Preliminary and Incomplete - Please do not cite

The African Growth and Opportunity Act and Trade Growth in Africa*

Garth Frazer†
University of Toronto

Johannes Van Biesebroeck
University of Toronto and NBER

July 14, 2005

Abstract

This paper explores whether one of the most important U.S. policies towards Africa over the past few decades achieved its desired result. In 2000, the United States dropped trade restrictions on a broad list of products through the African Growth and Opportunity Act (AGOA). While the products granted concessions under AGOA were uniform across countries, the set of products was not comprehensive. Since AGOA access was applied selectively to both countries and products, we rely on a triple difference-in-differences estimation of the impact of the policy, controlling for both country-level and product-level import surges at the time of AGOA onset. This approach allows us to better address the "endogeneity of policy" critique of standard difference-in-difference estimation than if either a country-level or a product-level analysis was performed separately. Despite the facts that i) the AGOA product list was chosen to not include "import-sensitive" products in the United States, ii) African countries had quota room in the products where quotas were removed, and iii) the general challenges of transactions costs in African countries, we find that AGOA has a large and robust impact on apparel imports into the U.S., and a smaller, but robust impact on the agricultural products treated by AGOA. Import responses were the largest in product categories where the tariffs removed were large. Implications of these findings are discussed.

JEL codes: F13, F14, F15, O19
Keywords: trade liberalization, sub-Saharan Africa

*We would like to thank Melanie O'Gorman and Lijun Zhang for excellent research assistance. Financial support from SSHRC is gratefully acknowledged.

†Corresponding author: Centre for Industrial Relations, University of Toronto, 121 St. George Street, Toronto, Ontario M5S 2E8 Canada. e-mail: gfrazer@chass.utoronto.ca.

1 Introduction

The overwhelming challenge in improving the human condition today is the challenge of development on the African continent. One of many factors cited for inhibiting the development of Africa and other low-income countries has been the trade barriers imposed by high-income countries on the imports of commodities in which poor countries are likely to have a comparative advantage: textiles and agricultural products in particular. This paper explores whether these trade barriers have actually mattered—that is, where they have been removed, have exports from Africa increased?

While the context for the question is the specific case of Africa and a specific set of trade barriers, the issue is much broader. It addresses the question of whether liberalization in trade policy leads to an increase in trade, and in particular the question of whether reductions in industrial countries' trade barriers to developing country imports lead to an increase in such imports. The paper takes advantage of a unilateral granting of trade concessions to the majority of sub-Saharan African countries by the United States in the form of the African Growth and Opportunity Act (2000). These trade concessions were uniform across all the African countries that were deemed eligible for AGOA.[1] The concessions fall into two categories, apparel and non-apparel items, with separate details of implementation for each category, which will be described later. While the products allowed duty-free and quota-free access under AGOA were uniform across countries, the set of products was not comprehensive. Therefore, since the duty-free access under AGOA applied selectively to both countries and products, but not to all countries, nor to all products, this implementation allows for triple difference-in-differences (DDD) estimation of the impact of the policy. As a result, we can muster a more robust defense to the endogeneity critique that applies to some difference-in-difference estimation (Besley and Case, 2000).

To examine the benefits of triple-difference estimates in this case, examine how the endogeneity critique might apply to our case if either a country-level or a product-level analysis

[1]The criteria for AGOA eligibility have generally been related to political and democratic freedoms. Generally speaking, countries that have been excluded from AGOA have had fairly significant failures on these fronts. The countries excluded from AGOA as of January 2, 2005 include: Zimbabwe, Cote d'Ivoire, Somalia, Liberia, Sudan, Burundi, Central African Republic, Eritrea, Comoros, Equatorial Guinea, Mayotte, Togo.

was performed separately. At the country-level, suppose that countries were being given AGOA-eligibility just as their economies started to improve, for example when the normal state of affairs is restored after a civil war. In this case, we might expect an increase in U.S. imports from this country at the same time as the country gained AGOA-eligibility, although the imports might just result from the overall boost in the exporter's economy.[2] The country-by-country difference-in-differences estimator would erroneously attribute the positive export effect to AGOA. At the product-level, suppose that the U.S. granted AGOA product status to those products for which its demand was about to increase.[3] Here again, a product-by-product difference-in-differences estimator would attribute a positive effect to AGOA, even if the import surge for eligible products extended to countries that were not AGOA-eligible.

This study will be able to address these critiques. The increase in imports into the U.S. of a specific AGOA-eligible product (P) from an AGOA-eligible country (C) during the AGOA period will be measured relative to: i) the overall increase in imports from country C during the AGOA period, and ii) the overall increase in imports of product P during that period, and iii) the base level of imports of an AGOA product from an AGOA country. In fact, the preferred specification will be even more general than this. It will allow for a full set of country-product fixed effects, while still controlling for country-level surges (i), and product-level surges (ii) during the AGOA period.

While this product and country variation in the AGOA eligibility clearly has its advantages in terms of isolating the impact of AGOA, it also has its limitations. For example, suppose that the U.S. administration chose to implement tariff concessions on products that African countries in general would have little hope of exporting to the U.S. (because of a lack of comparative advantage in those products, for example due to relative resource endowments or technology). In fact, the AGOA legislation only allows the President to grant duty-free treatment for non-apparel articles "after the U.S. Trade Representative and the U.S. International Trade Commission have determined that the article is not import sensitive

[2]In practice, there was some variation across countries in eligibility date for AGOA in general and even more so for the apparel provision in AGOA.

[3]To preview the results, U.S. worldwide imports of oil (a product given duty-free access under AGOA) were considerably higher post-AGOA.

when imported from African countries,"[4] suggesting that such selective implementation was indeed possible. If tariff concessions are applied to products that theory predicts African countries will not export for lack of comparative advantage, for example, the effect will differ from a widespread free-trade agreement. For this reason, it is not self-evident that one would find positive effects from AGOA, and finding no effect of AGOA cannot be interpreted more generally as no effect from broad trade liberalization. On the other hand, finding a positive effect of AGOA can be interpreted in the context of trade liberalization.

A second reason why one would not expect positive effects from AGOA is that in the African context, many would argue that trade restrictions are not the primary binding constraint on exports. Collier and Gunning (1999) identify the chief factors explaining Africa's poor economic performance as distorted product and credit markets, high risk, inadequate social capital, inadequate infrastructure, and poor public services. External factors, such as developed country trade restrictions are not seen as important factors. Therefore, these internal factors may continue to constrain African exports after the removal of the U.S. import restrictions. Moreover, the largest expected benefit of AGOA was its reduction of apparel tariffs and quotas. However, most African countries were well below their apparel quotas for import into the U.S., and so it is not clear that removal of these quotas would matter. Using estimates of Africa's supply response, Mattoo *et al.* (2003)'s conservative predictions were that AGOA would raise Africa's non-oil exports by 8–11 per cent.

In general, the importance of African development has at different times been emphasized by world leaders, and this has led to a variety of policy statements and initiatives, including the New Partnership for Africa's Development and debt relief. AGOA was such an effort, in this case a unilateral effort of the U.S. Administration under President Clinton, which has since been renewed by the Bush Administration. This paper attempts to estimate whether this initiative had any impact. The remainder of the paper is organized as follows. Section 2 gives background information on the U.S. system of trade preferences and discusses the relevant literature. The empirical specification is introduced in Section 4 and the data in Section 5. Results are in Section 6 and robustness checks follow in Section 7. Section 8

[4]This quotation is taken from a summary of the AGOA Legislation at the U.S. Government AGOA website at http://www.agoa.gov.

concludes.

2 Background

This paper evaluates the impact of the expansion of U.S. trade preferences for exports from African countries. Other studies have explored the impact of both free-trade agreements and expanded trade preferences on trade volumes. Several studies have evaluated the impact of the Canada-U.S. Free Trade Agreement and the North-American Free Trade Agreement (Trefler, 2004; Romalis, 2005; Burfisher *et al.* 2001; Clausing, 2001; Head and Ries, 1997), and found that the agreement increased trade among the parties. Other studies have explored other regional trade agreements.[5] In the African context, Carrère (2004) examines the impact of the five major African regional trade agreements, and two major currency unions in Africa over the period 1962 through 1996 and finds that these trade agreements and customs unions increase the trade between members.

In this paper, we evaluate the impact of non-reciprocal trade preferences rather than a reciprocal free-trade agreement. One might expect that non-reciprocal trade preferences granted would be more limited than those under a reciprocal free-trade agreement, where a country obtains something in exchange for its concessions. In fact, as mentioned, the rules of AGOA required that the items for inclusion on the AGOA list not be "import sensitive". The major preference regime offered by developed countries for developing country imports is the Generalized System of Preferences (GSP), which are preferences offered to most developing countries (the rule for eligibility is typically set by an income threshold) by most developed countries. AGOA involves the addition of a large number of products to the U.S. version of this list of products that are offered duty-free access.

Hoekman *et al.* (2002) study the potential effects of the removal of tariffs on high-tariff items (above 15 percent) in the United States, Japan, Europe and Canada on exports from least developed countries (LDCs). They find that such removal could potentially have

[5] Frankel *et al.* (1995) evaluate the welfare implications of the expansion of regional trading blocs and find evidence that some of these regional trading blocs have reduced welfare relative to the norm of most-favoured-nation (MFN) trade. Greaney (2001) found that that U.S.-Japan bilateral trade agreements over the period from 1980 to 1995 had little impact on U.S. exports to Japan for the manufactured products targeted in the agreements.

large effects on exports from LDCs. Similarly, Ianchovichina *et al.* (2001) explore the potential impact of preferential market access for a set of 37 Sub-Saharan African countries to the European Union, Japan, the U.S. and Canada, and find that the African exports would increase considerably were such access granted. However, it is worth noting that the products added to the GSP list under AGOA have an average tariff rate of 3.8% and so the impact may not be as large in this case.[6]

Other papers would suggest, ex ante, that the impact of AGOA could well be very limited. As already noted, Collier and Gunning (1999) do not see developed country tariffs as significant impediments to growth in Africa. Limão and Venables (2001) find that the relatively low level of African trade flows "is largely due to poor infrastructure." (p. 451) Rodrik (1998) studies the possible causes of poor export performance in Africa, and suggests that the dominant causes are low levels of per capita income, small country size, poor geography, and domestic (African government) trade policy. Wang and Winters (1998), in summarizing a set of World Bank technical papers, find that "the evidence suggests that it is African countries' own trade policies and not those of their partners that must be changed in order to promote growth." However, even in the cases where African countries have liberalized their trade policies, it has not immediately led to expanded exports. Morrissey and Rudaheranwa (1998) explore the impact of trade liberalization on exports in the context of Uganda. Specifically, they find that despite the abolition of export taxes, the liberalization of the foreign exchange market, and significant liberalization on imports, export earnings did not increase in Uganda. Milner *et al.* (2000) offer a partial solution, as they find in the context of Uganda that even after export taxes are abolished, transport costs remain a significant constraint on trade. Overall, then, there are a number of reasons why AGOA might not have an impact in the African context.

Mattoo *et al.* (2003) predict effects of AGOA *ex-ante* using information on pre-AGOA tariffs and assumptions on supply responses. For a country like Mauritius they predict an AGOA-effect of only 5% from 2001 to 2004 relative to the pre-AGOA export level. Absent the rules of origin requirements on yarn, which Mauritius turned out to be exempted from,

[6]The tariff rate is measured as an average of the ad valorem tariff rate and the ad valorem equivalent for specific tariffs.

an export increase of 36% was expected. For an even lesser developed country such as Madagascar, an export increase for textiles of 92% was expected.[7]

3 The Implementation of AGOA

When AGOA was first implemented on October 2, 2000, it applied to 34 countries in Sub-Saharan Africa. By January 2, 2005, six more countries have been added to the list of AGOA countries, and three countries have been removed. The newer countries, such as Sierra Leone, have generally been admitted after government stability was achieved. Three countries, Eritrea, Côte d'Ivoire, and the Central African Republic, have been removed from AGOA, as a result of failures regarding political or democratic freedoms.[8] All of these removals happen after the time period of our dataset, and therefore there are no countries leaving AGOA during our study period.[9]

AGOA allows for duty-free imports under two broad categories: apparel and non-apparel. The implementation of AGOA for non-apparel items has consisted of adding more than 1800 items to the list of items with zero import duty under Generalized System of Preferences (GSP). As a result, the number of goods on the general GSP list for AGOA countries has expanded from the 4600 items on the U.S.'s general GSP list to more than 6400 items, defined at the 8-digit HS (Harmonized System) level. The roughly 1800 non-apparel items added to the GSP list under AGOA will be referred to as AGOA-GSP products. As soon as a country is declared AGOA eligible, it can export any of the items on the AGOA-GSP list duty-free to the U.S.

On the other hand, duty-free access for apparel exports from an African country is not automatic as soon as AGOA-eligibility is granted. The first countries to be declared eligible for the 'apparel provision' were Kenya and Mauritius on January 18, 2001, three months after most countries were admitted to AGOA on October 2, 2000. Countries have been 'admitted'

[7] Most of the difference is the result of a higher supply estimate assumed for Madagascar versus Mauritius, 5 versus 1.

[8] Central African Republic was removed after a coup. Eritrea was removed after failing to implement elections and democratic reforms. Côte d'Ivoire was removed after the failure there of the implementation of a peace plan.

[9] We will include country or country-product fixed-effects to control for country-specific effects.

to the apparel provision at various times over the subsequent years. The apparel provision allows for duty-free and quota-free access to the U.S. market for most apparel products, provided that the fabric (or yarn, or thread) used comes either from the U.S. or AGOA countries. While the country-level quotas have been removed, a regional quota remains on the total size of these AGOA apparel imports that was initially set at 1.5% of overall U.S. imports, increasing to 3.5% of U.S. imports over an 8 year period. These caps were doubled under a set of amendments to AGOA, called AGOA II, and the new set of caps have not proved binding. In addition to the governance provisions required for admission to AGOA, countries seeking access to the apparel provision must first prove that they have an effective visa system to verify and enforce that the fabric or yarn used for apparel production was sourced from the U.S. or an AGOA-eligible country. Once this visa system is verified by the U.S., the country is declared eligible for the apparel provision. Once countries qualify for the apparel provision, they can also be considered for the 'special rule' for apparel. This special rule was designed to apply to 'lesser developed' AGOA countries, and allowed them to source their fabric or yarn inputs from anywhere in the world.[10] However, as of January 2, 2005, the only country of the twenty-four eligible for the apparel provision that did not qualify (either by rule or exception granted) to the 'special rule' was South Africa.

This paper tests whether trade liberalization, in the form of unilateral trade concessions granted by the U.S. to African countries has had any impact on the volume of African exports. Any of the standard trade models would predict that if these concessions were applied to products that African countries were either already exporting to the U.S., or to products that they should export to the U.S. given their comparative advantage or factor endowments, then the volume of these exports would increase under AGOA. Therefore, no formal model is presented, as this prediction would apply to a very wide class of models indeed.

[10] The rule is defined as a threshold on GDP per capita.

4 Empirical specification

Consider the following triple-difference specification:

$$\begin{aligned} \ln IMP_{cpt} &= \beta_1\ Ineffect_t * AGOA\_country_c * AGOA\_prod_p + \\ &\quad \beta_2\ Ineffect_t * AGOA\_country_c + \\ &\quad \beta_3\ Ineffect_t * AGOA\_prod_p + \\ &\quad country/prod_{cp} + year_t + \varepsilon_{cpt} \end{aligned} \tag{1}$$

where the variables are defined as follows. The left-hand side variable refers to the imports into the U.S. of product p from country c during period t. Since the paper is measuring the impact of a U.S. policy, all trade volumes considered in the formal testing of AGOA's impact will be imports into the U.S., as reported by the U.S. The variable $AGOA\_country_c$ is a time-invariant dummy that takes a value of one if a country is ever declared AGOA-eligible. Similarly, the variable $AGOA\_prod_p$ is a time-invariant dummy that takes a value of one for products eligible for duty-free import under AGOA. The $Ineffect_t$ variable is a dummy that switches from zero to one—for all countries and products—in 2001, when AGOA takes effect. Finally, a full set of country-product interaction dummies and time dummies are added as controls.

The intuition behind this specification can best be seen in the case where only two years of data are included, one year prior to AGOA, say 1999, and a second year when AGOA is in effect for some countries and products, say 2003. The AGOA implementation contains variation along three dimensions: i) pre-and-post AGOA, ii) between AGOA products and non-AGOA products, and iii) between AGOA countries and non-AGOA countries. Therefore, if we define AP as an AGOA product and NP as a non-AGOA product, then the triple-difference (DDD) inherent in the AGOA experiment is:

$$\begin{aligned} DDD &= \underbrace{((\ln IMP_{03}^{AP} - \ln IMP_{99}^{AP}) - (\ln IMP_{03}^{NP} - \ln IMP_{99}^{NP}))}_{AGOA\ Country\ -\ DD} \\ &\quad - \underbrace{((\ln IMP_{03}^{AP} - \ln IMP_{99}^{AP}) - (\ln IMP_{03}^{NP} - \ln IMP_{99}^{NP}))}_{Non-AGOA\ Country\ -\ DD} \end{aligned} \tag{2}$$

The standard difference-in-differences approach, used for example when measuring the effect of tariff preference given to a single country, is the first difference-in-differences (DD) term, labelled $AGOA\ Country - DD$. This measures the *difference in* the pre-post *differences* in imports between AGOA products and non-AGOA products within an AGOA country. Implicitly, the AGOA products are the treatment group, and the non-AGOA products the control group of the first DD experiment. However, we are able to be more careful than this, in that we can compare this first difference-in-differences within the AGOA country to the equivalent difference-in-differences in a non-AGOA country, as represented by the second term.

The simplest way of expressing the triple difference in (2) in regression form is to regress imports on a dummy variable for the AGOA implementation period ($Ineffect_t$) (the first difference), a dummy variable for AGOA products ($AGOA\_prod_p$) (the second difference) and a dummy variable for AGOA countries ($AGOA\_country_c$)(the third difference), as well as the three double interactions of these variables, and the single triple interaction of these dummies, with the true AGOA effect measured by the single triple interaction. Relative to the specification in equation (1), the full set of $country/prod_{cp}$ and $year_t$ fixed effects is replaced by[11]

$$\begin{aligned} country/prod_{cp} + year_t \quad \Rightarrow \quad & \alpha_1\ AGOA\_country_c * AGOA\_prod_p\ + \\ & \alpha_2\ AGOA\_country_c + \alpha_3\ AGOA\_prod_p + \alpha_4\ Ineffect_t \end{aligned} \tag{3}$$

This specification is substantially more restrictive than (1). It does not allow for country-level or product-level heterogeneity in terms of the base-level imports into the U.S. By using just a single AGOA country and AGOA product dummy, it restricts these effects to be the same across all countries and products. In the robustness checks in Section 7 we consider specifications with less general controls than equation (1).

Two more issues complicate the analysis. First, as mentioned before, AGOA treats apparel products differently from all other products that fall under the Act. In addition

[11] In our notation, variables are preceded by a coefficient (in Greek letters), while entries not preceded by coefficients indicate sets of dummies.

to the exemption from duties, apparel products are also exempted from the quota system of the Multi-Fibre Arrangement. It would be implausibly restrictive to force the effects to be of the same magnitudes for both groups of products. Therefore, two sets of the variables in (1) are included in the full specification: one for AGOA-GSP products[12] (GSP) and one for apparel products (APP).[13] Second, while for the GSP products the Act came into effect at approximately the same time for the vast majority of countries, this is not the case for the apparel provision. In order to account for the additional time-variation in country-eligibility for AGOA, the two $Ineffect_t$ variables switch to one at different times for both types of products and when interacted with GSP_ctry_c or APP_ctry_c the timing will vary by country as well (as discussed below).

The full specification for the benchmark estimation is given by

$$\begin{aligned} \ln IMP_{cpt} \;=\; & \beta_1\ Ineffect\_GSP_{ct} * GSP\_ctry_c * GSP\_prod_p + \\ & \beta_2\ Ineffect\_GSP_{ct} * GSP\_ctry_c + \\ & \beta_3\ Ineffect\_GSP_t * GSP\_prod_p + \\ & \delta_1\ Ineffect\_APP_{ct} * APP\_ctry_c * APP\_prod_p + \\ & \delta_2\ Ineffect\_APP_{ct} * APP\_ctry_c + \\ & \delta_3\ Ineffect\_APP_t * APP\_prod_p + \\ & country/prod_{cp} + year_t + \varepsilon_{cpt} \end{aligned} \tag{4}$$

Two time-invariant product dummies are now used, GSP_prod_p for GSP products, which are the non-apparel products added to the GSP list under AGOA, and APP_prod_p for apparel. The time-invariant country dummies also distinguish between countries that at any point in time fall under the Act (GSP_ctry_c) and the subset of these countries that, at some point additionally were declared eligible for the apparel provision (APP_ctry_c).

In specification (4) the $Ineffect_t$ variable has been replaced by two separate variables,

[12] hereafter referred to simply as GSP products

[13] In the empirical implementation, we will be even less restrictive than this, allowing for different effects across different subcategories of the AGOA-GSP products. However, for simplicity, that discussion is postponed until Section 6, as it does not add to the intuition, only to the algebra.

which are made country-specific where appropriate, i.e. $Ineffect\_GSP_{(c)t}$ and $Ineffect\_APP_{(c)t}$. To measure the effect of AGOA on import growth for eligible products in eligible countries—the triple interaction term—the actual time the Act has been in effect in each country is taken into account. As outlined in the previous section, while 34 of the 40 countries ever admitted to AGOA were admitted together on October 2, 2000, other countries were admitted more recently.[14] The interaction term, $GSP\_ctry_c * Ineffect\_GSP_{ct}$, controls for overall surges in imports from AGOA-eligible countries and is only included during the period AGOA is in effect in each of these countries. The term will absorb idiosyncratic surges potentially associated with each country's admission to AGOA.

On the other hand, $GSP\_prod_p * Ineffect\_GSP_t$ is included to control for overall surges in the non-apparel AGOA-eligible product imports into the U.S. (irrespective of country of origin) during the AGOA period. This term will soak up product-specific trends reflecting U.S. demand conditions that affect imports from all countries, AGOA or non-AGOA, alike, but that coincide with the time AGOA was in effect. As it also applies to non-AGOA countries, the timing cannot vary by country.[15,16]

The main coefficients of interest are β_1 and δ_1. β_1 estimates the impact of non-apparel access under AGOA and δ_1 estimates the impact of the apparel provision. Each of these triple interactions is measured relative to the three double interactions (country-time, product-time, country-product), as well as the level effects of the individual variables. For example, β_1 measures the surge in imports for products that were added to the GSP list under the Act coming from AGOA eligible countries when AGOA is in effect in that country. This is measured relative to: i) overall surges in imports from that country during the AGOA period, as captured by β_2; ii) overall surges in imports (worldwide) for GSP listed products during the AGOA period, as captured by β_3; iii) and the base level of imports pre-AGOA,

[14] The effect of the Act truly did not begin until 2001, as the President did not announce (and make official) the list of AGOA-GSP products until December 21, 2000, and, as noted, none of the countries were eligible for the apparel provision until 2001.

[15] The choice for a starting date to switch these country-invariant dummies from zero to one is relatively arbitrary. Since the vast majority of countries qualified for GSP at the outset of 2001, we chose 2001 for the onset of the $Ineffect\_GSP_t$ dummy. In contrast, twelve of the nineteen countries that are ever declared eligible for the apparel provision are declared such in the latter half of 2001 and the first half of 2002, and so we chose 2002 for the onset of $Ineffect\_APP_t$.

[16] Note that if these *Ineffect* dummies varied by country, the term would become perfectly collinear with the triple difference term.

captured by country-product interactions in specifications (1) and (4), or by α_1 in the more restrictive specification (3).

The discussion thus far has focused on the response of import levels when products become eligible for duty-free imports. Products for which African countries have positive export levels to the U.S. in spite of tariffs and quotas are likely to be products in which these countries have a strong comparative advantage. Most countries do not export the majority of products. Undoubtedly this reflects to a large extent comparative advantage, but it is also influenced by U.S. trade policy. The removal of import duties might entice countries to start exporting a wider range of products to the U.S. Especially in the case of apparel, the removal of quotas might have an important effect. Exporting is generally thought to require fixed setup costs; see for example Roberts and Tybout (1997). If expansion options are limited from the go ahead, because of quotas, many firms (countries) might not bother to enter the market at all.

As we include zero import observations in the estimation of equation (4), the estimated effects will include both the response at the intensive margin—increasing imports—and the extensive margin—starting to import—of a change to duty-free status. It is unlikely that both effects are of the same magnitude, which is implicitly assumed. We will use a linear probability model, using a dummy variable that takes the value of one if the country-product-time observation has positive imports into the U.S. and zero otherwise as dependent variable, to isolate the extensive margin response of the export decision. The right-hand side of equation (4) is unchanged and estimation is still with least squares. The advantage of the linear probability model is that we can keep the very general set of fixed effects. The main disadvantage, that predicted values are not restricted to lie on the (0,1) interval, is unlikely to be much of an issue as we include country-product dummies and all coefficients are identified off the time variation within country-product categories. Conditional on these controls, the effect of trade liberalization on the export probability is expected to be relatively small.

A third variation on the benchmark specification is designed to measure the import elasticity with respect to changes in tariff rates. Import tariffs on all AGOA eligible products are eliminated entirely, but the initial rates of protection differed widely by product. As a result, the extent of trade liberalization also varies widely. The distinction between GSP and

apparel products only captures a fraction of the cross-product variation in the liberalization experiment.

Multiplying the triple-interaction effects in (4) by the pre-AGOA tariff rates that the U.S. applied to each product for each country will allow us to recover the response of exports to changes in tariff rates. Multiplying with the logarithm of the tariff rate gives the export elasticity to percentage changes in tariffs. In this specification, the β_1 and γ_1 coefficients will measure the percentage import response to absolute or percentage changes in tariffs, instead of the import response from a change to duty-free status. We can look at the same effect in the linear probability regressions to measure the response to tariff changes at the extensive margin.

As apparel products enjoy an elimination of quotas as well as tariffs, we expect the tariff elasticity to capture only a part of the full import effect for apparel that is estimated with equation (4). For GSP products the two effects are expected to be similar as all tariff reductions under AGOA happen to be 100%. However, the coefficient estimates can be used to predict what the import response would be from tariff reductions in general, i.e. not only for the elimination of a tariff altogether.

5 Data

The trade data is taken from the U.N. COMTRADE database. The dependent variable for most of the analysis is the annual import of a particular product from each country in the world into the U.S., as reported by the U.S., over the period from 1998 to 2003. If nothing is reported, imports are set to zero.[17] For the regressions that look at the extensive margins a dummy variable is created that takes the value of one if imports are positive.

The list of non-apparel products that are added to the AGOA-GSP list by AGOA is published by the U.S. Trade Representative, as is the list of apparel products eligible for AGOA treatment.[18] The list of AGOA-eligible countries, including whether they qualified for the apparel provision and the date they became eligible is available from the U.S. International

[17] To create the dependent variable, we follow the usual practice of adding one unit (dollar) to all import values before taking logarithms.

[18] These lists are available on the U.S. Trade Representative web site at http://www.ustr.gov.

Trade Administration.[19]

The trade data from the COMTRADE database is provided at the HS 6-digit level, while the non-apparel product codes of the AGOA-GSP list are at the 8-digit level. To capture this fact, the GSP_prod_p variable is not a 0-1 dummy variable, but varies continuously between 0 and 1. It is constructed to represent for each 6-digit product the fraction of underlying 8-digit products that are eligible for duty-free imports. In the aggregation, 8-digit products are weighted by the total (worldwide) value of U.S. imports for the 8-digit subcategories in the pre-AGOA period. In contrast, the APP_prod_p variable is always a 0-1 dummy, as the products that fall under the apparel provision are defined at an aggregation level of 2, 4 or 6-digits, depending on the product.

The data on tariffs is taken from Feenstra, Romalis, and Schott (2002).[20] The tariff rates are set at the 8-digit level. As in the case of the import data, we average the tariff rates up to the 6-digit level, weighting the 8-digit tariff rates, by their value contribution to worldwide U.S. imports. As mentioned previously, the tariff rate is measured either as the ad valorem tariff rate or the ad valorem equivalent for specific tariffs.

In the robustness checks (discussed below), we estimate the equations with less general specifications, that do not include the large sets of fixed effects. To control for some heterogeneity by country, we use a number of standard variables that are generally found to predict trade volumes well in the gravity equation literature. The distance between two countries is calculated as the great circle distance between capital cities. Total GDP and per capita GDP are measured using the purchasing power parity method, and taken from the Penn World Tables, version 6.1. Other country-level variables—the size of the country and dummies for being landlocked and whether English is an official language—are taken from the World Development Indicators 2004 database.

[19] The list is available on the ITA-sponsored web site: http://www.agoa.gov.

[20] Considerable thanks are due to these authors for making this data available at http://www.nber.org/data.

6 Results

The results for equation (4) with a full set of country-product fixed effects, estimated on the full balanced panel of all countries worldwide for all 6-digit HS products, from 1998 to 2003 are in column (1) of Table 1. The coefficient δ_1 on the $Ineffect\_APP_{ct} * APP\_ctry_c * APP\_prod_p$ triple interaction term measures the effect of the apparel provision on imports into the U.S., and the coefficient β_1 on $Ineffect\_GSP_{ct} * GSP\_ctry_c * GSP\_prod_p$ measures the effect of the non-apparel concessions under AGOA. While both are positive and significant, the effect of the apparel provision is considerably larger, with the point estimate suggesting that AGOA has increased apparel exports by 51% ($e^{0.411} - 1$). The average impact on non-apparel items is to increase exports by an average of 8%.

While we estimate the equation with almost 5.1 million observations, we include 850,000 country-product dummy variables.[21] The effect is identified from the change in pre-post AGOA import levels for each country/product category, controlling for the baseline import level, and general AGOA-country (-product) import surges that extend to non-AGOA products (countries). For example, the 0.217 coefficient on $Ineffect\_APP_t * APP\_prod_p$ (δ_3) indicates that, on average, the U.S. imported 24.2% more apparel during the post-AGOA period, even from countries that are not AGOA eligible. The 51% effect we associate with the apparel provision in AGOA is in addition to this increase.[22]

The $Ineffect\_APP_t * APP\_prod_p$ effects in each column of Table 1 are positive, indicating increased apparel imports by the U.S. overall in the post-AGOA period. The additional interaction with the APP_ctry_c dummy—the triple interaction term—is always large and significant, indicating an additional import boost limited to AGOA countries. For GSP products, however, the pattern is notably different. The triple-interaction effect is almost always of opposite sign of the double interaction, $Ineffect\_GSP_t * GSP\_prod_p$. Increased imports of GSP products from AGOA countries are partly compensated for by reduced imports from non-AGOA countries.

[21] In addition, we include time dummies and controls that capture changes in other free-trade agreements that are initiated or modified in the 1998-2003 interval.

[22] Note that this increase controls for changes in the average price level across all goods (captured in the time dummies), it does not control for the changes in apparel prices *relative* to this overall price level. However, we these relative price changes to be minimal (or even negative) over the 1998-2003 period.

In comparison, the difference-in-differences (as opposed to triple difference) results are presented in columns (2) through (4). Because the 'treatment' under AGOA varies by country and product, the difference-in-differences method can either use just AGOA countries (and focus on the difference between AGOA and non-AGOA products), or just AGOA products (and focus on the difference between AGOA and non-AGOA countries). In column (2), the sample is limited to just AGOA countries, and so focuses on the difference between AGOA and non-AGOA products (the difference-in-differences in the first line of (2)). As in the triple-difference estimation, a full set of country-product fixed-effects and year dummies is included. The apparel and GSP 'ineffect' variables, controlling for overall changes at the onset of AGOA, are not collinear with the year dummies, as a result of the differential onset of AGOA-GSP and AGOA-apparel provisions for different countries. These are the 'ineffect*country' coefficients, which reduce to being 'ineffect' controls when examining just the AGOA countries. The results in column (2) highlight the importance of using the triple-difference method. Using difference-in-differences, the apparel effect is overestimated by 60% (compare .82 to .51), as it does not take into account the worldwide surge in U.S. apparel imports during the AGOA period. The AGOA-GSP effect is underestimated by 60% (compare .031 to .079), as it does not take into account the wordwide drop in U.S. AGOA-GSP imports during the AGOA period.

The difference-in-differences method can equally focus on the difference between AGOA and non-AGOA countries by using just AGOA treated products. In order to focus on the AGOA/non-AGOA country differences, the AGOA-apparel products should be examined separately from the AGOA-GSP products.[23] The full set of country-product fixed effects and time dummies continue to be included in columns (3) and (4). Here, we see that the difference-in-difference results are even more misleading. In column (3), the apparel effect becomes -0.026, and insignificant, and in column (4), the AGOA-GSP effect becomes -0.298 and highly significant. Both of these underestimate the impact of AGOA, as the estimates

[23]In the triple-difference results of column (1), the 'control' group for both apparel and GSP products is the set of non-apparel, non-GSP products. In columns (3) and (4), when using only AGOA products, and focusing on the cross-country differences, the apparel and GSP products can no longer be combined in the analysis. If they were, and the apparel variable was chosen as the included dummy, the apparel coefficient would be capturing the apparel effect relative to the average effect for AGOA-GSP products, making the AGOA-GSP products the 'control group', which, of course, makes no sense.

fail to take into account the overall drop in U.S. imports from AGOA countries during the AGOA period.

Finally, the last column in Table 1 contains the effects of AGOA on the probability of importing. The probability that a country eligible for the apparel provision under AGOA exports an apparel product to the U.S. is increased by 2.2% after passing of the Act. This increase in probability is highly significant. In terms of economic magnitude, it should be compared to an average probability of 23.5% for all countries worldwide and 9.4% for AGOA countries prior to the Act, for apparel. The GSP effect is also positive and significant, suggesting that the probability that an AGOA country exports an AGOA-GSP product to the U.S. is increased by 1.1% after the passing of the Act. This magnitude should be compared to an average probability of 9.8% for all countries worldwide and 4.4% for AGOA countries prior to the Act, for AGOA-GSP products. The ineffect*country interactions indicate that AGOA countries are reducing the number of products that they export to the U.S. This reduced propensity is mitigated for countries that fall under the Act.

$\Rightarrow$ [Table 1 approximately here] $\Leftarrow$

To this point, we have assumed that the impact of AGOA treatment is the same across subcategories of AGOA-GSP products. Now, we will relax this assumption. The 1835 8-digit HS products added to the GSP list under AGOA can be categorized as agricultural (617 products), minerals (4 products), petroleum and related products (11), and manufacturing, including chemicals (1203). The rules and timing of the AGOA treatment are identical for all of these sub-categories, and therefore allowing heterogeneous AGOA-treatment effects for these subcategories involves replacing all of the GSP terms in equation (4) with 4 terms–1 for each of the subcategories: agriculture, minerals, petroleum, and manufacturing. Table 2 repeats the specifications of Table 1, allowing for heterogeneous AGOA effects across GSP subcategories. Obviously, the effect on apparel exports does not change. For GSP sub-categories, we notice considerable differences in terms of overall effect. Most noticeably, the petroleum effect is negative, significant, and large. At first glance, this might suggest that the AGOA countries reduced petroleum exports to the U.S. after AGOA, but recall that this effect is relative to the worldwide change in total U.S. petroleum imports, which surged

over the period. This surge is captured by the $Ineffect\_GSP_t * GSP\_prod_p$ interaction for petroleum, which is much larger than the triple interaction and larger than the import increase for any of the other categories. While there has been a large increase in petroleum imports from AGOA countries during the AGOA period, these imports have not kept pace with the increased imports into the U.S. from other countries. This example highlights the importance of triple-differencing in order to see the full picture.

Looking at the other categories, it should be noted that since there are only 4 mineral AGOA-GSP products, the results on this coefficient in particular should not be interpreted too broadly. Even for the other AGOA-GSP categories, as noted previously, the set of products for which tariffs were eliminated has been chosen to *not* be "import sensitive" when imported from Africa. Those caveats in mind, in the main specification of equation (1), we see that each of the agricultural, mineral, and manufactured product category effects is positive and significant, although of varying magnitudes. As in Table 1, the comparable difference-in-differences estimates are reported, in column (2) focusing on variations across products in the AGOA countries sample, and in column (3) focusing on cross-country variation AGOA product sub-category samples. As in Table 1, we find that the difference-in-differences coefficients can be quite misleading. The only coefficient for which the difference-in-differences estimator does not give a biased result of the overall AGOA effect is cross-product difference-in-differences for GSP-Agriculture products in column (2). Otherwise, the difference-in-differences estimator provides an estimate that is too large, too small, or of the wrong sign in comparison to the preferred triple-difference estimator of column (1). Clearly, taking into account both product-level and country-level surges during the AGOA period matters considerably.

The final column explores the effect of AGOA on the probability of exporting a particular product. Here, the sign and significance mirrors the first column, but the magnitudes are different. The probability that an AGOA country exports a GSP-Agriculture product increases by 2.2% after the passing of AGOA, relative to a baseline percentage for AGOA countries for these products of 3.2% (and 7.4% in this category for all countries) prior to AGOA. That is, the probability of exporting these agricultural products almost doubles for AGOA countries. For minerals, the AGOA-related increase is 5.1%, relative to a baseline

of 0 for AGOA countries, and 1.6% for all countries prior to the Act. That is, no AGOA countries were exporting in the GSP-mineral sub-category (only 4 products here) prior to the Act, but following the act, the probability of exporting in these categories went up (to) 5.1% as a result of the Act. For GSP-manufactures, the probability of exporting increased by 0.6% as a result of AGOA, relative to a baseline of 5.0% for AGOA countries prior to the Act (and 11.1% for all countries prior to AGOA).

$$\Rightarrow \text{[Table 2 approximately here]} \Leftarrow$$

Next, we turn to results where the triple interaction term is additionally multiplied by the pre-AGOA U.S. tariff rates for each country and product. The results in Table 2 measured how much import growth can be expected from the elimination of tariff rates, a 100% reduction. Results in Table 3 can be used to predict import responses to smaller reductions in tariff levels as well.

The results in the first column demonstrate the level effect of tariff reductions. In particular, the results indicate that every percentage point reduction in tariff rates is associated with 3.5% higher imports of apparel and 0.69% higher imports for GSP-Agricultural products. The other effects are not significant. Given that the average pre-AGOA tariff for textiles is 13.1% and for GSP-Agricultural products it was 3.6 %, the effect of the elimination of tariff rates evaluated at the mean comes to a 45.6% increase for apparel and 2.5% for GSP-Agricultural products. For apparel, this result approximates the full AGOA effect of column (1) in Table 1. For the GSP-Agricultural case, the result is somewhat smaller. Column (2) attempts to estimate the elasticity of imports with respect to tariffs. The triple interaction is now multiplied by the logarithm of the pre-AGOA tariff rates. For apparel, the elasticity estimated is 0.19. However, for GSP tariffs, the elasticity estimated is 0.02 (and insignificant), a point to which we shall return momentarily.

The results for the probability of importing follow roughly the same pattern. The effect of absolute tariff reductions on import probabilities is reported in column (3). Here, we see that a 1% decrease in apparel tariffs, evaluated at the mean, would result in a 0.17% increase in the probability of apparel imports. For GSP-Agricultural products, a 1% decrease in tariff levels, evaluated at the mean, would result in a 0.076% increase in the probability of

importing. The tariff elasticity is estimated in column (4), with the results mirroring the results of column (2). Roughly half of both the apparel effect and GSP-Agricultural effect on import probability is captured by a 100% reduction in tariffs when the import elasticity is estimated directly. For apparel, the larger effect of the elimination can be explained by the joint elimination of the quotas. For all products, it is possible that elimination of a tariff has a larger effect than a reduction, for example by reducing administrative cost. However, another possibility is that the effects of AGOA could be nonlinear. An easy way of exploring differential effects based on initial tariff rates, for example, is to interact the triple interaction effect in equation (4) with dummies for different tariff classes. For apparel products we used eight tariff classes and for GSP products (again pooled), which are on average subject to lower tariffs, five.[24]

$$\Rightarrow \text{[Table 3 approximately here]} \Leftarrow$$

We plot the range of triple interaction effects for the apparel case in Figure 1 and the AGOA-GSP case in Figure 2. For apparel, the effects become significantly positive even for relatively moderate levels of initial protection. The estimated coefficients on each of the four lower categories are all above 0.1. However, these coefficients appear small in comparison to the effect of larger tariff reductions. The effect of a tariff reduction of more than 30% is a 10-fold increase in apparel exports. The GSP coefficients are much more modest. In fact, tariff reductions of less than 5% actually lead to a decline in exports, a puzzling result, which explains, at least mathematically, the estimated elasticity of 0.02 for AGOA-GSP products in Table 2. Tariff reductions of more than 30% can lead to an estimated 76% increase in GSP exports. In both cases, for initial tariff levels exceeding 30% the import response to the elimination of protection becomes extremely high. It suggests that these protectionist measures were highly effective in keeping out imports.

$$\Rightarrow \text{[Figures 1 \& 2 approximately here]} \Leftarrow$$

[24] The lowest tariff class dummy for apparel takes the value of one if pre-AGOA tariffs were between 0 and 3% and zero otherwise. Subsequent tariff classes use the following tariff brackets: 3–6%, 6–10%, 10–15%, 15–20%, 20–25%, 25–30%, and higher than 30%. For GSP products, the tariff brackets employed are: 0–5%, 5–10%, 10–20%, 20–30%, and 30% and higher.

7 Robustness Checks

The specification with country-product fixed effects, in equation (4), is very general but requires an enormous number of controls. Over the sample period, the U.S. reports imports from 166 different countries and 5120 different products at the 6-digit HS classification. This amounts to almost 850,000 dummies. To check the robustness of the previous findings, we relax the controls included in the specification. A specification with additive country and product dummies only requires 5286 fixed effects. This still allows for countries to have idiosyncratic reasons for their overall level of imports into the U.S., and products to have idiosyncratic reasons for their overall level of imports. As discussed earlier, the minimum set of controls to perform the triple difference experiment in equation (2) is to replace the country-product interaction dummies with the linear and interaction terms in equation (3). To control for some country-heterogeneity, we augment the equation with a set of control variables (X^j_{ct}) that are generally found to have strong predictive power for trade flows in the gravity equation literature. The more restrictive estimating equation can be written as

$$\begin{aligned} \ln IMP_{cpt} \;=\; & (\alpha_1 + \beta_1\ Ineffect\_GSP_{ct}) * GSP\_ctry_c * GSP\_prod_p + \\ & (\alpha_2 + \beta_2\ Ineffect\_GSP_{ct}) * GSP\_ctry_c + \\ & (\alpha_3 + \beta_3\ Ineffect\_GSP_t) * GSP\_prod_p + \\ & (\gamma_1 + \delta_1\ Ineffect\_APP_{ct}) * APP\_ctry_c * APP\_prod_p + \\ & (\gamma_2 + \delta_2\ Ineffect\_APP_{ct}) * APP\_ctry_c + \\ & (\gamma_3 + \delta_3\ Ineffect\_APP_t) * APP\_prod_p + \\ & year_t + \sum_j \xi_j X^j_{ct} + \varepsilon_{cpt} \end{aligned} \tag{5}$$

The α coefficients are not of interest in their own right.[25] They simply remove the level effects that AGOA products or countries have in common–effects are still allowed to differ for the GSP or apparel products. We will continue to focus on the changes post-AGOA, i.e.

[25] In the most general specification, with country-product interactions, none of the three α coefficients could be estimated. With additive country and product dummies, α_1 can be estimated. Without country dummies, α_2 can be estimated and without product dummies also α_3.

coefficients β_1 and δ_1.

Compared with the country-product interaction dummies in equation (4), the specification with additive country and product fixed effects does not allow heterogeneity in the country effects by industry or in the industry effect by country. Equation (5) further restricts the full set of country dummies to only three import levels: one for all GSP eligible countries, one for countries that are in addition eligible for the apparel provision, and a third one for all the other (non-AGOA) countries. Similarly, the entire set of 5120 product dummies is restricted to three values.

Results in Table 4 should be compared to the benchmark estimates for equation (4) in column (1) of Table 1, which are reproduced for convenience. In the second column, the country-product interaction dummies are replaced by additive dummies and two AGOA country-product interaction terms, one for APP and one for GSP. In the third column, the country dummies are replaced by a limited set of six variables to absorb some heterogeneity and two (AGOA) country dummies. Finally, results in column (4) drop the product dummies as well, and contain the estimates of equation (5).

Comparing the first two columns of Table 4, the estimated apparel coefficient increases substantially, from 0.411 to 0.951 if multiplicative country-product dummies are replaced by additive dummies. For GSP products, the effect goes in the opposite direction. The effects for GSP-Agriculture, GSP-Minerals, and GSP_Manufactures diminish in column (2), and become insignificant. Enforcing homogeneity on the country-product interaction matters a lot. The country-product interactions that are added (e.g. $APP\_ctry_c * APP\_prod_p$), which allow for a different base-level of imports for treated and untreated country-product pairs, are estimated highly significantly. Relative to the average import level for each country and product, apparel imports were on average much lower pre-AGOA for the treated country-products (the -1.355 coefficient estimate translates into a 74% lower import level), while each of the GSP-Agriculture, GSP-Minerals, GSP-Petroleum, and GSP-Manufactures were higher pre-AGOA for the treated country-products. Relative to these baselines–now restricted to be identical for all treated country-product pairs–the effect of AGOA is heightened for apparel, but diminished for GSP products.

Further replacing some or all of the fixed effects by a limited set of variables hardly makes

a difference for apparel. However, for the GSP-Agriculture products, the estimate for the triple interaction effect is 0.081 (8.4%) when a full set of product dummies and two country dummies are used, and remains significant when the set of product dummies is replaced by a single GSP_prod_p dummy. Therefore, the effect of AGOA for the GSP-Agricultural products certainly appears to be more robust than the other GSP sub-categories (except petroleum, discussed earlier). Comparing across the different columns, all the positive point estimates on the triple-interaction AGOA effects remain positive and similar in size. However, ignoring the heterogeneity across country-sector pairs invariable raises the standard errors, making several of the effects insignificantly different from zero.

$\Rightarrow$ [Table 4 approximately here] $\Leftarrow$

Finally, the linear probability model with a dummy variable for positive or zero import values as dependent variable is estimated with the same sets of controls in Table 5. The results in the four columns of Table 5 are very much in line with the patterns for the total AGOA effects in Table 4. The apparel effect essentially triples when country-product interactions are replaced by additive dummies, but it remains at that same level if most controls are dropped subsequently. The GSP-Agriculture effect is halved with the replacement of country-product interactions by additive dummies, but remains at the same level with the subsequent dropping of controls in columns (3) and (4), and remains significant near 0.01.

$\Rightarrow$ [Table 5 approximately here] $\Leftarrow$

8 Conclusion

This paper has evaluated the impact of the African Growth and Opportunity Act (AGOA), enacted at the end of 2000 by the United States. The approach we have used allows us to control very generally for country-product specific baseline levels of imports and we control for AGOA-country and AGOA-product specific import trends in the post-AGOA period. As a result, we can be fairly confident that the results we estimate are directly tied to the Act. The results highlight the importance of using triple-difference estimation in this context. The results obtained on the same sample using standard difference-in-differences approaches

that focus only on AGOA products, or only on AGOA countries, give misleading estimates of the impact of AGOA.

The import responses to AGOA we estimate are very large for apparel products: imports increase on average by 51%. This is at the upper range of predictions pre-AGOA, see for example Mattoo *et al.* (2003). On the other hand, for GSP products, the results, while significant, are not as strong. This is not surprising given that the pre-AGOA tariffs were much lower for AGOA-GSP than for AGOA-apparel products, and there was no quota-removal on these products (as the vast majority had not been subject to quotas). Specifically, the pre-AGOA tariffs were only 3.8% for these products as a whole. Despite this fairly small tariff reduction on average, we see that in our preferred estimates (allowing for considerable heterogeneity), AGOA increased imports of AGOA-GSP products by 7.9%, a non-negligible amount for the small tariff reductions. Within sub-categories, the effect was larger. In the GSP-Agricultural category, the increase was 14%, compared to 54% in the minerals category and 6% in the manufactures category. The agricultural effect remains significant in a variety of specifications. This fact is certainly consistent with the prioritization of agriculture by African countries in the negotiations of the Doha Round of the World Trade Organization, where the large production subsidies and export subsidies of agricultural products by the U.S. and Europe (rather than the relatively small average tariff reductions of AGOA) are the primary target.

The impact of tariff reductions under AGOA appears to be non-linear, with larger tariff reductions resulting in disproportionate increases in imports, across both the apparel and AGOA-GSP categories. Small tariff reductions result in either no effect on exports, or in some cases a negative effect. The negative effect would be consistent with resources being shifted from the sectors of low tariff reductions to those of higher tariff reductions (in addition to the shift from non-AGOA to AGOA products), but more research would need to be done to firmly conclude this point.

The largest effect of AGOA was clearly in terms of apparel imports, and this effect must be interpreted in the temporal context in which the preferences were granted. Prior to January 1, 2005, industrialized countries, including the U.S., imposed quotas on apparel imports within the framework of the Multi-Fibre Arrangement (MFA). Under the Agreement on

Textiles and Clothing of the World Trade Organization, these quotas were gradually reduced between 1998 and 2005, but the quota removals on the most significant products in value terms were left until January 1, 2005. Therefore, the apparel impact of AGOA for African countries was to enact the quota removals earlier than January 1, 2005,[26] the date at which other developing countries would also be freed from these quotas. If the fixed costs to exporting had been large enough, and the African countries did not have a comparative advantage in apparel production in comparison to, for example, China or India, we might not expect AGOA to have an impact on apparel exports from Africa. The fact that the impact of AGOA was sizeable in terms of African apparel exports implies that either i) the fixed costs to expanding (apparel) exports can be recouped within a couple of years, or ii) that apparel producers expected Africa to have a continuing comparative advantage in apparel production after the expiration of the MFA, or iii) that the duty-free access for AGOA apparel products matters in addition to the quota-free access.[27] Regardless, it will be very interesting to see whether the 'head start' on the quota removals has lasting, or only transitory, effects on Africa's apparel exports.

A further conclusion can be made from this study. In the context of the apparel preferences offered under AGOA, none of the other limitations frequently cited for the African context (poor infrastructure, distorted product and credit markets, high risk, inadequate social capital, and poor public services) proved to be binding constraints to expanding apparel exports under AGOA. While this might seem like a fairly modest statement, as the literature summarized in the paper suggests, in the African context, it is not.

[26] The 'average' date for a country to be declared eligible for the apparel provision of AGOA was April 28, 2002.

[27] It is worth noting that this 'comparative advantage' can result from political actions (such as U.S. 'safeguard' actions), as well as a desire to diversify the source of apparel imports, in addition to the more traditional forms of cost considerations.

References

[1] Besley, Timothy and Case, Anne. "Unnatural Experiments? Estimating the Incidence of Endogenous Policies." *Economic Journal*, November 2000, 110, pp. F672-F694.

[2] Burfisher, Mary E.; Robinson, Sherman and Thierfelder, Karen. "The Impact of NAFTA on the United States." *Journal of Economic Perspectives*, Winter 2001, 15(1), pp. 125-44.

[3] Carrère, Céline. "African Regional Agreements: Impact on Trade with or without Currency Unions." *Journal of African Economies*, June 2004, 13(2), pp. 199-239.

[4] Coe, David T. and Hoffmaister, Alexander W. "North-South Trade: Is Africa Unusual." *Journal of African Economies*, July 1999, 8(2), pp. 228-256.

[5] Collier, Paul and Jan Willem Gunning. 1999. "Explaining African Economic Performance." *Journal of Economic Literature*, March 1999, 37, pp. 64-111.

[6] Clausing, Kimberly A. "Trade Creation and Trade Diversion in the Canada-United States Free Trade Agreement." *Canadian Journal of Economics*, August 2001, 34(3), pp. 677-696.

[7] Feenstra, Robert C.; Romalis, John and Schott, Peter K. "U.S. Imports, Exports, and Tariff Data, 1989-2001." National Bureau of Economic Research (Cambridge, MA) Working Paper No.9387, December 2002.

[8] Frankel, Jeffrey; Stein, Ernesto and Wei, Shang-jin. "Trading blocs and the Americas: The Natural, the Unnatural, and the Super-Natural." *Journal of Development Economics*, 1995, 47, pp. 61-95.

[9] Foroutan, Faezah and Pritchett, Lant. "Intra-Sub-Saharan African Trade: Is It too Little?" *Journal of African Economies*, May 1993, 2(1), pp. 74-105.

[10] Greaney, Theresa M. "Assessing the Impacts of US-Japan Bilateral Trade Agreements, 1980-1995." *World Economy*, February 2001, 24(2), pp. 127-157.

[11] Head, Keith and Ries, John. "Market-Access Effects of Trade Liberalization: Evidence from the Canada-U.S. Free Trade Agreement," in Robert C. Feenstra, ed., The Effects of U.S. Trade Protection and Promotion Policies. Chicago: University of Chicago Press, 1997, pp. 323-342.

[12] Hoekman, Bernard; Ng, Francis and Olarreaga, Marcelo. "Eliminating Excessive Tariffs on Exports of Least Developed Countries." *World Bank Economic Review*, 2002, 16(1), pp. 1-21.

[13] Ianchovichina, Elena; Mattoo, Aaditya and Olarreaga, Marcelo. "Unrestricted Market Access for Sub-Saharan Africa." *Journal of African Economies*, December 2001, 10(4), pp. 410-432.

[14] Limao, Nuno and Venables, Anthony J. "Infrastructure, Geographical Disadvantage, Transport Costs and Trade." *World Bank Economic Review*, 2001, 15(3), pp. 451-479.

[15] Mattoo, Aaditya; Roy, Devesh and Subramanian, Arvind. "The Africa Growth and Opportunity Act and its Rules of Origin: Genersoity Undermined?" *World Economy*, June 2003, 26(6), pp. 829-851.

[16] Milner, Chris; Morrissey, Oliver and Rudaheranwa, Nicodemus. "Policy and Non-Policy Barriers to Trade and Implicit Taxation of Exports in Uganda." Journal of Development Studies, December 2000, 37(2), pp. 67-90.

[17] Morrissey, Oliver and Rudaheranwa, Nicodemus. "Ugandan Trade Policy and Export Performance in the 1990s." University of Nottingham, CREDIT Research Paper 98/12, 1998, (CDP006).

[18] Roberts, Mark and James Tybout. "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs." American Economic Review, September 1997, 87, pp. 545-64.

[19] Rodrik, Dani. "Trade Policy and Economic Performance in Sub-Saharan Africa," National Bureau of Economic Research (Cambridge, MA) Working Paper No.6562, May 1998.

[20] Romalis, John. "Would Rich Country Trade Preferences Help Poor Countries Grow? Evidence from the Generalized System of Preferences," mimeo, University of Chicago, 2003.

[21] Romalis, John. "NAFTA's and CUSFTA's Impact on International Trade," National Bureau of Economic Research (Cambridge, MA) Working Paper No. 11059, January 2005.

[22] Trefler, Daniel. "The Long and Short of the Canada-U.S. Free Trade Agreement." *American Economic Review*, September 2004, 94(4), pp. 870-895.

[23] Wang, Zhen Kun and Winters, L. Alan. "Africa's Role in Multilateral Trade Negotiations: Past and Future." *Journal of African Economies*, Supplement 1 June 1998, 7(0), pp. 1-33.

Table 1: Benchmark results for the AGOA effect

dependent variable	ln *IMP*	ln *IMP*	ln *IMP*	ln *IMP*	import dummy
sample	full	only AGOA countries	only AGOA-APP products	only AGOA-GSP products	full
method	triple-diffs	diff-in-diffs	diff-in-diffs	diff-in-diffs	triple-diffs
	(1)	(2)	(3)	(4)	(5)
Marginal Apparel Effect	0.51	0.82	-0.03	0.00	0.02
Marginal GSP Effect	0.079	0.031	0.00	-0.26	0.01
APP: ineffect*ctry*prod	0.411	0.600	-0.026		0.022
	(15.62)**	(37.11)**	(0.78)		(8.24)**
GSP: ineffect*ctry*prod	0.076	0.031		-0.298	0.011
	(5.67)**	(3.93)**		(25.44)**	(8.44)**
APP: ineffect*country	-0.246	-0.253			-0.036
	(35.97)**	(52.82)**			(53.21)**
GSP: ineffect*country	-0.253	-0.118			-0.029
	(46.32)**	(20.53)**			(54.04)**
APP: ineffect*prod	0.217				0.020
	(24.99)**				(22.73)**
GSP: ineffect*prod	-0.043				-0.003
	(7.54)**				(4.47)**
Observations	5099520	1105920	238044	858552	5099520
Number of fixed-effects	849920	184320	39674	143092	849920

Notes: Absolute value of t-statistics in parentheses; * significant at 5%; ** significant at 1%

Controls include country-product interaction and year dummies and dummies for free-trade agreements that came into effect during the study period, as well as changes in trade relations (into and out of MFN and into and out of GSP eligibility).

Table 2: Benchmark results for the AGOA effect

dependent variable	ln *IMP*	ln *IMP*	ln *IMP*	import dummy
sample	full	only AGOA countries	only AGOA products**	full
method	triple-diffs	diff-in-diffs	diff-in-diffs	triple-diffs
	(1)	(2)	(3)	(4)
Marginal Apparel Effect	0.51	0.82	-0.03	0.02
Marginal GSP Effect				
Agriculture	0.14	0.14	-0.21	0.02
Minerals	0.54	0.33	0.10	0.05
Petroleum	-0.84	2.37	-0.91	-0.09
Manufactures	0.06	-0.03	-0.28	0.01
Ineffect*Country*Product Interaction				
APP	0.411	0.600	-0.026	0.022
	(15.63)**	(37.10)**	(0.78)	(8.24)**
GSP-Agriculture	0.134	0.133	-0.234	0.022
	(5.94)**	(10.12)**	(12.89)**	(9.75)**
GSP-Minerals:	0.432	0.284	0.095	0.051
	(2.84)**	(3.20)**	(1.07)	(3.38)**
GSP-Petroleum:	-1.85	1.216	-2.383	-0.091
	(8.62)**	(9.69)**	(4.47)**	(4.24)**
GSP-Manufactures:	0.055	-0.027	-0.327	0.006
	(3.39)**	(2.92)**	(21.81)**	(3.92)**
Ineffect*Country Interaction				
APP	-0.246	-0.253		-0.036
	(35.98)**	(52.83)**		(53.21)**
GSP	-0.253	-0.117		-0.029
	(46.33)**	(20.51)**		(54.03)**
Ineffect*Product Interaction				
APP	0.217			0.02
	(24.98)**			(22.73)**
GSP-Agriculture:	0.003			0.001
	(0.32)			(1.56)
GSP-Minerals:	-0.15			-0.011
	(2.31)*			(1.7)
GSP-Petroleum:	3.185			0.176
	(34.64)**			(19.21)**
GSP-Manufactures:	-0.081			-0.005
	(11.82)**			(7.81)**
Observations	5099520	983040	902376	5099520
Number of fixed-effects	849920	163840	150396	849920

Notes: Absolute value of t-statistics in parentheses; * significant at 5%; ** significant at 1%

Controls include country-product interaction and year dummies and dummies for free-trade agreements that came into effect during the study period, as well as changes in trade relations (into and out of MFN and into and out of GSP eligibility).

**Each of the coefficients in column (3) comes from a separate regression that includes only the relevant sub-sample of AGOA products. For example, the coefficient in this column for GSP-Agriculture is the coefficient on the 'double-difference' when only GSP-Agriculture products are included. A single column is used for all of these results for brevity.

Table 3: Results for the tariff elasticity of the AGOA effect

dependent variable tariffs measured in	ln *IMP* levels (1)	ln *IMP* logs (2)	import dummy levels (3)	import dummy logs (4)
imp. elast. wrt tariffs (APP)		0.189		0.009
imp. elast. wrt tariffs (GSP)		0.020		0.003
Ineffect*Country*Product*Pre-AGOATariff Rate				
APP	3.477	0.189	0.169	0.009
	(20.43)**	(18.07)**	(10.01)**	(8.85)**
GSP-Agriculture	0.690	0.020	0.076	0.003
	(2.42)*	(1.21)	(2.66)**	(2.09)*
GSP-Minerals:	5.862	0.187	0.731	0.024
	(1.23)	(1.21)	(1.55)	(1.54)
GSP-Petroleum:	-122.799	-1.372	-15.438	-0.204
	(1.79)	(1.50)	(2.26)*	(2.24)*
GSP-Manufactures:	0.337	-0.025	-0.009	-0.005
	(1.09)	(1.66)	(0.28)	(3.51)**
Ineffect*Country Interaction				
APP	-0.249	-0.249	-0.036	-0.036
	(36.43)**	(36.24)**	(53.46)**	(53.19)**
GSP	-0.246	-0.243	-0.028	-0.028
	(46.81)**	(46.12)**	(53.87)**	(53.21)**
Ineffect*Product Interaction				
APP	0.216	0.217	0.020	0.020
	(25.01)**	(24.89)**	(22.86)**	(22.71)**
GSP-Agriculture:	0.031	0.033	0.006	0.006
	(2.28)*	(2.37)*	(4.49)**	(4.46)**
GSP-Minerals:	-0.177	-0.175	-0.011	-0.011
	(2.03)*	(2.02)*	(1.27)	(1.25)
GSP-Petroleum:	9.219	9.205	0.539	0.538
	(46.81)**	(46.85)**	(27.54)**	(27.54)**
GSP-Manufactures:	-0.083	-0.079	-0.005	-0.004
	(9.27)**	(8.81)**	(5.21)**	(4.62)**
Observations	5093604	5090640	5093604	5093604
Number of fixed-effects	848934	848440	848934	848934

Notes: Absolute value of t-statistics in parentheses; * significant at 5%; ** significant at 1%
Controls include country-product interaction and year dummies and dummies for free-trade agreements that came into effect during the study period, as well as changes in trade relations (into
In column (1) the triple-difference term is multiplied by the logarithm of the pre-AGOA tariff rate instead of the level as in the other columns.

Table 4: Robustness checks for controls: overall effects

dependent variable	ln *IMP*	ln *IMP*	ln *IMP*	ln *IMP*
estimation method	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)
Marginal Apparel Effect	0.51	1.59	1.53	1.50
Marginal GSP Effect	0.14	0.06	0.08	0.09
Ineffect*Country*Product Interaction				
APP	0.411	0.951	0.928	0.916
	(15.63)**	(23.44)**	(21.05)**	(19.31)**
GSP-Agriculture	0.134	0.054	0.081	0.088
	(5.94)**	(1.56)	(2.15)*	(2.16)*
GSP-Minerals:	0.432	0.266	0.303	0.313
	(2.84)**	(1.13)	(1.19)	(1.14)
GSP-Petroleum:	-1.85	-2.097	-2.036	-2.041
	(8.62)**	(6.33)**	(5.65)**	(5.27)**
GSP-Manufactures:	0.055	0.026	0.029	0.03
	(3.39)**	(1.03)	(1.09)	(1.04)
Ineffect*Country Interaction				
APP	-0.246	-0.271	-0.334	-0.395
	(35.98)**	(23.82)**	(30.08)**	(33.06)**
GSP	-0.253	-0.248	-0.265	-0.295
	(46.33)**	(27.31)**	(29.37)**	(30.39)**
Ineffect*Product Interaction				
APP	0.217	0.166	0.196	0.212
	(24.98)**	(11.52)**	(12.24)**	(12.26)**
GSP-Agriculture:	0.003	0.018	-0.013	-0.024
	(0.32)	(1.11)	(0.76)	(1.27)
GSP-Minerals:	-0.15	-0.12	-0.163	-0.179
	(2.31)*	(1.12)	(1.38)	(1.41)
GSP-Petroleum:	3.185	3.229	3.159	3.166
	(34.64)**	(21.31)**	(18.88)**	(17.58)**
GSP-Manufactures:	-0.081	-0.076	-0.079	-0.081
	(11.82)**	(6.68)**	(6.33)**	(6.02)**
Country*Product Interaction				
APP		-1.355	-1.308	-1.376
		(61.27)**	(54.45)**	(53.11)**
GSP-Agriculture:		0.863	0.869	0.926
		(38.06)**	(35.30)**	(34.83)**
GSP-Minerals:		1.22	1.229	1.315
		(7.99)**	(7.41)**	(7.34)**
GSP-Petroleum:		0.516	0.528	0.494
		(2.39)*	(2.25)*	(1.95)
GSP-Manufactures:		0.157	0.156	0.167
		(9.71)**	(8.85)**	(8.80)**
Country Dummy				
APP			-0.358	-0.515
			(46.91)**	(62.75)**
GSP			0.899	0.778
			(121.91)**	(97.43)**
Product Dummy				
APP				1.833
				(182.03)**
GSP-Agriculture:				-1.09
				(80.80)**
GSP-Minerals:				-1.602
				(17.62)**
GSP-Petroleum:				0.566
				(4.40)**
GSP-Manufactures:				-0.175
				(18.12)**
fixed-effects	country/product	country+prod	product	-
	849920	5120+166	5120	-
			gravity equation variables included	
Observations	5099520	5099520	4951040	4951040

Notes: Absolute value of t-statistics in parentheses; * significant at 5%; ** significant at 1%
Controls include country-product interaction and year dummies and dummies for free-trade agreements that came into effect during the study period, as well as changes in trade relations (into and out of MFN and into and out of GSP eligibility).

The gravity controls include the distance from the U.S., country area, GDP and GDP/capita, as well as a dummy for landlocked countries and for English-speaking countries. In addition, controls for trade-status with the U.S. (MFN or GSP status), as well as for each of the U.S.'s free trade agreements are also included.

Table 5: Robustness checks for controls at the extensive margin

dependent variable	import dummy	import dummy	import dummy	import dummy
estimation method	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)
Ineffect*Country*Product Interaction				
APP	0.022	0.069	0.067	0.066
	(8.24)**	(20.07)**	(18.02)**	(16.87)**
GSP-Agriculture	0.022	0.011	0.013	0.013
	(9.75)**	(3.64)**	(4.00)**	(3.96)**
GSP-Minerals:	0.051	0.031	0.034	0.035
	(3.38)**	(1.57)	(1.59)	(1.55)
GSP-Petroleum:	-0.091	-0.111	-0.107	-0.107
	(4.24)**	(3.96)**	(3.52)**	(3.35)**
GSP-Manufactures:	0.006	0.003	0.003	0.003
	(3.92)**	(1.3)	(1.38)	(1.34)
Ineffect*Country Interaction				
APP	-0.036	-0.038	-0.03	-0.035
	(53.21)**	(39.77)**	(32.03)**	(35.04)**
GSP	-0.029	-0.029	-0.038	-0.037
	(54.03)**	(37.24)**	(49.85)**	(45.59)**
Ineffect*Product Interaction				
APP	0.02	0.015	0.018	0.019
	(22.73)**	(12.39)**	(12.91)**	(13.31)**
GSP-Agriculture:	0.001	0.003	0.001	0
	(1.56)	(2.59)**	(0.76)	(0.17)
GSP-Minerals:	-0.011	-0.007	-0.011	-0.012
	(1.7)	(0.82)	(1.09)	(1.17)
GSP-Petroleum:	0.176	0.179	0.175	0.175
	(19.21)**	(13.95)**	(12.35)**	(11.74)**
GSP-Manufactures:	-0.005	-0.005	-0.005	-0.005
	(7.81)**	(4.86)**	(4.80)**	(4.73)**
Country*Product Interaction				
APP		-0.111	-0.108	-0.114
		(59.13)**	(52.99)**	(53.32)**
GSP-Agriculture:		0.061	0.061	0.066
		(31.62)**	(29.39)**	(30.00)**
GSP-Minerals:		0.092	0.093	0.1
		(7.12)**	(6.62)**	(6.77)**
GSP-Petroleum:		0.073	0.074	0.075
		(4.00)**	(3.74)**	(3.60)**
GSP-Manufactures:		0.013	0.013	0.014
		(9.54)**	(8.75)**	(9.00)**
Country Dummy				
APP			-0.02	-0.024
			(30.36)**	(36.07)**
GSP			0.078	0.063
			(125.19)**	(95.39)**
Product Dummy				
APP				0.164
				(197.54)**
GSP-Agriculture:				-0.091
				(81.18)**
GSP-Minerals:				-0.138
				(18.38)**
GSP-Petroleum:				-0.027
				(2.55)*
GSP-Manufactures:				-0.018
				(22.23)**
fixed-effects	country/product	country+prod	product	-
	849920	5120+166	5120	-
			gravity equation variables included	
Observations	5099520	5099520	4951040	4951040

Notes: Absolute value of t-statistics in parentheses; * significant at 5%; ** significant at 1%
Controls include country-product interaction and year dummies and dummies for free-trade agreements that came into effect during the study period, as well as changes in trade relations (into and out of GSP eligibility).
as
a dummy for landlocked countries and for English-speaking countries. In addition, controls for trade-status with the U.S. (MFN or GSP status), as well as for each of the U.S.'s free trade agreements are also included.

Figure 1: Effect of Pre-AGOA Tariffs on Log(Imports) for AGOA apparel products at different tatiff levels (with confidence intervals)

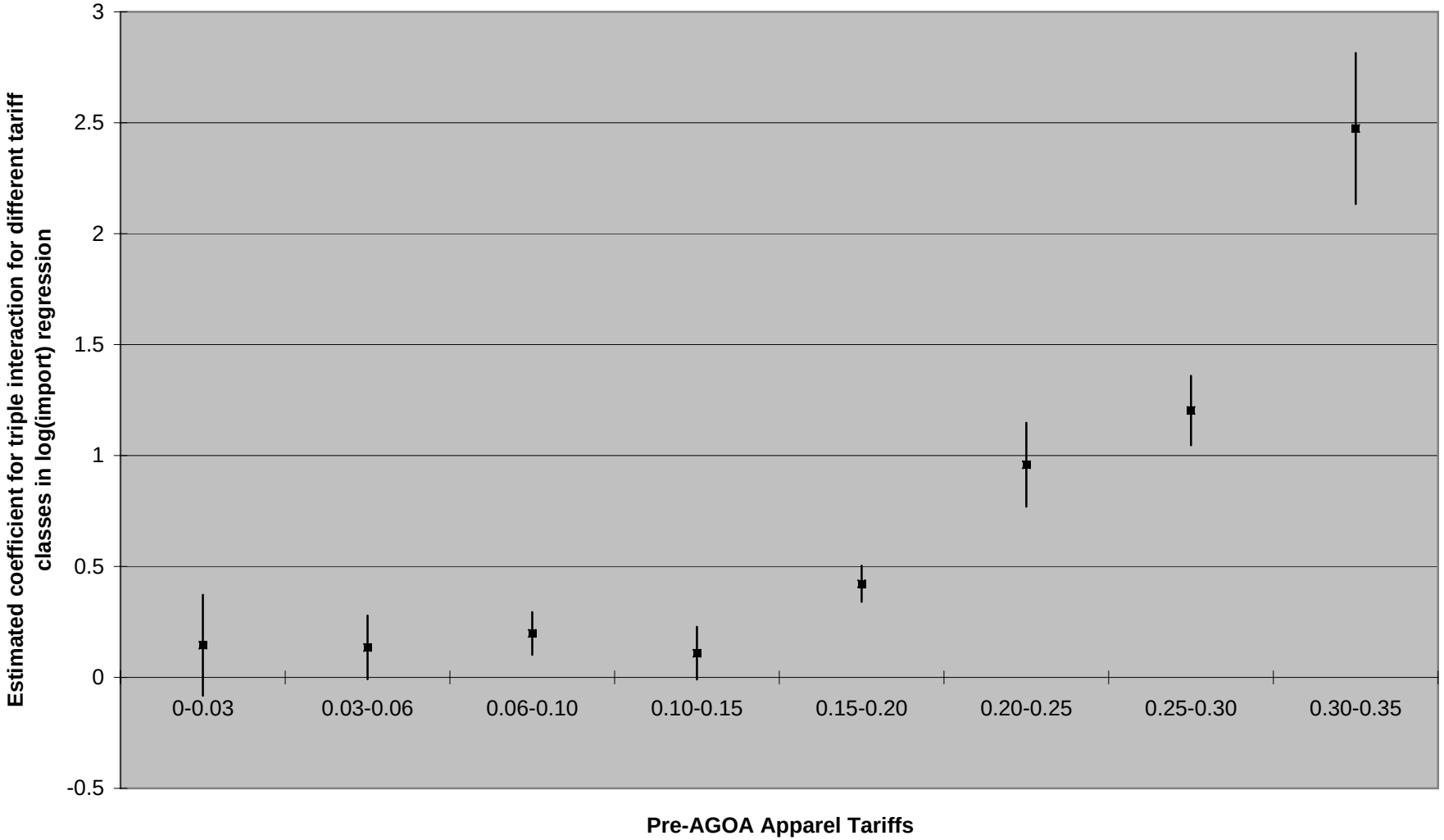

Figure 2: Effect of Pre-AGOA Tariffs on Log(Imports) for AGOA-GSP products at different tariff levels (including confidence intervals)