

Preferential Market Access Design

Evidence and Lessons from African Apparel Exports
to the US and the EU

Jaime de Melo
Alberto Portugal-Perez

The World Bank
Development Research Group
Trade and Integration Team
February 2013



Abstract

Least developed countries rely on preferential market access. Proof of sufficient transformation has to be provided to customs in importing countries by meeting Rules of Origin requirements to benefit from these preferences. These Rules of Origin have turned out to be complicated and burdensome for exporters in the least developed countries. Starting around 2001, under the United States Africa Growth Opportunity Act, 22 African countries exporting apparel to the United States can use fabric from any origin (single transformation) and still meet the criterion for preferential access (the so-called Special Rule), while the European Union continued to require yarn to be woven into fabric and then made into

apparel in the same country (double transformation). This paper uses panel estimates over 1996–2004 to exploit this quasi-experimental change in the design of preferences. The paper estimates that this simplification contributed to an increase in export volume of about 168 percent for the top seven beneficiaries or approximately four times as much as the 44 percent growth effect from the initial preference access under the Africa Growth Opportunity Act without the single transformation. This change in design also mattered for diversity in apparel exports, as the number of export varieties grew more rapidly under the Africa Growth Opportunity Act special regime.

This paper is a product of the Trade and Integration Team, Development Research Group. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The authors may be contacted at jaime.demelo@unige.ch and aportugalperez@worldbank.org.

The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

**Preferential Market Access Design: Evidence and Lessons from African Apparel
Exports to the US and the EU***

Jaime de Melo*

University of Geneva and FERDI
and

Alberto Portugal-Perez[†]
World Bank

JEL classification number: F12, F13, F15.

Keywords: Rules of Origin, AGOA, Everything-But-Arms, African Caribbean Pacific, African Least Developed Countries.

*E-mail: jaime.demelo@unige.ch

[†]E-mail: aportugalperez@worldbank.org. Sector Board: Economic Policy (EPOL)

* Without implicating them, we would like to thank Olivier Cadot, Céline Carrère, Patrick Conway, Caroline Freund, Marco Fugazza, Bo Honoré, Hiau Looi Kee, Jaya Krishnakumar, Leonardo Iacovone, Daniel Lederman, Aaditya Mattoo, Caglar Ozden, Marcelo Olarreaga, Nicolas Schmitt, James Tybout, and participants at seminars at the University of Geneva, the World Trade Organization, and the World Bank for helpful comments as well as the editor and two referees on earlier versions of this paper. Any opinions expressed in this paper are the authors' and not those of their respective institutions. We take responsibility for remaining errors.

1. Introduction

Throughout the Doha negotiations, the Least Developed Countries (LDCs) have objected about the lack of attention to the loss of market access in developed-country markets, notably the result of complicated requirements that exporters must meet in order to qualify for preferential access.¹ These requirements mean that exporters must satisfy rules of origin (RoO), i.e. prove that products benefitting from preferential access have sufficient domestic content. These RoO have turned out to be cumbersome and complicated. For example, in the case of NAFTA, Cadot et al. (2005) estimate that one-third of the rise in the border price of Mexican Textile and Apparel exports to the US is found to compensate for the costs of complying with NAFTA's rules of origin. They also estimate that NAFTA raised the price of intermediates sold by US firms to Mexico by 12 percent so that in the end, NAFTA's rules of origin 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 ends up reducing the intended market access preferences they are supposed to grant (see a summary of estimates in Cadot and de Melo (2007)). Based on the quasi-natural experiment provided by US 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 from facing restrictive technical requirements.

Meeting Rules of Origin (RoO) requirements is the core implementation tool in all preferential schemes.² 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 subsequent transformation can be considered as originating); (ii) numerous product-specific RoO usually

¹ Preferential access from paying duties below MFN rates allows LDCs to get 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 US Africa Growth Opportunity Act are the major ways non-reciprocal 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 "LDC plus" package. The package failed to be agreed 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 (FTAs) or 'non-reciprocal' preferential schemes granted by industrial countries to developing countries like the Generalized System of Preferences (GSP), require satisfying Rules of Origin (RoO) to prevent trade deflection, i.e. to import through the low tariff partner and re-export towards other higher tariff partners in the area with little or no transformation on the product. Estevadeordal and Suominen (2006) give a thorough description of RoO around the world.

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).³ A growing literature concludes that these requirements necessary to prevent trade deflection –i.e. importing via the low tariff partner and then re-exporting duty-free within the preferential area– really serve as protectionist devices that end up impeding market access for the intended beneficiaries.

This evidence is based on two ingredients: (i) utilization rates of preferences (at the tariff-line level) or the share of imports entering a market under preferential 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 having a change of tariff classification combined with a technical requirement is more restrictive than only having a change of tariff classification requirement).

Repeated analysis of disaggregated data shows a positive correlation between the extent of preferential access and the value of the constructed restrictiveness indexes (a higher value of the index indicating a more restrictive product-specific RoO). The data also show a tapering off or even a decline in utilization rates as preferential margins increase, presumably because it becomes more costly to satisfy rules becoming increasingly complex. These correlations have led researchers to conclude that RoO can be “made-to-measure” protectionist devices. With a large share of North-South trade taking place under preferential status, getting a better grasp of the effects of RoO is now a first-order priority in 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 a RoO regime. The data often show high utilization of preferences for tariff lines with zero Most Favored Nation (MFN) tariffs even though compliance costs are estimated at around 2-3% of the product price (see for instance Manchin

³ See Estevadeordal and Suominen (2006) for a detailed description of both set of rules. For example, the EU has over 500 different product-specific RoO (Cadot and de Melo (2008)).

⁴ Krueger (1997, 1999) are the seminal contributions. Estevadeordal’s (2000) study of Mexican exports under NAFTA is the first that evaluates the overall restrictiveness of RoO. Krishna (2006) surveys the theoretical literature, and Cadot and de Melo (2008) the empirical literature.

(2006) and François, Hoekman and Manchin (2006)). To give an example using data from this study, between 90% and 97% of qualifying African exports of apparel enter the US and EU under their respective preferential regimes, the AGOA for the US 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 has been drastically different in recent years (see figure 1). When, the origin requirement was drastically simplified under AGOA, in spite of remarkably similar average preferential margins in the US and in the EU (US MFN tariff of 11.5% in 2004 and EU preferential margin of 11.0%), growth of apparel exports to the US took off while apparel exported to the EU remained flat. Thus, assessing the restrictiveness of RoO only by inspecting utilization rates would suggest low costs, while ignoring that export growth rates to the two destinations have diverged around the time when meeting origin requirements to one market, the US, were relaxed.

This is why it is desirable to go beyond 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 US in its preferential trade policies. Early on under AGOA, the US introduced a ‘special regime’--the ‘third-country provision’--which consists in allowing the use of fabric from any origin in the making of apparel (rather than requiring US fabric originating domestically or from the US), relative to the no-change environment of EU preferential regimes still requiring European or locally-produced fabric. To our knowledge, this is the first such estimate.

Controlling for other factors, we estimate that relaxing RoO by allowing the use of fabric from any origin increased apparel exports to the US by about 168 percent for the top 7 (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 HS4-digit level for knitted apparel (Chapter-61) and non-knitted apparel (Chapter-62) over the period 1996-2004 which spans the period when the US relaxed the origin requirement for African apparel with the “Special Rule” to be described

shortly. In addition to this increase in exports, we observe a higher rate of new products exported to the US than to the EU at the HS6-level during the period. ⁵

We proceed as follows. Section 2 describes the conditions for preferential access of African apparel to the US and EU markets and the introduction of the Special Rule under 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 turn to estimates at the disaggregate level (HS-4 or HS-6 levels) to capture the effects of technical requirements which are defined at the HS-4 level in Textiles and Apparel. Section 4 presents the data and the econometric strategy to deal with the many zero observations in the sample. Section 5 reports the results from disentangling the effects of the Special Rule from those following from the reduction in tariffs in the US market. Section 6 then studies the evolution of new apparel varieties during the period using a count model. Section 7 concludes.

2. Qualifying for Preferential Market Access Under EU and US Preferences in Textiles and Apparel

Market Access to the EU: Apparel under the Generalized System of Preferences (GSP) and Everything But Arms. Since 1971, the Generalized System of Preferences (GSP) provides non-reciprocal 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 entails 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 cut and made-up into clothing. ⁶

⁵ Strong response to a reduction in fixed costs associated with meeting origin requirements are 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 for a cross-section of 200 Bangladeshi firms (data collected over the period 1999-2004) exporting woven textiles to the EU and US markets under much the same assumptions as ours: all production is for exports, and exports are destined to one or both the EU and US markets. They estimate that a \$1 reduction in fixed costs would generate an increase in exports in the range 10%-40% and conclude that easy-to-obtain preferences and/or reduction in fixed costs can have a catalytic effect and that preferences need not divert trade from other markets as predicted in a setting with no fixed costs. Though the methodology is different and they do not study the costs of RoO in a dynamic context panel like us, the magnitude of their estimates are in line with ours.

⁶ Under the EU's "Single List"—also called 'PANEURO'—in operation since 2000, the EU GSP system also 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

Market Access to the US: Apparel under AGOA. Operational since the second semester of 2000, AGOA provides tariff-free access for a group of 22 African countries, a non-negligible market access since many goods are excluded from the US (GSP) (e.g. watches, footwear, handbags, luggage, work gloves, and apparel). Thus, unlike beneficiaries of US GSP preferences, AGOA beneficiaries do not pay the US MFN tariff of 11.5%. Initially, RoO for apparel under AGOA applied the triple transformation process used for NAFTA and other US preferential schemes. That is, apparel had to be assembled in one or more AGOA eligible countries from US fabrics (or African-country fabrics up to a specified percentage), which in turn were made from US 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 fabric (cotton, yarn, textile) used to produce it. In effect, meeting origin requirement under the AGOA’s Special Rule only required applying a single-transformation requirement (fabric → apparel).

3. The Special Rule and Export Trends

Average MFN tariffs for apparel⁷ for the US (11.5%) and the EU (11.0%) were very close throughout the 1996-2004 period. Thus the preferential margins (equal to the height of the MFN tariff since African exporters had duty-free access to EU and US markets) were very similar once AGOA became operative. By the end of 2004, 22 countries benefited from the Special Rule under AGOA. The list of AGOA beneficiaries is given 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 US under AGOA. Countries with an important volume of exports to either destination have a high rate of utilization of preferences so that taking the 22 countries as a group, the utilization of preferences was 97.6 % for AGOA and 91.2% for Everything But Arms or Cotonou.

Cotonou regimes, leading us to lump together EU imports under both schemes in table 1 (see de Melo and Portugal-Perez (2008) for details).

⁷ We consider the two categories of apparel (i) knitted apparel (HS-61) and (ii) non-knitted apparel (HS-62).

Table 1 here: Countries Benefiting from AGOA Special Rule in 2004

Export volumes, growth rates of exports, utilization of preferences, and year of entry of the Special Rule are all indicated in table 1 in descending order of the market share to the US in 2004. Not surprisingly, the ranking of exporters to the US is different than the ranking of exporters to the EU, the differences reflecting partly the importance of language in trade and hence of shares at the beginning of the periods, but probably also that English-speaking countries picked earlier on the AGOA opportunity. Except for Madagascar, the growth rate of exports to the US has increased for all 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 US below 1 percent fluctuate greatly.

Yet, in spite of 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 7 exporters, the focus of our estimates. Figure 1(b) shows the evolution of apparel exported to the US by each of the top 7 exporters. The data are aggregated over a potential of 111 knitted (CH-61) and 118 non-knitted (CH-62) apparel products defined at the HS-6 digit level. Trends for knitted and non-knitted apparel were similar for both countries with US 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 around 2000 (the year the US 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 US—see table 1). Figure 1(b) also shows a large drop in exports from Madagascar in 2002, the year of political turmoil following a contested presidential election.

Figure 1(a) Apparel exports of 22 countries benefiting from AGOA's Special Rule by 2004

Figure 1(b) Apparel exports of top 7 AGOA exporters to the US

Two trends are apparent in the raw data. First, prior to 2000, the paths of African apparel exports to the US and to the EU are alike. Then, as shown in figures 1(a) and especially 1(b), apparel exports to the US increased substantially, with the timing of the change in the growth path coinciding with the entry into force of 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 until 2000 and then declined mainly because of the political crisis that hit Madagascar, the largest exporter to the EU at the end of 2001.⁸ Second, exports to both markets are dominated throughout by the 7 large exporters who follow quite similar trends in both markets. We come back later to the lack of export response by the other countries.

Since 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 moving later on to the single-transformation rule. Initially, we regressed the log of the aggregate exports apparel (HS-61 and HS-62) on a time trend, country fixed effects and two dummy variables, one taking the value of one starting in 2000 when the US removed the MFN tariff on apparel exports from the AGOA beneficiaries, another taking the value of one starting on the year when 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 as we could not get significant estimates for the coefficients on the dummy variables capturing the effects of AGOA (with the triple-transformation) and of the passage to the special rule. Two reasons account for this. First, the time series for each country only spans 9 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 rules of origin vary across products. Nor do they take into account exports to the EU, the change in preference margins in the US market which was different across products or other changes in the EU and the US markets.

⁸ In both the US 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 went down 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 US more than tripled from 0.027 percent in 2000 to 0.090 percent in 2004.

Data permitting, a satisfactory approach might be to develop a fully structural model in which heterogeneous firms decide whether or not to enter the textile market, then select a destination (i.e. EU or US 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

The alternative to a structural model is to ‘let the data speak’ in a less ambitious framework. In the Appendix, we sketch such a model in which a representative apparel producer sells all its production either to the US 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 since 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 one 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 while 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. to an increase in preferential access under AGOA to the US), and (ii) a relaxation of the rule of origin which lowers its production costs.

4. Data and Econometric Strategy

4.1. Specification and Data

Specification The model sketched above suggests that, after controlling for idiosyncratic factors in each market, export sales of individual apparel products towards the EU and US

⁹ This is the route followed by Cherkashin et al (2010). They rely on cross-section data only for estimation which does not allow them to tackle directly 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 raise unit production costs by 15%, that obtaining a quota license to sell to the US under the MFA costs 7%, that decisions about entry into each market are made separately, that expenditures on 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 US markets would require firm-level data which was collected by the authors of the Bangladesh study but that are not available for any of the AGOA beneficiaries.

destinations should depend on changes in preferential access, measured by changes in the preferential margin ($tmar$), and on changes in the RoO. For the EU and the US, 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 requirements. Because only a subset of apparel varieties are exported, the sample is censored. We estimate the following log linear relationship:

$$\ln(a_v + X_{i,t}^{j,k}) = \beta_1 (tmar_{i,t}^{j,US}) (TT_t^{j,US}) + \beta_2 (tmar_{i,t}^{j,US}) (SR_t^{j,US}) + \beta_3 (VC_{i,t}^{j,EU}) + \beta_4 D_i^{Mad-02} + \sum_{j \in J} \sum_{k \in K} \delta_{j,k} (D_i^j \times D_i^k) + \varepsilon_{i,t}^{j,k} \quad (1)$$

$j \in J = \{7(\text{or } 22) \text{ African exporters}\}$
 $k \in K = \{EU, US\}$ t = 1996, ..., 2004
 $i = 1, \dots, 34 \in (CH61-CH62)$

where :

- $X_{i,t}^{j,k}$ are exports of apparel variety i from African country j to market k (EU or US) 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 got duty-free access so $tpref_{i,t}^{j,k} = 0$ and

$tmar = tmfn / (1 + tmfn)$, over 1996-2004. In the US, African exporters of apparel paid the MFN tariff over the period 1996-1999, i.e. $tpref_{i,t}^{j,k} = tmfn_{i,t}^{j,k}$ and $tmar = 0$, then obtained duty-free access starting in 2000, so $tpref_{i,t}^{j,k} = 0$ and $tmar = tmfn / (1 + tmfn)$ over the period 2000-04.

Here β_1 captures the effects of preferences on exports of variety i under the triple transformation rule up until the date when countries qualify for the Special Rule under AGOA. For the EU, since the preferential margin is virtually unchanged and equal to the MFN rate throughout the period, the only change in preferential access to be taken into account comes from a relaxation of the value content rule (see below).

- $TT_t^{j,US}$ is a dummy variable that is set to one when exports of country j are subject to the triple transformation rule of AGOA.

- $SR_t^{j,US}$ 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 β_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 in a less restrictive cumulation rule in some non-knitted apparel (HS-62) allowed from 2000 onwards. It takes the value one if variety i is subject to an alternative (or optional) less restrictive regional value-content (VC) rule allowing apparel non-qualifying for cumulation provided that its value does not exceed 40% (or in some cases 47.5%) of the product price in year t (≥ 2000) when exporting on a preferential basis to the EU, and zero otherwise. Here, β_3 captures the reduction in costs for exports to the EU from moving to a less restrictive RoO.
- $D_i^{Madag-02}$ is a dummy taking the value of 1 for Madagascar's export loss in 2002 provoked by its political crisis.
- $D_i^j [D_i^k]$ is a dummy variable controlling for unobserved time-invariant fixed effects by exporter j [importer k] such as distance or a common language (due to multi-collinearity, export or import-specific dummies cannot be included in the model)
- $\varepsilon_{i,t}^{j,k}$ 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, we expect the effect on exports of the single transformation to be bigger 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 7 major exporters and another for all 22 beneficiaries. The panel covers the period 1996-2004 which coincides with the removal of quotas set out at the end of the Agreement on Textiles and Clothing (ATC) in January the 1st, 2005. Although the choice of the period was constrained by data availability, the episode is a convenient one since there is no

need to control for the removal of quotas at the end of the ATC. In a post-quota world, US 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 HS6-digit. However, because 95% of the volume of apparel exports is accounted for by the 7 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.

4.2. Econometric Strategy

Two constraints guided our estimation strategy. First, a lack of plausible instruments at this 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 taken in a first step, then a decision is taken on volume in a second step¹⁰. Second, we were confronted to a large number of zero-exports –or zeroes– in the data disaggregated at the HS-6 level: 95% of zero observations for the whole sample of 22 exporters, and 86% for the reduced sample of the top-7 exporters. However, the product-specific RoO under 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 to the HS-4 level. As a result, the number of zero trade flows is brought down to 60 percent of observations for the top 7 exporters.

Since this is still a large number of zero observations, we deal with it by contrasting several estimators in table 2. Two benchmark estimates are reported. Column 1 reports OLS estimates with $\ln(X_{i,t}^{j,k})$ as the dependent variable that considers observation for positive-only exports¹¹, and column 2 reports Tobit estimates. To overcome the sensitivity of estimates to the arbitrary

¹⁰ Ideally, one would want to implement a two-stage procedure in which a decision to export a specific apparel product is taken in a first step, then in a second step a decision is taken on volume and destination. To satisfy the exclusion restriction in such a 2-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 is to shift up all export values are shifted up by one unit (i.e. fixing $av=1$ in (1)) before applying the logarithmic transformation and proceed with OLS (see for instance Frankel et al. (1997)). The results are close to those reported in column 1 in table 2. While this approach has the advantage of including all observations, it does not solve the problem that the resulting estimates are inconsistent.

choice of the parameter $\alpha_v = \ln$ in the standard Tobit¹², 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 (we refer to it as the ET-Tobit estimator). This means that the dependent variable will be censored at the value $\ln(a_v)$.

But estimates from Tobit models rely on the 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 deals with heteroskedasticity in constant-elasticity models and is found to perform well in gravity models where there are also zero flows. Using Monte-Carlo simulations, SS-T show 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 col. 4.

Yet, the PPML has not been tested in a panel data context, and it also has shortcomings. For example, Martin and Pham (2008) have pointed out 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.

This brings us to implement the trimmed least absolute deviations (LAD) estimator for limited dependent variable models with fixed effects proposed by Honoré (1992) maintaining $\ln(\alpha_v + X_{i,t}^{j,k})$ as the dependent variable. This estimator has the advantage of being consistent and asymptotically normal. Therefore, it is neither necessary to assume a parametric form for the errors –such as normality– nor to assume homoscedasticity, 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

¹² As discussed below the value of estimated coefficients are very sensitive to the choice of a_v , specially β_1 and β_2 .

the preferred estimator.¹³ In our case, it also turns out to produce 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 and/or reasonable magnitudes. For all 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.

5. Results

5.1. Main Results

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

Table 2 here: Elasticity of Exports to Changes in RoO

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.¹⁴ 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 β_1 and β_2 , which are very sensitive to the

¹³ In their simulations, SS-T(2006 and 2011) do not assess the performance of the PPML either in a panel context or in the presence of omitted variable bias and/or measurement error. In addition, the Trimmed LAD estimator for Tobit models used here is not considered as a contender to the PPML estimator in the simulations reported by SS-T.

¹⁴ We estimate pooled Tobit models. Their maintained 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 have arguably a similar structure. Moreover, as discussed by Woodridge (2002), the Tobit is flexible and it 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.

choice of a_v used to avoid truncation, are implausible. Indeed, estimates for β_1 and β_2 become smaller as a_v increases. ET-Tobit estimates reported in Column 3 include an estimate of the value of a_v that fits best the data. As can be seen by comparing results in cols 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 and, even though 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 models¹⁵. Column 5 reports estimates when applying the Poisson Pseudo Maximum Likelihood (PPML) to deal with heteroskedastic errors. Adopting the single transformation rule is now estimated to increase exports to 158%. There is, however, a sign reversal for the VC coefficient.

Finally column 5 reports the LAD estimates that do not require normality of errors nor homoskedasticity. All the coefficients have the expected sign, are statistically significant and have plausible values, including the estimates for β_1 and β_2 . Moving from the triple to the single transformation requirement increased imports from 44 percent to 168 percent. The presence of the alternative VC requirement for some non-knitted apparel is associated with an increase in exports of 35%.

These estimates may still appear to be on the high side. However African exports to the US were very low before the Special Rule, accounting for less than 0.001 percent in both the EU and US markets. This low base must have contributed to the large elasticity responses. As to the different estimates reported in table 2, besides yielding more reasonable estimates, the R^2 value for the Trimmed LAD estimator is higher than for the PPLM and passes the 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 a lot of zero values and the estimates are

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

likely to be contaminated by the presence of omitted variable bias, and/or measurement error.¹⁶

5.2. Additional Estimates and Robustness Checks

Table 3 turns to the cumulative effects of the AGOA Special Rule on exports by including three additional dummy variables ($SR2_{i,t}^{US}$, $SR3_{i,t}^{US}$, and $SR4_{i,t}^{US}$) interacted with preferential margins to specification (2). These variables capture the supplementary or cumulative effects on exports of each additional year under the Special Rule program. Thus $SR2_{i,t}^{US}$ is equal to one if country j is at least in the second year after being entitled to the Special Rule (which includes the third and the fourth year), and zero if not. The same applies for $SR3_{i,t}^{US}$ and $SR4_{i,t}^{US}$. Then, the coefficient of $SR_{i,t}^{US}$ 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 as they are similar to baseline estimates.

Table 3 here: Additional Estimates and Robustness checks

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 biggest change in exports is registered during the first year suggesting that preferential exports increased immediately after the implementation of the Special Rule which is what one would expect in clothing where fashion changes rapidly from season to season and hence input requirements change constantly, so relaxing input requirements have an immediate effect on exporters. A country reaching the second year under the Special Rule has an average additional increase in exports of 53%. Countries reaching the third and fourth year under the Special Rule further increase their exports under AGOA by an additional 53% and 32%, respectively.

¹⁶ At the end of their answer to Martin and Pham (2008), Santos-Silva and Tenreyro (2010) affirm that: “the PPML estimator can certainly be outperformed in some situations, and we very much welcome the scrutiny of our results.” As simulations using data-generating processes in SS-T(2006 and 2010) fail to assess the performance of the PPML in a panel context, in the presence of omitted variable bias, and/or measurement error and do not consider the Trimmed LAD estimator for Tobit models. We conclude that this justifies the approach used here.

Notice that according to these estimates, the total effect on exports of benefiting from the Special Rule four years is 242%, a figure larger than the average effect of 168% estimated in column 5 of table 2, as 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 7 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 question: Why were some African countries so much more successful at taking up preferences and at experiencing higher export growth in apparel? Among others, a possible explanation lies in the business environment of a country that may be more conducive to attract foreign investment in apparel plants and to diminish trading and other fixed costs which can be proxied by a country's rank in the World Bank "Doing Business" indicator.¹⁷ Figure 2 confronts the Ease of Doing Business (DB)¹⁸ ranking of African countries benefiting from the Special Rule against their apparel export growth during AGOA (measured by the difference of exports (in logs) at 2004 and at the beginning of AGOA). Indeed, on average countries best ranked along the DB indicator experienced higher growth in apparel exports during AGOA, and the correlation coefficient, ($\rho=-0.55$) is highly significant.

Figure 2 here: Export Growth and the Business Environment

Recall that the SR dummy is set equal to one if a country benefits from the rule for at least 9 months. As Botswana and Malawi were eligible to the Special Rule from August 2001, whereas Swaziland was eligible from July 2001, the effect may already be reflected in the exports data from 2001 onwards. 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 onwards for Botswana, Malawi and

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. Being quantitative rather than subjective, the indicator is less subject to bias than the more-widely used indicators of governance.

¹⁸ We use Doing Business (DB) data for 2008 released on June 1, 2008, as it includes more African countries in the sample than reports in previous years. Indeed, for instance, DB 2006 coverage is limited to 6 out of the 22 African countries. Yet, for these six countries, the relative ranking of DB 2008 does not change significantly with respect to DB 2006.

Swaziland, and remains unchanged for other countries¹⁹. Compared to the baseline estimates, the estimated impact of Special Rule on exports decrease slightly from 168 percent to 158 percent.

Finally, the results hold up to the following robustness checks, not reported here but available upon request. First, we replicated the estimations reported in table 2 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 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 at taking up preferential market access under the Special Rule context. Second, we also controlled for unobserved year-specific effects by adding time dummies to the model. None of their coefficients were 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 lead to our large estimated values. Thus we carried out separate estimates for knitted (Chapter-61) and non-knitted apparel (Chapter-62). As the path of knitted and non-knitted apparel were very similar, it is not surprising that a dummy variable distinguishing between the two was not significant. We also added a variable to capture the effects of fluctuations in the \$/€ real exchange rate. The estimated coefficient turned out insignificant in spite the strong depreciation of the dollar to the Euro during the period.

6. Count Model Estimates

To further explore the incidence 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), we compute the number of apparel varieties at the

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.

HS6-digit level exported by country i to country j at time t , η_t^{ij} . We start by assuming that, conditional on a matrix of regressors $\mathbf{X} = [X_{it}]$, the count η_t^{ij} follows a Poisson distribution with parameter $\lambda_{it} = \exp(X_{it}\beta)$. The set of regressors, \mathbf{X} , include the preferential tariff in market k , $t_t^{k,mfn}$, the SR dummy, $R_{i,t}^{j,k}$, and income in market k , Y_t^k .

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 US 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 entry of firms into the market.

Figure 3: Kernel density estimates

There are two problems with estimating the log-likelihood function associated with the Poisson Regression Model (PRM). First, it is likely that there is heterogeneity across countries which can be handled by using fixed effects (FE) or random effects (RE). Second, the Poisson requires that the mean and variance of the count be equal, else there is over-dispersion. This is not the case in our data (see the results from the over-dispersion test in table 4). Then, PRM estimates are robust, but inefficient with downward-biased standard errors. This can be corrected by using the negative binomial regression model (NBRM). Hence we report in table 4 the estimates from pooled, fixed effects (FE) and random effects (RE) with the NBRM.²⁰

²⁰ The NBRM generalizes the Poisson model by re-parametrizing the parameter in the PRM as a random variable following a gamma distribution. Expressions for the log-likelihoods are given in Cameron and Trivedi (2009). Results from the PRM model which are more robust can be retrieved as a special case of the NBRM. Since they are very similar to those obtained with the NBRM model, to save space, we do not report them here, but they are available upon request.

Table 4: Count Estimates: Negative Binomial Model

With the exception of $\ln(\text{GDP})$ 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 between a minimum of 39% ($=\exp(0.33)-1$) and a maximum of 61% ($=\exp(0.48)-1$). Because the number of varieties exported by these African countries is small compared to the total universe of varieties that can be exported, these counterfactual estimates appear plausible.

7. Conclusions

If it is a truism that 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 has to be produced from qualifying yarn, essentially yarn coming from the preference-grantor (i.e., the US), implying a triple transformation in the beneficiary country since that qualifying yarn has first to be woven into fabric, and then the fabric has to be cut and made-up into clothing. As explained in the introduction, the relaxation of this rule by the US to the single-transformation rule, called the "Special Rule" under 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, vary across HS product lines within the same product category, and utilization rates of preferences do not follow the expected pattern of an increase in utilization as preference margins go up. This is why a 'quasi-natural' experiment like the passage to the single-transformation (Special Rule)

under AGOA presents a unique opportunity to study the costs of RoO requirements. The results in the paper confirm earlier (see Cadot and de Melo (2008) and more recent (Cherkashin et al. 2010) work that RoO represent high fixed costs for exporting firms.

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

While the split in export increase between the Special Rule and tariff reduction effects are large and cannot be expected to have been estimated with precision because of the quality of the data, it is nonetheless noteworthy since a more standard evaluation based solely on the high utilization rates of preferences would erroneously conclude that the special ("triple transformation") requirements in textiles and apparel had little effects since utilization rates remained high for exports to both destinations. And for those who argue that there is not much preferential access for OECD countries to grant to Less Developed Countries 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% range. Indeed, under preferential market access, more lenient RoO diminish costs for exporters and might have encouraged export diversification, i.e. export growth at the extensive margin. While export diversification also took place for sales to the EU market, it was less than to the US market. To our knowledge, this is the first evidence suggesting that restrictive product-specific RoO are likely to hamper export diversification.

Third, the study also points out to 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, taking place during the first three years a country benefits from this special regime.

Finally, the impact of the AGOA's Special Rule was different across countries. Since 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, even though we produced suggestive evidence that the supply response was conditioned by the business environment (at least as captured by the doing business indicator of the World Bank).²¹

To conclude, studies of the effects of preferential market access should focus as much on design as on preferences per se. 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 developing exports at the intensive and the extensive margins.

Development-friendly policies consistent with the spirit of granting preferential access to low-income countries would benefit from designing implementation schemes that would start by

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 felt by foreign investors as 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 US among countries eligible to the AGOA's Special Rule. For an early account on 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.

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. Fast growing middle income countries like China that are granting preferential access to LDCs should also consider designing simple RoO.

References

Cadot, O, C. Carrère, J. de Melo, A. Portugal-Perez (2005), "Market Access and Welfare Under Free Trade Agreements : The case of Textiles under NAFTA", *World Bank Economic Review*, 19(3), 379-405.

Cadot, Olivier, Antoni Esteveordal, Akiko Suwa-Eisenmann, and Thierry Verdier, eds. (2006a) *The Origin of Goods: Rules of Origin in Regional Trade Agreements*. London: Oxford University Press.

Cadot, Olivier. and J. de Melo (2008) "Why OECD Countries Should Reform their Rules of Origin", *World Bank Research Observer*, 23, 77-105.

Cameron, A. Colin and Pravin K. Trivedi (2009) "Microeconometrics Using Stata" ,Stata Press, 706 pages.

Carrère, C., and J. de Melo (2006), "Are Different Rules of Origin Equally Costly? Estimates from NAFTA" chp. 7 in O. Cadot et al. eds., pp. 191-212.

Cherkashin, Ivan. Svetlana. Demidova, Hiau Looi Kee and Kala. Krihsna (2010) « Firm Heterogeneity and Costly Trade : A New Estimation Strategy and Policy Experiments » NBER #16577

Eaton Jonathan, and A. Tamura (1994), "Bilateralism and regionalism in Japanese and U.S. trade and direct foreign investment patterns", *Journal of the Japanese and International Economies* 8 (1994) (4), pp. 478–510.

Esteveordal, Antoni. (2000), "Negotiating Preferential Access: The Case of the North American Free Trade Agreement"; *Journal of World Trade*,34 (1): 141–66.

Esteveordal, Antoni and Kati Suominen (2006), "Mapping and Measuring Rules of Origin Around the World" in Cadot et al. eds. , 69-113.

Frankel, J, E. Stein and W.Shang-Jim (1997) "Regional Trading Blocs in the World Trading System", Institute for International Economics, Washington, D.C.

Francois, Joseph, Bernard Hoekman, and Miriam Manchin, "Preference Erosion and Multilateral Trade Liberalization," *World Bank Economic Review*, 20 (2006), 197-216.

Honoré, Bo E. (1992): "Trimmed LAD and Least Squares Estimation of Truncated and Censored Regression Models with Fixed Effects," *Econometrica*, Vol. 60, No. 3, Pages 533-565.

Krishna, Kala. (2006) "Understanding Rules of Origin", in Cadot et al. eds., 19-34.

Krueger, Anne O. (1997) "Free Trade Agreements versus Customs Unions", *Journal of Development Economics*, Volume 54, Issue 1, October 1997, Pages 169-187.

Krueger, Anne (1999) "Free Trade Agreements as Protectionist Devices: Rules of Origin," in James R. Melvin, James C. Moore, and Raymond Riezman, eds., *Trade, Theory and Econometrics: Essays in Honor of John C. Chipman* (New York: Routledge Press), pp. 91–101.

Manchin, Miriam. (2006) "Preference Utilisation and Tariff Reduction in EU Imports from ACP Countries" *The World Economy*, Vol. 29, No. 9, pp. 1243-1266, September 2006.

Martin, Will and Cong Pham (2008), "Estimating the Gravity Model When Zero Trade Flows are Important", mimeo, World Bank

Melo, Jaime de, and Alberto Portugal-Perez (2008) "Rules of Origin, Preferences and Diversification in Apparel: African Exports to the US and the EU", CEPR discussion paper #7072.

Santos Silva, J. and Silvana Tenreyro (2006), "The log of Gravity", *The Review of Economics and Statistics*, 88: 361-5.

Santos Silva, J. and Silvana Tenreyro (2010), "Further simulation evidence on the performance of the Poisson Pseudo-maximum likelihood estimator" *Economics Letters* 112: 220-222,

Woodridge, J.M. (2002), *Econometric Analysis of Cross-Section and Panel Data*, Cambridge: MIT Press

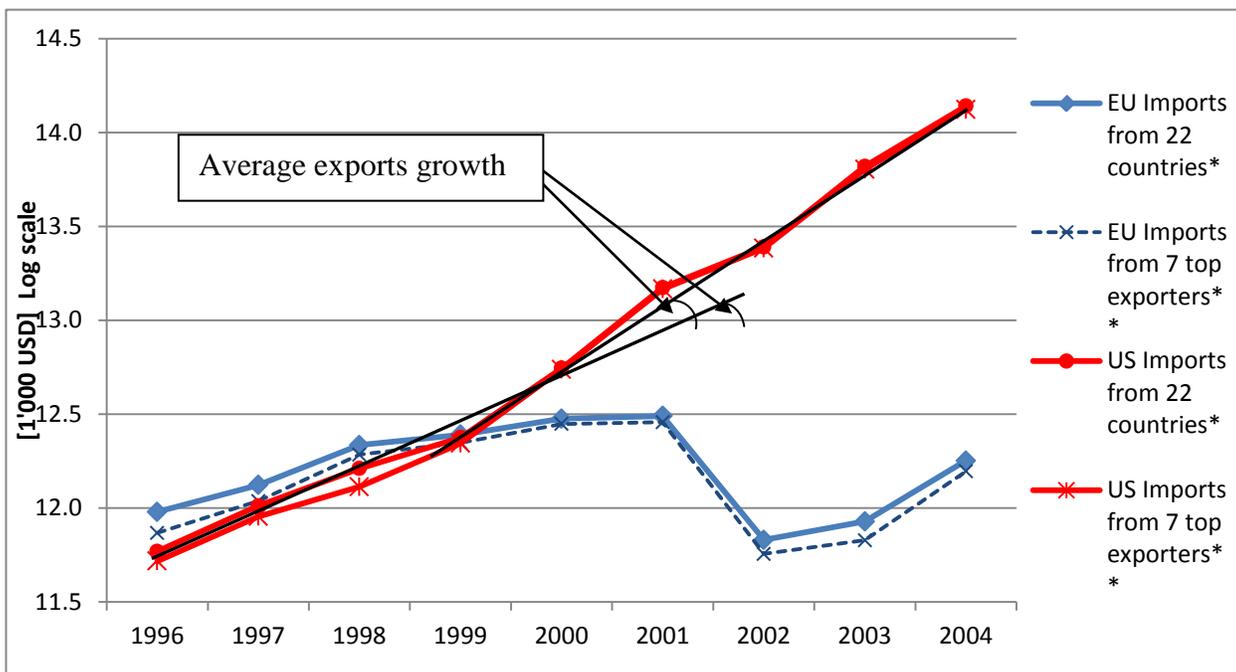
World Bank (2008) "Doing Business Database", <http://www.doingbusiness.org/>

Tables and figures to

Preferential Market Access Design:

Evidence and Lessons from African Apparel Exports to the US and to the EU

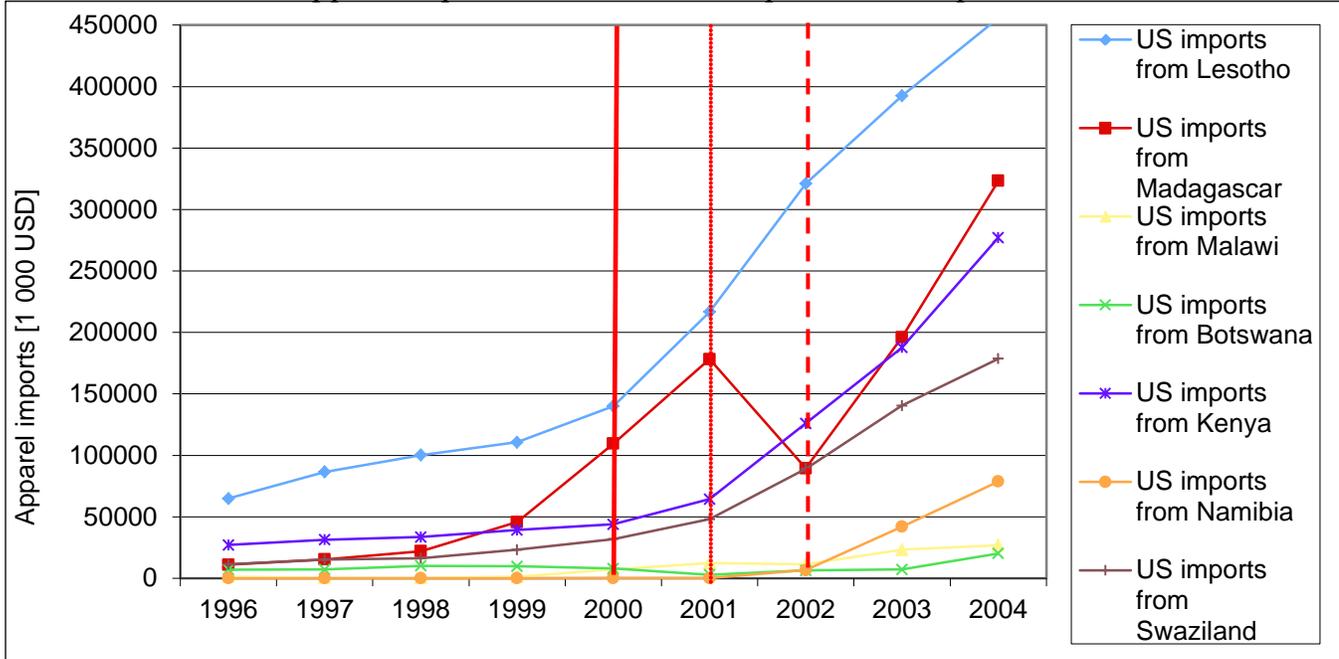
Figure 1(a)
Apparel exports of 22 countries benefiting from AGOA-SR by 2004



* Yearly data from 1996 to 2004. The 22 Sub Saharan countries benefiting from AGOA-SR 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 7 exporters are : Botswana, Cameroon, Ghana, Kenya, Lesotho, Madagascar, Namibia, Nigeria, and Swaziland.

Source: Authors' calculations on data from WTO Integrated Data Base .

Figure 1(b)
Apparel exports to the US from top 7 African exporters



Source: Authors' calculations on data from UN COMTRADE through WITS.

Vertical lines indicate year of entry of AGOA and of Single Rule (SR).
 Year of entry into effect of AGOA: 2000 for all countries (full line)
 Year of entry of SR for Kenya, Lesotho and Madagascar (2001) (dotted-line)
 Year of entry of SR for Botswana, Malawi, Swaziland (2002) (dashed-line)

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 parenthesis):

$$\ln(\text{exp}04) - \ln(\text{exp}01) = 5.86 - 0.37(\text{DB_rank})$$

(1.61) (0.12)

N:21 obs. ; Adj R-squared = 0.28

Figure 3
Kernel density estimates by destination

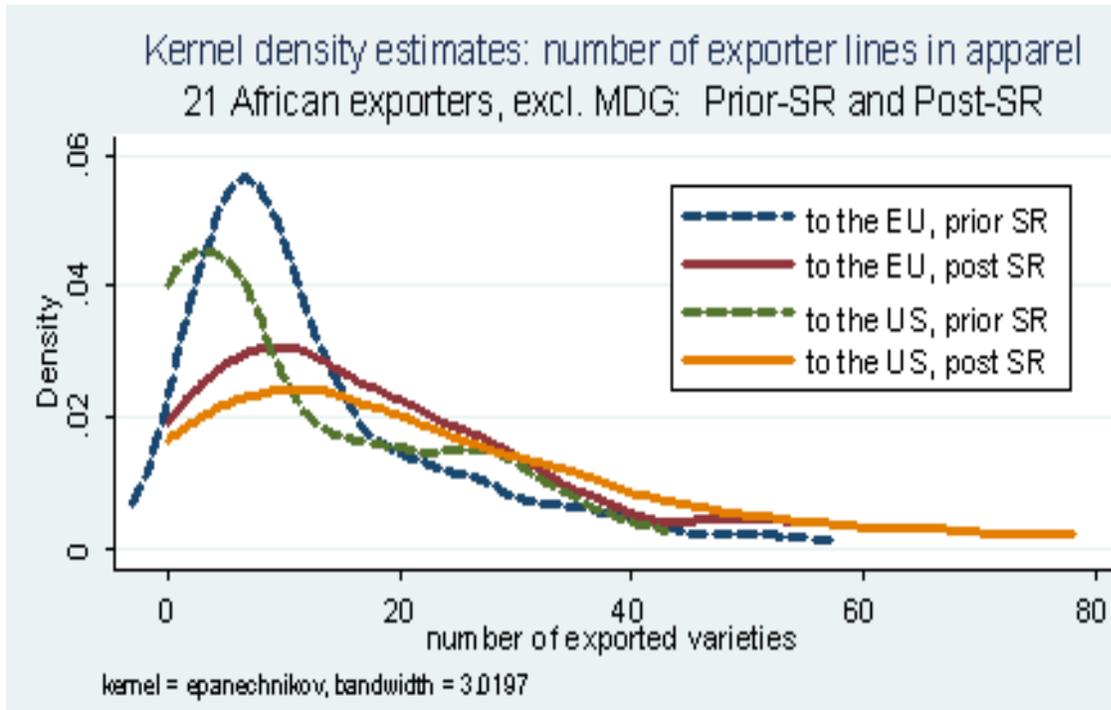


Table 1: Apparel exports of countries benefiting from AGOA's Special Rule (SR) in 2004

| | | Exports to the EU in 2004 ^a | | Exports to the US in 2004 ^a | | Date of entry into force of AGOA SR (year, month) ^d | Exports growth to the US (yearly rate) ^c | |
|----|--------------|--|-------------------------------|--|-------------------------------|--|---|---------------|
| | | share | Utilization Rate ^b | share | Utilization Rate ^b | | Before AGOA SR | After AGOA SR |
| 1 | Lesotho | 0.50% | 24.49% | 32.92% | 98.18% | 01.apr (01) | 21.23% | 34.32% |
| 2 | Madagascar | 85.77% | 96.83% | 23.34% | 97.27% | 01.mar(01) | 77.62% | 31.07% |
| 3 | Kenya | 1.54% | 92.53% | 20.01% | 97.94% | 01.jan(01) | 12.77% | 58.55% |
| 4 | Swaziland | 0.53% | 1.75% | 12.90% | 98.34% | 01.jul(02) | 29.15% | 53.88% |
| 5 | Namibia | 0.05% | 72.95% | 5.68% | 96.50% | 01.dec(02) | - | 837.93% |
| 6 | Botswana | 6.01% | 74.67% | 1.46% | 99.44% | 01.aug(02) | 2.85% | 26.55% |
| 7 | Malawi | 0.06% | 94.52% | 1.93% | 95.17% | 01.aug(02) | 54.90% | 38.27% |
| 8 | Ghana | 0.07% | 82.22% | 0.53% | 96.26% | 02.mar(02) | 23.00% | 214.41% |
| 9 | Uganda | 0.00% | 9.48% | 0.29% | 100.00% | 01.oct(02) | - | 576.03% |
| 10 | Ethiopia | 0.34% | 97.24% | 0.24% | 99.80% | 01.aug(02) | -66.55% | 400.08% |
| 11 | Cape Verde | 2.43% | 99.77% | 0.22% | 95.03% | 02.aug(03) | 111.26% | 35.75% |
| 12 | Tanzania | 1.80% | 99.53% | 0.18% | 99.00% | 02.feb(02) | -72.17% | 618.97% |
| 13 | Mozambique | 0.08% | 94.70% | 0.16% | 85.15% | 02.feb(02) | -16.70% | 131.84% |
| 14 | Sierra Leone | 0.38% | 4.04% | 0.11% | 0.00% | 04.apr(04) | 86.91% | 80.57% |
| 15 | Cameroon | 0.17% | 23.10% | 0.02% | 0.00% | 02.mar(02) | 30.88% | 0.10% |
| 16 | Nigeria | 0.04% | 1.67% | 0.01% | 1.37% | 04.jul(04) | 3.70% | -54.16% |
| 17 | Zambia | 0.00% | 100.00% | 0.00% | 78.67% | 01.dec(02) | -1.22% | -49.65% |
| 18 | Mali | 0.03% | 10.49% | 0.00% | 0.00% | 03.dec(04) | 34.97% | -86.55% |
| 19 | Senegal | 0.17% | 93.90% | 0.00% | 0.00% | 02.apr(02) | -30.47% | -27.65% |
| 20 | Niger | 0.03% | 82.09% | 0.00% | 0.00% | 03.dec(04) | -10.94% | -57.70% |
| 21 | Benin | 0.01% | 41.97% | 0.00% | 0.00% | 04.jan(04) | 2.92% | - |
| 22 | Rwanda | 0.00% | 30.23% | 0.00% | 0.00% | 03.mar(03) | - | - |
| | TOTAL | 100% | 91.2% | 100% | 97.7% | | 21.2% | 34.3% |

Source: Authors' calculations from COMTRADE data. Countries ranked by decreasing order of combined total apparel exports to the US.

a) The value of total exports from these 22 countries to the EU [US] 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 US preferential schemes obtained from USITC.

c) Average over the period.

^d SR 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)

**Table 2:
Elasticity of Exports to Changes in Rules of Origin**

| | 1 | 2 | 3 | 4 | 5 |
|--|---------------------|-------------------|----------------------------|--------------------|---------------------------------------|
| Dependent variable | ln(X(>0)) | ln(1+X) | ln(a_v+X) | lnX | ln(a_v+X) |
| Regressors (a) | OLS | Tobit | ET-Tobit | PPML | FE Tobit (Trimmed LAD) (c) |
| $TT_t^{US} \times tmar_{i,t}^{j,US} (>0)$ | 0.06 [0.02]*** | 0.4 [0.08]*** | 0.14 [0.03]*** | 0.06 [0.01]*** | 0.04 [0.01]*** |
| $SR_t^{US} \times tmar_{i,t}^{j,US} (>0)$ | 0.15 [0.02]*** | 0.88 [0.07]*** | 0.33 [0.02]*** | 0.15 [0.01]*** | 0.16 [0.01]*** |
| $VC_{i,t}^{j,EU} (>0)$ | -0.45 [0.26]* | 0.39 [0.61] | 0.03 [0.17] | -0.39 [0.10]*** | 0.35 [0.11]*** |
| $D_i^{Madag-02} (<0)$ | -0.23 [0.11]** | -1.45 [0.80]* | -0.61 [0.26]** | -0.65 [0.20]*** | -0.29 [0.10]** |
| a_v (>0) | | | 8386.02 [898.8]*** | | |
| Ramsey RESET test (d) | 0.05 | 0.027 | 0.649 | 0.001 | 0.186 |
| Observations | 1697 | 4284 | 4284 | 4284 | 4284 |
| R² (b) | 0.34 | 0.34 | 0.35 | 0.09 | 0.37 |
| Approx change in exports due to TT at $tmar_{i,t}^{j,US} = 11\%$ | 66% | 440% | 154% | 66% | 44% |
| Approx change in exports due to SR at $tmar_{i,t}^{j,US} = 10.5\%$ | 158% | 924% | 347% | 158% | 168% |

Notes. See equation 2 for definition of regressors. Standard errors in brackets are clustered at the exporter-importer-year level. Dependent variable: $X = X_{i,t}^{j,k}$ exports of apparel variety i at the HS-4 level of aggregation from j (top 7 AGOA exporters) to k (US or EU) in year t. All regressions include exporter dummies as well as interaction terms between exporter-dummies and EU-dummies
* significant at 10%; ** significant at 5%; *** significant at 1%.

(a) Expected signs from equation (2) in parenthesis.

(b) R² values are the square of the correlation between the fitted and the actual value of the dependent variables.

(c) Trimmed Least Absolute Deviation (LAD) estimator for fixed effects (FE) Tobit models developed by Honore (1992) implemented with STATA “pantob” ado-file available at:

<http://www.princeton.edu/~honore/stata/index.html>

(d) P-values reported here. Low p- values (e.g. below 0.1) indicate misspecification.

Table 3: Additional Estimates and Robustness Checks

| | 1 Temporal | | 2 Country-specific | | 3 Alternative SR | |
|---|---|---|---|---|---|---|
| Dependent variable | ln(a _v +X) | | ln(a _v +X) | | ln(a _v +X) | |
| Independent variables | FE Tobit^(c) (Trimmed LAD) | | FE Tobit^(c) (Trimmed LAD) | | FE Tobit^(c) (Trimmed LAD) | |
| | 1a Coeff. | 1b Approx change in exports for an average tmar. | 2a Coeff. | 2b Approx change in exports for an average tmar. | 3a Coeff. | 3b Approx change in exports for an average tmar. |
| $SR_{i,t}^{US} \times tmar_{i,t}^{j,US}$ | 0.1 [0.01]*** | 105% | | | | |
| $SR2_{i,t}^{US} \times tmar_{i,t}^{j,US}$ | 0.05 [0.01]*** | 53% | | | | |
| $SR3_{i,t}^{US} \times tmar_{i,t}^{j,US}$ | 0.05 [0.01]*** | 53% | | | | |
| $SR4_{i,t}^{US} \times tmar_{i,t}^{j,US}$ | 0.03 [0.01]*** | 32% | | | | |
| $D_i^{Bot} \times SR_t^{US} \times tmar_{i,t}^{j,US}$ | | | 0.07 [0.02]*** | 74% | | |
| $D_i^{Ken} \times SR_t^{US} \times tmar_{i,t}^{j,US}$ | | | 0.18 [0.02]*** | 189% | | |
| $D_i^{Les} \times SR_t^{US} \times tmar_{i,t}^{j,US}$ | | | 0.14 [0.02]*** | 147% | | |
| $D_i^{Mad} \times SR_t^{US} \times tmar_{i,t}^{j,US}$ | | | 0.22 [0.03]*** | 231% | | |
| $D_i^{Mal} \times SR_t^{US} \times tmar_{i,t}^{j,US}$ | | | 0.13 [0.03]*** | 137% | | |
| $D_i^{Nam} \times SR_t^{US} \times tmar_{i,t}^{j,US}$ | | | 0.15 [0.04]*** | 158% | | |
| $D_i^{Swa} \times SR_t^{US} \times tmar_{i,t}^{j,US}$ | | | 0.22 [0.02]*** | 231% | | |
| $ASR_t^{US} \times tmar_{i,t}^{j,US}$ (c) | | | | | 0.15 [0.01]*** | 158% |
| $ATT_t^{US} \times tmar_{i,t}^{j,US}$ | | | | | 0.04 [0.01]*** | 44% |
| Observations | 4284 | | 4284 | | 4284 | |
| R² (a) | 0.37 | | 0.38 | | 0.37 | |

Notes: Same sample as in table 3. The specification also includes all the variables included in table 3 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 3 (not reported to save space). Bootstrapped standard errors are in brackets. Standard errors in brackets are clustered at the exporter-importer-year level

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

- (a) R^2 values are the square of the correlation between the fitted and the actual value of the dependent variables.
- (b) $RA^{i,k}_{i,t}=1$, for $t \geq t^*$ where $t^*=2001$ for Madagascar, Lesotho, and Kenya and $t^*=2002$ for Swaziland, Namibia, Botswana and Malawi; $RA^{i,k}_{i,t}=0$, otherwise.
- (c) Trimmed Least Absolute Deviation (LAD) estimator (see table 3)

Table 4: Count Estimates: Negative Binomial Model

| | 1 | 2 | 3 | 4 | 5 |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|
| | pooled | pooled | pooled | FE | RE |
| Dependent variable | | | | | |
| $R_{i,t}^{j,k} (>0)$ | 0.33 [0.15]** | 0.36 [0.08]*** | 0.4 [0.12]*** | 0.48 [0.09]*** | 0.47 [0.09]*** |
| $t_t^{k,mfn} (<0)$ | -0.03 [0.01]*** | -0.03 [0.01]*** | -0.03 [0.01]*** | -0.02 [0.01]*** | -0.02 [0.01]*** |
| $\ln(Y_t^k) (>0)$ | | | -0.19 [0.36] | | |
| Constant | 2.93 [0.07]*** | 1.56 [0.16]*** | 7.15 [10.66] | 1.97 [0.14]*** | 2 [0.14]*** |
| Observations | 396 | 396 | 396 | 396 | 396 |
| Number of groups (importer-exporter pairs) | | | | 44 | 44 |
| Fixed exporter-specific effects | No | Yes | Yes | Yes | No |
| Test of overdispersion [$H_0 : \theta = 0$ (no-overdispersion)] | | | | | |
| Chi-2 | 6522.81 | 749.56 | 748.99 | | |
| p-value | 0 | 0 | 0 | | |

Notes:

Definition of variables: See text

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix. Modelling Exports under Binding ROO

Consider the following simple model of the apparel market under a PSRO. Competitive African firms produce a differentiated product under CRTS according to a technology to be described shortly and face a downward sloping for the differentiated product they sell in the US and EU markets where they compete with exports from other developing countries who sell at MFN-tariff-inclusive unit price p_w^k (see below) in country k , $k \in K = \{EU, US\}$. Then, under the assumption that the tariff-induced rents accrue to exporters, the internal price of African apparel in country k is $p^k = (1 + t^{k, pref}) q^k$, where $t^{k, pref}$ is the tariff applied to African apparel by country k , and q^k is the border price. The demand function for African apparel in country k , X_D^k , can be written as:

$$X_D^k(p^k, Y^k, PS_w^k), \text{ with } \partial X_D^k / \partial p^k < 0, \partial X_D^k / \partial Y^k > 0, \text{ and } \partial X_D^k / \partial PS_w^k > 0 \quad (0.1)$$

where Y^k is the income of country k ; PS_w^k is a market price index of apparel substitutes to African apparel that is imported under the MFN regime from other countries, such as Asian imports that were also subject to quotas. Then, $PS_w^k = \overline{PS}^* (1 + t^{k, MFN})$ with \overline{PS}^* indicating the (exogenously given) border price of apparel imported on a non-preferential basis and subject to an MFN tariff ($t^{k, MFN}$).

Profit-maximizing, price-taking, African apparel producers equate marginal revenue and marginal cost:

$$p^k(\cdot) + \frac{\partial p^k(\cdot)}{\partial X^k} X^k = (1 + t^{k, pref}) (MC_X^k). \quad (0.2)$$

where $p^k(\cdot)$ is the inverse demand function of apparel from country k .

The model is completed by describing how RoO affect firms' marginal costs. For simplicity, but without loss of generality, let apparel be assembled by combining value added with an intermediate good (fabric or textiles) under a Leontief technology with an input-output coefficient, a_v : $X = \min\{f(K, L); V / a_v\}$. Fabric (textiles) from different sources are perfect substitutes with V^{EU} representing fabric produced either domestically or imported from countries qualifying for cumulation under EU schemes at price p_V^{EU} . Third-country (say Asian-source) fabric, V^* , is imported from the rest of the world at price p_V^* . Then $V = V^{EU} + V^*$ is the total quantity of fabric used. African producers are assumed to be price-takers in the market for textiles so (p_V^{EU}, p_V^*) is fixed.

Let $\varphi(X)$ be the value added cost function dual to the value added production function, $f(\cdot)$, and $\varphi'(X) \equiv d\varphi(X) / dX$ the corresponding marginal cost function assumed to be constant (African producers hire domestic factors at constant prices). With perfect substitutability across intermediates, in the absence of a ROO requirement, African producers will choose the cheapest source, as they do under the SR. Then the marginal cost of apparel exported to the US is constant and given by:

$$MC_X^{US} () = \varphi'(X) + a_v \min \{ p_V^{EU}, p_V^* \} \quad (0.3)$$

By contrast, to qualify for EU preferences under EBA or ACP, African exporters have to use fabric qualifying for cumulation with a binding RoO specifying a minimum value content r expressed here as a proportion of total intermediate use (as shown in Appendix C, to qualify for preferential access in the EU market, on average, producers had to have 7% of originating inputs from qualifying countries). In the unlikely case where EU fabric is the cheapest ($p_V^* > p_V^{EU}$), then $V = V^{EU}$ and expression (1.3) also describes the marginal cost of apparel exported to the EU. But, when $p_V^{EU} > p_V^*$, the RoO becomes binding and the marginal cost of apparel qualifying for preferences under EBA or ACP is expressed by:

$$MC_X^{EU} () = \varphi'(X) + a_v [r p_V^{EU} + (1-r) p_V^*] \quad (0.4)$$

With a value-content restriction (or equivalently a double transformation rule) marginal cost for sales to the EU will be an increasing function of the restrictiveness of the ROO, i.e. ($dMC_X^{EU} (r) / dr > 0$).

Letting X^k denote equilibrium sales in market k , under fairly general conditions describing the demand curve (see Appendix 1) that are satisfied by a linear demand curve, total differentiation of (1.2) leads to:

$$\frac{dX^{EU}}{dr} < 0 \text{ and } \frac{dX^k}{dY^k} > 0, \frac{dX^k}{dt^{k,pref}} < 0, \frac{dX^k}{dt^{k,MFN}} > 0, \text{ for } k \in K = \{EU, US\}, \quad (0.5)$$

These comparative static results guide the empirical analysis that follows (see Portugal-Perez (2008) for a graphical analysis). First, other things equal, binding RoO reduce equilibrium export sales of EBA/ACP beneficiaries to the EU. If the production decision and the allocation decisions across markets are separable, then the introduction of the SR--which is equivalent to a relaxation of the binding ROO to the US market-- will lead African firms to redirect sales to the US market.²² Second, an increase in income in the EU or US leads to an increase in sales (if apparel is a normal good). Third, an increase in preferences (i.e. a lower value of $t^{k,pref}$ as under AGOA when previously excluded apparel now qualified for preferential access also leads to an increase in sales. Fourth, preference erosion via a decrease in MFN tariffs leads to a reduction in sales as substitutes from third-countries replace African apparel export sales. As will be shown below, all four comparative statics predictions are confirmed in the data.

4. Evidence

We now take the model's prediction to the data discussing first the specification of the model and the data, then how we selected the sample in view of the large number of zero trade flows in the data. Ideally, the model would require data on costs at the product level to measure how

²² De Melo and Winters (1991) analyze a similar situation for the allocation of VER-restricted exports of footwear to restricted and unrestricted markets under separable and non-separable production and allocation decisions.

restrictive the double transformation rule actually is. Unfortunately no such data are available at the sector level, let alone at the product level, and we are forced to resort to dummy variables to capture the effects of the double transformation rule.