added exports before considering country-pair-sector fixed effects. This negative average effect disappears, but the significance remains unaltered when country-pair-sector fixed effects are included.

The third important finding is that the AGOA has a significant, positive average effect on the recipients' overall domestic value-added exports to gross exports ratio when considering distance. Thus, the AGOA has a positive and statistically significant influence on the share of the domestic value-added exports generated by the recipients' economies that is embodied in the recipients' gross exports to the U.S.A. However, this positive AGOA effect on the overall domestic value-added to gross exports ratio disappears and remains statistically significant when country-pair-sector fixed effects are included. Also, as with the base regressions, the AGOA's effect on the recipients' overall domestic value-added exports to gross exports ratio remains unaltered when estimating sector-specific AGOA impacts.

The fourth key finding is that the AGOA has an uneven effect, across the five sectors, on the recipients' gross exports and domestic value-added exports. For example, the AGOA has an insignificant effect on the recipients' gross exports and domestic value-added exports in the agriculture sector, the textiles and apparel sector, and the petroleum sector. On the other hand, the AGOA has an insignificant impact on the recipients' gross exports and domestic value-added exports in the mining and quarrying sector when distance is included. The AGOA's average effect in this sector becomes negative and statistically significant when considering country-pair-sector fixed effects. In the food and beverages sector, the AGOA has a significant, but negative, average impact on the recipients' gross exports and domestic value-added exports when considering distance. This negative average effect becomes insignificant when considering country-pair-sector fixed effects.

The fifth finding is that AGOA has a positive and significant average effect on the recipients' domestic value-added exports to gross exports ratio in the agriculture, food and beverages, and petroleum sectors. On the other hand, the AGOA has an insignificant average effect on the recipients' domestic value-added exports to gross exports ratio in the mining and quarrying sector as well as the textiles and apparel sector. When country-pair-sector fixed effects are considered, the AGOA's effect on the recipients' domestic value-added exports to gross exports ratio is only positive and statistically significant in the mining and quarrying sector. The AGOA's impact on the recipients' domestic value-added exports to gross exports ratio in the other four sectors becomes insignificant.

This study set out to reveal the key determinants which influence the SSA's extensive and intensive value-added trade margins. This analysis was done by employing an HMR two-step procedure model and using highly disaggregated, balanced panel data for 1990-2013. The first stage of the process revealed the factors which affect the probability of AGOA recipients exporting to the U.S.A. (extensive margin). The results from this assessment indicated that, in terms of the probability to export, or the extensive margin, a common religion has a positive effect on the AGOA recipients' decision to export.

The second stage, which modeled agricultural, domestic value-added trade flows, revealed the factors that affect export volumes (intensive margin). The results from this step suggested that trade membership had a positive effect on the intensive margin. Distance negatively affected the volume of agricultural value-added exports originating from AGOA recipients and going to the

U.S.A. This finding was in line with the IMF (2017) recommendations that the SSA region needed to improve its infrastructure in order to enhance its export diversification and growth. Given the high importance of transportation infrastructure as a critical determinant of value-added trade performance (Shepherd, 2017), this result was no surprise. Improving the transportation infrastructure is one way that SSA countries can better connect with GVCs.

The findings from this thesis can be further improved by performing a counterfactual analysis. Also, by incorporating the AGOA preferential tariff rates since AGOA preferential treatment is applied at the sectoral level, only selected countries, and products are eligible for receiving AGOA preferential benefits.

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APPENDIX

Table A1. The AGOA Recipients' Eligibility, Suspension, Reinstatement, and Graduation

Country	Date Declared Eligible	First Graduation or Suspension	Reinstated	Second Graduation or Suspension
Angola	12/30/2003			
Benin	10/2/2000			
Botswana	10/2/2000			
Burkina Faso	12/10/2004			
Burundi	1/6/2006	1/1/2016		
Cameroon	10/2/2000			
Cape Verde	10/2/2000			
Central Africa Republic	10/2/2000	1/1/2004		
Chad	10/2/2000			
Comoros	6/30/2008			
DR Congo	1/1/2003	1/1/2011		
Congo	10/2/2000			
Côte d'Ivoire	5/16/2002	1/1/2005	10/25/2011	
Djibouti	10/2/2000			
Equatorial Guinea***				
Eritrea	10/2/2000	1/1/2004		
Ethiopia	10/2/2000			
Gabon	10/2/2000			
Gambia	1/1/2003	1/1/2015		
Ghana	10/2/2000			
Guinea	10/2/2000	12/23/2009	10/25/2011	
Guinea-Bissau	10/2/2000	12/20/2012	12/23/2014	
Kenya	10/2/2000			
Lesotho	10/2/2000			
Liberia	1/1/2007			
Madagascar	6/26/2000	12/23/2009	6/26/2014	
Malawi	10/2/2000			
Mali	10/2/2000	12/20/2012	1/1/2014	
Mauritania	10/2/2000	1/1/2006	6/28/2007	1/1/2009
Mauritius	10/2/2000			
Mozambique	10/2/2000			

Sources: U.S. International Department of Commerce, 2016; and World Trade Organization, Preferential Trade Agreements, 2016; and African Growth and Opportunity Act, 2016

Table A1. The AGOA Recipients' Eligibility, Suspension, Reinstatement, and Graduation (continued)

Country	Date Declared Eligible	First Graduation or Suspension	Reinstated	First Graduation or Suspension
Sao Tome and Principe	10/2/2000			
Namibia	10/2/2000			
Niger	10/2/2000	12/23/2009	10/25/2011	
Nigeria	10/2/2000			
Rwanda	10/2/2000			
Senegal	10/2/2000			
Seychelles	10/2/2000	1/01/2017[G30]		
Sierra Leone	10/23/2002			
Somalia***				
South Africa	10/2/2000			
South Sudan[31]	1/1/2013	1/1/2015		
Sudan***				
Swaziland	1/18/2001	1/1/2015		
Tanzania	10/2/2000			
Togo	4/17/2008			
Uganda	10/2/2000			
Zambia	10/2/2000			
Zimbabwe***[32]				

Sources: U.S. International Department of Commerce, 2016; and World Trade Organization, Preferential Trade Agreements, 2016; and African Growth and Opportunity Act, 2016

[30G] indicates that a country graduated from receiving AGOA benefits

[31]South Sudan gained independence from Sudan in 2011 (i.e. since 2011 there are 49 SSA countries)

[32] ** indicates that an SSA country has not received the AGOA benefits since its enactment due to failure of meeting eligibility requirements.

Table A2. Eora Sector Classification

Industry Code	Sector Description	Industry Code	Sector Description
1	Agriculture	14	Construction
2	Fishing	15	Maintenance and Repair
3	Mining and Quarrying	16	Wholesale Trade
4	Food & Beverages	17	Retail Trade
5	Textiles and Wearing Apparel	18	Hotels and Restaurants
6	Wood and Paper	19	Transport
7	Petroleum, Chemical and Non-Metallic Mineral Products	20	Post and Telecommunications
8	Metal Products	21	Financial Intermediation and Business Activities
9	Electrical and Machinery	22	Public Administration
10	Transport Equipment	23	Education, Health and Other Services
11	Other Manufacturing	24	Private Households
12	Recycling	25	Others
13	Electricity, Gas and Water	26	Re-export & Re-import

Source: Eora Multi-region Input-Output Tables, 2016 (http://worldmrio.com/simplified/)

Table A3. The Updated List of Sub-Saharan African Countries as from 2011

Angola	Congo	Guinea	Mozambique	Sudan
Benin	Côte d'Ivoire	Guinea-Bissau*	Namibia	Swaziland
Botswana	Djibouti	Kenya	Niger	Tanzania
Burkina Faso	DR Congo	Lesotho	Nigeria	Togo
Burundi	Equatorial Guinea*	Liberia	Rwanda	Uganda
Cameroon	Eritrea	Madagascar	Sao Tome and Principe	Zambia
Cape Verde	Ethiopia	Malawi	Sierra Leone	Zimbabwe
Central Africa Republic	Gabon	Mali	Somalia	
Chad	Gambia	Mauritania	South Africa	
Comoros*	Ghana	Mauritius	South Sudan	

Source: US Code Sec. §3706 Sub-Saharan Africa defined, 2016.[33]
Notes: * indicates to SSA countries that are not on the UNCTAD-Eora Input-Output Table. South Sudan gained independence from Sudan in 2011 (i.e. since 2011 there are 49 SSA countries)

[33] US Code Sec. §3706 - http://uscode.house.gov/view.xhtml?req=(title:19 percent20section:3706 percent20edition:prelim

Table A4. Summary Statistics of the Dependent Variables and Trade Policy Variables

Variable		Mean	Std. Dev.	Min	Max	Observations
$EXGR_{ij,st}$	overall	15794.63	454880.5	0	200000000	N =20889076
	between		385941.2	0	95300000	n = 922532
	within		230189.8	-71500000	126000000	T bar = 22.6432
$DVAExp_{ij,st}$	overall	11889.08	342321.6	0	129000000	N =20889076
	between		289049.7	0	79200000	n = 922532
	within		178124.8	-49200000	80400000	T bar = 22.6432
$VAX_{ij,st}$	overall	.8418818	.1475366	.0000237	.9999999	N =19964992
	between		.143819	.0000289	.9999998	n = 882151
	within		.0247483	-.080278	1.679113	T bar = 22.6322
$AGOA_{ij,t}$	overall	.0005962	.0244099	0	1	N =20889076
	between		.0168799	0	.5416667	n = 922532
	within		.0172264	-.5410705	.8755962	T bar = 22.6432
${Onein_{WTO}}_{ij,t}$	overall	.3856223	.486742	0	1	N =20889076
	between		.4098582	0	1	n = 922532
	within		.2607239	-.572711	1.343956	T bar = 22.6432
${Bothin_{WTO}}_{ij,t}$	overall	.4832579	.4997196	0	1	N =20889076
	between		.4427854	0	1	n = 922532
	within		.2326297	-.4750754	1.441591	T bar = 22.6432
${PTA_{dummy}}_{ij,t}$	overall	.0882135	.2836051	0	1	N =20889076
	between		.2538558	0	1	n = 922532
	within		.114798	-.7754229	.9215468	T bar = 22.6432
${RTA_{dummy}}_{ij,t}$	overall	.131065	.3374714	0	1	N =20889076
	between		.3002064	0	1	n = 922532
	within		.147075	-.8272684	.981065	T bar = 22.6432

Table A5. Multicollinearity Test Results

Variable	VIF	1/VIF
${common_{lang}}_{ij}$	2.57	0.388624
${comlang_{ethan}}_{ij}$	2.54	0.393286
${Bothin_{WTO}}_{ij,t}$	2.50	0.399708
${Onein_{WTO}}_{ij,t}$	2.44	0.410340
$AGOA_{ij,t}$	1.25	0.802938
$lndistw_{ij}$	1.25	0.803060
$contiguity_{ij}$	1.17	0.851697
${RTA_{dummy}}_{ij,t}$	1.14	0.880578
$comcur_{ij}$	1.07	0.934556
$AGOA_{ij,t}$*Agriculture	1.05	0.954568
$AGOA_{ij,t}$*Food_Bev	1.05	0.954568
$AGOA_{ij,t}$*Mining_Q	1.05	0.954568
$AGOA_{ij,t}$*Petroleum	1.05	0.954568
$AGOA_{ij,t}$*Textiles_App	1.05	0.954568
$colony_{ij}$	1.04	0.959308
${PTA_{dummy}}_{ij,t}$	1.04	0.963024
Mean VIF	1.45	

Table A6. Sectoral Structural Gravity Estimations of AGOA Impacts on Overall Trade Flows

Column Number	(1)	(2)	(3)	(4)	(5)	(6)
Variables	$EXGR_{ij,st}$	$DVAExp_{ij,st}$	$VAX_{ij,st}$	$EXGR_{ij,st}$	$DVAExp_{ij,st}$	$VAX_{ij,st}$
$lndistw_{ij}$	-0.818***	-0.823***	0.0226***			
	(0.0163)	(0.0172)	(0.000298)			
$lnExpo_{pop}$	-0.173***	-0.177***	-0.000276	-0.00798***	-0.00896***	-0.000163*
	(0.0101)	(0.0104)	(0.000357)	(0.00174)	(0.00209)	(9.81e-05)
$lnImpo_{pop}$	0.00719	0.0205	-0.00154***	-0.00518***	-0.00542***	0.000287***
	(0.0155)	(0.0156)	(0.000236)	(0.00124)	(0.00121)	(7.14e-05)
$contiguity_{ij}$	0.396***	0.392***	-0.0183***	0.186***	0.232***	0.00641***
	(0.0293)	(0.0288)	(0.00195)	(0.0543)	(0.0623)	(0.00126)
${common_{lang}}_{ij}$	0.212***	0.203***	-0.0154***	-0.0459**	-0.0217	0.000104
	(0.0291)	(0.0292)	(0.000487)	(0.0204)	(0.0194)	(0.000263)
$colony_{ij}$	0.179***	0.206***	-0.0220***	0.0463**	0.0444*	-0.00838***
	(0.0394)	(0.0372)	(0.00172)	(0.0215)	(0.0229)	(0.00109)
${Onein_{WTO}}_{ij,t}$	0.474***	0.453***	-0.0107***	-0.138***	-0.158***	0.00245***
	(0.110)	(0.112)	(0.000788)	(0.0479)	(0.0486)	(0.000339)
${Bothin_{WTO}}_{ij,t}$	1.462***	1.415***	-0.0335***	-0.158***	-0.183***	0.00365***
	(0.154)	(0.156)	(0.00150)	(0.0583)	(0.0621)	(0.000662)
${RTA_{dummy}}_{ij,t}$	0.261***	0.276***	-0.0112***	0.00645	0.00660	-0.000262**
	(0.0259)	(0.0273)	(0.000494)	(0.00422)	(0.00494)	(0.000120)
${PTA_{dummy}}_{ij,t}$	-0.00175	0.0179	-0.0198***	-0.00741	-0.00403	-0.00161***
	(0.0430)	(0.0473)	(0.000884)	(0.0134)	(0.0152)	(0.000213)
$AGOA_{ij,t}$	-0.231	-0.104	0.0285***	-0.0196	-0.0323	-0.00663***
	(0.212)	(0.227)	(0.00493)	(0.0334)	(0.0373)	(0.00108)
Constant	20.08***	19.85***	-0.330***	15.00***	14.78***	-0.155***
	(0.240)	(0.247)	(0.00302)	(0.0603)	(0.0654)	(0.000505)
Exporter-Sector-Time FE	Yes	Yes	Yes	No	No	No
Importer-Sector-Time FE	Yes	Yes	Yes	No	No	No
Country-Pair-Sector FE	No	No	No	Yes	Yes	Yes
Observations	19,964,992	19,964,992	19,964,992	19,964,992	19,964,992	19,964,992
Log pseudolikelihood	-68147600000	-51867600000	-18546452.6	-982279323.8	-751392371.7	-18372938.92
Number of Clusters	882,151	882,151	882,151	882,151	882,151	882,151
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.9597	0.9597	0.0087	0.9994	0.9994	0.0179

Notes: Robust standard errors in parentheses (clustered by country-pair-sector).
***, **, * denote significance level 1%, 5% and 10% respectively

Table A7. Sectoral Structural Gravity Estimation of Sector Specific AGOA Impacts on Trade Flows

Column Number	(1)	(2)	(3)	(4)	(5)	(6)
Variables	$EXGR_{ij,st}$	$DVAExp_{ij,st}$	$VAX_{ij,st}$	$EXGR_{ij,st}$	$DVAExp_{ij,st}$	$VAX_{ij,st}$
$lndistw_{ij}$	-0.818***	-0.823***	0.0226***			
	(0.0163)	(0.0172)	(0.000298)			
$lnExpo\_pop$	-0.173***	-0.177***	-0.000276	-0.00798***	-0.00896***	-0.000163*
	(0.0101)	(0.0104)	(0.000357)	(0.00174)	(0.00209)	(9.81e-05)
$lnImpo\_pop$	0.00718	0.0204	-0.00154***	-0.00517***	-0.00541***	0.000287***
	(0.0155)	(0.0156)	(0.000236)	(0.00124)	(0.00121)	(7.14e-05)
$contiguity_{ij}$	0.396***	0.392***	-0.0183***	0.186***	0.232***	0.00641***
	(0.0293)	(0.0288)	(0.00195)	(0.0543)	(0.0623)	(0.00126)
$common\_lang_{ij}$	0.212***	0.203***	-0.0154***	-0.0460**	-0.0218	0.000103
	(0.0291)	(0.0292)	(0.000487)	(0.0204)	(0.0194)	(0.000263)
$colony_{ij}$	0.179***	0.206***	-0.0220***	0.0463**	0.0444*	-0.00838***
	(0.0394)	(0.0372)	(0.00172)	(0.0215)	(0.0229)	(0.00109)
$Onein\_WTO_{ij,t}$	0.474***	0.453***	-0.0107***	-0.138***	-0.158***	0.00245***
	(0.110)	(0.112)	(0.000788)	(0.0479)	(0.0486)	(0.000339)
$Bothin\_WTO_{ij,t}$	1.462***	1.415***	-0.0335***	-0.158***	-0.183***	0.00365***
	(0.154)	(0.156)	(0.00150)	(0.0583)	(0.0621)	(0.000662)
$RTA\_dummy_{ij,t}$	0.261***	0.276***	-0.0112***	0.00659	0.00676	-0.000261**
	(0.0259)	(0.0273)	(0.000494)	(0.00423)	(0.00495)	(0.000120)
$PTA\_dummy_{ij,t}$	-0.000603	0.0189	-0.0198***	-0.00818	-0.00485	-0.00161***
	(0.0429)	(0.0472)	(0.000884)	(0.0133)	(0.0150)	(0.000213)
$AGOA_{ij,t}$	-0.508***	-0.390**	0.0161***	0.0441***	0.0298*	-0.00608***
	(0.175)	(0.173)	(0.00450)	(0.0157)	(0.0161)	(0.00101)

Table A7. Sectoral Structural Gravity Estimation of Sector Specific AGOA Impacts on Trade Flows (continued)

Column Number	(1)	(2)	(3)	(4)	(5)	(6)
Variables	$EXGR_{ij,st}$	$DVAExp_{ij,st}$	$VAX_{ij,st}$	$EXGR_{ij,st}$	$DVAExp_{ij,st}$	$VAX_{ij,st}$
$AGOA_{ij,t}$*Agriculture	-0.0137	-0.0720	0.0647**	-0.0193	0.0202	0.00451
	(0.281)	(0.296)	(0.0288)	(0.0449)	(0.0551)	(0.00471)
$AGOA_{ij,t}$*Mining_Q	0.712	0.599	-0.00166	-0.162*	-0.148*	0.00398**
	(0.514)	(0.510)	(0.00575)	(0.0880)	(0.0881)	(0.00186)
$AGOA_{ij,t}$*Food_Bev	-0.656**	-0.629**	0.135***	0.0461	0.0242	-0.00544
	(0.293)	(0.314)	(0.0487)	(0.0561)	(0.0548)	(0.0115)
$AGOA_{ij,t}$*Textiles_App	-0.0352	0.402	0.129	-0.0527	-0.0475	-0.0289
	(0.241)	(0.372)	(0.0917)	(0.0570)	(0.115)	(0.0195)
$AGOA_{ij,t}$* Petroleum	0.412	0.472	0.0633***	-0.0771	-0.0561	0.00239
	(0.412)	(0.421)	(0.0169)	(0.0660)	(0.0611)	(0.00385)
Constant	20.08***	19.85***	-0.330***	15.00***	14.78***	-0.155***
	(0.240)	(0.248)	(0.00302)	(0.0603)	(0.0654)	(0.000505)
87						
Exporter-Sector-Time FE	Yes	Yes	Yes	No	No	No
Importer-Sector-Time FE	Yes	Yes	Yes	No	No	No
Country-Pair-Sector FE	No	No	No	Yes	Yes	Yes
Observations	19,964,992	19,964,992	19,964,992	19,964,992	19,964,992	19,964,992
Log pseudolikelihood	- 68126500000	- 51853800000	- 18546447.42	- 982126433.4	- 751274566.9	- 18372938.87
Number of Clusters	882,151	882,151	882,151	882,151	882,151	882,151
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.9597	0.9597	0.0087	0.9994	0.9994	0.0179

Notes: Robust standard errors in parentheses (clustered by country-pair-sector).
***, **, * denote significance level 1%, 5% and 10% respectively

Table A8. Helpman, Melitz, and Rubinstein (2008) Two Step Estimation Results

	(Extensive Margin)	(Intensive Margin)
Variables	Agriculture	Agriculture
$lndistw_{ij}$	0.0335***	-1.179***
	(0.00447)	(0.212)
$lnExpo\_pop$	0.00784***	-0.334***
	(0.000956)	(0.0675)
$lnImpo\_pop$	0.00686***	-0.0595
	(0.000899)	(0.0595)
$common\_lang_{ij}$	0.00384	0.206**
	(0.00865)	(0.104)
$contiguity_{ij}$	0.0521**	0.0134
	(0.0243)	(0.372)
$colony_{ij}$	-0.0166	0.567***
	(0.0262)	(0.142)
$common\_religion_{ij}$	0.0236*	
	(0.0121)	
$Onein\_WTO_{ij,t}$	0.119***	-1.575*
	(0.00811)	(0.835)
$Bothin\_WTO_{ij,t}$	0.124***	-1.381
	(0.00880)	(0.980)
$PTA\_dummy_{ij,t}$	-0.00311	0.122
	(0.00755)	(0.125)
$RTA\_dummy_{ij,t}$	-0.00455	0.437***
	(0.00641)	(0.0863)
$AGOA_{ij,t}$	-0.0142	-0.273
	(0.0494)	(0.264)
invmills		-8.025
		(6.764)
Constant	-6.733***	76.09
	(0.0405)	(46.35)
Exporter-Sector-Time Effects	No	Yes
Importer-Sector-Time Effects	No	Yes
Country-Pair-Sector FE	No	No
Observations	20,320,040	777,259
Number of Panelvar	897,962	34,352
Log pseudolikelihood	-236145.85	-1391587831
Prob > chi2	0.0000	0.0000
Pseudo R^2		0.9315

Notes: Robust standard errors in parentheses (clustered by country-pair-sector)
***, **, * denote significance level 1%, 5% and 10% respectively

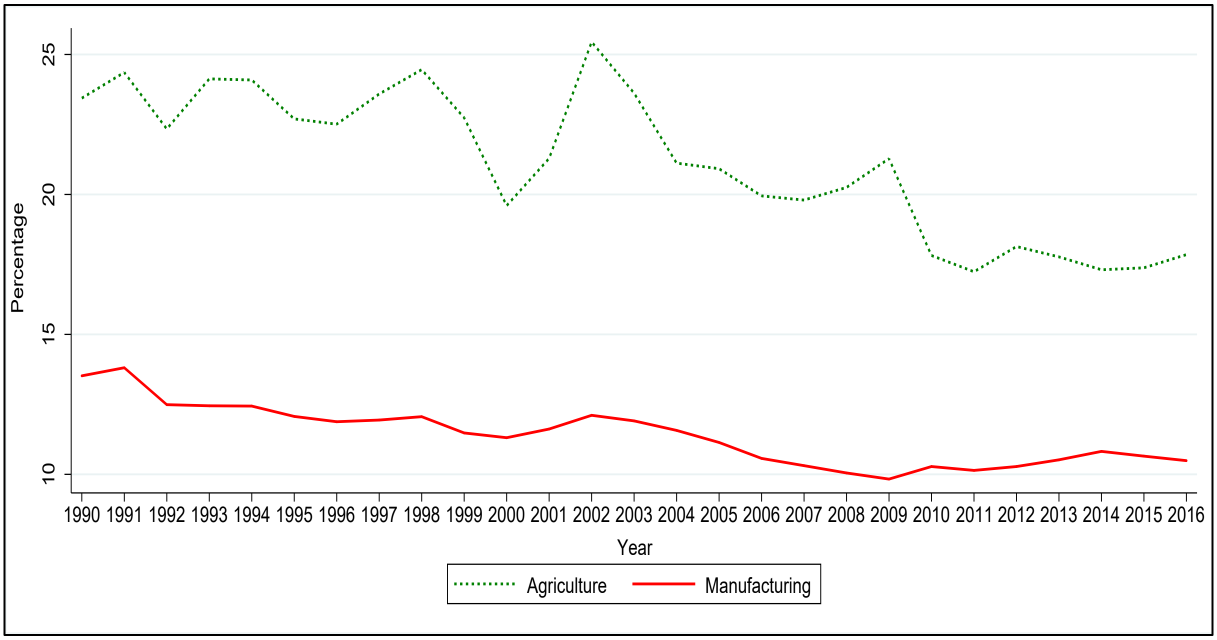

Figure A1. SSA's Agriculture and Manufacturing Value-Added Contribution to GDP
Source: World Bank, 2017

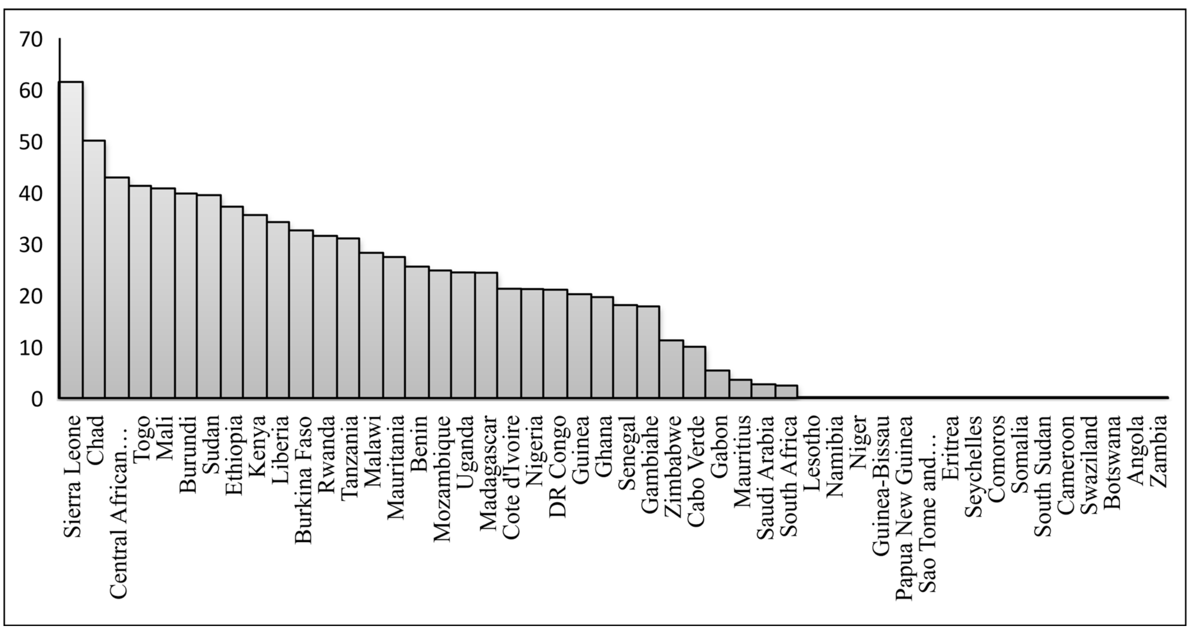

Figure A2. Agriculture Value-Added Percent of GDP in SSA Countries in 2016
Source: World Bank, 2017

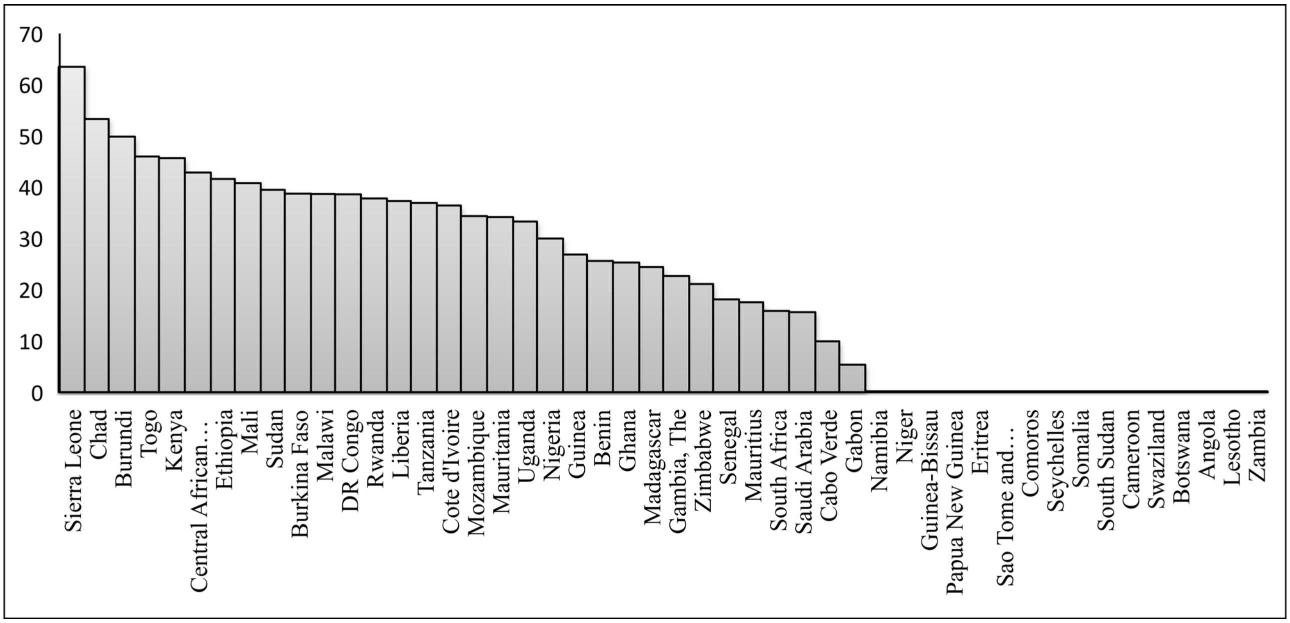

Figure A3. Manufacturing Value-Added Percent of GDP in SSA Countries in 2016
Source: World Bank, 2017

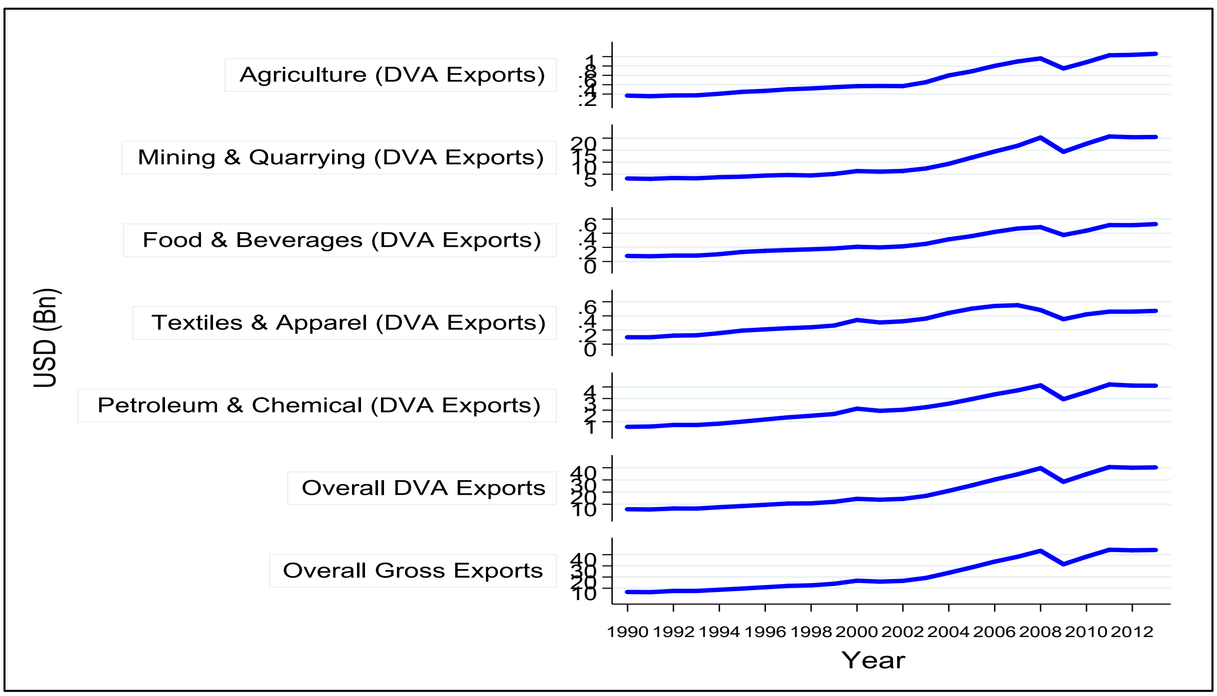

Figure A4. SSA's Domestic Value-Added Exports to the U.S.A. Over Time
Source: Author's calculations using Eora Multi-region Input-Output Tables, 2016

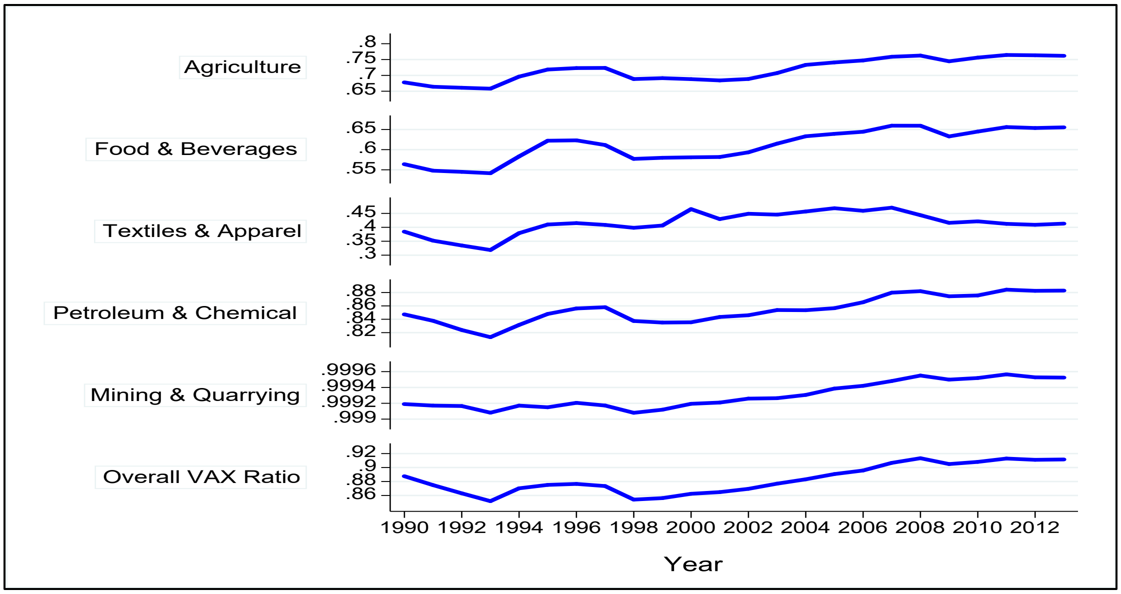

Figure A5. SSA's Value Added to Exports Ratio Over Time
Source: Author's calculation using Eora Multi-region Input-Output Tables, 2016

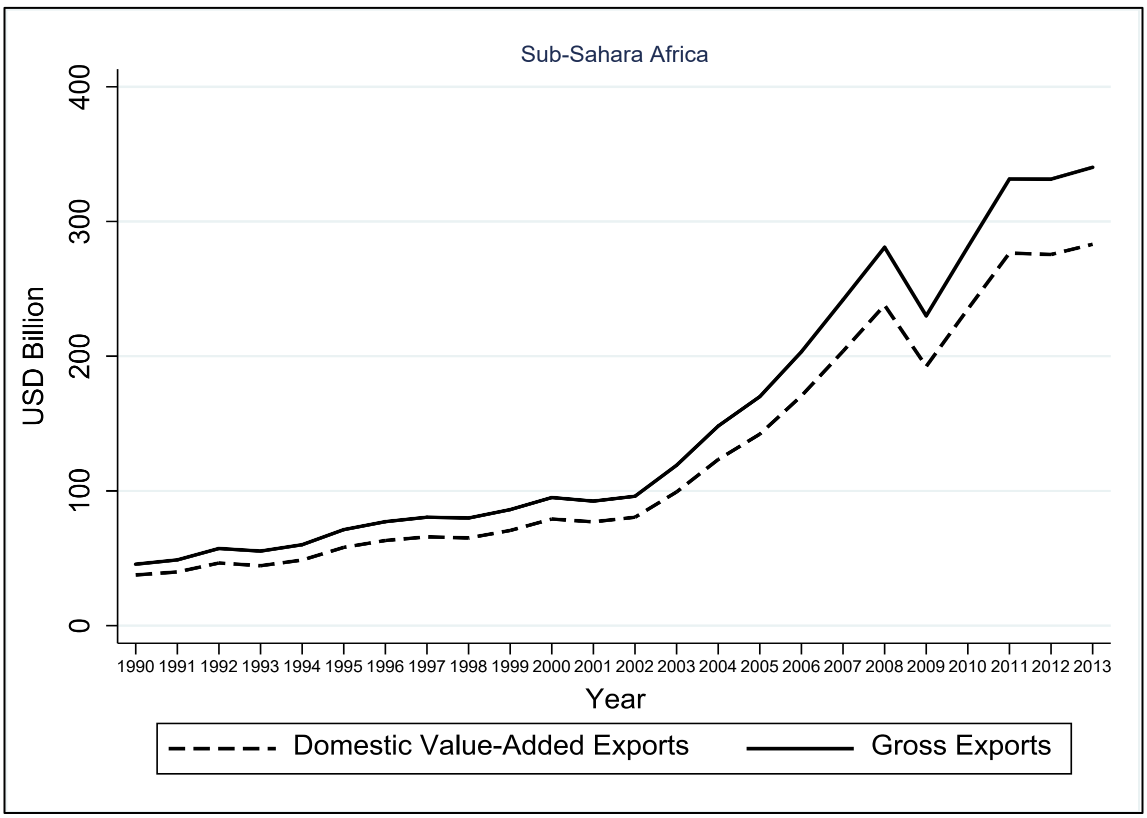

Figure A6. SSA's Domestic Value-Added Exports and Gross Exports Over Time
Source: Author's calculation using Eora Multi-region Input-Output Tables, 2016

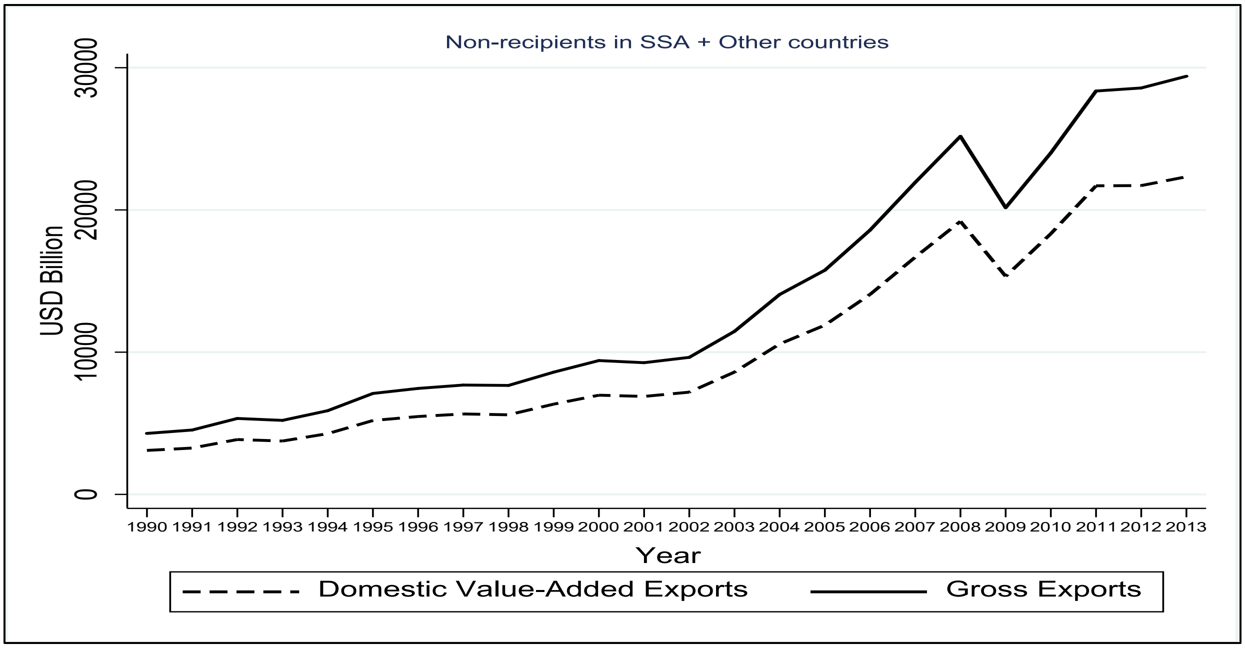

Figure A7. Non-recipients' Domestic Value-Added Exports and Gross Exports Over Time
Source: Author's calculation using Eora Multi-region Input-Output Tables, 2016

Figure A8. ROW's Domestic Value-Added Exports and Gross Exports Over Time
Source: Author's calculation using Eora Multi-region Input-Output Tables, 2016

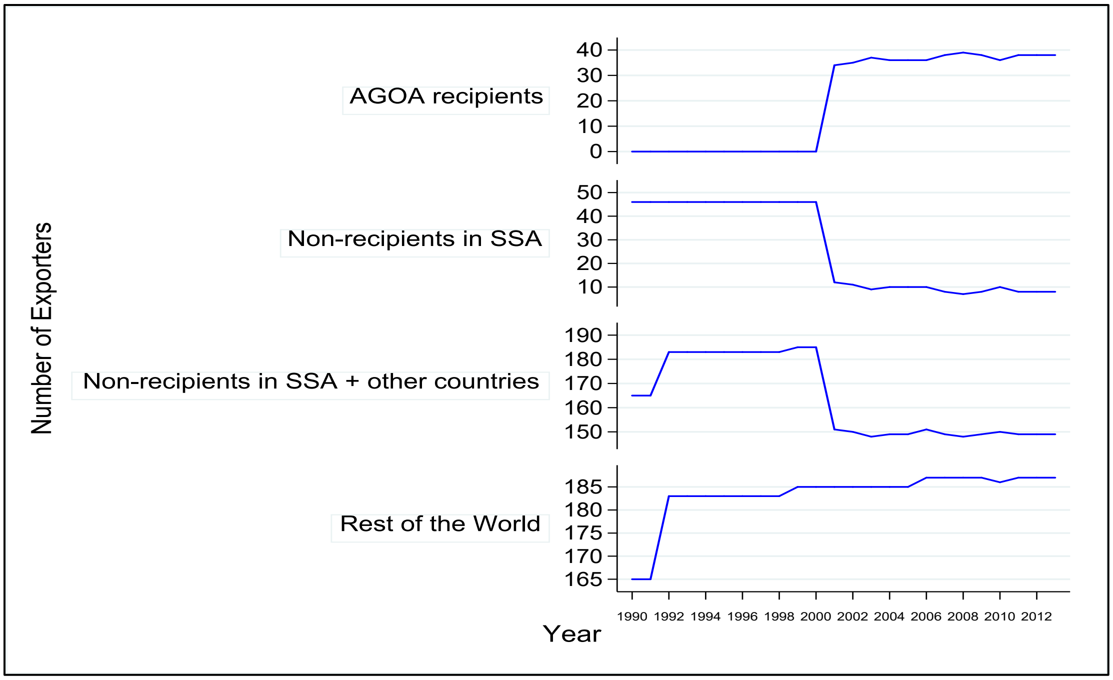

Figure A9. Variation in Number of Exporters Over Time
Source: Author's calculation using Eora Multi-region Input-Output Tables, 2016

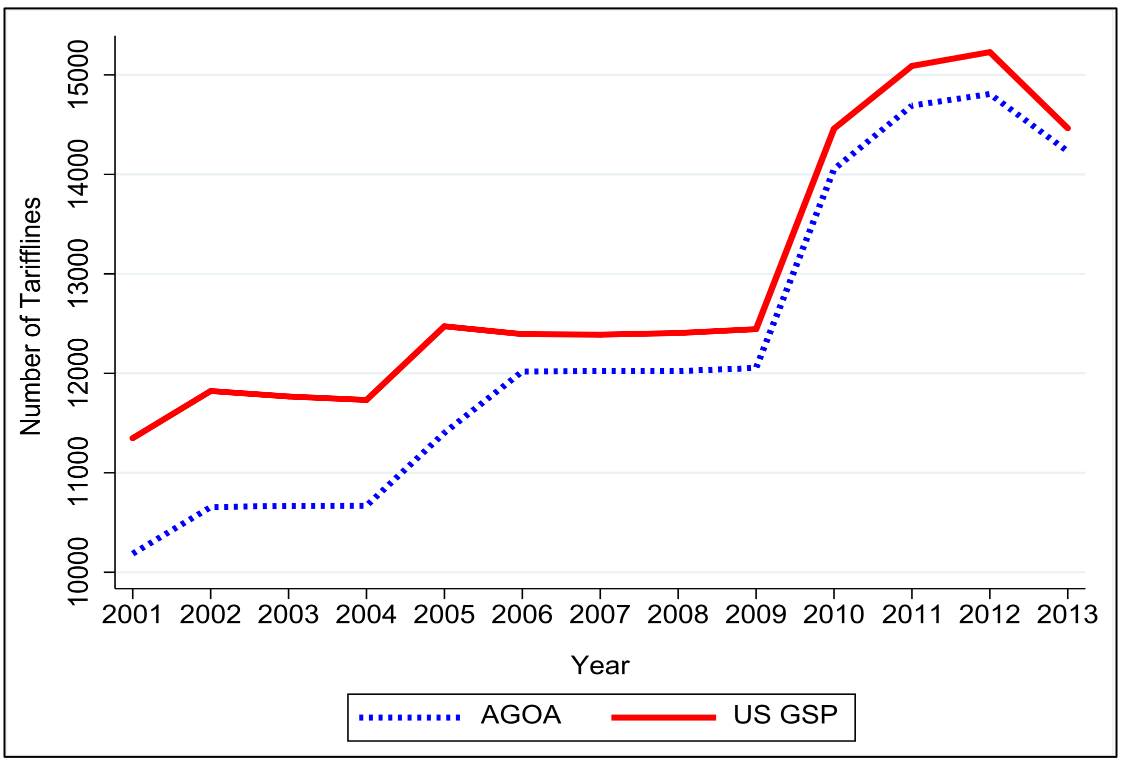

Figure A10. Product Coverage Under AGOA and U.S. GSP by Year
Source: World Integrated Trade Solution, 2017

Year: 2000														Final Demand (FD) Matrix				
		Country 1				Country 2				Country 3				Country 1	Country 2	Country 3		
	T matrix	Sector 1	Sector 2	Sector 3	Sector 4	Sector 1	Sector 2	Sector 3	Sector 4	Sector 1	Sector 2	Sector 3	Sector 4	Households	Households	Households	Gross Output	Gross Exports
Country 1	Sector 1	346	156	95	594	819	154	832	397	409	562	241	554	394	902	446	6,901	5,316
Country 1	Sector 2	354	443	7	908	42	92	561	839	470	770	83	368	514	694	512	6,657	4,431
Country 1	Sector 3	291	795	243	825	753	2	340	232	251	605	526	610	384	753	909	7,518	4,980
Country 1	Sector 4	637	259	289	813	500	716	947	645	856	221	898	41	91	653	301	7,868	5,778
Country 2	Sector 1	547	466	910	276	518	149	779	553	197	285	305	828	630	565	857	7,864	5,300
Country 2	Sector 2	752	936	822	638	611	496	98	924	608	689	872	972	847	209	37	9,511	7,173
Country 2	Sector 3	295	444	7	828	929	535	367	257	890	429	641	26	165	419	886	7,117	4,610
Country 2	Sector 4	113	518	791	459	79	748	254	218	586	673	424	157	800	355	501	6,677	5,022
Country 3	Sector 1	46	457	552	572	632	680	730	607	796	186	15	958	338	320	194	7,082	4,934
Country 3	Sector 2	962	96	544	96	675	113	711	337	787	571	241	211	479	14	608	6,445	4,027
Country 3	Sector 3	531	190	686	191	374	615	788	738	351	32	565	622	269	814	559	7,326	5,197
Country 3	Sector 4	857	776	897	18	915	482	308	458	253	145	982	270	700	822	729	8,612	6,233
																	89,578	
	VA matrix																	
Country 1	Value Added	1,172	1,120	1,676	1,648	-	-	-	-	-	-	-	-					
Country 2	Value Added	-	-	-	-	1,019	4,730	401	471	-	-	-	-					
Country 3	Value Added	-	-	-	-	-	-	-	-	626	1,278	1,532	2,995					
	Total input	6,901	6,657	7,518	7,868	7,864	9,511	7,117	6,677	7,082	6,445	7,326	8,612	89,578				

Figure A11. Example of Eora Multi-region Input-Output Table
Source: Eora Multi-region Input-Output Tables, 2016 (http://worldmrio.com/simplified/)