
Jaime de Melo and Alberto Portugal-Perez

The least developed countries rely on preferential market access. To benefit from these preferences, proof of sufficient transformation must be provided to customs in importing countries by meeting the rules of origin requirements. These rules of origin are complicated and burdensome to exporters in least developed countries. Since 2001, under the U.S. Africa Growth Opportunity Act (AGOA), 22 African countries that export apparel to the United States have been able to use fabric of any origin (single transformation) and still meet the criterion for preferential access (the so-called Special Rule). In contrast, the EU has continued to require yarn to be woven into fabric and then made into apparel in the same country (double transformation). Panel estimates for the 1996–2004 period exploit this quasi-experimental change in the design of preferences. Estimates show that this simplification contributed to an increase in export volume of approximately 168 percent for the top seven beneficiaries, or approximately four times as much as the 44 percent growth effect from the initial preferential access under the AGOA without single transformation. This change in design was also important for diversity in apparel exports because the number of export varieties grew more rapidly under the AGOA special regime. JEL codes: F12, F13, F15

Throughout the Doha negotiations, the least developed countries (LDCs) have objected to the lack of attention to the loss of market access in developed-country markets, which is the result of complicated requirements that exporters must
meet to qualify for preferential access. These requirements mean that exporters must satisfy rules of origin (RoO); that is, they must prove that products that benefit from preferential access have sufficient domestic content. These RoO are cumbersome and complicated. For example, in the case of NAFTA, Cadot et al. (2005) estimate that one-third of the increase in the border price of Mexican textile and apparel exports to the United States is to compensate for the costs of complying with NAFTA’s RoO. They also estimate that NAFTA raised the price of intermediates sold by U.S. firms to Mexico by 12 percent. Ultimately, NAFTA’s RoO halved the gains from duty-free market access for Mexican exports of textiles and apparel. Many feel that the design of these requirements is costly and reduces the intended market access that is supposed to be granted by preferences (see a summary of estimates in Cadot and de Melo (2007)). Based on the quasi-natural experiment provided by the U.S. duty-free access to African exporters of textiles and apparel under the Africa Growth Opportunity Act (AGOA), this paper estimates the costs in terms of lower export growth and less product diversity due to restrictive technical requirements.

Meeting RoO requirements is the core implementation tool in all preferential schemes. Typically, RoO have two components: (i) economy-wide rules that apply to all products receiving preferences (i.e., roll-up for materials that serve as input in the subsequent transformation can be considered as originating from the appropriate country); and (ii) numerous product-specific RoO that are usually defined at the four- or six-digit level of aggregation in the Harmonized System (HS-6 or HS-4) (e.g., technical requirements in the production of the textiles and apparel sector examined here). A growing body of literature concludes that the requirements necessary to prevent trade deflection (i.e., importing via the low tariff partner and then reexporting duty-free within the preferential area) serve as protectionist devices that ultimately impede market access for the intended beneficiaries.

This evidence is based on two factors: (i) the utilization rates of preferences (at the tariff-line level) or the share of imports entering a market under preferential

1. Preferential access from paying duties below MFN rates allows LDCs to obtain a higher price for their exports than MFN competitors. The Generalized System of Preferences in place since 1971 and the more recent EU Everything But Arms initiative and the U.S. Africa Growth Opportunity Act are the major nonreciprocal preferential access channels available for LDCs. In his last attempt at salvaging the Round in July 2011, Pascal Lamy called for a plan B, dubbed the “LDC plus” package. The package failed to be approved in December 2011. The core of the package was duty-free quota-free market access and simplified rules of origin for LDCs.

2. Any preferential trading scheme falling short of a full-fledged Customs Union, such as “reciprocal” Free-Trade-Areas or “nonreciprocal” preferential schemes granted by industrial countries to developing countries such as the Generalized System of Preferences, require the satisfaction of RoO to prevent trade deflection (i.e. to import through the low tariff partner and reexport to other higher-tariff partners in the area with little or no transformation of the product). Estevadeordal and Suominen (2006) provide a thorough description of RoO around the world.

3. See Estevadeordal and Suominen (2006) for a detailed description of both sets of rules. For example, the EU has over 500 different product-specific RoO (Cadot and de Melo 2007).
access and (ii) synthetic ordinal indexes, based on simple observation rules intended to capture in a single ordinal index the restrictiveness of multiple and complex product-specific RoO (for example, a change of tariff classification combined with a technical requirement is more restrictive than only a change of tariff classification requirement).

Repeated analyses of disaggregated data show a positive correlation between the extent of preferential access and the value of the constructed restrictiveness indexes (a higher value of the index indicates a more restrictive product-specific RoO). The data also show a tapering off or decline in utilization rates as preferential margins increase, presumably because it becomes more costly to satisfy increasingly complex rules. These correlations have led researchers to conclude that RoO may be “made-to-measure” protectionist devices. With a large share of North-South trade occurring with preferential status, obtaining a better grasp of the effects of RoO is a first-order priority for improving our understanding of the overall restrictiveness of trade policy.4

The difficulty with the available evidence is the presumption that variation in utilization rates is a plausible indicator of the costs of an RoO regime. The data often show high utilization of preferences for tariff lines with zero most favored nation (MFN) tariffs, although compliance costs are estimated at approximately 2–3 percent of the product price (see, for instance, Manchin (2006) and François, Hoekman, and Manchin (2006)). To give an example using data from this study, between 90 percent and 97 percent of qualifying African exports of apparel enter the United States and EU under their respective preferential regimes, the AGOA for the United States and Everything But Arms or Cotonou preferences for the EU (see table 1). Yet, as shown here, export patterns of textiles and apparel to the two destinations have differed drastically in recent years (see figure 1).

When the origin requirement was drastically simplified under the AGOA, despite remarkably similar average preferential margins in the United States and the EU (U.S. MFN tariff of 11.5 percent in 2004 and EU preferential margin of 11.0 percent), apparel exports to the United States took off, whereas apparel exports to the EU remained flat. Thus, assessing the restrictiveness of RoO only by inspecting utilization rates would suggest low costs while ignoring the fact that export growth rates to the two destinations diverged at about the time when origin requirements to one market, the United States, were relaxed.

Thus, it is desirable to go beyond the inspection of utilization rates and indices of restrictiveness to isolate the effects of meeting origin requirements. This paper isolates the costs of meeting these origin requirements by exploiting a relaxation of the “yarn forward” rule for textiles and apparel applied by the United States in its preferential trade policies. In the early stages of the AGOA, the United

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Table 1. Apparel Exports of Countries Benefiting from the AGOA’s Special Rule in 2004

<table>
<thead>
<tr>
<th>Country</th>
<th>Share Utilization Rate</th>
<th>Share Utilization Rate</th>
<th>Date of entry into force of AGOA SR</th>
<th>Export growth to the United States (yearly rate)</th>
<th>Before AGOA SR</th>
<th>After AGOA SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesotho</td>
<td>0.50% 24.49%</td>
<td>32.92% 98.18%</td>
<td>01.apr(01)</td>
<td>21.23% 34.32%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madagascar</td>
<td>85.77% 96.83%</td>
<td>23.34% 97.27%</td>
<td>01.mar(01)</td>
<td>77.62% 31.07%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>1.54% 92.53%</td>
<td>20.01% 97.94%</td>
<td>01.jan(01)</td>
<td>12.77% 58.55%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swaziland</td>
<td>0.53% 1.75%</td>
<td>12.90% 98.34%</td>
<td>01.jul(02)</td>
<td>29.15% 53.88%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Namibia</td>
<td>0.05% 72.95%</td>
<td>5.68% 96.50%</td>
<td>01.dec(02)</td>
<td>837.93%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Botswana</td>
<td>6.01% 74.67%</td>
<td>1.46% 99.44%</td>
<td>01.aug(02)</td>
<td>2.85% 26.55%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malawi</td>
<td>0.06% 94.52%</td>
<td>1.93% 95.17%</td>
<td>01.aug(02)</td>
<td>54.90% 38.27%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td>0.07% 82.22%</td>
<td>0.53% 96.26%</td>
<td>02.mar(02)</td>
<td>23.00% 214.41%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>0.00% 9.48%</td>
<td>0.29% 100.00%</td>
<td>01.oct(02)</td>
<td>576.03%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethiopia</td>
<td>0.34% 97.24%</td>
<td>0.24% 99.80%</td>
<td>01.aug(02)</td>
<td>400.08%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cape Verde</td>
<td>2.43% 99.77%</td>
<td>0.22% 95.03%</td>
<td>02.aug(03)</td>
<td>111.26% 35.75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>1.80% 99.53%</td>
<td>0.18% 99.00%</td>
<td>02.feb(02)</td>
<td>618.97%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mozambique</td>
<td>0.08% 94.70%</td>
<td>0.16% 85.15%</td>
<td>02.feb(02)</td>
<td>131.84%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>0.38% 4.04%</td>
<td>0.11% 0.00%</td>
<td>04.apr(04)</td>
<td>80.57%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cameroon</td>
<td>0.17% 23.10%</td>
<td>0.02% 0.00%</td>
<td>02.mar(02)</td>
<td>0.10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td>0.04% 1.67%</td>
<td>0.01% 1.37%</td>
<td>04.jul(04)</td>
<td>3.70% -54.16%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td>0.00% 100.00%</td>
<td>0.00% 78.67%</td>
<td>01.dec(02)</td>
<td>-1.22% -49.65%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mali</td>
<td>0.03% 10.49%</td>
<td>0.00% 0.00%</td>
<td>03.dec(04)</td>
<td>34.97% -86.55%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>0.17% 93.90%</td>
<td>0.00% 0.00%</td>
<td>02.apr(02)</td>
<td>-30.47% -27.65%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Niger</td>
<td>0.03% 82.09%</td>
<td>0.00% 0.00%</td>
<td>03.dec(04)</td>
<td>-10.94% -37.70%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benin</td>
<td>0.01% 41.97%</td>
<td>0.00% 0.00%</td>
<td>04.jan(04)</td>
<td>2.92%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rwanda</td>
<td>0.00% 30.23%</td>
<td>0.00% 0.00%</td>
<td>03.mar(03)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>100% 91.2%</td>
<td>100% 97.7%</td>
<td></td>
<td>21.2% 34.3%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: AGOA SR indicates the AGOA’s Special Rule.

a The value of total exports from these 22 countries to the EU (United States) is 209.6 [1385.1] Mio USD in 2004.

b The utilization rate of preferences is defined as the percentage of imports entering into a country on a preferential basis with respect to total imports. The figure on utilization rates for EU preferences in 2004 was obtained from EUROSTAT. Utilization rates for U.S. preferential schemes were obtained from the U.S. International Trade Commission.

c Average over the period.

d The Special Rule is assumed to enter into effect in the calendar year, if it is prior to July 1 (the year is indicated in parenthesis in the column).

Source: Authors’ calculations using data from COMTRADE. Countries ranked by decreasing order of combined total apparel exports to the United States.
**Figure 1(a).** Apparel Exports of 22 Countries Benefiting from the AGOA Special Rule by 2004

Notes: Yearly data from 1996 to 2004 are presented. The 22 sub-Saharan countries benefiting from the AGOA Special Rule by 2004 as well as ACP are Benin, Botswana, Cameroon, Cape Verde, Ethiopia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Swaziland, Tanzania, Uganda, and Zambia. The top seven exporters are Botswana, Cameroon, Ghana, Kenya, Lesotho, Madagascar, Namibia, Nigeria, and Swaziland.

Source: Authors’ calculations on data from COMTRADE.

**Figure 1(b).** Apparel Exports to the United States from Top Seven African Exporters

Notes: Vertical lines indicate year of entry of the AGOA and of the Special Rule. The year of entry into effect of the AGOA is 2000 for all countries (full line). The year of entry of the Special Rule for Kenya, Lesotho, and Madagascar is 2001 (dotted line). The year of entry of the Special Rule for Botswana, Malawi, and Swaziland is 2002 (dashed line).

Source: Authors’ calculations on data from COMTRADE.
States introduced a special regime, the “third-country provision,” which consists of allowing the use of fabric from any origin in the making of apparel (rather than requiring U.S. fabric originating domestically or from the United States). In contrast, the unchanged environment of EU preferential regimes still required European or locally produced fabric. To our knowledge, this is the first such estimate.

Controlling for other factors, estimates show that relaxing RoO by allowing the use of fabric from any origin increased apparel exports to the United States by approximately 168 percent for the top seven (out of 22) qualifying African exporters in the group. We attribute the lack of supply response in the other countries receiving the AGOA’s Special Rule to institutional weakness. These estimates are based on product-level exports at the HS-4-digit level for knitted apparel (Chapter 61) and nonknitted apparel (Chapter 62) over the 1996–2004 period, when the United States relaxed the origin requirement for African apparel with the Special Rule, to be described shortly. In addition to this increase in exports, a higher rate of new products was exported to the United States than to the EU at the HS-6-level during this period.5

The paper proceeds as follows. Section 2 describes the conditions for preferential access of African apparel to the U.S. and EU markets and the introduction of the Special Rule under the AGOA. Section 3 describes the timing of the introduction of the Special Rule and the evolution of aggregate exports of textiles and apparel. The remaining sections examine estimates at the disaggregate level (HS-4 or HS-6 levels) to capture the effects of technical requirements defined at the HS-4 level in textiles and apparel. Section 4 presents the data and the econometric strategy to address the many zero observations in the sample. Section 5 reports the results of disentangling the effects of the Special Rule from those following from the reduction in tariffs in the U.S. market. Section 6 studies the evolution of new apparel varieties during the period using a count model. Section 7 concludes.

I. Qualifying for Preferential Market Access under EU and U.S. Preferences in Textiles and Apparel

What follows is a brief description of origin requirements under EU and U.S. preferential regimes granted to African exporters of apparel.

5. Strong response to a reduction in fixed costs associated with meeting origin requirements is also obtained by Cherkashin et al. (2010), who study the effects of granting preferences with and without RoO for exports of woven apparel from Bangladesh. Their study is of a cross-section of 200 Bangladeshi firms (data collected over the 1999–2004 period) exporting woven textiles to the EU and U.S. markets under much the same assumptions as ours: all production is for exports, and exports are destined to either the EU or the U.S. market, or both. They estimate that a $1 reduction in fixed costs would generate an increase in exports in the range of $10–40, and they conclude that easy-to-obtain preferences, reduction in fixed costs, or both may have a catalytic effect and that preferences need not divert trade from other markets, as predicted in a setting with no fixed costs. Although the methodology is different and they do not study the costs of RoO in a dynamic context panel like this study, the magnitude of their estimates are in line with ours.
Market Access to the EU: Apparel under the Generalized System of Preferences and Everything but Arms

Since 1971, the Generalized System of Preferences has provided nonreciprocal preferential access to the EU market. For textiles and apparel, the product-specific RoO required that apparel should be manufactured from qualifying yarn (i.e., yarn originating in the country or in the EU). Production from yarn requires that a double-transformation process (yarn → textile → apparel) must take place in the beneficiary country, with the yarn being woven into fabric and then the fabric being cut and made into clothing.  

Market Access to the United States: Apparel under the AGOA

Operational since the second semester of 2000, the AGOA provides tariff-free access for a group of 22 African countries, a nonnegligible market access because many goods are excluded from the United States (Generalized System of Preferences) (e.g., watches, footwear, handbags, luggage, work gloves, and apparel). Thus, unlike beneficiaries of U.S. Generalized System of Preferences, the AGOA beneficiaries do not pay the U.S. MFN tariff of 11.5 percent. Initially, RoO for apparel under the AGOA applied the triple-transformation process used for NAFTA and other U.S. preferential schemes. That is, apparel had to be assembled in one or more AGOA-eligible countries from U.S. fabrics (or African-country fabrics up to a specified percentage), which were made from U.S. yarn in the “yarn-forward” rule. The Special Rule for 22 African countries (mostly LDCs), starting in 2001 for most countries (see table 1 below for the date of entry into force), relaxed this triple-transformation rule (cotton → yarn → textile → apparel) by conferring duty-free access to apparel regardless of the origin of the fabric (cotton, yarn, textile) used to produce it. In effect, meeting origin requirements under the AGOA’s Special Rule only required the application of a single-transformation requirement (fabric → apparel).

II. The Special Rule and Export Trends

Average MFN tariffs for apparel for the United States (11.5 percent) and the EU (11.0 percent) were very close throughout the 1996–2004 period. Thus, the preferential margins (equal to the height of the MFN tariff because African exporters had duty-free access to EU and U.S. markets) were very similar once the AGOA became operative. By the end of 2004, 22 countries benefited from the Special

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6. Under the EU’s “Single List” (also called “PANEURO”), in operation since 2000, the EU Generalized System of Preferences accepted bilateral cumulation between the EU and a beneficiary country (cumulation provisions allow contracting parties to use intermediate goods from each other without losing origin status). Similar rules were applied for Everything But Arms and Cotonou regimes, leading us to combine EU imports under both schemes in table 1 (see de Melo and Portugal-Perez (2008) for details).

7. Two categories of apparel are considered: (i) knitted apparel (HS-61) and (ii) nonknitted apparel (HS-62).
Rule under the AGOA. The list of AGOA beneficiaries is presented in table 1, which also reports the utilization rate of preferences across apparel products for each of these 22 countries when exporting to the EU (under Everything But Arms or Cotonou) and when exporting to the United States under the AGOA. Countries with an important volume of exports to either destination have a high rate of utilization of preferences. Therefore, taking the 22 countries as a group, the utilization of preferences was 97.6 percent for the AGOA and 91.2 percent for Everything But Arms or Cotonou.

Export volumes, growth rates of exports, utilization of preferences, and the year of entry of the Special Rule are all indicated in table 1 in descending order of the market share to the United States in 2004. Not surprisingly, the ranking of exporters to the United States is different from the ranking of exporters to the EU. The differences partly reflect the importance of language in trade. For exports to the United States, they also reflect that English-speaking countries accepted the AGOA opportunity earlier. Except for Madagascar, the growth rate of exports to the United States has increased for all of these major exporters. Note also that the seven major exporters are among the early recipients of the Special Rule, with three major exporters benefitting from it in 2001. Growth rates for countries with market shares in the United States below 1 percent fluctuate significantly.

Yet, despite these high utilization rates under both schemes, export volumes evolved quite differently across the two destinations. Figure 1(a) shows the evolution of export volumes for the 22 AGOA beneficiaries and for the top seven exporters, the focus of our estimates. Figure (1b) shows the evolution of apparel exported to the United States by each of the top seven exporters. The data are aggregated over a potential of 111 knitted (CH-61) and 118 nonknitted (CH-62) apparel products defined at the HS-6-digit level. Trends for knitted and nonknitted apparel were similar for both countries, with U.S. imports of knitted apparel (less sensitive to the double-transformation rule) growing more rapidly (not reported in the figures) Figure 1(b) shows the sharp increase in apparel exports starting at about 2000 (the year the U.S. tariff was set to zero for AGOA beneficiaries) and 2001 (the year the Special Rule entered into force for Kenya, Lesotho, and Madagascar, the three largest exporters of apparel to the United States; see table 1). Figure 1(b) also shows a large drop in exports from Madagascar in 2002, a year of political turmoil following a contested presidential election.

Two trends are apparent in the raw data. First, prior to 2000, the paths of African apparel exports to the United States and the EU are alike. As shown in figure 1(a) and especially in figure 1(b), apparel exports to the United States increased substantially, with the timing of the change in the growth path coinciding with the entry into force of the AGOA in 2000 and of the Special Rule in 2001. By contrast, the value of exports to the EU for this same group of countries remained relatively flat from 1996 to 2000 and then declined, mainly because of the political crisis that hit Madagascar, the largest exporter to the EU at the end
of 2001. Second, exports to both markets are dominated throughout by the seven large exporters, who follow quite similar trends in both markets. The lack of export response by the other countries is discussed later.

Because this paper seeks to estimate the effects of moving from the triple-transformation rule to the single-transformation rule, it is important to attempt to disentangle the relative importance of removing tariffs alone from subsequently moving to the single-transformation rule. Initially, the log of the aggregate exports apparel (HS-61 and HS-62) is regressed on a time trend, country fixed effects (FE), and two dummy variables, one taking the value of one starting in 2000 when the United States removed the MFN tariff on apparel exports from the AGOA beneficiaries and the other taking the value of one starting the year the single-transformation rule was adopted in the country. The time trend coefficient estimate is significant and shows an average growth of 22 percent per year over the period for the 22 countries. Unfortunately, but not surprisingly, the results were disappointing because significant estimates for the coefficients on the dummy variables capturing the effects of the AGOA (with the triple transformation) and of the passage to the special rule could not be obtained. Two reasons account for this. First, the time series for each country only spans nine years. Second, there are large year-to-year fluctuations, especially for the less significant exporters (see the average growth rates of exports in the last column of table 1).

In any event, these estimates do not take into account that RoO vary across products, nor do they take into account exports to the EU, the change in preference margins in the U.S. market (which was different across products), or other changes in the EU and the U.S. markets. Data permitting, a satisfactory approach might be to develop a fully structural model in which heterogeneous firms decide whether to enter the textile market and then select a destination (i.e., the EU, United States, or both) and finally decide under which trade regime to export (i.e., under a preferential regime with fixed costs associated with proving origin or under MFN with no fixed costs).9

8. In both the United States and the EU, apparel imports from AGOA countries as a share of all apparel imports were small, constituting less than 0.1 percent throughout the period. Indeed, AGOA apparel imported by the EU as a share of all its apparel imports decreased by half, from 0.012 percent in 2000 to 0.006 percent in 2004. However, AGOA apparel as a share of all apparel imported by the United States more than tripled, from 0.027 percent in 2000 to 0.090 percent in 2004.

9. This is the route followed by Cherkashin et al (2010). They rely on cross-sectional data only for estimation, which does not allow them to directly address the effects of change in RoO, as we do here. Their identification relies on assuming (rather than estimating) that costs associated with meeting origin requirements increase unit production costs by 15 percent, that obtaining a quota license to sell to the United States under the MFA costs 7 percent, that decisions about entry into each market are made separately, and that expenditures for Bangladeshi goods come entirely at the expense of expenditures from other exporters. In any case, to fit a structural model to the exports of apparel by several African countries to the EU and U.S. markets would require firm-level data that was collected by the authors of the Bangladesh study but that are not available for any of the AGOA beneficiaries.
The alternative to a structural model is to “let the data speak” in a less ambitious framework. In de Melo and Portugal-Perez (2008), we sketch such a model, in which a representative apparel producer sells all its production to either the U.S. or the EU market or to both under preferential status (these are the two main export destinations for AGOA beneficiaries). The producer sells differentiated products (or, because we do not have firm data, heterogeneous firms sell a homogenous product to both markets with fixed entry costs to each market). The firm uses textiles as an input and faces a downward-sloping demand curve in each of the two destination markets. Under the single-transformation (“third-country provision”) rule introduced by the Special Rule, the firm chooses its textiles from the low-cost suppliers, whereas under the double- or triple-transformation rules, it is forced to purchase textiles from the high-cost partner. The comparative statics of the model show that export sales to a market respond positively to (i) a fall in tariffs (i.e., an increase in preferential access under the AGOA to the United States) and (ii) a relaxation of the rule of origin, which lowers its production costs.

III. Data and Econometric Strategy

After describing the specification, this section presents our data and our econometric strategy.

Specification

The model sketched above suggests that, after controlling for idiosyncratic factors in each market, export sales of individual apparel products to EU and U.S. destinations should depend on changes in preferential access, measured by changes in the preferential margin \((tmar)\), and changes in the RoO. For the EU and the United States, RoO in textiles and apparel are defined at the HS-4 level. They include the double- and triple-transformation criteria described above along with other value-content (VC) requirements. Because only a subset of apparel varieties is exported, the sample is censored. The following log linear relationship is estimated:

\[
\ln \left( a_v + X_{i,t} \right) = \beta_1 \left( tmar_{i,t}^{US} \right) \left( TT_{i,t}^{US} \right) + \beta_2 \left( tmar_{i,t}^{US} \right) \left( SR_{i,t}^{US} \right) + \beta_3 \left( VC_{i,t}^{EU} \right) + \beta_4 D_{i}^{Mad-02} + \sum_{j \in J} \sum_{k \in K} \delta_{j,k} \left( D_j^i \times D_k^i \right) + \epsilon_{i,t},
\]

\( j \in J = \{7(\text{or} \ 22) \text{ African exporters} \} \)

\( k \in K = \{\text{EU, US}\} \)

\( t = 1996, \ldots, 2004 \)

\( i = 1, \ldots, 34 \in (\text{CH61} - \text{CH62}) \)
where $X_{i,t}^{j,k}$ are exports of apparel variety $i$ from African country $j$ to market $k$ (EU or United States) in year $t$, $a_V$ is a parameter used to avoid truncation of the dependent variable to be estimated (see below); $tmar_{i,t}^{j,k} = \frac{tmfn_{i,t}^{j,k} - tPref_{i,t}^{j,k}}{1 + tmfn_{i,t}^{j,k}}$ is the preferential margin for country $i$ on product $j$ sold in market $k$ in year $t$. In the EU, African exporters obtained duty-free access, so $tPref_{i,t}^{j,k} = 0$ and $tmar = tmfn / (1 + tmfn)$ for 1996–2004. In the United States, African exporters of apparel paid the MFN tariff over the 1996–1999 period, $tPref_{i,t}^{j,k} = tmfn_{i,t}^{j,k}$ and $tmar = 0$, and then obtained duty-free access starting in 2000, so $tPref_{i,t}^{j,k} = 0$ and $tmar = tmfn / (1 + tmfn)$ over the period 2000–2004. Here, $\beta_1$ captures the effects of preferences on exports of variety $i$ under the triple-transformation rule until the date when countries qualify for the Special Rule under the AGOA. For the EU, because the preferential margin is virtually unchanged and is equal to the MFN rate throughout the period, the only change in preferential access to be considered comes from a relaxation of the value content rule (see below). $TT_{i,t}^{j,US}$ is a dummy variable that is set to one when exports of country $j$ are subject to the triple-transformation rule of the AGOA. $SR_{i,t}^{j,US}$ is a dummy variable that is set to one when the single-transformation rule becomes operative for country $j$’s exports and replaces the triple-transformation rule (starting in 2001 for three countries and in 2002 for four countries; see table 1). Here, $\beta_2$ captures the reduction in export costs from moving to the Special Rule on exports of variety $i$ from country $j$. Interaction with the $tmar$ variable allows for the elimination of the triple transformation on export growth to depend on the height of the preferential margin. $VC_{i,t}^{j,EU}$ is a dummy variable accounting for the change in RoO under EU preferences, which consisted of a less restrictive cumulation rule for some nonknitted apparel (HS-62) allowed from 2000 onward. It takes the value of one if variety $ii$ is subject to an alternative (or optional) less restrictive regional VC rule allowing apparel that does not qualify for cumulation, provided that its value does not exceed 40 percent (or, in some cases, 47.5 percent) of the product price in year $t(\geq 2000)$ when exporting on a preferential basis to the EU, and zero otherwise. Here, $\beta_3$ captures the reduction in costs for exports to the EU from moving to a less restrictive RoO. $D_{i,t}^{Madag-02}$ is a dummy taking the value of one for Madagascar’s export loss in 2002 provoked by its political crisis. $D_{j}[D_{k}]$ is a dummy variable controlling for unobserved time-invariant FE by exporter $j$ [importer $k$], such as distance or a common language (due to multicollinearity, export- or import-specific dummies cannot be included in the model). $\epsilon_{i,t}^{j,k}$ is the error term.

The expected signs for the coefficients are $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, and $\beta_4 < 0$. In addition, the effect on exports of the single transformation is expected to be larger than the effect of the triple transformation, that is, $\beta_2 > \beta_1$. 
Data

The model is estimated for 34 varieties of apparel at the HS-4-digit level for two samples, one for the seven major exporters and another for all 22 beneficiaries. The panel covers the 1996–2004 period, which coincides with the removal of quotas set at the end of the Agreement on Textiles and Clothing on January 1, 2005. Although the choice of the period was constrained by data availability, the episode is convenient because there is no need to control for the removal of quotas at the end of the Agreement on Textiles and Clothing. In a postquota world, U.S. and EU markets are expected to be flooded by apparel from larger exporters, such as China and India, which were previously bounded by quotas. Export data and tariff data were compiled from IDB-WTO and TRAINS/WITS at the HS-6-digit. The discussion paper version (de Melo and Portugal-Perez, 2008) provides details and descriptive statistics for the sample. However, because 95 percent of the volume of apparel exports is accounted for by the seven major exporters, we report results of estimates on this reduced sample where data quality is arguably superior not only because there are positive aggregate exports by each country every year but also because these countries export a larger number of products.

Econometric Strategy

Two constraints guided our estimation strategy. First, a lack of plausible instruments at the detailed product level precluded us from implementing a two-stage procedure in which a decision to export a specific apparel product to a given destination is made in a first step, and then a decision is made on volume in a second step.10 Second, we were confronted with a large number of zero exports (or zeroes) in the data disaggregated at the HS-6 level: 95 percent were zero observations for the whole sample of 22 exporters; and 86 percent, for the reduced sample of the top seven exporters. However, the product-specific RoO under the AGOA were defined at the HS-4 level, and the VC rule under EU preferences was defined at the HS-4 level. This led us to aggregate data at the HS-4 level. As a result, the number of zero trade flows was reduced to 60 percent of observations for the top seven exporters.

Because this is still a large number of zero observations, we address it by contrasting several estimators in table 2. Two benchmark estimates are reported. Column 1 reports ordinary least squares (OLS) estimates with \( \ln(X_{i,t}^{j,k}) \) the dependent variable, which considers observation of positive-only exports,11 and

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10. Ideally, one would want to implement a two-stage procedure in which a decision to export a specific apparel product is made in a first step, and then, in a second step, a decision is made about volume and destination. To satisfy the exclusion restriction in such a two-stage Heckman estimation method would require an appropriate exogenous instrument that would influence only the decision to export in the first stage and not the volume of exports in the second stage. Such an instrument is not available at this level of disaggregation.

11. Another benchmark (reported in de Melo & Portugal-Perez, 2008) is to shift all export values up by one unit (i.e., fixing \( a_i = 1 \) in equation (1)) before applying the logarithmic transformation and proceeding with OLS (see, for instance, Frankel et al. (1997)). The results are close to those reported in column 1 of table 2. Although this approach has the advantage of including all observations, it does not solve the problem of the inconsistent resulting estimates.
column 2 reports Tobit estimates. To overcome the sensitivity of estimates to the arbitrary choice of the parameter $a_v = 1$ in the standard Tobit, column 3 reports estimates from the maximum likelihood estimator proposed by Eaton and Tamura (1994). This estimator endogenizes the choice of the $a_v$ parameter (this is referred to as the ET-Tobit estimator). Thus, the dependent variable will be censored at the value $\ln(a_v)$.

However, estimates from Tobit models rely on assumptions of normality and homoskedasticity of errors, which are rejected by statistical tests in our data and model (see below), so the estimates are inconsistent. One solution is to resort to the increasingly popular Poisson Pseudo Maximum Likelihood (PPML) estimator proposed by Santos Silva and Tenreyro (SS-T) (2006). The PPML estimator addresses heteroskedasticity in constant-elasticity models and is found to perform well in gravity models where there are zero flows. Using Monte Carlo simulations, SS-T show that that the PPML estimator produces estimates with the lowest bias for different patterns of heteroskedasticity for a data-generating process relying on a cross-section. Results with the PPML are reported in column 4.

However, the PPML has not been tested in a panel data context, and it has shortcomings. For example, Martin and Pham (2008) have noted that the data-generating process used by SS-T did not produce zero values properly. When correcting the data-generating process to obtain a sample with an important number of zero-value observations (a situation closer to ours), Martin and Pham find that the ET-Tobit estimates have a lower bias than those obtained with the PPML estimator.

Thus, we implement the trimmed least absolute deviations (LAD) estimator for limited dependent variable models with FE proposed by Honoré (1992), maintaining $\ln(a_v + X_{i,t}^{j,k})$ as the dependent variable. This estimator has the advantage of being consistent and asymptotically normal. Therefore, it is not necessary to assume a parametric form for the errors (such as normality) or to assume homoskedasticity, both of which are rejected by the data. Given the large number of zeroes in the data and the rejection of the usual assumptions about the errors, it would appear that, on a priori grounds, the LAD estimator is the preferred estimator. In our case, it also produces the most plausible coefficient estimates. For example, although the PPML produces an estimate of the Special Rule coefficient that is closest to the one estimated by the trimmed LAD method, some of the other coefficient estimates do not have expected signs or reasonable magnitudes. For these reasons, the results in column 5 with the trimmed LAD estimator are retained as the preferred set of estimates. Additional estimates in table 3 are based on this estimator.

12. As discussed below, the value of estimated coefficients is very sensitive to the choice of $a_v$, especially $\beta_1$ and $\beta_2$.
13. In their simulations, SS-T (2006 and 2011) do not assess the performance of the PPML in either a panel context or in the presence of omitted variable bias, measurement error, or both. In addition, the Trimmed LAD estimator for Tobit models used here is not considered a contender to the PPML estimator in the simulations reported by SS-T.
Table 2. Elasticity of Exports to Changes in Rules of Origin

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regressors</td>
<td>ln(X(&gt;0))</td>
<td>ln(1 + X)</td>
<td>ln(a_v + X)</td>
<td>lnX</td>
<td>ln(a_v + X)</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>Tobit</td>
<td>ET-Tobit</td>
<td>PPML</td>
<td>FE Tobit</td>
</tr>
<tr>
<td>TT_{US} \times tmar_{i,t} (&gt;0)</td>
<td>0.06 [0.02]**</td>
<td>0.4 [0.08]**</td>
<td>0.14 [0.03]**</td>
<td>0.06 [0.01]*****</td>
<td>0.04</td>
</tr>
<tr>
<td>SR_{EU} \times tmar_{i,t} (&gt;0)</td>
<td>0.15 [0.02]**</td>
<td>0.88 [0.07]**</td>
<td>0.33 [0.02]**</td>
<td>0.15 [0.01]*****</td>
<td>0.16</td>
</tr>
<tr>
<td>VR_{i,t} (&gt;0)</td>
<td>-0.45 [-0.26]*</td>
<td>0.39 [0.61]</td>
<td>0.03 [0.17]</td>
<td>-0.39</td>
<td>0.35</td>
</tr>
<tr>
<td>VR_{i,t} (&gt;0)</td>
<td>-0.23 [-0.11]**</td>
<td>-1.45 [-0.80]*</td>
<td>-0.61 [0.26]**</td>
<td>-0.65 [0.20]*****</td>
<td>-0.29 [-0.10]**</td>
</tr>
<tr>
<td>a_v (&gt;0)</td>
<td>8386.02 [898.8]**</td>
<td>66%</td>
<td>440%</td>
<td>11%</td>
<td>16%</td>
</tr>
<tr>
<td>Ramsey RESET test</td>
<td>0.05</td>
<td>0.027</td>
<td>0.649</td>
<td>0.001</td>
<td>0.186</td>
</tr>
<tr>
<td>Observations</td>
<td>1697</td>
<td>4284</td>
<td>4284</td>
<td>4284</td>
<td>4284</td>
</tr>
<tr>
<td>R^2</td>
<td>0.34</td>
<td>0.34</td>
<td>0.35</td>
<td>0.09</td>
<td>0.37</td>
</tr>
<tr>
<td>Approx. change in exports due to TT at tmar_{i,t} US = 11%</td>
<td>66%</td>
<td>440%</td>
<td>154%</td>
<td>66%</td>
<td>44%</td>
</tr>
<tr>
<td>Approx. change in exports due to the Special Rule at tmar_{i,t} US = 10.5%</td>
<td>158%</td>
<td>924%</td>
<td>347%</td>
<td>158%</td>
<td>168%</td>
</tr>
</tbody>
</table>

Notes: See equation (1) for definition of regressors. Standard errors in brackets are clustered at the exporter-importer-year level. The dependent variable is \( X = X_{i,k}^{j} \) exports of apparel variety \( i \) at the HS-4 level of aggregation from \( j \) (top seven AGOA exporters) to \( k \) (United States or EU) in year \( t \). All regressions include exporter dummies as well as interaction terms between exporter dummies and EU dummies. TT indicates the triple transformation.

a Expected signs from estimated coefficients are in parenthesis.

b R^2 values are the square of the correlation between the fitted and the actual value of the dependent variables.


d \( p \) values reported here. Low \( p \) values (e.g., below 0.1) indicate misspecification.

Source: Authors’ analysis based on data described in the text.
IV. Results

Table 2 presents the main results of estimating equation (1) with the last two rows reporting the estimated change of exports to the triple transformation at an average preferential margin of 11 percent and to the introduction of the single rule at an average preferential margin of 10.5 percent for each estimator. Column 1 reports the truncated OLS method. Not all coefficients have the expected sign: the coefficient of VC is negative and nonsignificant. Switching from the triple to the simple transformation rule is estimated to boost apparel exports from 66 percent to 158 percent.

Columns 2 and 3 report estimates for the “standard” Tobit (with $a_v = 1$) and the ET-Tobit, which account more appropriately than OLS for corner solution outcomes of the dependent variable. The overall fit for the models summarized in the likelihood-ratio values and the $R^2$ values (at the bottom of the table) are reasonably good. All coefficients now have the expected sign and are significant, but the estimated values of $\beta_1$ and $\beta_2$, which are very sensitive to the choice of $a_v$ used to avoid truncation, are implausible. Indeed, estimates for $\beta_1$ and $\beta_2$ become smaller as $a_v$ increases. ET-Tobit estimates reported in column 3 include an estimate of the value of $a_v$ that best fits the data. As observed by comparing the results in columns 2 and 3, the “quick fix” approach should be avoided, at least when there are many zero values for the regressand. All coefficient signs are as expected. Although the parameter values are more plausible, they are still on the high side.

Recall that Tobit models (columns 2 and 3) rely on the assumptions of normality and homoskedasticity of errors. Unfortunately, statistical tests reject normality and homoskedasticity of errors in both models. Column 5 reports estimates when applying the PPML to address heteroscedastic errors. Adopting the single-transformation rule is now estimated to increase exports to 158 percent. There is, however, a sign reversal for the VC coefficient.

Finally, column 5 reports the LAD estimates that do not require normality of errors or homoskedasticity. All the coefficients have the expected sign, are statistically significant, and have plausible values, including the estimates for $\beta_1$ and $\beta_2$. Moving from the triple- to the single-transformation requirement increases imports from 44 percent to 168 percent. The presence of the alternative VC

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14. Pooled Tobit models are estimated. Their hypothesis is that the structure of the error term is uniform across exporters and years. This assumption is defensible insofar as African exporters in our sample arguably have a similar structure. Moreover, as discussed by Woodridge (2002), the Tobit is flexible and can accommodate many categories of independent variables, such as time dummies, interactions of time dummies with time-constant or time-varying variables, or lagged dependent variables.

15. The standard Lagrange multiplier tests of homoskedasticity and normality of errors for Tobit models are used here. See Cameron and Trivedi (2009) for more details on how to implement the tests in Stata. The $p$ values of the Lagrange multiplier tests for both Tobit (column 2, table 2) and ET-tobit (column 3, table 2) are small (values of about 0.001). Thus, the tests reject homoskedasticity and the normality of errors.


Table 3. Additional Estimates and Robustness Checks

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>1 Temporal ln(a_v + X) FE Tobitc (Trimmed LAD)</th>
<th>2 Country-specific ln(a_v + X) FE Tobitc (Trimmed LAD)</th>
<th>3 Alternative Special Rule ln(a_v + X) FE Tobitc (Trimmed LAD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR_{1,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.1 [0.01]*** 105%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SR_{2,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.05 [0.01]*** 53%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SR_{3,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.05 [0.01]*** 53%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SR_{4,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.03 [0.01]*** 32%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di_{Bo} × SR_{i,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.07 [0.02]*** 74%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di_{Ke} × SR_{i,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.18 [0.02]*** 189%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di_{Bo} × SR_{i,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.14 [0.02]*** 147%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di_{Ma} × SR_{i,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.22 [0.03]*** 231%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di_{Na} × SR_{i,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.13 [0.03]*** 137%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di_{Na} × SR_{i,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.15 [0.04]*** 158%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di_{Swa} × SR_{i,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.22 [0.02]*** 231%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASR_{i,t}^{US} × tmar_{i,t}^{US} b</td>
<td>0.15 [0.01]*** 158%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATT_{i,t}^{US} × tmar_{i,t}^{US}</td>
<td>0.04 [0.01]*** 44%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>4,284</td>
<td>4,284</td>
<td>4,284</td>
</tr>
<tr>
<td>R^2</td>
<td>0.37</td>
<td>0.38</td>
<td>0.37</td>
</tr>
</tbody>
</table>

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Notes: The specification also includes all the variables included in regressions in table 2, which are not reported here to save space. All estimates include exporter dummies as well as interaction terms between exporter dummies and EU dummies and the other regressors in table 2 (not reported to save space). Bootstrapped standard errors are in brackets. Standard errors in brackets are clustered at the exporter-importer-year level.

a R^2 values are the square of the correlation between the fitted and the actual value of the dependent variables.

b ASR_{i,t}^{US} = 1, for t ≥ t^*, where t^* = 2001 for Madagascar, Lesotho, and Kenya and t^* = 2002 for Swaziland, Namibia, Botswana, and Malawi; ASR_{i,t}^{US} = 0 otherwise.

c Trimmed LAD estimator (see table 3).

Source: Authors’ analysis based on data described in the text.
requirement for some nonknitted apparel is associated with an increase in exports of 35 percent.

These estimates may still appear to be on the high side. However, African exports to the United States were very low before the Special Rule, accounting for less than 0.001 percent in both the EU and U.S. markets. This low base must have contributed to the large elasticity responses. Regarding the different estimates reported in table 2, in addition to yielding more reasonable estimates, the R² value for the Trimmed LAD estimator is higher than for the PPLM and passes Ramsey’s RESET test for model misspecification. In sum, the Trimmed LAD estimator outperforms the PPML, at least for this panel data set, where there many zero values and the estimates are likely to be contaminated by the presence of omitted variable bias, measurement error, or both.16

Additional Estimates and Robustness Checks

Table 3 presents the cumulative effects of the AGOA Special Rule on exports by including three additional dummy variables \( SR_{i,t}^{2,US} \), \( SR_{i,t}^{3,US} \) and \( SR_{i,t}^{4,US} \) interacted with the preferential margins to equation (1). These variables capture the supplementary or cumulative effects on exports of each additional year under the Special Rule program. Thus, \( SR_{i,t}^{2,US} \) is equal to one if country \( j \) is at least in the second year after being entitled to the Special Rule, and zero if not. The same applies for \( SR_{i,t}^{3,US} \) and \( SR_{i,t}^{4,US} \). Then, the coefficient of \( SR_{i,t}^{1,US} \) no longer captures the average effect on exports of benefiting from the Special Rule, but only the effect of being in the first year under this program. To save space, coefficient estimates for VC and for the dummy for Madagascar are not included in the table because they are similar to baseline estimates.

Column 1b reports the approximate increase of exports computed from estimates of the dummy coefficients in column 1a evaluated at an average preferential margin of 10.5 percent. The largest change in exports is registered during the first year, suggesting that preferential exports increased immediately after the implementation of the Special Rule. This result is what one would expect in clothing, where fashion changes rapidly from season to season and input requirements change constantly, so relaxing input requirements has an immediate effect on exporters. A country reaching the second year under the Special Rule has an average additional increase in exports of 53 percent. Countries reaching the third and fourth years under the Special Rule further increase their exports under the AGOA by an additional 53 percent and 32 percent, respectively. Notice that according to these estimates, the total effect on exports of benefiting from the Special Rule for four years is 242 percent, a figure larger than the average effect of 168 percent

16. At the end of their answer to Martin and Pham (2008), Santos-Silva and Tenreyro (2010) affirm, “The PPML estimator can certainly be outperformed in some situations, and we very much welcome the scrutiny of our results.” Simulations using data-generating processes in SS-T (2006 and 2010) fail to assess the performance of the PPML in a panel context and in the presence of omitted variable bias, measurement error, or both and do not consider the Trimmed LAD estimator for Tobit models. We conclude that this justifies the approach used here.
estimated in column 5 of table 2 because only three exporters in our sample make it to the fourth year.

Columns 2a and 2b show the differential effect of the single-transformation rule across the seven exporters. The effect for all countries is positive. The effect of the Special Rule on exports from Kenya, Madagascar, and Swaziland are found to be the largest. The different performance among receivers of the Special Rule begs the following question: why were some African countries so much more successful at taking up preferences and experiencing higher export growth in apparel? A possible explanation lies in the business environment of a country that may be more conducive to attracting foreign investment in apparel plants and to diminishing trading and other fixed costs, which can be proxied by a country’s rank in the World Bank “Doing Business” (DB) indicator.17 Figure 2 presents the DB18 ranking of African countries benefiting from the Special Rule and their apparel export growth during the AGOA (measured by the difference of exports (in logs) at 2004 and at the beginning of the AGOA). On average, countries that are highest ranked along the DB indicator experience higher growth in apparel exports during the AGOA, and the correlation coefficient ($\rho = -0.55$) is highly significant.

Recall that the Special Rule dummy is set equal to one if a country benefits from the rule for at least nine months. Botswana and Malawi were eligible for the Special Rule from August 2001, whereas Swaziland was eligible from July 2001, so the effect may already be reflected in the export data from 2001 onward. Column 3 reports the export elasticity estimate at an average preferential margin when the dummy, $RA_{j,k,i,t}$, is equal to one from 2001 onward for Botswana, Malawi, and Swaziland and remains unchanged for other countries19. Compared to the baseline estimates, the estimated impact of the Special Rule on exports decreases slightly, from 168 percent to 158 percent.

Finally, the results hold for the following robustness checks (available upon request). First, the estimations reported in table 2 are replicated for two samples: a sample of 16 countries with positive aggregate exports for each year and the full sample of 22 countries. With few exceptions, the estimates are globally close to those in table 2. As expected, the dummy for turmoil in Madagascar in 2002 loses significance when all 22 countries are

---

17. The indicator, available in the form of a ranking for 178 countries, is a simple average of the regulations affecting ten stages of a business’ life: starting a business, dealing with licenses, employing workers, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts, and closing a business. Because it is quantitative rather than subjective, the indicator is less subject to bias than the more widely used indicators of governance.

18. DB data for 2008 released on June 1, 2008, are used because they include more African countries in the sample than reports in previous years. For instance, DB 2006 coverage is limited to six out of the 22 African countries. However, for these six countries, the relative ranking of DB 2008 does not change significantly with respect to DB 2006.

19. In other words, $RA_{j,k,i,t} = 1$ for $t \geq t^*$ where $t^*$ = 2001 for Madagascar, Lesotho, and Kenya and $t^* = 2002$ for Swaziland, Namibia, Botswana, and Malawi; $RA_{j,k,i,t} = 0$ otherwise.
included in the sample. However, more surprisingly, the coefficient value of the VC dummy is now larger than the one for the Special Rule, which might reflect the inclusion of a large number of small countries that were not successful in adopting preferential market access under the Special Rule context. Second, unobserved year-specific effects are controlled for by adding time dummies to the model. None of their coefficients was significant, as if no unobserved effect specific to a single year was left unexplained by all other dependent variables. Third, we checked for the possibility that omitted variable bias and measurement error could have led to our large estimated values. Thus, separate estimates are performed for knitted (Chapter 61) and nonknitted apparel (Chapter 62). Because the paths of knitted and nonknitted apparel were very similar, it is not surprising that a dummy variable distinguishing between the two was not significant. A variable to capture the effects of fluctuations in the dollar-to-Euro real exchange rate was also added. The estimated coefficient was insignificant despite the strong depreciation of the dollar to the Euro during the period.

**Figure 2. Apparel Export Growth and the Business Environment**

Notes: A higher indicator value in the DB rank indicates a less favorable environment. Fitted values for the regression line in the figure are (standard errors in parentheses)

\[ \text{Ln}(\text{exp04}) - \text{Ln}(\text{exp01}) = 5.86 - 0.37(\text{DB\_rank}). \]

\[ (1.61) \quad (0.12) \]

Number of observations: 21; Adjusted R^2 = 0.28.

Source: Authors’ analysis based on data from DB and COMTRADE.
V. COUNT MODEL ESTIMATES

To further explore the effect of the Special Rule on the growth of apparel exports at the extensive margin (i.e., exporting new products rather than expanding the volume of existing export products at the intensive margin), the number of apparel varieties is computed at the HS-6-digit level exported by country $i$ to country $j$ at time $t$, $h_{ij}^t$. We begin by assuming that, conditional on a matrix of regressors $X = [X_{it}]$, the count $h_{ij}^t$ follows a Poisson distribution with parameter $\lambda_{it} = \exp (X_{it}\beta)$. The set of regressors, $X$, includes the preferential tariff in market $k$, $t_{k,mfn}^t$, the Special Rule dummy, $R_{i,k}^t$, and income in market $k$, $Y_k^t$.

Figure 3 displays the estimated kernel densities of exported varieties when observations are broken down along market destination and along the date of entry into force of the AGOA’s Special Rule, with the exclusion of the outlier Madagascar (including Madagascar does not change the general pattern, except for a longer tail). The kernel is right skewed, suggestive of a Poisson distribution. As expected, the mass of the distribution is displaced to the right when the Special Rule entered into force, implying that more varieties were exported, on average, to each market. However, this transfer is more accentuated for varieties exported to the United States than for varieties exported to the EU. Although we are not able to attribute these patterns to firm entry into the market, they are in accordance with those reported in Cherkashin et al. (2010), where a reduction in fixed costs leads to the entry of firms into the market.

There are two problems with estimating the log-likelihood function associated with the Poisson regression model. First, it is likely that there is heterogeneity across countries, which can be handled by using FE or random effects. Second, the Poisson requires that the mean and variance of the count be equal, or there is overdispersion. This is not the case in our data (see the results from the overdispersion test in table 4). Thus, Poisson regression model estimates are robust but inefficient, with downward-biased standard errors. This inefficiency can be corrected by using the negative binomial regression model (NBRM). Hence, the estimates from pooled FE and random effects with the NBRM are reported in table 4.20

With the exception of ln(GDP) in the export market, which is insignificant, all coefficients have the expected sign and are significant. According to these estimates, the percentage increase in the number of apparel varieties exported following the implementation of the AGOA’s Special Rule ranges from a minimum of 39 percent ($= \exp(0.33) - 1$) to a maximum of 61 percent ($= \exp(0.48) - 1$). Because the number of varieties exported by these African countries is small

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20. The NBRM generalizes the Poisson model by reparametrizing the parameter in the Poisson regression model as a random variable following a gamma distribution. Expressions for the log-likelihoods are given in Cameron and Trivedi (2009). Results from the Poisson regression model that are more robust can be retrieved as a special case of the NBRM. Because they are very similar to those obtained with the NBRM model, they are not reported here to save space, but they are available upon request.
compared to the total universe of varieties that can be exported, these counterfactual estimates appear plausible.

VI. Conclusions

If preferential market access requires preferences in the first place, actual market access depends on the design of the preference scheme. This paper has explored the effects of loosening a particularly costly product-specific rule of origin for apparel, the so-called “triple-transformation” rule. This rule requires that apparel must be produced from qualifying yarn, which is essentially yarn from the preference grantor (i.e., the United States), implying a triple transformation in the beneficiary country because the qualifying yarn first must be woven into fabric, and then the fabric must be cut and made into clothing. As explained in the introduction, the relaxation of this rule by the United States to the single-transformation rule, called the Special Rule under the AGOA for a group of African countries, provides a “quasi-natural” benchmark against which the effects of a change in this RoO can be evaluated. This benchmark is particularly welcome because RoO are extremely complex, are rarely modified, and vary across HS product lines within the same product category, and the utilization rates of preferences do not follow the expected pattern of an increase in utilization as preference margins increase. In this context, a “quasi-natural” experiment such as the change to single transformation (Special Rule) under the AGOA presents a unique opportunity to study the costs of RoO requirements. The results in this paper confirm earlier (see Cadot and de Melo 2007) and more...
Table 4. Count Estimates: Negative Binomial Model

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>1 Pooled</th>
<th>2 Pooled</th>
<th>3 Pooled</th>
<th>4 FE</th>
<th>5 RE</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R^{k}_{i,t}(&gt;0)$</td>
<td>0.33</td>
<td>0.36</td>
<td>0.40</td>
<td>0.48</td>
<td>0.47</td>
</tr>
<tr>
<td>t_{k,mfn}(&lt;0)</td>
<td>-0.03</td>
<td>-0.03</td>
<td>-0.03</td>
<td>-0.02</td>
<td>-0.02</td>
</tr>
<tr>
<td>ln ($Y^{k}_{i}(&gt;0)$</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Constant</td>
<td>2.93</td>
<td>1.56</td>
<td>7.15</td>
<td>1.97</td>
<td>2.00</td>
</tr>
<tr>
<td>Observations</td>
<td>396</td>
<td>396</td>
<td>396</td>
<td>396</td>
<td>396</td>
</tr>
<tr>
<td>Fixed exporter-specific effects</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Test of overdispersion [H0 : $\theta = 0$ (no overdispersion)]</td>
<td>$\chi^2$</td>
<td>6,522.81</td>
<td>749.56</td>
<td>748.99</td>
<td></td>
</tr>
<tr>
<td>$p$ value</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Notes: Standard errors are presented in brackets. RE indicates random effects.
Source: Authors’ analysis based on data described in the text.
recent (Cherkashin et al. 2010) work suggesting that RoO represent high fixed costs for exporting firms.

First, taking advantage of this quasi-natural experiment setting in which African exports to the EU and the United States benefited from the same preferential margin of approximately 10 percent in both markets under Everything But Arms and the AGOA and controlling for other factors, estimates show that the AGOA’s Special Rule was associated with an increase in apparel exports from the seven main exporters of approximately 168 percent. This is nearly four times as much as the estimate of the effects of the tariff removal on sub-Saharan African exports to the United States, estimated at a 44 percent increase in exports. None of the coefficients for unobserved year-specific effects or time-dummies was significant, suggesting, at first sight, the absence of misspecification. These large estimates reflect the very low starting base for all AGOA beneficiaries.

Although the split in export increase between the Special Rule and tariff reduction effects is large and cannot be expected to have been estimated with precision because of the quality of the data, it is nonetheless noteworthy because a more standard evaluation, based solely on the high utilization rates of preferences, would erroneously conclude that the special ("triple transformation") requirements for textiles and apparel had minimal effects because utilization rates remained high for exports to both destinations. For those who argue that there is little preferential access for OECD countries to grant to LDCs because average tariffs barriers are already low, the results suggest a potential multiple effect of relaxing a commonly used RoO in apparel with export growth for the receiving countries (by a factor of four, in this case study).

Second, the detailed analysis at the product level revealed that less restrictive RoO are associated with an expansion of the range of exported apparel in the 30–60 percent range. Indeed, under preferential market access, more lenient RoO diminish costs for exporters and may encourage export diversification (i.e., export growth at the extensive margin). Although export diversification also occurred for sales to the EU market, it was less than to the U.S. market. To our knowledge, this is the first evidence suggesting that restrictive product-specific RoO are likely to hamper export diversification.

Third, the study notes learning effects and a differential impact across countries. With respect to the dynamic effects of the AGOA’s Special Rule, there is evidence that the uptake of preferences is gradual over time, occurring during the first three years a country benefits from this special regime.

Finally, the impact of the AGOA’s Special Rule differed across countries. Because the Special Rule was not introduced in the same year for all countries, these results are strongly suggestive that differences in RoO accounted for differences in performance. However, because we could not control for factors that might have influenced supply response (e.g., the quality of infrastructure, political and social stability, governance, fiscal policies aiming to attract foreign investment), we could not account for the uneven effects of the single-
transformation rule across countries, although there is suggestive evidence that the supply response was conditioned by the business environment (at least as captured by the DB indicator of the World Bank).21

To conclude, studies on the effects of preferential market access should focus as much on design as on preferences. Indeed, strict RoO have often been justified as a means to support more processing in developing countries by encouraging integrated production within a country or within groups of countries through various cumulation schemes, as in the case of textiles and apparel. However, at least in the case of apparel produced by the low-income African countries, the double-transformation requirement by the EU has discouraged the development of exports at the intensive and extensive margins.

Development-friendly policies consistent with the spirit of preferential access to low-income countries would benefit from implementation schemes that would begin by relaxing the stringency of RoO requirements. It is encouraging that the EU has relaxed the double-transformation requirement when negotiating the Economic Partnership Agreements with African Caribbean Pacific countries. Rapidly growing middle-income countries such as China that are granting preferential access to LDCs should also consider designing simple RoO.

REFERENCES


Cameron, A. C., and P. K. Trivedi. 2009. Microeconometrics Using Stata. College Station, TX: Stata Press.


21. For instance, Lesotho, one of the successful exporters, managed to attract foreign investment in the textiles industry by offering a low corporate tax and further tax concessions for locating factories in towns outside Maseru, the capital. Furthermore, the political and social environment was considered by foreign investors to be more stable after a period of political instability. The result was a sudden increase in foreign investment, mainly originating from Asia, and Lesotho became one of the largest exporters to the United States of the countries eligible for the AGOA’s Special Rule. For an early account of the successful case of Lesotho, see “Lesotho seen as gateway to US market: Trade agreements have eased access for investors and helped diversify employment opportunities for locals,” Financial Times, August 23, 2001.


