

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

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Abstract

Least developing countries (LDC) rely on preferential market access which is mechanically eroded by the tariff reductions by grantor countries to other countries. Effective market access depends on the severity of the Rules of Origin that have to be met to qualify for these preferences. These Rules of Origin have turned out to be complicated and burdensome for LDC exporters. Since 2001, under the US Africa Growth Opportunity Act (AGOA), 22 African countries exporting apparel to the US can use fabric from any origin and still meet the criterion for preferential access (single transformation), while the European Union continued to require yarn to be woven into fabric and then made-up into apparel in the same country (double transformation). ... / ...

JEL classification number: F12, F13, F15.

Keywords: Rules of Origin, AGOA, EBA, ACP, African Least Developed Countries.

This is a shortened and substantially revised version of CEPR DP #7072 available on the CEPR website. All references to appendices are to appendices in the DP paper version. 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.

... / ...). Panel estimates over the 1996-2004 period exploit this quasi-experimental change in the design of preferences. We estimate that this simplification contributed to an increase in export volume of about 210 percent for the top seven beneficiaries or approximately six times as much as the growth effect of the 12 percent preferential margin granted under AGOA. This change in design also mattered for diversity in apparel exports as the number of export varieties grew more rapidly under the AGOA- special regime.

1. Introduction

Maintaining preferential market access for the Least Developed Countries (LDCs) in the face of mechanical preference erosion as tariffs are reduced continues to occupy attention in multilateral trade negotiations. In turn, qualifying for preferential access, whether or not reciprocal, requires meeting 'origin requirements', i.e. satisfying that products benefitting from preferential access have sufficient domestic content. As explained here, these 'rules of origin' (RoO) have turned out to be cumbersome and complicated. Many feel that the design of these requirements is costly and ends up reducing the intended market access preferences are supposed to grant. Focusing on a case study of apparel exports by Sub-Saharan African LDCs to the two largest grantors of preferences, the EU and the US, this paper gives evidence that simplification in the design of RoO enhances developing-country market access to industrialized countries' markets and has a catalytic effect, at least for Sub-Saharan African LDCs. The implication is that "trade aid" through market forces can then be a powerful stimulant for beneficiaries when RoO give easy-to-access preferences.

Meeting Rules of Origin (RoO) requirements is the core implementation tool in all preferential schemes.¹ 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-rules of origin (PSRO) usually defined at the four or six digit level of aggregation in the Harmonized System (HS-6 or HS-4) (i.e. technical requirements in the production of the textiles and apparel sector examined here).² 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 index the restrictiveness of multiple and complex PSRO at the tariff-line level (for example having a change of tariff

¹ 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 Rules of Origin (RoO) to prevent trade deflection. Estevadeordal and Suominen (2006) give a thorough description of RoO around the world.

² See Estevadeordal and Suominen (2006) for a detailed description of both set of rules. For example, the EU has over 500 different PSRO (Cadot and de Melo (2008)).

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 PSRO). 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 PSRO 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.³

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 (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 Africa Growth Opportunity Act (AGOA) for the US and Everything But Arms (EBA) or Cotonou preferences for the EU. Yet, as shown here, export growth of textiles and apparel to the two destinations has been drastically different in recent years. 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%), growth of apparel exports to the US took off while apparel exported to the EU remained flat. Thus, assessing the restrictiveness of RoO only on 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 does so by exploiting a relaxation of rules of origin by the US under AGOA, 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 the so-called ‘double transformation requirement’), 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 the PSRO by allowing the use of fabric from any origin increased apparel exports to the US by about 210 percent for the top 7 (out of 22) qualifying African exporters in the group. We attribute the lack of supply response in the other

³ 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 PSRO. Krishna (2006) surveys the theoretical literature, and Cadot and de Melo (2008) the empirical literature.

countries receiving the AGOA-SR 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 Regime' to be described in more detail 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.⁴

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" (SR) under AGOA. Section 3 describes the evolution of exports and preferential margins to the two destinations and carries out an 'event-analysis'. This gives a first set of before-and-after growth estimates that do not control for other intervening factors. Section 4 presents the econometric model and the econometric strategy to deal with the many zero observations in the sample. Section 5 presents the main results disentangling the effects of the SR 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 (EBA). Since 1971, the Generalized System of Preferences (GSP) provides non-reciprocal preferential access to the EU market. For textiles and apparel, the PSRO 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.⁵

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 Generalized System of Preferences (GSP) (e.g. watches, footwear, handbags, luggage, work gloves, and apparel). Thus, unlike beneficiaries of US GSP

⁴ 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.

⁵ 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 EBA and Cotonou regimes, leading us to lump together EU imports under both schemes in table 1 (see de Melo and Portugal-Perez (2008) for details).

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. 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. The “Special Rule” (henceforth ‘SR’) for LDCs established since 2001 (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-SR only required applying a single-transformation requirement (fabric → apparel).

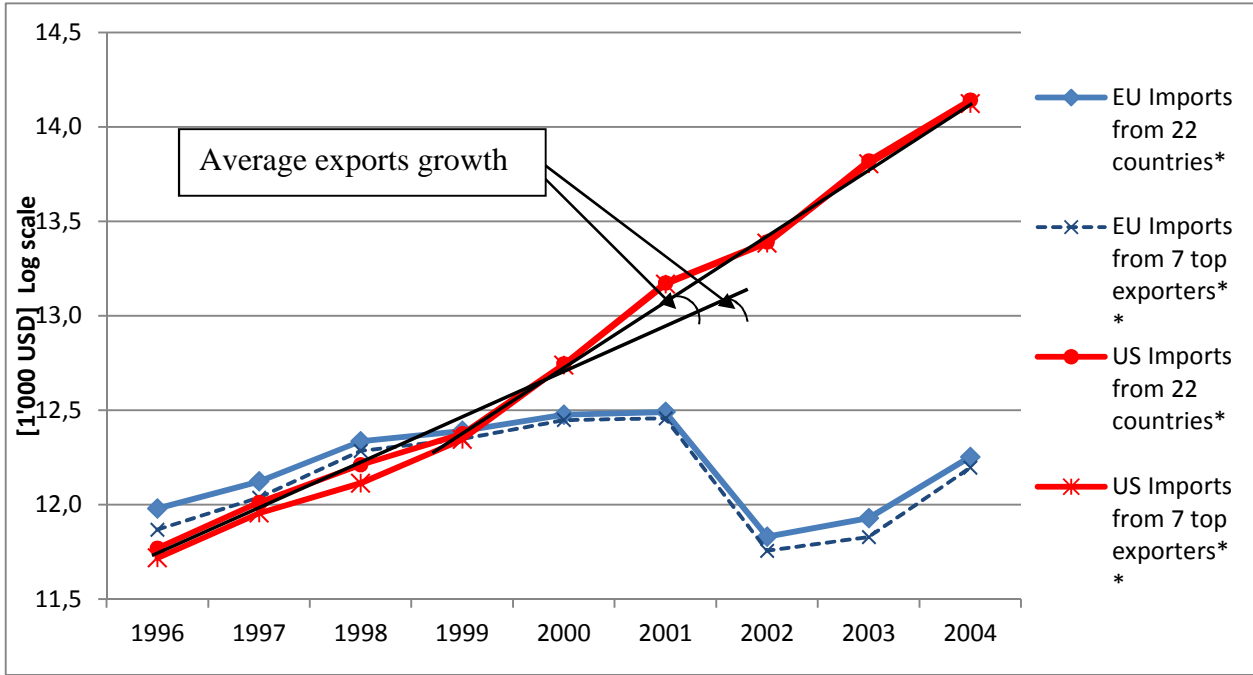
3 Export Trends and Event-Analysis Estimates

By the end of 2004, 22 countries benefited from the SR under AGOA. 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 SR entered into force for Lesotho and Madagascar, the two 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(c) shows the very similar MFN tariffs for the US and the EU throughout the period. Thus the preferential margins for African exporters to the EU and the US were very similar once AGOA became operative.

Two trends are apparent. 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. 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 2001.⁶ 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.

⁶ 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.

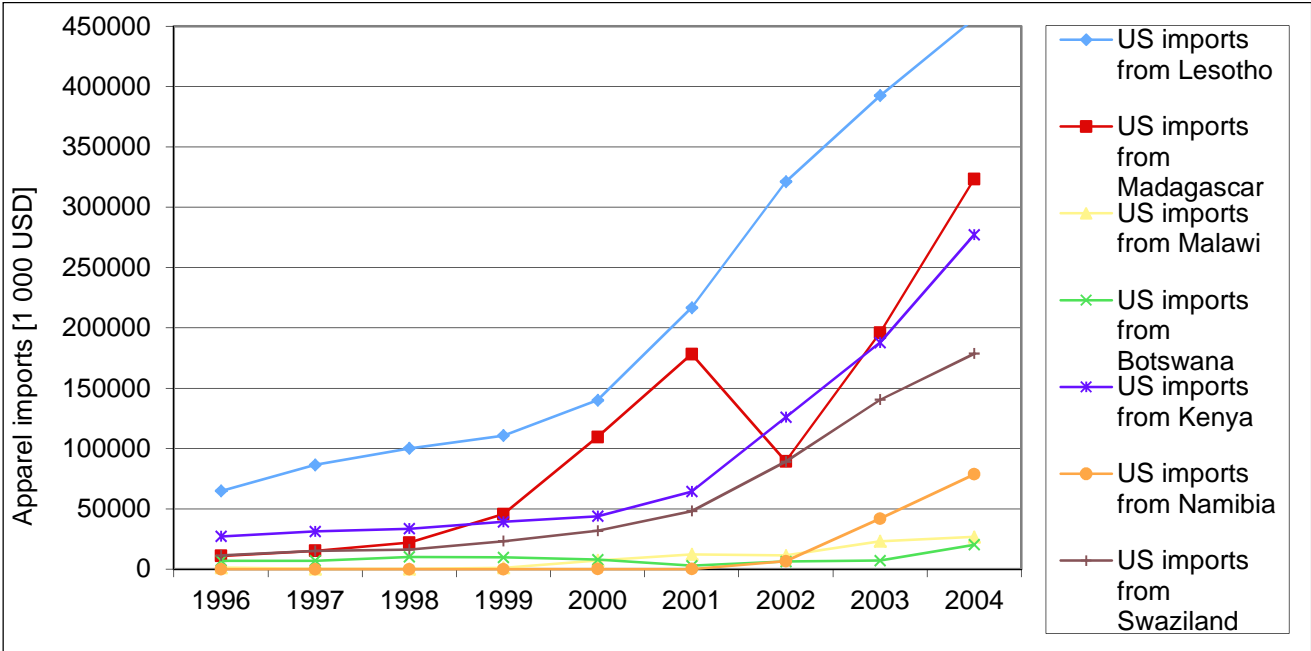
Figure 1(a) Apparel exports of 22 countries benefiting from AGOA-SR by 2004



* 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.

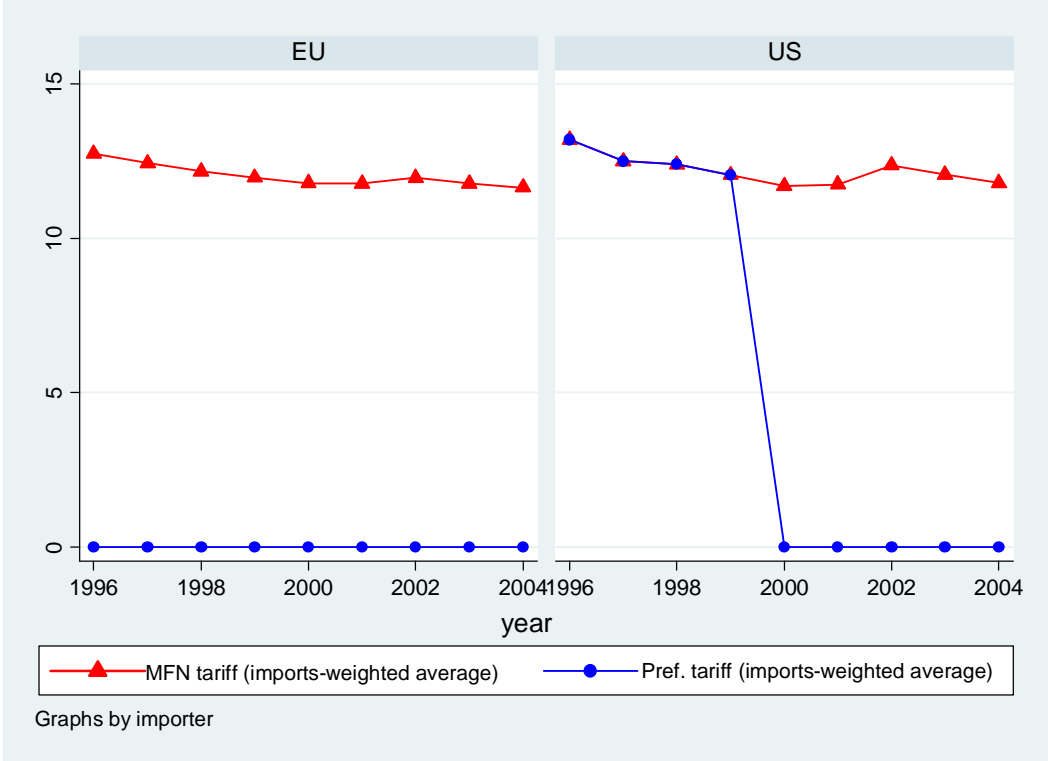
Source: Authors' calculations on data from WTO Integrated Data Base.

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



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

Figure 1(c): Preferential margins to the US and EU markets



Note: Preferential tariffs applied by the US are set equal to the MFN tariff prior to the implementation of AGOA and set equal to zero once it is implemented.

Export volumes, growth rates of exports, utilization of preferences, and year of entry of the SR are all indicated in table 1 in descending order of the combined market share to the EU and the US. Except for Madagascar, the growth rate of exports to the US has increased for all these major exporters. Note that the seven major exporters are among the early recipients of the SR. Yet, exports from three other early recipients (Ethiopia, Uganda and Zambia) did not take off.

Table 1 : Countries Benefiting from AGOA 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)	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	21.23%	34.32%
2	Madagascar	85.77%	96.83%	23.34%	97.27%	01.mar	77.62%	31.07%
3	Kenya	1.54%	92.53%	20.01%	97.94%	01.jan	12.77%	58.55%
4	Swaziland	0.53%	1.75%	12.90%	98.34%	01.jul	29.15%	53.88%
5	Namibia	0.05%	72.95%	5.68%	96.50%	01.dec	-	837.93%
6	Botswana	6.01%	74.67%	1.46%	99.44%	01.aug	2.85%	26.55%
7	Malawi	0.06%	94.52%	1.93%	95.17%	01.aug	54.90%	38.27%
8	Ghana	0.07%	82.22%	0.53%	96.26%	02.mar	23.00%	214.41%
9	Uganda	0.00%	9.48%	0.29%	100.00%	01.oct	-	576.03%
10	Ethiopia	0.34%	97.24%	0.24%	99.80%	01.aug	-66.55%	400.08%
11	Cape Verde	2.43%	99.77%	0.22%	95.03%	02.aug	111.26%	35.75%
12	Tanzania	1.80%	99.53%	0.18%	99.00%	02.feb	-72.17%	618.97%
13	Mozambique	0.08%	94.70%	0.16%	85.15%	02.féb	-16.70%	131.84%
14	Sierra Leone	0.38%	4.04%	0.11%	0.00%	04.apr	86.91%	80.57%
15	Cameroon	0.17%	23.10%	0.02%	0.00%	02.mar	30.88%	0.10%
16	Nigeria	0.04%	1.67%	0.01%	1.37%	04.jul	3.70%	-54.16%
17	Zambia	0.00%	100.00%	0.00%	78.67%	01.dec	-1.22%	-49.65%
18	Mali	0.03%	10.49%	0.00%	0.00%	03.dec	34.97%	-86.55%
19	Senegal	0.17%	93.90%	0.00%	0.00%	02.apr	-30.47%	-27.65%
20	Niger	0.03%	82.09%	0.00%	0.00%	03.dec	-10.94%	-57.70%
21	Benin	0.01%	41.97%	0.00%	0.00%	04.jan	2.92%	-
22	Rwanda	0.00%	30.23%	0.00%	0.00%	03.mar	-	-
	TOTAL	100%	91.20%	100%	97.65%	01.apr	21.23%	34.32%

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 can be more easily obtained since USITC collects and makes available the program under which imports enter the US.

c) Exports growth are estimated from yearly export figures. Exports growth are not reported if a country has zero exports at the beginning of the period. If the country has benefited from eligibility to the SR before the end of August of a year, the country is assumed to have benefited from the rule the whole year.

Table 1 also reports the utilization rate of preferences across apparel products for each of these 22 countries when exporting to the EU (under EBA 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 EBA or Cotonou. Yet, in spite of these high utilization rates under both schemes, export volumes evolved quite differently.

To control for the fact that the SR was not granted to all beneficiaries on the same year, we reorganize the data by converting calendar-years into event-years (so-called "event-analysis") to check for statistically significant changes around the time when the SR was introduced. Table 2 reports estimates of the following three specifications:

$$\begin{aligned}
 \ln(X_{jt}) &= \beta_0 + \beta_1 \times SR_{jt} + \beta_2 \mu_j + \varepsilon_{jt} \\
 \ln(X_{jt}) &= \alpha_0 + \alpha_1 \times Year_{jt} + \alpha_2 \mu_j + \varepsilon_{jt} \\
 \Delta \ln(X_{jt}) &= \gamma_0 + \gamma_1 SR_{jt} + \gamma_2 \mu_j + \varepsilon_{jt}
 \end{aligned}
 \tag{O.1}$$

where X_{jt} are country j 's aggregated apparel exports (HS-61 and HS-62) to the US in year t ; SR_{jt} is a dummy variable taking a value of 1 if the SR regime is active; μ_j is a vector containing exporter-specific dummies, and; $Year_{jt}$ denotes the event-year in which a country benefits from the SR . Estimation is over the period 1996-2004.

Table 2 : Event-analysis based aggregate growth of apparel to the US market

	1	2	3	4	5	6
Dependent Variable	$\ln(X_{jt})$	$\ln(X_{jt})$	$\ln(X_{jt})$	$\ln(X_{jt})$	$\Delta \ln(X_{jt})$	$\Delta \ln(X_{jt})$
Year (α_i)		0,22 [0.05]***		0,44 [0.08]***		
SR (β_i)	1,4 [0.29]***		2,21 [0.50]***			
SR (γ_i)					0,58 [0.31]*	0,64 [0.28]**
Constant	3,53 [0.70]***	4,36 [0.72]***	8,18 [0.29]***	9,37 [0.25]***	0,45 [1.21]	0,05 [0.17]
Observations	177	177	177	177	146	146
R-squared	0,76	0,76	0,1	0,13	0,1	0,04
Sample (# countries)	22	22	22	22	22	22
Exporter-specific dummies	Yes	Yes	No	No	Yes	No

Notes: Dependent variable: X_{jt} Aggregate export of apparel, knitted (HS-61) and non-knitted (HS-62)

SR: AGOA special regime (single transformation rule) dummy= 1 if SR in effect

Standard errors in brackets. *significant at 10%; ** significant at 5%; *** significant at 1%

Source: Authors' estimates

Results reported in table 2 show that the coefficients detecting changes in export growth after the introduction of the SR (cols. 1 and 2) are highly significant suggesting that something happened to aggregate apparel exports to the US around the time when the SR was adopted. According to the estimates, the SR is associated with an average increase of about 305% ($=\exp(1.4) - 1$) in apparel exports for the bloc of 22 countries (col. 1) and growth of apparel exports of nearly 24% ($=\exp(0.22)-1$) (col.2). Results are robust to the exclusion of the exporter-specific dummies (cols 3 and 4). Though estimated less precisely, the estimates in column 5 suggest that the SR increases apparel exports from the bloc of African countries by about 64% per year, an estimate that holds up to the removal of the exporter dummies (column 6).⁷

These first estimates suggest a total increase of about 300% in apparel exports for the bloc of 22 countries with a yearly growth of apparel exports of over 20% a year, results that are robust to several specification and sample size checks. However, these estimates do not take into account that rules of origin vary across products. Nor do they take into account the change in preference margins in the US market (see figure 1(c)), or other changes in the EU and the US markets.

⁷ There is a large number of zero-exports at the product line (HS-6) (between 70% and over 90% of the 229 export lines have zeroes in most if not all years) and some countries had zero aggregate exports of apparel in some years. Appendix A reports estimates with a smaller sample of 16 countries with no holes in aggregate exports at some point in the sample period. The results are very close to those reported here.

4 Empirical Framework

We wish to isolate the cost-lowering effects of the move to the AGOA-SR from other factors. Estimating the impact associated with PSRO is difficult because these rules are complex and because they remain unchanged.⁸ Data permitting, a satisfactory approach might be to develop a fully structural model. This is the route followed by Cherkashin et al. (2010). In their model, heterogeneous firms decide whether or not to enter the textile market, then which destination to export to (i.e. EU or US or both) and finally they 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). The downside of this approach is that obtaining a solution to their structural model requires a number of strong identifying restrictions, notably on costs associated with meeting origin requirements.⁹ More importantly, their reliance on cross-section data only for estimation do not allow them to tackle directly the effects of change in rules as we do here. In any case, to fit a structural model to the exports of apparel by SSA 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.

The alternative to a structural model is to 'let the data speak' in a less ambitious framework. In Appendix B, 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 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), (ii) an increase in income in the destination market and (iii) a relaxation of the rule of origin which lowers its production costs. These predictions are brought to the data below.

⁸ As mentioned in the introduction, most estimates come from studies of utilization rates or from price comparisons from sales to preferential versus non-preferential destinations. For example, Carrère and de Melo (2006) show that having controlled for variations in preferential access, utilization rates were higher when indices of the restrictiveness of the PSRO had lower values (i.e. were less restrictive). Using a switching regression approach, Francois et al (2006) find that firms start using preferences when preferential margins exceed 4 percentage points. Drawing on Mexican export data on exports of apparel at the HS-8 level, Cadot et al. (2005) find that the pass-through of the preferences is only 80% and that this pass-through falls to 50% when increased costs for intermediates purchased from the US under the RoO requirement are factored in.

⁹ Identification assumes 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.

4.1. Model Specification and data.

Model Specification. The model sketched above suggests that, after controlling for idiosyncratic factors in each market, export sales of individual textile products towards the EU and US destinations should depend on changes in preferential access, changes in income capturing demand shifters in the EU and the US, and on changes in PRSO. Because only a subset of the apparel varieties are exported, the sample is censored. We estimate the following log linear relationship :

$$\ln(a_v + X_{i,t}^{j,k}) = \beta_0 + \beta_1(R_{i,t}^{j,k}) + \beta_2(VC_{i,t}^{j,k}) + \beta_3(t_{i,t}^{k,mfn}) + \beta_4(t_{i,t}^{j,k,pref}) + \beta_5 \ln(Y_t^k) + \beta_6 D_i^{Madag-02} + \sum_{j \in J} \sum_{k \in K} \delta_{j,k} (D_i^j \times D_i^k) + \varepsilon_{i,t}^{j,k} \quad (0.2)$$

$j \in J = \{ 7 \text{ (or 22) African exporters} \}$ $k \in K = \{EU, US\}$ $t = 1996, \dots, 2004$

$i = 1, \dots, 229 \in (CH61-CH62)$

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).
- $R_{i,t}^{j,k}$ is a dummy variable that captures the presence of the SR. It is set equal to one if country j benefits from the AGOA-SR allowing the use of textiles from any source and still qualifying for preferences ($k = US$) in year $t (\geq 2000)$, and zero otherwise. $R_{i,t}^{j,k}$ is set equal to one for the first year and the consecutive ones if country j has benefited from SR eligibility for more than four months during the year. For example, Botswana and Malawi were entitled the SR from August 2001, so the dummy is set equal to one for $t = 2001$ and for successive years.
- $VC_{i,t}^{j,k}$ is a dummy variable accounting for less restrictive cumulation in some non-knitted apparel (HS-62) allowed by the EU since 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 $t (\geq 2000)$ when exporting on a preferential basis to the EU ($k = EU$), and zero otherwise.
- $t_{i,t}^{k,mfn}$ is the MFN tariff applied on apparel product i by importer k in year t .

- $t_{i,t}^{j,k,pref}$ is the preferential tariff applied on apparel product i imported from j that benefits from country k 's preferential regime when complying with the PSRO. Preferential tariffs are set equal to the MFN tariff prior to the implementation of a preferential agreement and set equal to zero once a preferential regime is implemented (set equal to zero throughout the period for the EU and starting in 2000 for the US).
- Y_t^k is GDP of country k (EU or US) in year t .
- $D_i^j [D_i^k]$ 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)
- $D_i^{Madag-02}$ is a dummy taking the value of 1 for Madagascar's export loss in 2002 provoked by its political crisis.
- $\varepsilon_{i,t}^{j,k}$ is the error term.

The expected signs for the coefficients are: $\beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 < 0, \beta_5 > 0, \beta_6 < 0$, and we expect the coefficient of the value-content (VC) dummy to be positive but smaller than the one for the SR-dummy ($\beta_2 < \beta_1$).

Data. The model is estimated for 34 varieties of apparel (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. GDP is expressed in constant 2000 US dollars and was compiled from the World Development Indicators. The Appendix gives details and descriptive statistics for the sample. 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 PSRO under AGOA were defined at the HS-2 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 3. Two benchmark estimates are reported. Column 1 reports OLS estimates with $\ln(1 + X_{i,t}^{j,k})$ 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 choice of the parameter $a_v = 1$ 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 $\ln(a_v)$ (see Appendix D for further discussion).

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 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

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. In order to satisfy the exclusion restriction typical in such a 2-stage Heckman estimation method, such an approach 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.

¹¹ Another benchmark is to shift up all export values are shifted up by one unit (i.e. fixing $a_v=1$ in (0.2)) 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 3. While this approach has the advantage of including all observations, it does not solve the problem that the resulting estimates are inconsistent.

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

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 $\ln(a_v + X_{i,t}^{j,k})$ as the dependent variable. This estimator has the advantage of being consistent and asymptotically normal. Therefore, it is 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 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 SR 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 a 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 4 are based on this estimator.

5. Results

5.1 Main Results

Table 3 presents the results from estimating **Erreur ! Source du renvoi introuvable.** with the last row reporting the estimated elasticity of exports to the introduction of the SR (as captured by the $R_{i,t}^{j,k}$ dummy) for the corresponding estimator (appendix D gives the details on the ET-Tobit and the computation of marginal effects). Column 1 reports the truncated OLS method. Not all coefficients have the expected sign: the coefficient of $\ln(\text{GDP})$ is negative and the coefficient of VC is negative, but both are non-significant. Switching from the double to the simple transformation rule is estimated to boost apparel exports by 226 per cent.¹⁴

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 Results (not reported here) from estimating OLS with $\ln(1+X)$ as the dependent variable incorporates all the observations. The estimated β_1 is slightly reduced but still positive and significant. Although the sign of $\ln(\text{GDP})$ and VC coefficients switch to their expected signs, including zero observations in an OLS model leads to biased estimates.

Table 3 here: Elasticity of Exports to Changes in RoO

	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)
$R_{i,t}^{j,k}$ (>0)	1,18 [0.21]***	4,84 [0.94]***	1,94 [0.33]***	0,8 [0.12]***	1,14 [0.11]***
$VC_{i,t}^{j,k}$ (>0)	-0,28 [0.26]	0,5 [0.59]	0,09 [0.17]	-0,61 [0.13]***	0,33 [0.11]***
$I_{i,t}^{k,mfn}$ (>0)	0,2 [0.03]***	1,28 [0.09]***	0,46 [0.03]***	0,11 [0.01]***	0,07 [0.02]***
$I_{i,t}^{j,k,pref}$ (<0)	-0,05 [0.02]***	-0,19 [0.07]***	-0,07 [0.02]***	-0,02 [0.01]**	-0,03 [0.01]***
$\ln(Y_t^k)$ (>0)	-0,33 [1.19]	15,08 [4.95]***	5,03 [1.62]***	5,29 [0.91]***	0,76 [0.43]*
$D_i^{Madag-02}$ (<0)	-0,21 [0.11]*	-1,25 [0.39]***	-0,53 [0.12]***	-0,68 [0.08]***	-0,24 [0.10]**
a_v (>0)			8399,3 [9.40]***		
Ramsey					
RESET test (d)	0,001	0,001	0,103	0,001	0,186
Observations	1697	4284	4284	4284	4284
R² (b)	0,35	0,36	0,37	0,11	0,37
Approx change in exports	225,44%	12546,94%	595,88%	122,55%	212,68%

Notes. See equation 1 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.

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

(a) Expected signs from equation (1) in parenthesis. Estimates in columns 1 to 4, and 6 include a constant, exporter dummies, interaction terms between exporter-dummies and EU-dummies. Estimates in column 5 have exporter-importer-product fixed effects.

(b) R² statistics 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) was implemented with STATA "pantob" ado-file available at: <http://www.princeton.edu/~honore/stata/index.html>

(d) Low Ramsey test p-values are related to misspecification.

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.¹⁵ 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 value of β_1 , which is very sensitive to the choice of a_v used to avoid truncation, is implausible. Indeed, differences between ‘observations’ of the dependent variables, $\ln(a_v + X_{i,t}^{j,k})$, becomes smaller as a_v increases.¹⁶ ET-Tobit estimates reported in Column 3 include an estimate of the value of a_v that fits best the data. All coefficient signs are as expected and, even though the parameter values are more plausible, almost all estimates are 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 models¹⁷. 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 by 123%. The income elasticity of demand estimate is still high and there is also 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 estimate for β_1 now suggesting that removing the double transformation requirement increased imports by 212 percent. The presence of the alternative VC requirement for some non-knitted apparel is associated with an increase of 33%, whereas the income elasticity of the demand for African apparel imports goes down to 0.76. The 12 percentage point cut in tariffs applied to Africa apparel following AGOA is estimated to have increased African exports by about 36 percent ($=12*0.03$), i.e. about 17 percent of the effect associated with removing the double transformation technical requirement.

¹⁵ 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.

¹⁶ Coefficient estimates for β_1 next to corresponding values of a_v are: ($a_v =1, \beta_1=4.84$); ($a_v =0.1, \beta_1=5.34$); ($a_v =0.01, \beta_1=6.18$);($a_v =10, \beta_1=3.68$) confirming that the estimates under this approach depend on the relation of a_v to the sample mean.

¹⁷ 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 3, table2) and ET-tobit (column 4, table 2), are small. Thus, the tests reject the homoskedasticity and the normality of errors:

LM tests (P-values)	Tobit	ET-Tobit
H0: Homoskedasticity	0.001	0.001
H0: Normality of errors	0.001	0.001

These estimates may still appear to be on the high side. However African exports to the US are very low before the SR, and they account for less than 0.001 percent in both the EU and US markets were less than. Both factors must have contributed to the large elasticity responses. As to the different estimates reported in table 3, 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 likely to be contaminated by the presence of omitted variable bias, and/or measurement error.¹⁸

5.2. Additional Estimates and Robustness Checks

Table 4 turns to the cumulative effects of the AGOA-SR on exports by including three additional dummy variables $(R2_{i,t}^{j,k}, R3_{i,t}^{j,k}, \text{ and } R4_{i,t}^{j,k})$ to specification **Erreur! Source du renvoi introuvable.** These dummy variables capture the supplementary or cumulative effects on exports of an additional year under the SR program. Thus $R2_{i,t}^{j,k}$ is equal to one if country j is at least in the second year after being entitled to the SR program (which includes the third and the fourth year), and zero if not. The same applies for $R3_{i,t}^{j,k}$ and $R4_{i,t}^{j,k}$. Then, the coefficient of $R_{i,t}^{j,k}$ no longer captures the average effect on exports of benefiting from the SR, but only the cumulative effect of being at the first year under the SR program. To save space, coefficient estimates for the other variables are not included in the table as they are similar to baseline estimates.

¹⁸ At the end of their answer to "The Log of Gravity revisited", Santos-Silva and Teneyro (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 2011) 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, it is worth pursuing scrutiny along these directions.

Table 4: Additional Estimates and Robustness checks

	1 Temporal		2 Country-specific		3 Alternative. SR		4 Triple Transf.	
Dependent variable	ln(a _v +X)		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)		FE Tobit^(c) (Trimmed LAD)	
	1a Coeff.	1b Approx change in exports	2a Coeff.	2b Approx change in exports	3a Coeff.	3b Approx change in exports	4a Coeff.	4b Approx change in exports
$R_{i,t}^{j,k}$	0.68 [0.10]***	97.4%						
$R2_{i,t}^{j,k}$	0.39 [0.10]***	47.7%						
$R3_{i,t}^{j,k}$	0.56 [0.09]***	75.1%						
$R4_{i,t}^{j,k}$	0.1 [0.13]	10.5%						
$D_i^{Bot} \times R_{i,t}^{j,k}$			0.23 [0.20]	25.9%				
$D_i^{Ken} \times R_{i,t}^{j,k}$			2.02 [0.34]***	653.8%				
$D_i^{Les} \times R_{i,t}^{j,k}$			0.82 [0.18]***	127.0%				
$D_i^{Mad} \times R_{i,t}^{j,k}$			1.74 [0.28]***	469.7%				
$D_i^{Mala} \times R_{i,t}^{j,k}$			0.86 [0.27]***	136.3%				
$D_i^{Nam} \times R_{i,t}^{j,k}$			0.96 [0.33]***	161.2%				
$D_i^{Swa} \times R_{i,t}^{j,k}$			1.42 [0.33]***	313.7%				
$RA_{i,t}^{j,k}(c)$					1.02 [0.10]***	177.3%	0.81 [0.12]***	124.8%
$TT_{i,t}^{j,k}$							-0.36 [0.11]***	-30.2%
Observations	4284		4284		4284		4284	
R² (a)	0.37		0.38		0.37		0.37	

Notes: Same sample as in table 3. The specification also includes the variables included in table 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 reported in table 3. 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%.

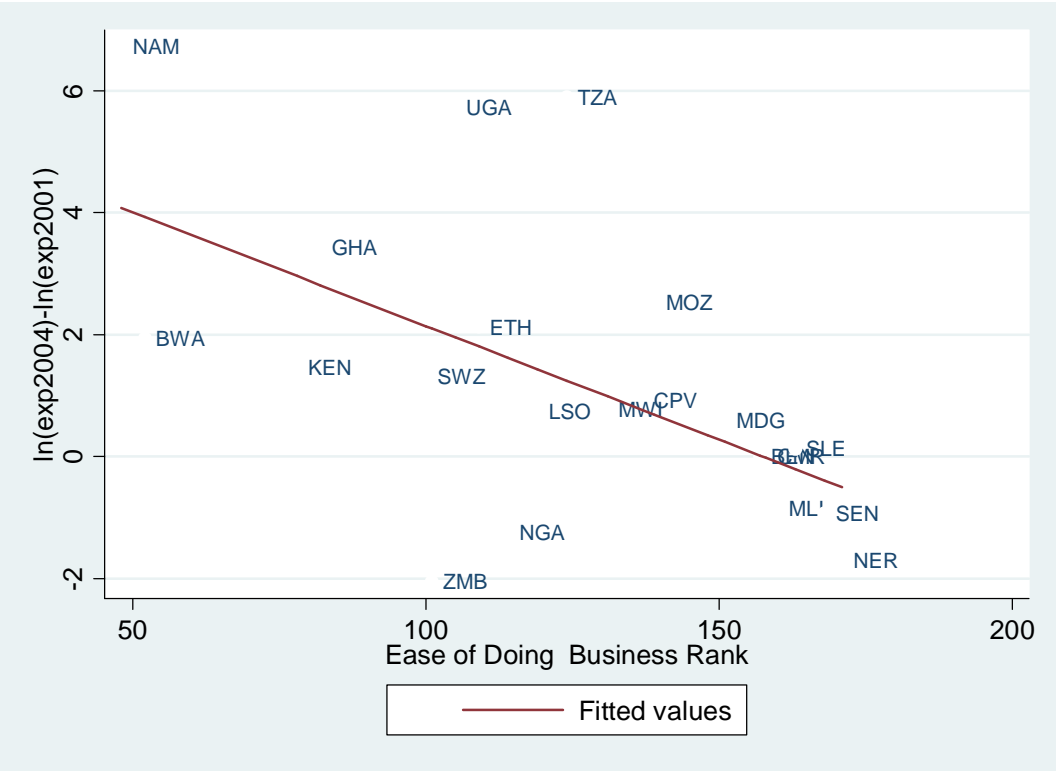
Column 1b reports the approximate growth rates of exports computed from estimates of the dummy-coefficients in column 1a. The biggest change in exports is registered during the first year suggesting that preferential exports increased immediately after the implementation of the SR which is what one would 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. Of the average cumulated increase of 220 percent in the three year period, close to 40 percent occurred in the first year.

Columns 2a and 2b show the differential effect of the SR across the 7 exporters. The effect for all countries is positive, although the smallest coefficient for Botswana is not significant. The effect of the SR on exports from Kenya and Madagascar are found to be the largest. The differential performance among receivers of the SR begs the question why some African countries were 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.¹⁹ Figure 2 confronts the Ease of Doing Business (DB)²⁰ ranking of African countries benefiting from the SR 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.

¹⁹ 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.

²⁰ 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.

Figure 2 : 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 = 0.2766

As explained previously, the SR dummy is set equal to one if a country benefits from the rule for at least 4 months. As Botswana and Malawi were eligible to the SR from August 2001, whereas Swaziland was eligible from July 2001, the effect may be reflected in the exports data only from 2002 onwards. Column 3 reports the export elasticity estimate when the dummy, $RA^{j,k}_{i,t}$, is equal to one only from 2002 onwards for Botswana, Malawi and Swaziland, and remains unchanged for other countries²¹. Compared to the baseline estimates, the estimated impact of SR on exports decrease slightly to 177 percent.

RoO for textiles & apparel under AGOA was first characterized in 2000 by a triple transformation (TT) rule, which was subsequently transformed into the single-transformation requirement with the SR for eligible Lesser Developed countries. An alternative way to characterize the TT rule in 2000 is to include in the baseline estimates the following dummy: $TT^{j,k}_{i,t} = 1$ for $t=2000$, and zero otherwise.²² As seen in columns 4a and 4b, the coefficient of the SR dummy remains significant

²¹ 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.

²² We are grateful to a referee for suggesting this point.

and positive, whereas the negative and significant coefficient of $TT_{i,t}^{j,k}$ confirms that the triple transformation requirement does not promote exports of countries benefiting from AGOA preferences to the U. S. market.

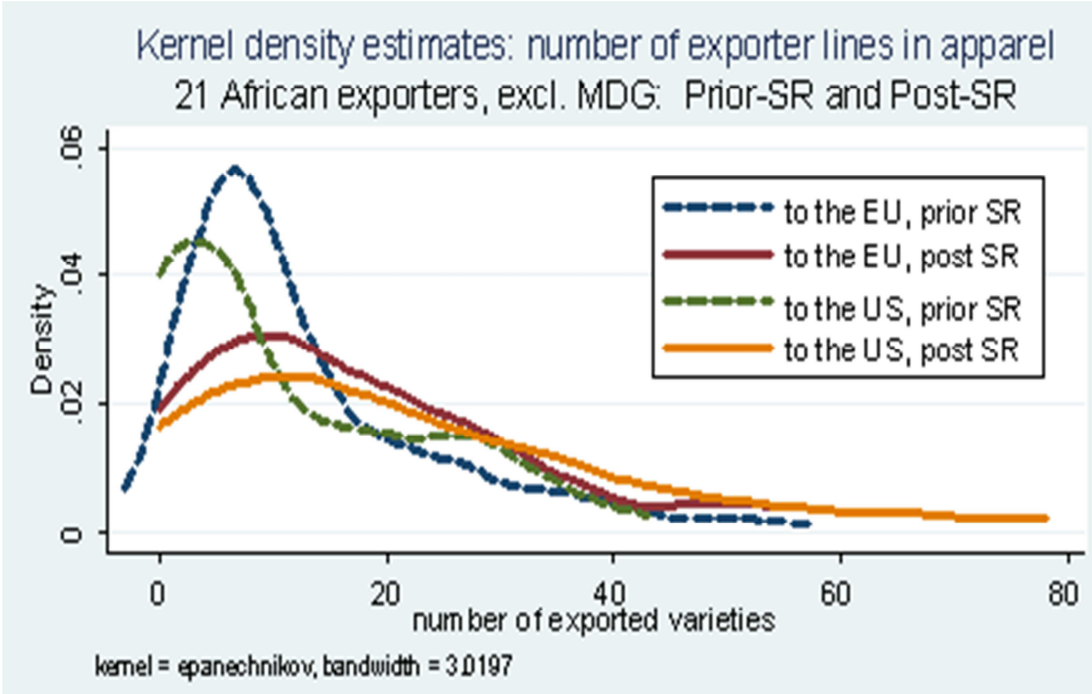
Finally, the results hold up to the following robustness checks reported in the Appendix. First, we replicated the estimations reported in table 3 for two samples: a sample of 16 countries with positive aggregate exports for each year, and the full sample of 22 countries. With few exceptions, the estimates are globally close to those in table 3. 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 SR which might reflect the inclusion of a large number of small countries that were not successful at taking up preferential market access under the SR context. 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. Omitted variable bias and measurement error leading to our large estimated values could have resulted from not separating knitted (Chapter-61) and non-knitted apparel (Chapter-62) and from omitting an index of importer j 's real exchange rate. 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. Adding a variable to capture the effects of fluctuations in the $\$/\epsilon$ real exchange rate turned out also 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 SR 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 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-SR, 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 SR 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 5). 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 5 the estimates from pooled, fixed effects (FE) and random effects (RE) with the NBRM.²³

²³ 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 5: 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%

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 SR 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 (PSRO) 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 Regime" (SR) under AGOA) for a group of African countries provides a 'quasi-natural' benchmark against which the effects of a change in this PSRO can be evaluated. This benchmark is particularly welcome because PSRO are extremely complex, are rarely modified, vary across HS product lines within the same product category, and patterns of utilization 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 (SR) 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 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 10% in both markets under EBA 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 212 percent. This is close to six times as much as the estimate of the effects of the tariff removal on Sub-Saharan African exports to the US estimated as a 36 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 PSRO in apparel with export growth for the receiving countries (by a factor of six 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 or export growth at the extensive margin. While export diversification also took place for sales to the EU market, to our knowledge, this is the first evidence suggesting that restrictive PSRO 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-SR, there is evidence that the uptake of preferences is gradual over time, taking place during the first three years a country benefits from the SR.

Finally, the impact of the AGOA-SR was different across countries. Since the SR 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 SR 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).²⁴

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

²⁴ 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-SR. 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" August 23, 2001. Financial Times.

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/>

**Appendices to
Rules of Origin, Preferences and Diversification in Apparel:
African Exports to the US and to the EU
by
Jaime de Melo and Alberto Portugal-Perez
November 24, 2008**

Appendix A: Additional tables and figures

Appendix B: A simple model

Appendix C. Product Specific Rules of Origin in T&A

Appendix D. The Eaton-Tamura (ET) tobit model.

Appendix A: Additional tables and figures

Table A.1 : Sample and Descriptive statistics

At the HS-6, the sample has potentially 90,684 observations (=229 x 22 x 2 x 9) from which 83523 have zero-export values, i.e. about 92 percent of exports observations have zero values. Tariff lines 611011, 611012, and 611019, were excluded from the set of varieties because there are no exports from any country before 2002. The same applies to tariff line 611010 for which there are no exports after 2001. We suspect that this pattern might have reflected a change in the tariff classification with the latter line been disaggregated in the three former categories. Three tariff lines (610799, 611699, and 620321) that are imported by the EU and US from other-than-African sources were also omitted from the sample.

Below is a summary of the number of years with zero aggregate exports to the EU and to the US, respectively, in parenthesis (maximum: 9 years). Benin (0,3); Botswana (0,0); Cameroon (0,0); Capo Verde (0,0); Ethiopia (0,0); Ghana (0,0); Kenya (0,0); Lesotho(0,0); Madagascar(0,0); Mali (0,0); Mozambique (0,1); Malawi (1,0); Namibia (0,3); Níger (0,0); Nigeria (0,0);Rwanda (2,7); Senegal (0,0); Sierra Leone (0,0); Swaziland (0,0);Tanzania (0,0); Uganda (0,4); Zambia (1, 3).

For the reduced panel considering the 7 major exporter countries, 24958 observations out of 28854(=229 x 7 x 2 x 9) are zeros, that is 86.5% of observations.

Descriptive Statistics

Variable	TOP 7 exporters (reduced sample)			All 22 countries (full sample)		
	Obs	Mean	Std. Dev	Obs	Mean	Std. Dev
$\ln(1 + X_{i,t}^{j,k})$	13590	3.158	5.203	33408	2.063	4.181
$\ln(1 + X_{i,t}^{j,k})$	13590	12.66	4.208	33408	12.47	4.097
$\ln(1 + X_{i,t}^{j,k})$	13590	3.044	6.3	33408	2.958	6.118
$VC_{i,t}^{j,k}$	13590	0.072	0.259	33408	0.083	0.276
$R_{i,t}^{j,k}$	13590	0.2	0.4	33408	0.161	0.368
$\ln(Y_t^k)$	13590	29.79	0.122	33408	29.79	0.122

Table A2 : Robustness checks on the sample of 22 AGOA-SR countries at HS-6

	1	2	3	4	5
	OLS[ln(m)>0]	OLS[ln(1+m)]	Tobit	ET-Tobit	PPML
$R_{i,t}^{j,k} (>0)$	0.74 [0.12]***	0.42 [0.03]***	3.31 [0.40]***	1.33 [0.14]***	0.85 [0.24]***
$VC_{i,t}^{j,k} (>0)$	-0.13 [0.10]	0.46 [0.04]***	5.21 [0.38]***	1.69 [0.14]***	-0.41 [0.22]*
$t_{i,t}^{k,mfn} (>0)$	0.05 [0.01]***	0.02 [0.00]***	0.12 [0.03]***	0.06 [0.01]***	-0.01 [0.01]
$t_{i,t}^{j,k,pref} (<0)$	-0.03 [0.01]***	-0.02 [0.00]***	-0.22 [0.03]***	-0.08 [0.01]***	-0.01 [0.01]
$\ln(Y_t^k) (>0)$	-2.19 [0.55]***	0.33 [0.15]**	5.24 [1.92]***	1.87 [0.68]***	4.45 [1.48]***
$D_i^{Madag-02} (<0)$	-0.17 [0.17]	0.04 [0.12]	-1.11 [0.88]	-0.46 [0.31]	-0.59 [0.25]**
$a_v (>0)$				1,005.13 [43.23]***	
Observations	7161	90684	90684	90684	90684
R² or Pseudo R² (a)	0.41	0.16	0.25	0.26	
Dependent variable	ln(1+X)	ln(1+X)	ln(a_v+X)	X	ln(X)

Notes:

Standard errors in brackets

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

All estimates include a constant, exporter dummies as well as interaction terms between exporter-dummies and EU-dummies.

(a) R² are reported for OLS regressions and McKelvey and Zavoina's Pseudo R² are reported for Tobit and ET-Tobit regressions.

Table A3 : Robustness checks on the sample of top 6 exporters, excluding Madagascar

	1	2	3	4	5
	OLS[ln(m)>0]	OLS[ln(1+m)]	Tobit	ET-Tobit	PPML
$R_{i,t}^{j,k} (>0)$	0.96 [0.21]***	0.87 [0.08]***	6.34 [0.85]***	2.15 [0.27]***	0.71 [0.30]**
$VC_{i,t}^{j,k} (>0)$	-0.93 [0.24]***	0.14 [0.09]	2.54 [0.95]***	0.61 [0.31]**	-1.85 [0.32]***
$t_{i,t}^{k,mfn} (>0)$	0.06 [0.01]***	0.06 [0.01]***	0.48 [0.05]***	0.16 [0.02]***	-0.01 [0.01]
$t_{i,t}^{j,k,pref} (<0)$	0 [0.02]	-0.03 [0.01]***	-0.22 [0.06]***	-0.07 [0.02]***	0 [0.02]
$\ln(Y_t^k) (>0)$	-0.32 [1.14]	0.87 [0.39]**	13.19 [4.54]***	4.31 [1.44]***	6.35 [2.44]***
$a_v (>0)$	19.75 [34.15]	-26.32 [11.63]**	-431.82 [135.52]***	3,701.00 [338.97]***	-179.75
Observations	2148	24732	24732	24732	24732
R² or Pseudo R² (a)	0.32	0.07	0.16	0.17	
Dependent variable	ln(1+X)	ln(1+X)	ln(a_v+X)	X	ln(X)

Notes:

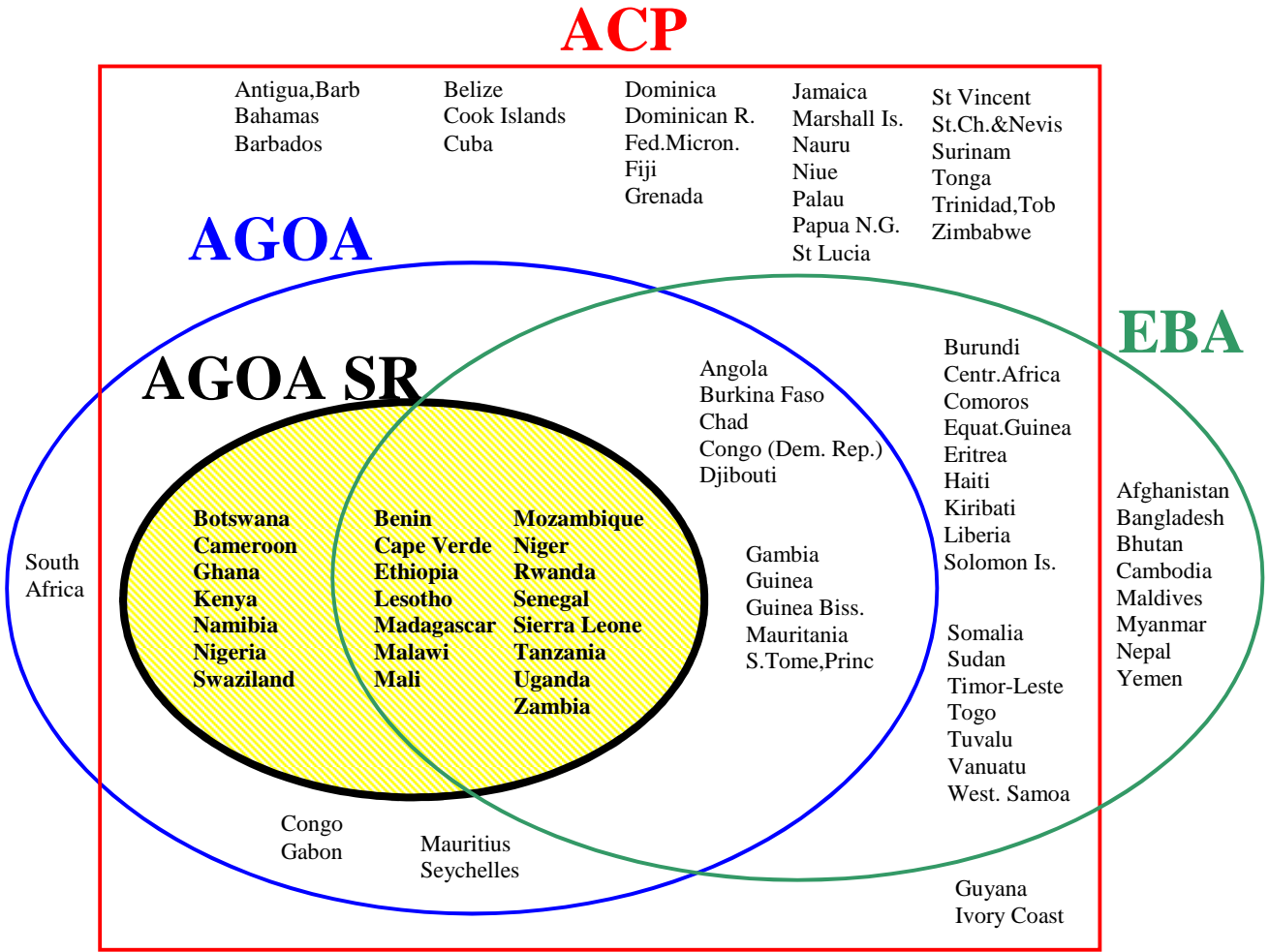
Standard errors in brackets

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

All estimates include a constant, exporter dummies as well as interaction terms between exporter-dummies and EU-dummies.

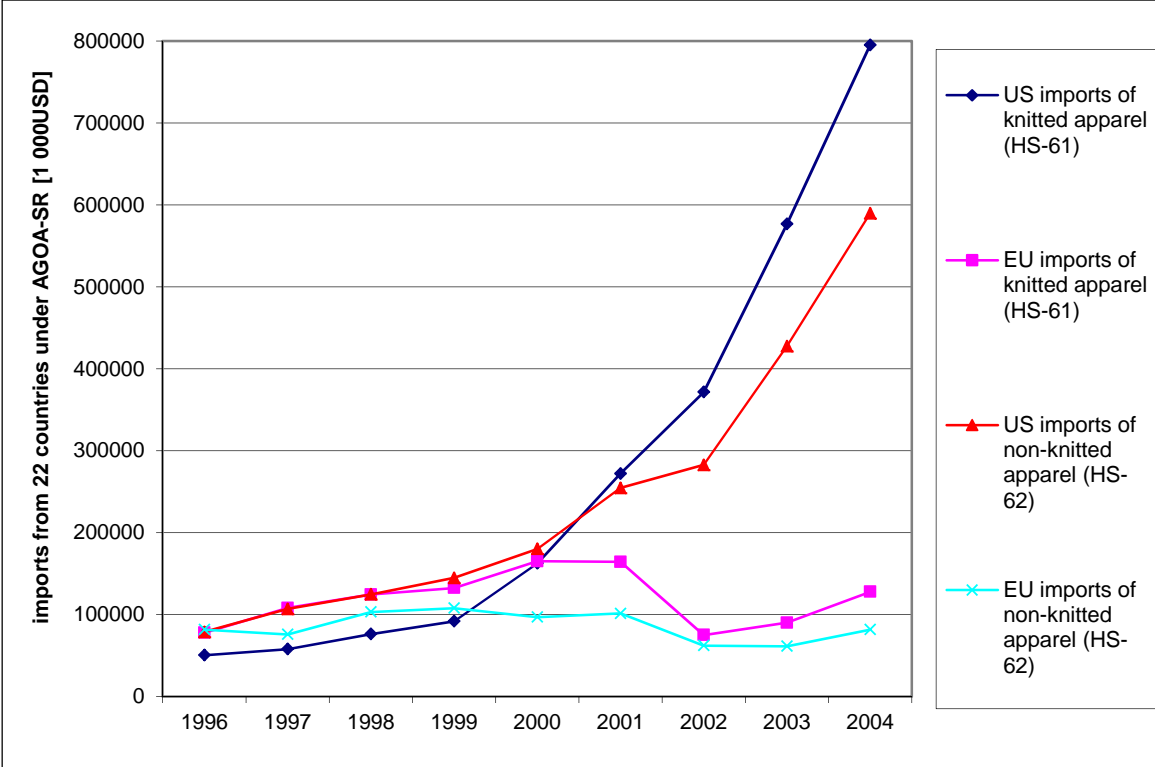
(a) R² are reported for OLS regressions and McKelvey and Zavoina's Pseudo R² are reported for Tobit and ET-Tobit regressions.

Figure A1:A map of AGOA, ACP and EBA in 2004



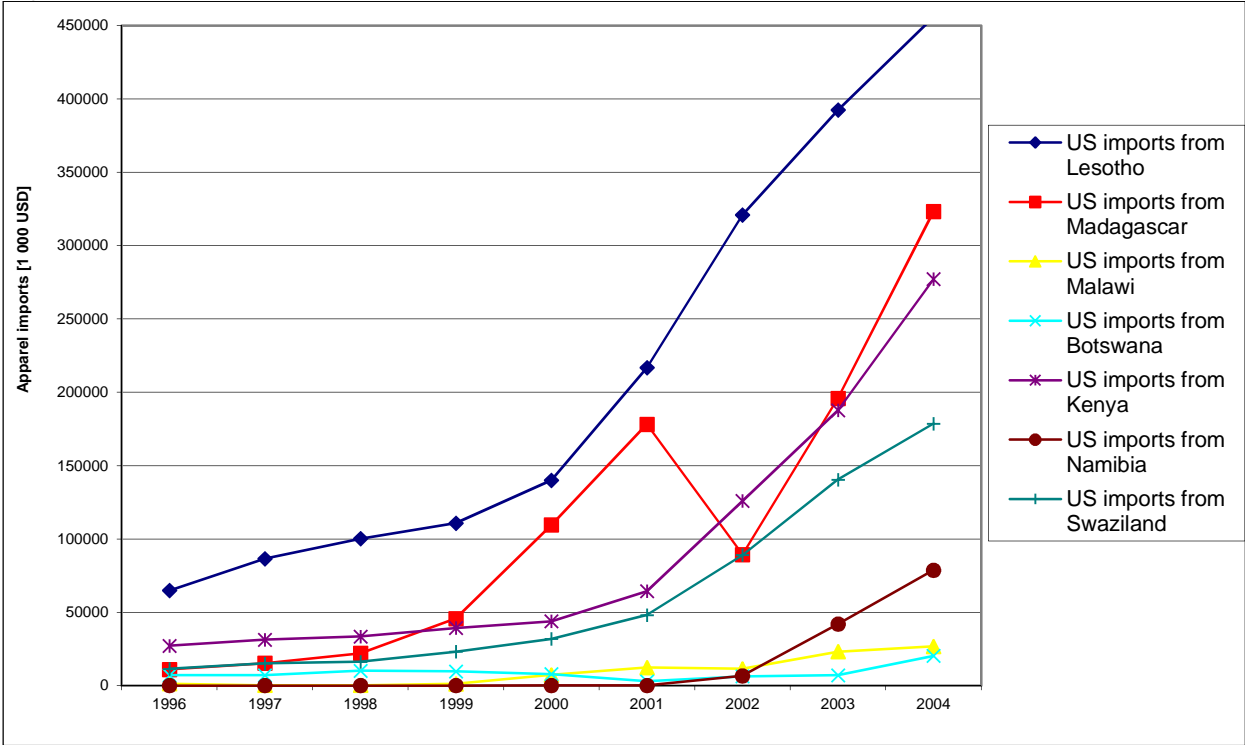
Source: Portugal-Perez (2007)
Mauritius was designated to benefit from AGOA SR in December 2004.

Figure A2 : EU and US Imports of knitted (HS-61) and non-knitted (HS-62) apparel



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

Figure A3 : US apparel imports from top 7 exporters



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

Appendix B : A simple model of Exports under Binding ROO

B.1. . 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 $X_D^k(p^k, Y^k, PS_w^k)$, with

$$\partial X_D^k / \partial p^k < 0, \quad \partial X_D^k / \partial Y^k > 0, \quad \text{and} \quad \partial X_D^k / \partial PS_w^k > 0 \quad (0.3)$$

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, $PS_w^k = \bar{PS}^* (1 + t^{k,MFN})$ with \bar{PS}^* indicating the (exogenously given) border price of apparel imported on 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:

$$p^k () + \frac{\partial p^k ()}{\partial X^k} X^k = (1 + t^{k,pref}) (MC_X^k) \quad (0.4)$$

where $p^k ()$ 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:

$$MC_X^{US}(\cdot) = \varphi'(X) + a_v \min\{p_V^{EU}, p_V^*\} \quad (0.5)$$

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 **Erreur ! Source du renvoi introuvable.** 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:

$$MC_X^{EU}(\cdot) = \varphi'(X) + a_v [rp_V^{EU} + (1-r)p_V^*] \quad (0.6)$$

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 **Erreur ! Source du renvoi introuvable.** leads to:

$$\frac{dX^{EU}}{dr} < 0 \quad \text{and} \quad \frac{dX^k}{dY^k} > 0, \frac{dX^k}{dt^{k,pref}} < 0, \frac{dX^k}{dt^{k,MFN}} > 0, \quad \text{for } k \in K = \{EU, US\}, \quad (0.7)$$

These comparative static results guide the empirical analysis in the paper (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.²⁵ 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

²⁵ De Melo and Winters (1991) analyze a similar situation for the allocation of a VER-on exports of footwear to restricted and unrestricted markets under separable and non-separable production and allocation decisions.

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.

B.2. Derivation of expression (1.5)

To lighten the notation, let the prices of substitutes, $PS_w^k = P_w^k$. Then profit-maximizing pricing for sellers of African apparel implies:

$$p^k(X^k, Y^k, P_w^k) + \frac{\partial p^k(X^k, Y^k, P_w^k)}{\partial X^k} X^k = (1 + t^{k,pref}) (MC_X^k) \quad (1.4)$$

where $p^k(\cdot)$ is the inverse demand function of country k and $P_w^k = \bar{P}^*(1 + t^{k,MFN})$.

Totally differentiating expression (1.4), we obtain:

$$\left\{ \frac{\partial^2 p^k(\cdot)}{\partial (X^k)^2} X^k + 2 \frac{\partial p^k(\cdot)}{\partial X^k} - (1 + t^{k,pref}) \frac{\partial MC_X^k(\cdot)}{\partial X^k} \right\} dX^k + \left\{ \frac{\partial^2 p^k(\cdot)}{\partial X^k \partial Y^k} X^k + \frac{\partial p^k(\cdot)}{\partial Y^k} \right\} dY^k +$$

$$- \{MC_X^k(\cdot)\} dt^{k,pref} - \left\{ (1 + t^{k,pref}) \frac{\partial MC_X^k(\cdot)}{\partial r} \right\} dr + \left\{ \frac{\partial^2 p^k(\cdot)}{\partial X^k \partial P_w^k} \bar{P}^* X^k + \frac{\partial p^k(\cdot)}{\partial P_w^k} \bar{P}^* \right\} dt^{k,MFN} = 0$$

Since we assumed: $\frac{\partial MC_X^k(\cdot)}{\partial X^k} = 0$, we have :

$$A \times dX^k + B \times dY^k + C \times dt^{k,pref} + D \times dr + E \times dt^{k,MFN} = 0 \quad (A1)$$

Where: $A = \frac{\partial^2 p^k(\cdot)}{\partial (X^k)^2} X^k + 2 \frac{\partial p^k(\cdot)}{\partial X^k}$, $B = \frac{\partial^2 p^k(\cdot)}{\partial X^k \partial Y^k} X^k + \frac{\partial p^k(\cdot)}{\partial Y^k}$, $C = -MC_X^k(\cdot)$;

$$D = -(1 + t^{k,pref}) \frac{\partial MC_X^k(\cdot)}{\partial r}, \text{ and } E = \frac{\partial^2 p^k(\cdot)}{\partial X^k \partial P_w^k} \bar{P}^* X^k + \frac{\partial p^k(\cdot)}{\partial P_w^k} \bar{P}^* .$$

Then from (A1) :

$A > 0$ if and only if $-\frac{\partial^2 p^k(\cdot)}{\partial (X^k)^2} X^k > 2 \frac{\partial p^k(\cdot)}{\partial X^k}$, which is verified, for instance, if we

assume a linear demand function, so that $\frac{\partial^2 p^k(\cdot)}{\partial (X^k)^2} = 0$.

$B > 0$ if and only if $\frac{\partial^2 p^k(\cdot)}{\partial X^k \partial Y^k} X^k > \frac{\partial p^k(\cdot)}{\partial Y^k}$, which is verified, for instance, when we

assume that $\frac{\partial^2 p^k(\cdot)}{\partial X^k \partial Y^k} > 0$.

$C < 0$ and $D < 0$.

$E > 0$ if and only if $\frac{\partial^2 p^k(\cdot)}{\partial X^k \partial P_w^k} X^k > \frac{\partial p^k(\cdot)}{\partial P_w^k}$, which is verified, for instance, when we

assume that $\frac{\partial^2 p^k(\cdot)}{\partial X^k \partial P_w^k} > 0$.

Then,

$$\frac{dX^k}{dY^k} = -\frac{B}{A} > 0, \frac{dX^k}{dt^{k,prel}} = \frac{C}{A} < 0, \frac{dX^{EU}}{dr} = \frac{D}{A} < 0 \text{ and } \frac{dX^k}{dt^{k,MFN}} = -\frac{E}{A} > 0$$

Appendix C. Product Specific Rules of Origin in T&A

PTA	Rules of Origin	Legal texts
NAFTA	<ul style="list-style-type: none"> ▪ Rules of origin for T&A are very complex. In order to be eligible for preferential access under NAFTA, most textiles and apparel must be produced, i. e. cut and sewn, in the NAFTA area from yarn also made in a NAFTA country. This is called <u>the triple transformation process</u>. ▪ In the case of cotton and man-made fibre spun yarn, the fibre must originate from North America, i.e. the NAFTA area. 	<p>The NAFTA agreement can be found at: http://www.nafta-sec-alena.org/DefaultSite/index_e.a.spx?DetailID=78</p> <p>Rules applying to trade in textiles and apparel goods between NAFTA countries are set out in annex 300-B. All specific rules of origin are detailed in annex 401.</p>
AGOA general regime	<ul style="list-style-type: none"> ▪ AGOA provides quota-free and duty-free treatment to apparel assembled (and/or cut) in one or more beneficiary SSA country from US fabrics, which in turn are made out of US yarn. Apparel articles assembled from fabric formed in beneficiary SSA countries from US yarn or originating in one or more beneficiary sub-Saharan African countries are allowed only in an amount not to exceed an applicable percentage²⁶ (sec 112). ▪ AGOA allows for diagonal cumulation with respect to other SSA beneficiary countries (sec 112) ▪ Apparel imports made with regional (African) fabric and yarn are subject to a cap of 1.5% of the aggregate square meter equivalents of all apparel articles imported into the US in the preceding 12-month period (section 111), growing proportionally to 3.5% of overall imports over an 8 year period. The amendments to AGOA signed in 2002 (AGOA II) double the applicable percentages of the cap. ▪ The AGOA Acceleration Act (AGOA III), signed in 2004, increases the De Minimis Rule from its current level of 7 percent to 10 percent. This rule states that apparel products assembled in Sub-Saharan Africa which would otherwise be considered eligible for AGOA benefits but for the presence of some fibbers or yarns not wholly formed in the United States or the beneficiary Sub-Saharan African country will still be eligible for benefits as long as the total weight of all such fibbers and yarns is not more than a certain percent of the total weight of the article. 	<p>The African Growth and Opportunity Act (AGOA) was signed into law on May 18, 2000 as Title 1 of The Trade and Development Act of 2000.</p> <p>President Bush signed amendments to AGOA (a.k.a. AGOA II) on August 6, 2002 as Sec. 3108 of the Trade Act of 2002.</p> <p>Finally, the AGOA Acceleration Act (AGOA III) was signed by the US President on July 12, 2004.</p> <p>The above mentioned legal texts are integrally downloadable at the website: http://www.goa.gov/goa_legislation/goa_legislation.html</p>

²⁶ Initially, the applicable percentage is equal to 1.5 percent for the 1-year period beginning October 1, 2000, increased in each of the seven succeeding 1-year periods by equal increments, so that for the period beginning October 1, 2007, the applicable percentage does not exceed 3.5 percent. See Then this applicable percentage has been “doubled” by AGOA II.

<p>AGOA's special regime for Lesser Developed Countries</p>	<ul style="list-style-type: none"> ▪ AGOA grants special ROO to “lesser developed countries”. These countries are allowed to use third country fabric and yarn and still qualify for AGOA preferences. In other words, making up fabric into clothing, or -<u>simple transformation process</u>- is sufficient to confer origin. ▪ The special regime for LDCs expires on September 30, 2007 but can be renewed by Congress, as has been previously done. 	<p>Sec 112 of the8 AGOA legal text</p>
<p>EU's GSP/EBA and Cotonu (ACP) Agreements</p>	<ul style="list-style-type: none"> ▪ EU rules of origin for apparel require production from yarn. This entails that a <u>double transformation process</u> must take place in the beneficiary country with the yarn being woven into fabric and then the fabric cut and made-up into clothing. ▪ Product specific rules of origin (PSRO) for textiles and apparel under EBA and Cotonou (ACP) are the same. ▪ There are differences in the cumulation schemes between the EBA or GSP and those of the Cotonou Agreement. Under the Cotonou Agreement, there is full cumulation among African countries, so that regional fabrics can be used without losing originating status. Under the GSP there is more limited partial or diagonal cumulation that can only take place within four regional groupings: ASEAN, CACM, the Andean Community and SAARC but not amongst ACP countries²⁷. Therefore, LDC countries members to ACP who are also eligible to export to the EU under the EBA may, and often do, prefer to continue exporting under ACP, in part, due to the more liberal RoO existing under the latter. <p>The ACP agreement attaches extensive conditions to cumulation with non-ACP countries as well as South Africa (see Annexes IX-XI to Protocol 1 of the ACP agreement). However, diagonal cumulation under GSP is constrained by the requirement that the value-added in the final stage of production exceeds the highest customs value of any of the inputs used from countries in the regional grouping (art 72a).</p>	<p>The Everything but Arms (EBA) Agreement has been incorporated as amendment to the EU- GSP system as Regulation EC 416/2001 and was signed on 28 February 2001 and can be found at http://trade.ec.europa.eu/doclib/docs/2004/october/tradoc_111459.pdf</p> <p>ROO under the EU- GSP schemes are defined by Articles 66 to 97 and Annexes 14 to 18 and 21 of Regulation (EEC) No. 2454/93²⁸, as amended by Regulations Nos. 12/97, 1602/2000 and 881/2003 .</p> <p>The ACP partnership Agreement was signed in Cotonou on 23 June 2000 and the text can be found at http://eur-lex.europa.eu/LexUriServ/site/en/oj/2000/L_317/L_31720001215en00030286.pdf</p> <p>RoO under the ACP agreement are detailed in Protocol 1 of the ACP Agreement: "Concerning the definition of the concept of origination products and methods of administrative cooperation", as well as its annexes.</p>

Source: Portugal-Perez (2007)

²⁷ Bilateral GSP cumulation applies between the EC and the beneficiary country, diagonal cumulation applies between the EC, Norway and Switzerland and the beneficiary country and regional cumulation applies between the beneficiary country belonging to one of the three GSP regional cumulation groups (Group I (Brunei-Darussalam, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, Vietnam), Group II (Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Peru, Venezuela), and Group III (Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka)). These types of cumulation may be combined for a single operation. Source: http://ec.europa.eu/taxation_customs/customs/customs_duties/rules_origin/preferential/article_779_en.htm

²⁸ http://europa.eu.int/eur-lex/en/consleg/pdf/1993/en_1993R2454_do_001.pdf

Appendix D. The Eaton-Tamura (ET) tobit model.

This appendix spells out the ET model estimated in the main text and derives expressions for the marginal effects drawing a distinction between continuous variables (lumped in vector x_{it}^{jk}) and dummy variables (lumped in vector R_{it}^{jk})

D1. The Eaton-Tamura (ET) tobit model

Consider the following ‘Tobit-like’ model:

$$\ln(a_v + M_{it}^{jk}) = \begin{cases} y_{it}^{jk*} = \beta_0 + \beta_1 x_{it}^{jk} + \beta_2 R_{it}^{jk} + \varepsilon_{it}^{jk} \equiv Z_{it}^{jk} \theta_M + \varepsilon_{it}^{jk}, & \text{if } y_{it}^{jk*} \geq \ln(a_v) \\ \ln(a_v) & \text{if } y_{it}^{jk*} < \ln(a_v) \end{cases} \quad (0.8)$$

where M_{it}^{jk} is country k’s imports of apparel variety j from country j at year t, x_{it}^{jk} is a continuous regressor, R_{it}^{jk} is a dummy variable, and a_v is endogenously determined in the maximum-likelihood procedure. Notice that $M_{it}^{jk} \geq 0$, and that

$$\varepsilon_{it}^{jk} \sim \text{Normal}(0, \sigma^2).$$

Notice also that for simplicity, we defined: $\beta_0 + \beta_1 x_{it}^{jk} + \beta_2 R_{it}^{jk} (\equiv Z_{it}^{jk} \theta_M)$, and

$$\ln(a_v + M_{it}^{jk}) (\equiv y_{it}^{jk})$$

Model Erreur ! Source du renvoi introuvable. is equivalent to the **constant elasticity model**:

$$M_{it}^{jk} = \begin{cases} M_{it}^{jk*} = -a_v + \exp(\beta_0 + \beta_1 x_{it}^{jk} + \beta_2 R_{it}^{jk}) \exp(\varepsilon_{it}^{jk}) & \text{if } M_{it}^{jk*} \geq 0 \\ 0 & \text{if } M_{it}^{jk*} < 0 \end{cases} \quad (0.9)$$

As $\varepsilon_{it}^{jk} \sim \text{Normal}(0, \sigma^2)$, then $\exp(\varepsilon_{it}^{jk})$ is a log-normal random variable.

From model **Erreur ! Source du renvoi introuvable.**, the maximum likelihood estimates of a_v and $\theta_M (= (\beta_0, \beta_1, \beta_2))$ maximize the log-likelihood function:

$$\ln L(a_v, \theta_M) = \sum_{M=0} \ln(F_{it}) + \sum_{M>0} \left\{ -\ln(a_v + M_{it}^{jk}) - 0.5(\ln(2\pi) + \ln(\ln(2\pi))) - (1/2\sigma^2) \left[\ln(a_v + M_{it}^{jk}) - Z_{it}^{jk} \theta_M \right]^2 \right\}$$

where $F_{it} = \text{Prob}(M_{it}^{jk} = 0) = \text{Prob}(\varepsilon_{it}^{jk} \geq \ln(a_v) - Z_{it}^{jk} \theta_M)$ ²⁹, as determined from

Erreur ! Source du renvoi introuvable.

²⁹ We correct for the typographical errors in the log-likelihood function Eaton and Tamura (1994), page 491.

D2. Evaluating the marginal effects in a ET tobit model

We are interested in calculating the two marginal effects:

$$1) \frac{\partial E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right]}{\partial x_{it}^{jk}} \text{ for the continuous variable } x_{it}^{jk}$$

$$2) \frac{\Delta E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right]}{\Delta R_{it}^{jk}} \text{ for the dummy variable } R_{it}^{jk}$$

$$1) \frac{\partial E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right]}{\partial x_{it}^{jk}}$$

We deduce from model **Erreur ! Source du renvoi introuvable.**:

$$E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right] = -a_v + \exp(\beta_0 + \beta_1 x_{it}^{jk} + \beta_2 R_{it}^{jk}) E \left[\exp(\varepsilon_{it}^{jk}) \mid M_{it}^{jk} > 0 \right] \quad (0.10)$$

Deriving **Erreur ! Source du renvoi introuvable.**, with respect to x_{it}^{jk} :

$$\begin{aligned} \frac{\partial E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right]}{\partial x_{it}^{jk}} &= \beta_1 \left(\exp(\beta_0 + \beta_1 x_{it}^{jk} + \beta_2 R_{it}^{jk}) E \left[\exp(\varepsilon_{it}^{jk}) \mid M_{it}^{jk} > 0 \right] \right) \\ &= \beta_1 \left(-a_v + \exp(\beta_0 + \beta_1 x_{it}^{jk} + \beta_2 R_{it}^{jk}) E \left[\exp(\varepsilon_{it}^{jk}) \mid M_{it}^{jk} > 0 \right] + a_v \right) \\ &= \beta_1 \left(a_v + E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right] \right) \end{aligned} \quad (0.11)$$

Furthermore, if x_{ij} is a variable expressed in percent terms (such as a tariff) or a logarithmic variable (such as log(GDP)), we will be interested in estimating the semi-elasticity:

$$\begin{aligned} \frac{\partial E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right]}{\partial x_{it}^{jk}} \frac{1}{E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right]} &= \beta_1 \left(a_v + E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right] \right) \frac{1}{E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right]} \\ &= \beta_1 \left(1 + \frac{a_v}{E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right]} \right) \end{aligned} \quad (0.12)$$

This semi elasticity can be interpreted as the percent change in imports following a 1% increase in the value of the continuous variable x_{ij}

2) Using the definition of model **Erreur ! Source du renvoi introuvable.**, we develop:

$$\begin{aligned}
\frac{\Delta E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right]}{\Delta \partial R_{it}^{jk}} &= E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0, R = 1 \right] - E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0, R = 0 \right] \\
&= -a_v + \exp(\beta_0 + \beta_1 x_{it}^{jk} + \beta_2) E \left[\exp(\varepsilon_{it}^{jk}) \mid M_{it}^{jk} > 0 \right] \\
&\quad + a_v - \exp(\beta_0 + \beta_1 x_{it}^{jk}) E \left[\exp(\varepsilon_{it}^{jk}) \mid M_{it}^{jk} > 0 \right] \\
&= \left[\exp(\beta_2) - 1 \right] \exp(\beta_0 + \beta_1 x_{it}^{jk}) E \left[\exp(\varepsilon_{it}^{jk}) \mid M_{it}^{jk} > 0 \right] \\
&= \left[\exp(\beta_2) - 1 \right] \times E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0, R = 0 \right]
\end{aligned} \tag{0.13}$$

We are interested in evaluating the percent change of the expected value of positive values of the dependent variable (here imports) following a unit-change in the dummy R_{it}^{jk} (in our case shifting from a double to a single transformation RoO for apparel).

The expression is equal to:

$$\frac{\Delta E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0 \right]}{\Delta \partial R_{it}^{jk}} \frac{1}{E \left[M_{it}^{jk} \mid M_{it}^{jk*} > 0, R = 0 \right]} = \left[\exp(\beta_2) - 1 \right] \tag{0.14}$$



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