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# THE RISE AND FALL OF (CHINESE) AFRICAN APPAREL EXPORTS[a]

Lorenzo Rotunno[b]
Pierre-Louis Vézina[c]
Zheng Wang[d]

Abstract

During the final years of the Multifiber Agreement the US imposed strict import quotas on Chinese apparel while it gave African apparel duty- and quota-free access. The combination of these policies led to a rapid but ephemeral rise of African exports. In this paper we argue that the African success can be explained by a temporary transhipment of Chinese apparel driven by quota-hopping Chinese assembly firms. We first provide a large body of anecdotal evidence on the Chinese apparel wave in African countries. Second, we show that Chinese apparel exports to African countries predict US imports from the same countries and in the same apparel categories but only where transhipment incentives are present, i.e. for products with binding quotas in the US and for countries with preferential access to the US unconstrained by rules of origin. Using input-output linkages, we then show that African countries imported quasi-finished products with little assembly work left to do, rather than primary textile inputs. We estimate that direct transhipment may account for around half of AGOA countries apparel exports.

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[b] Graduate Institute of International and Development Studies, Geneva. Email: lorenzo.rotunno@graduateinstitute.ch
[c] University of Oxford. Email: pierre-louis.vezina@economics.ox.ac.uk
[d] University of Nottingham. Email: ralwang@gmail.com

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INSTITUT DE HAUTES ÉTUDES INTERNATIONALES ET DU DÉVELOPPEMENT
GRADUATE INSTITUTE OF INTERNATIONAL AND DEVELOPMENT STUDIES
CP 136 – CH-1211 GENÈVE 21
TÉL +41 22 908 57 00
http://graduateinstitute.ch

# 1 Introduction

The African Growth and Opportunity Act (AGOA), which enabled African countries to export over 4,000 products, including hundreds of apparel products, quota-free and duty-free to the US, has been the object of much economic research. Collier and Venables (2007) and Frazer and Biesebroeck (2010) both find that the AGOA trade preferences had a positive and significant impact on exports from Africa to the US. Yet the rapid rise of African apparel exports to the US has not survived the demise of the Multifiber Agreement (MFA) in 2005 (Fig. 1, top panel), when Chinese exports took over (Harrigan and Barrows, 2009), and has not been accompanied by dynamic growth benefits (Edwards and Lawrence, 2010).

In this paper we argue the success was rapid but short-lived as a large share of AGOA exports were in fact Chinese exports aimed for the US but transhipped through AGOA countries, with little assembly work done in Africa. We argue the transhipment was induced by a combination of two coinciding policy regimes, i.e. the AGOA and the MFA[1]. As pointed out by Brambilla et al. (2010), the quotas imposed on Chinese exports during the MFA regime guaranteed smaller developing countries access to the US market. This implicit export subsidy for African countries, coupled with AGOA preferences, was thus a golden opportunity for African apparel exporters. Yet, as highlighted by Collier and Venables (2007), a key feature of the AGOA preferences was the absence of rules of origin (ROOs), which are usually imposed under trade agreements to avoid transhipment. This "loophole" in AGOA rules thus provided an opportunity for Chinese exporters to merely tranship their products via "screwdriver plants" in AGOA, avoiding MFA quotas and on top benefitting from AGOA preferences. On the contrary, ROOs were duly imposed by the EU, and this explains why US imports from AGOA countries started booming in 2001 while the EU's did not (Fig. 1). The end of the system of quotas on Chinese exports rendered the transhipment unnecessary and thus led to the departure of footloose factories and the fall of AGOA exports.

[1] As is customary, we use "MFA" to refer to its continuation, the Agreement on Textile and Clothing (1995-2004).

The suspicion that AGOA and MFA policies spurred a Chinese textile manufacturing wave in Africa has been documented by a recent literature as well as news reports. According to Naumann (2008), Chinese and Taiwanese producers formed the bulk of a textile "diaspora" in Lesotho, Madagascar, and Kenya, which have seen a revival of their sectors owing to these foreign investments. Taiwan-Economic-News (2005) reports that 30 Taiwanese textile factories have stampeded to establish footholds in Africa, mainly in Lesotho and Swaziland. Rolfe and Woodward (2005) find that in the Kenyan Export Processing Zone, 80% of the 34 garment plants had Asian owners. Gibbon (2003) writes that in Madagascar in 2002, Far Eastern-owned firms accounted for 30% of employment.

Moreover, the literature has highlighted the role played by the MFA quotas imposed by the US on Chinese apparel on top of AGOA's role in the export sucess. Traub-Merz (2006) and Zafar (2007) note that Chinese factories in several African countries had been set up to take advantage of easy African access to the US market under AGOA and that exports have been concentrated in formerly quota-restrained products, such as basic trousers, t-shirts, and sweaters. Rolfe and Woodward (2005) observe that 99% of exports from the five most AGOA-successful countries were covered by US quotas on India and China. Kaplinsky and Morris (2008) and Na-Allah and Muchie (2010) also point out that Asian garment firms established plants in Africa in order to take advantage of MFA quotas. de Voest (2012) surveyed Chinese private firms to identify the factors leading them to invest and operate in Africa and found that taking advantage of international trade agreements was a top-five motive.

What's more, a large number of papers emphasize that the inputs of apparel firms in Africa were most-often Chinese. de Voest (2012) documents that the Taiwanese clothing firms in Lesotho imported 93% of material input from network sources in Asia where China constitutes the major supplier. Rolfe and Woodward (2005) find that the local components in Kenyan apparel exports accounts for only 3% of the export sales value. Phelps et al. (2009) surveyed 23 of an estimated 35 clothing manufactures in Kenya and found that all companies imported the necessary fabric from their parent company located in China, Pakistan, Hong Kong, Taiwan, and Sri Lanka. This is confirmed by data from the World Bank's Enterprise Surveys, summarized in Table 1, which suggest

that most firms in the garment sector in Africa sourced their inputs from abroad. Yet there is also anecdotal evidence that the inputs were quasi-finished products with little work to be done. Edwards and Lawrence (2010) describe the experience of Lesotho firms which, "almost entirely foreign owned, typically provide assembly, packaging and shipping services and depend on their Asian headquarters to generate orders, design the clothes, and send them the fabric they need". Lall (2005) also explains how East Asian firms in Lesotho had tight links with "full package" apparel suppliers from Hong Kong. Fernandez-Stark et al. (2011) adds that Taiwanese operations in Lesotho are limited to assembly and that local linkages are low, which is in line with the quota-hopping and footloose strategy of these firms.

We go further than the previous literature and the anecdotal evidence by empirically tracing the transhipment from China to the US via AGOA. More precisely, we show that Chinese apparel exports to AGOA, defined at the 6-digit level in the HS classification, predict AGOA exports to the US, within country-product and across time. To show that this correlation indeed captures transhipment, we show it only holds in countries which faced no rules of origin within the AGOA framework, and only for products bound by US quotas on Chinese exports. In other words, we find the strongest indication of quota-hopping transhipment where incentives were highest and where it was legally possible to do so. This result is robust to various estimation specifications, using alternative definitions of quota bindingness, looking at trade volume in values as well as in quantities, and investigating countries individually or pooled together. As a reassuring check, we show that apparel exports from any of the world's top 8 apparel exporters other than China have no prediction power for AGOA's exports.

Using the US Input-Output matrix, we then show that AGOA countries did not import intermediate inputs from China but rather finished products with little additional work remaining. This confirms the role played by lax rules of origin in quota-hopping transhipment. Finally, using our benchmark regression result, we provide a quantitative estimate of the transhipment of Chinese apparel products through African exports to the US. Our calculation shows that lax rules of origin and quotas may be behind a sizeable share of AGOA exports, e.g. as much as 64% of Botswana's exports and 45% of Kenya's.

Our paper is close to Edwards and Lawrence (2010) who build a theoretical model to show that the US quotas on Chinese exports served as an implicit subsidy for African apparel exporters. They argue the subsidy was greater the smaller the local value-added and was a greater share of overall production the lower the final price of the product. According to their model, MFA quotas led AGOA countries (Lesotho in their case study) to export low value-added, fabric-intensive and low-priced clothing. The product selection of African exports to the US market was thus induced by variations in the implicit subsidies of quota. In this paper we argue instead that the selection was due to quota hopping by Chinese firms and that the absence of ROOs explains why little value was added in Africa. In turn, this explains why little production spillovers occurred.

In a nutshell, our paper provides evidence on the unintended consequences of economic policies, here the transhipment that resulted from the combination of US quotas against China and preferences for Africa. This transhipment explains the surprisingly fast and robust impact AGOA had on apparel imports into the US even though almost no eligible countries faced import quotas beforehand (Frazer and Biesebroeck, 2010). As Collier and Venables (2007), we highlight that the absence of ROOs was key to the opening of factories in Africa, as Chinese production fragmented to take advantage of favorable trade preferences. This rapid rise and fall confirms the prediction of Baldwin (2011), namely that supply-chain industrialization can lead to fast growth but can have limited spillovers and comes with the risk of further re-locations of production.

The remainder of the paper proceeds as follows. In Section 2 we present the empirical strategy. Section 3 describes the data, Section 4 presents the results, and Section 5 concludes with a discussion on policy implications.

# 2 Tracing transhipment: Empirical strategy

To identify transhipment empirically, we exploit policy differences across countries, products, and periods. We focus on the narrowest possible comparison group, namely only on apparel products, only on AGOA countries, and look across the pre- and post-AGOA

periods, to identify as precisely as possible the effect of Chinese transhipment on African exports to the US [2]. We proceed through three main steps. First, we check whether US imports of apparel products from AGOA are higher from countries that are allowed to use inputs from third countries through a special 3rd-country-fabric rule. Indeed, when in 2001 the US granted AGOA beneficiaries duty- and quota-free access to the US for around 4,000 products including apparel under the AGOA "Wearing Apparel" provision[3], lesser-developed countries could benefit from a special rule ("3rd-country fabric") that allowed exports to enter the US without any ROOs on the source of fabrics or other inputs. The only requirement was for the products to be assembled in AGOA.[4] Among AGOA countries under the "Wearing Apparel" provision, only Botswana, Mauritius, Namibia, and South Africa faced rules of origin as they were not lesser-developed countries. Nevertheless, rules of origin were removed for Namibia and Botswana in 2003 and for Mauritius temporarily in 2005. The absence of ROOs created incentives for Chinese exporters to assemble their products in AGOA countries and access the US market duty-free and quota-free. While Chinese exporters could circumvent quota restrictions by locating in other MFA countries with unused quotas or in non-MFA countries paying the Most-Favored-Nation (MFN) tariff, AGOA provided duty- and quota-free treatment and on top the 3rd-country rule allowed for the use of Chinese inputs, further lowering trade costs, and probably rendering the re-location of assembly activities economically worthwhile. We thus estimate

[2]We don't include the years 2009 and 2010 to avoid capturing the effect of the Great Trade Collapse (Baldwin, 2009), as shown in Fig. 1

[3]Not all AGOA countries automatically became eligible for the "Wearing Apparel" provision. Countries had to be certified as having taken adequate steps to "establish effective product visa systems to prevent illegal transhipment and the use of counterfeit documentation, as well as having instituted required enforcement and verification procedures". The products in the Apparel provision list are HS categories 61 and 62 (apparel and clothing, knitted or not knitted) and HS headings 6501, 6502, 6503, 6504 (hats and other headgears). Source: ustr.gov. Hat tip: Jo Van Biesebroeck.

[4]If Chinese exporters transhipped final apparel products without any assembly done in Africa, and used fake certificates of origin, they were doing something illegal. A report for the US Congress (Jones, 2006) explains how in 2005 the US sent "Textile Production Verification Teams" to inspect foreign factories. The report mentions that US producers have accused Chinese manufacturers of illegal transhipment particularly through countries part of AGOA. According to the US Government Accountability Office (GAO, 2004), investigating teams were sent to visit factories in Lesotho, Mauritius, South Africa, Kenya, Madagascar, Swaziland, and Botswana in 2002, visiting a quarter of all factories in the latter two countries. It is not mentioned, however, whether or how any case of illegal activities was detected.

the following regression:

$$US_{ijt} = \beta_0 Third_{jt} + \alpha_{ij} + \gamma_t + \epsilon_{ijt} \tag{1}$$

where $i$ indexes the HS6 apparel product line, $j$ denotes the AGOA country, and $t$ the year. The variable $US$ collects US imports (in logs) from AGOA countries,[5] while $Third$ is an indicator variable for 3rd-country-fabric eligibility. The terms $\alpha_{ij}$ and $\gamma_t$ are country-product and year fixed effects to control for any possible country-product-specific shocks (e.g. local labor-market shocks) and time shocks common to all countries and products (e.g. macro-level conditions affecting US trade with Africa). The key parameter $\beta_0$ reveals the export-creating effect of the 3rd-country-fabric rule. The specification in Eq. (1) is similar to the baseline regression of Frazer and Biesebroeck (2010, Eq. (1)), who estimate it more flexibly on the whole list of HS6 products and countries and find a positive and significant effect of the AGOA apparel provision.

As a second step, we test whether the trade-creating effects of the 3rd-country-fabric rule are heterogeneous across products with respect to the restrictiveness of the quotas imposed by the US on Chinese apparel exports. Indeed, not only were the transhipment incentives that started in 2001 different across countries but they also varied across apparel products. Some products faced binding quotas in the US, some barely filled their quotas and others were not subject to any quota restrictions. If transhipment was mainly driven by quota-hopping, it is more likely to have occurred in products facing restrictive quotas. We thus run the following regression:

$$US_{ijt} = \beta_0 FR_{it} + \beta_1 \left(Third_{jt} \times FR_{it}\right) + \alpha_{ij} + \rho_{jt} + \epsilon_{ijt} \tag{2}$$

where $FR$ is the quota fill rate (i.e. the ratio of US imports from China to the US quota limit) for each product each year. We follow the literature on the effects of the MFA (see, e.g., Harrigan and Barrows, 2009; Bernhofen et al., 2012) and use the fill rate as a proxy

[5] Both US imports from AGOA and Chinese exports to AGOA have many zero trade flows (almost 95% of the sample for US imports from and 85% for Chinese exports to AGOA ). We add one (in thousands US$) to both flows before taking logs. In some of the robustness checks, we take into account the implications of the zeros.

for quota restrictiveness. The specification includes country-product and country-year fixed effects, which absorb the main effect of $Third$.[6] The inclusion of $\rho_{jt}$ controls for possible shocks specific to an AGOA country and year (e.g. exchange-rate fluctuations). The coefficient on the interaction term, $\beta_1$, indicates whether the 3rd-country-fabric rule promoted exports even more for products for which Chinese exporters faced more restrictive quotas.

Finally, we bring into the picture the role of Chinese apparel exports to AGOA. We suggest that transhipment can be observed in the correlation between AGOA imports of apparel from China and exports to the US. The idea is that if transhipment occurred with little assembly work, the same products that were imported in the African country should be exported to the US[7]. If this correlation indeed captures transhipment, it should be highest where transhipment incentives are highest, i.e. for products facing quotas in the US and in AGOA countries facing no rules of origin. To this end, our baseline "transhipment" regression takes the following form:

$$\begin{aligned} US_{ijt} = \beta_0 FR_{it} + \beta_1 CH_{ijt} + \beta_2 \left(Third_{jt} \times FR_{it}\right) + \beta_3 \left(Third_{jt} \times CH_{ijt}\right) + \\ + \beta_4 \left(FR_{it} \times CH_{ijt}\right) + \beta_5 \left(Third_{jt} \times FR_{it} \times CH_{ijt}\right) + \alpha_{ij} + \rho_{jt} + \epsilon_{ijt} \end{aligned} \tag{3}$$

where $CH$ are Chinese exports (in logs) to the AGOA country $j$. This specification interacts the estimated coefficients of Eq. (2) with the level of Chinese exports to Africa, $CH$. More precisely, $\beta_1$ in Eq. (2) is now linearly dependent on the level of $CH$. According to this identification strategy, we expect to find a positive coefficient on the three-way interaction term, $\beta_5$, if transhipment indeed occurred. This would imply the correlation between $CH$ and $US$, which we call the "transhipment elasticity", to be the highest in 3rd-country-fabric-eligible countries and in products with restrictive quotas. Before turning to our results, we first describe the data in the next section.

[6] Estimations are performed using the STATA program `reg2hdfe` of Guimarães and Portugal (2010), adjusted for the clustering of standard errors at the product level.

[7] In a further check we use the US Input-Output matrix to check for the possibility of inputs imported from China being correlated with inputs theoretically required to produce the apparel products exported to the US.

# 3 Data and descriptive evidence

Our data set consists of all AGOA-eligible apparel products from 1996 (the first year of the 1996 version of HS classification) to 2008 (the last year of US quotas on Chinese exports of textiles and apparel) and includes all countries that entered AGOA within this period.[8] Information on the AGOA and AGOA-Apparel accession dates by country are taken from AGOA.gov, cross-checked with information from AGOA.info and from the OTEXA website. AGOA entered into force in October 2000, so we consider 2001 its first year. Eligibility for the 3rd-country-fabric rule occurred in different (daily) dates. For this study, we consider a country as being eligible in year $t$ if it became so before 31st July of the same year. Eligibility is summarized in the top panel of Fig. 3.

The empirical analysis requires data on US imports, Chinese exports, and quotas imposed by the US on apparel imports from China. In order to keep compatibility between US and Chinese trade data, we carry out our analysis at the 6-digit level, the most disaggregated and internationally comparable level of HS product classification. The value of US imports (in thousand US$) is taken from the USITC website, which records the tariff regime under which a product enters the US market. Specifically, shipments from AGOA countries could enter the US under AGOA (i.e. duty- and quota-free), under the General Scheme of Preferences (GSP) for developing countries, or under the Most-favored-Nation (MFN) tariff regime. This information allows us to identify imports that *actually* entered the US market duty-free when eligible, rather than eligibility only.[9] Aggregated data for the years 2003 to 2008 from AGOA.info confirms that, conditional on exporting, preference utilization was high, and that almost all exports of the big apparel exporters, i.e. Kenya, Lesotho, Madagascar, and Swaziland, were exploiting the 3rd-country-fabric rule (Fig. 2). This again implies that the inputs used were neither from AGOA countries nor from the US. Consequently, the US imports variable equals

[8] Three countries, i.e. the Central African Republic, Côte d'Ivoire, and Mauritania lost AGOA status during the period, the first two in 2004 and the last one in 2006. None of these countries were eligible for the Apparel provision. Among apparel-eligible countries, only Madagascar lost its AGOA status, but in 2010.

[9] Preference utilization has been an issue for exports of textile products from African countries to the US and the EU, the two major markets that grant preferences to those countries (see de Melo and Portugal-Pérez, 2008).

imports that entered under the AGOA scheme for Apparel-eligible countries and the sum of GSP and MFN imports for non-apparel-eligible countries.[10] Data on Chinese exports to AGOA countries is from the UN Comtrade database.

Quota fill rates from 1996 to 2004 are from Brambilla et al. (2010) and from 2005 to 2008 from the the US Customs and Border Protection (CBP) website. Importantly, the number of products under quota fell dramatically in 2005 as a result of the end of the MFA. Still, in May 2005, new temporary quotas were agreed between the US and China due to the surge of imports from China. This new safeguard system against Chinese textiles remained in force until the end of 2008. Fig. 4 gives the distribution of fill rates from 2001 to 2008. Fill rates are available at 3-digit categories defined by OTEXA and can be mapped to the US HTS10 classification.[11] We then apply the methodology described in Bernhofen et al. (2012) to aggregate the fill rates at the HS6 level. We follow Brambilla et al. (2010) and Harrigan and Barrows (2009) by considering a quota with fill rate above 90% as a binding quota. Some apparel products were not subject to quota in a given year and thus have a zero fill rate.[12] For most products subject to a quota, the fill rate was above 80%. We superpose the distributions at the HTS10 and HS6 level to show that aggregating at the HS6 level does not alter the original distribution.

Fig. 3 maps the big exporters of apparel to the US, the big importers of Chinese apparel, as well as 3rd-country-fabric eligibility. US imports are mostly from a few countries, especially those that are eligible for the 3rd-country rule and that set up an export-processing zone devoted to apparel and textiles, i.e. Kenya, Madagascar, Lesotho, and Swaziland. These same countries also receive relatively large amounts of Chinese apparel exports, although some other countries in West Africa, i.e. Togo, Benin, and Guinea, are also big importers (relative to their economic size) of Chinese apparel.

[10] Imports from South Africa and Mauritius, the two apparel-eligible countries that faced rules of origin, mostly entered under the AGOA scheme (around 75% of their exports).

[11] See the OTEXA website for the concordance table. We follow Brambilla et al. (2010) and assign the same fill rate to HTS 10-digit products within the same OTEXA 3-digit category.

[12] There are few cases and only until 2004 where quotas were imposed but no imports from China were observed. We treat such product-year observations as having a zero fill rate.

# 4 Results and robustness

## 4.1 Baseline estimates

The estimation results of models (1) to (3) are presented in Table 2. Columns (1) and (4) show that, for both trade values and quantities (dozens of items or kilograms[13]), eligibility for the 3rd-country-fabric rule, by providing duty-free and ROOs-free access to the US market, increases significantly apparel exports to the US, consistent with the finding of Frazer and Biesebroeck (2010). The difference in export growth due to this eligibility is around 15% of trade values and 20% of trade quantities.

Columns (2) and (5) report the estimates of model (2) which examines the role of the MFA quotas on top of AGOA preferences. The results show that, for countries eligible for the 3rd-country-fabric rule, apparel exports are significantly higher in products for which China faces tighter quota in the US. This confirms that AGOA promoted the exports of quota-bound products significantly more.

Columns (3) and (6) contain the estimation results of model (3) which adds Chinese exports to AGOA, $CH$, into the specification. This model allows us to estimate the "transhipment elasticity", namely the correlation between Chinese exports to AGOA and US imports from the same AGOA country in the same product. Particularly, the three-way interaction term $Third \times FR \times CH$ allows the transhipment elasticity to vary along the level of quota bindingness of products and across countries. As expected, this triple interaction term has a positive and significant coefficient, whether we look at trade values or trade quantities. In other words, we only find a positive and significant correlation between US apparel imports from AGOA and AGOA apparel imports from China where transhipment incentives are present. Fig. 6 graphs this key result. For both 3rd-country-rule eligible and non-eligible countries, we plot the transhipment elasticity, i.e. the marginal effect of Chinese exports to AGOA on US imports from AGOA, against

[13]For ease of comparison, the estimation samples for all regressions include only product/country/year observations where the units of quantity of US imports and Chinese exports match. After all the adjustments to maximize the matching of units across the different data sources (e.g. convert dozen pairs and items to dozens), 2% of the sample is dropped from the estimation sample because of mismatched units.

the quota fill rate. In countries where apparel exporters are not constrained by ROOs, the transhipment elasticity is positive and significant and increases with the restrictiveness of US quotas on Chinese imports. In countries that are not covered by the 3rd-country-fabric rule, the transhipment elasticity is insignificant and does not increase with the quota fill rate.

We also estimate model (3) country by country splitting the sample into the AGOA period (2001-2008) and the pre-AGOA period (1996-2000). We plot the transhipment elasticities for quota-bound products obtained from these regressions in Fig. 5. Whether we run the regression using trade vales or quantities, in 3rd-country-rule countries the transhipment elasticity was always higher during the AGOA period, and it is especially so in the countries identified by Frazer and Biesebroeck (2010) as the biggest winners from AGOA apparel exports, namely, Kenya, Madagascar, and Lesotho.

## 4.2 Robustness checks

In order to exclude the possibility that our benchmark result is driven by other factors than transhipment, we validate the above findings through a number of robustness checks.

Firstly, to smooth out the possible noise in the yearly quota fill rate and to have constant treatment and control groups at the product level, we use a treatment dummy which takes the value of one if the 2001-2008 average of the quota fill rate is greater than 90% and zero otherwise, as an alternative proxy for quota restrictiveness. The treatment and control product groups are here constant across time. Results in Table 3 and summarized in Fig. 7 confirm the benchmark results.[14] For both trade values and quantities, the transhipment elasticity is statistically positive only in 3rd-country-fabric eligible countries and highest for quota-bound products. More importantly, the double difference in the transhipment elasticity between quota-bound and non-bound products and between 3rd-country-fabric eligible and non-eligible countries, which is given by the coefficient on the three-way interaction term ($Third \times Quota \times CH$), is positive and

[14]Using an alternative and looser definition of quota bindingness, namely replacing the dummy with a one for any product facing a quota, does not change the results (not reported).

significantly different from zero. Also, the size of the coefficient is slightly larger than in Table 2, as the treatment dummy creates more extreme comparisons.

A further concern with the results obtained so far may be that both trade flow variables in our transhipment regression have many zeros (see footnote 5). This can partly contribute to the positive correlation of Chinese exports to and US imports from 3rd-country-fabric eligible countries if zero trade values are prevalent among products with high quota fill rates. To see whether this is the case, we run regression (3) dropping all observations where both US imports and Chinese exports are equal to zero. As reported in Table 4, this reduces the sample size by 85%. Yet, the coefficient on the three-way interaction is positive and significant, confirming our previous findings. As a further robustness test, we convert the trade-flow variables in dummies equal to one if we observe a positive trade flow and to zero otherwise. Given the high dimensionality of the fixed effects and the number of interactive terms in the regression, we opt for a linear probability model. The estimates reported in Columns (2) and (5) validate the baseline results, showing that the probability of observing positive US apparel imports is significantly higher in 3rd-country-fabric eligible countries, for products with positive Chinese exports and constrained by US quota. Finally, the results are confirmed using another functional form where we add 0.001 instead of 1 (i.e. we add one dollar rather than one thousand dollars in the case of trade values) before taking logs of trade flows.

Thirdly, as a large fraction of Chinese exports are processed through Hong Kong (Feenstra and Hanson, 2004), it is possible that Chinese apparel aimed for transhipment come as *Hong Kong exports*, instead of Chinese exports, to Africa. To account for this possibility, in Columns (4) and (8) of Table 4, we re-estimate the transhipment regression (3) replacing Chinese exports by the sum of Chinese exports and Hong Kong re-exports. Under this specification the transhipment elasticity remains positive and statistically significant, confirming our transhipment result.

Fourthly, to show that the positive transhipment elasticity is unique to Chinese exports, we re-estimate specification (3) by replacing Chinese exports with exports from exports from the largest exporters of apparel and textiles, namely Belgium, France, India,

Italy, South Korea, and Turkey. Results in Table 5 confirm that only AGOA imports from China predict US imports from AGOA significantly and positively in 3rd-country-fabric eligible countries and for products with high quota fill rate.

One last concern is that the correlation between US imports and Chinese exports, rather than capturing transhipment, captures a deflection of Chinese exports combined with a diversion of US imports, caused by MFA quotas and AGOA preferences. Indeed the two flows could be correlated simply because AGOA countries specialized their exports in the products China exports. Our specification controls for this possibility as the 3-way interaction includes a dummy for 3rd-country-fabric eligibility, rather than AGOA eligibility. To put it differently, for countries such as Mauritius and South Africa, two major African apparel producers part of AGOA but facing rules of origin, we find no significant transhipment elasticity (this is also shown in Fig. 5). If it were simply a deflection-diversion result, it should have appeared in these countries as well.

### 4.3 Size of transhipment

As a byproduct of our transhipment regression (Table 2) we can simulate the level of US imports that would have been observed had there been rules of origin or no MFA quotas, taking everything else constant. This gives us counterfactual scenarios corresponding to a world where transhipment incentives would be lower. As per our 3-way interaction model, this scenario has heterogeneous effects across products and countries. Our results, which should be interpreted only as back-of-the-envelope calculations, are presented in Table 6. We find that the 3rd-country rule may account for as much as 45% of Botswana's apparel exports, 30% of Kenya's, 22% of Madagascar's, and 13% of Lesotho's. The MFA quotas account for almost similarly-large shares of exports. In South Africa and Mauritius, where the sourcing of inputs was subject to ROOs, quotas on Chinese exports seemed to have had almost no effect on exports to the US. When we combine the effect of lax ROOs with MFA quotas, we find that these policies may account for as much as 64% of Botswana's apparel exports, 45% of Kenya's, 35% of Madagascar's, and 23% of Lesotho's.

## 4.4 Chinese inputs and African apparel exports

The evidence so far shows that AGOA apparel imports from China are significantly correlated with AGOA apparel exports to the US, and this only in 3rd-country-fabric eligible countries and for products that are subject to US quotas imposed on China. This gives a strong indication of transhipment, suggesting that the quota-hopping re-location involved only the last stages of the production process. This finding has important implications from a development perspective. Indeed, as noted in the introduction, the boom in AGOA apparel exports was not accompanied by dynamic growth benefits and this may be because Chinese firms focused on the final touches of the value chain, using quasi-finished products as inputs, where value added is lowest (Fernandez-Stark et al., 2011). If, on the contrary, Chinese firms in Africa had imported intermediate inputs from China and then processed them with contributions from local production factors, the transhipment may have had positive spillover effects on the local apparel industry.

To further confirm that AGOA countries only engaged in the last steps of the production process, we use input-output linkages between apparel products and their textile inputs to check to which extent AGOA countries imported *intermediate inputs* from China. Since most AGOA countries lack detailed input-output matrices, we use the US one.[15] Each HS6 apparel product is mapped to a production process using the Bureau of Economic Analysis (BEA) concordance table. A production process consists in a set of input values needed to produce one dollar of output. We thus estimate the value of required inputs that would be needed to produce the AGOA exports of each country and year in the following way:

$$Req\_input_{hjt} = \sum_{i \in I} \lambda_{ih} USimp_{ijt} \tag{4}$$

where $h$ indicates the textile input and $I$ is the set of apparel products used in the regression analysis.[16] The $\lambda$ term quantifies the amount of the textile input $h$ that is

[15] The 1997 IO Total Requirement table and the corresponding concordance tables are used in the analysis.

[16] The set of textile inputs are the categories listed on the OTEXA webiste (aggregated at the HS6 level), once the apparel products have been dropped. We thus do not consider apparel products as possible inputs.

embedded in one dollar of the apparel product $i$.

If Chinese exports were inputs for AGOA's screwdriver plants, they should mimic the input-requirements predicted by AGOA's exports. We thus check whether China's exports of textile inputs to AGOA can be explained by the inputs predicted by the theoretical production process. Quite intriguingly, the results in columns (1) to (3) of Table 7 suggest that required inputs are negatively correlated with Chinese exports[17]. This results also hold if we lag Chinese exports by a year, in the case where production would involve a one-year lag (results not shown). It thus seems highly unlikely that textile inputs were imported from China.

To illustrate this result graphically, we define "missing inputs" as the difference between "required" inputs and the actual inputs imported from China. Fig. 8 shows that in the countries we identified as successful apparel exporters, input imports are indeed "missing". The distribution of mainly positive values suggests that Chinese textile exports to AGOA fall short of the inputs required by AGOA countries to produce their apparel exports to the US. This pattern suggests that the production process in Africa was indeed more concentrated on the final assembly touches, where no textile inputs are necessary.

# 5 Concluding remarks

This paper has shown that the combination of restrictive quotas on Chinese apparel exports in the US and preferential treatment for African exports resulted in quota-hopping transhipment from China to the US via AGOA countries. As highlighted by Brambilla et al. (2010), the MFA resulted in a regime which guaranteed smaller developing countries access to the US market. Coupled with AGOA, the incentives of the quotas were strong enough to spur a new trade route, despite the poor infrastructure, high risk, and poor public services associated with African countries, as noted by Frazer and Biesebroeck (2010). In terms of policy implications, this paper sheds light on the unintended consequences

[17]The regressions in columns (4) to (6), which confirm those of (1) to (3), are done when considering only exports of quota-bound products to the US

of regulation on the organization of international trade. The success of African apparel exports confirms that supply-chain industrialization can lead to fast exports growth, as suggested by Baldwin (2011). Still, this success may have been ephemeral due to the distortive "loopholes" in global trade policies that created an artificially-profitable fragmentation of production. Hence, trade and development policies should be designed more carefully to mitigate fickle firm re-locations.

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Table 1: Foreign sourcing and export in the garment industry in Africa

| | Year | % of firms using supplies of foreign origin | % of total inputs that are of foreign origin | % of firms exporting directly or indirectly |
|---|---|---|---|---|
| Botswana | 2005 | 80.5 | 62.0 | 23.6 |
| Ghana | 2006 | 67.7 | 37.9 | 44.2 |
| Kenya | 2006 | 55.8 | 31.8 | 28.5 |
| Madagascar | 2008 | 78.9 | 62.8 | 78.7 |
| Mauritius | 2008 | 42.2 | 31.8 | 40.3 |
| Swaziland | 2005 | 74.4 | 62.2 | 80.7 |
| Tanzania | 2005 | 57.4 | 38.5 | 5.7 |
| South Africa | 2006 | 35.3 | 15.8 | 22.1 |

Note: Data from the World Bank Enterprise Surveys. Number for South Africa is for the sector: Textiles, Garments, Leather, Paper and Publishing.

Table 2: Transhipment regression

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Values | | | Quantities | | |
| Third | 0.158*** | | | 0.214*** | | |
| | (0.0259) | | | (0.0378) | | |
| FR | | -0.0250* | -0.0228* | | -0.0356* | -0.0309* |
| | | (0.0140) | (0.0126) | | (0.0202) | (0.0183) |
| Third × FR | | 0.216*** | 0.144*** | | 0.297*** | 0.197*** |
| | | (0.0512) | (0.0363) | | (0.0724) | (0.0503) |
| CH | | | -0.0124** | | | -0.00567 |
| | | | (0.00618) | | | (0.00367) |
| FR × CH | | | 0.00520 | | | 0.00217 |
| | | | (0.00991) | | | (0.00637) |
| Third × CH | | | 0.0226** | | | 0.0137* |
| | | | (0.0102) | | | (0.00741) |
| Third × FR × CH | | | 0.0627** | | | 0.0416** |
| | | | (0.0279) | | | (0.0206) |
| Obs | 140,246 | 140,246 | 140,246 | 140,246 | 140,246 | 140,246 |
| R2 | 0.659 | 0.680 | 0.682 | 0.633 | 0.655 | 0.656 |

Note: Columns (1) and (4) include country-product and year fixed effects, all other regressions include country-product and country-year fixed effects. Standard errors clustered at the product level.
*** significant at 1%, ** significant at 5%, * significant at 10%.

Table 3: Transhipment regression with treatment dummy

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Values | | Quantities | |
| Third × Quota | 0.384*** | 0.232** | 0.543*** | 0.337** |
| | (0.125) | (0.0915) | (0.181) | (0.136) |
| CH | | -0.000318 | | 0.00291 |
| | | (0.00418) | | (0.00256) |
| Quota × CH | | -0.0168* | | -0.0170** |
| | | (0.00941) | | (0.00688) |
| Third × CH | | 0.0242** | | 0.0137* |
| | | (0.0116) | | (0.00823) |
| Third × Quota × CH | | 0.0865** | | 0.0582** |
| | | (0.0374) | | (0.0288) |
| Obs | 140,246 | 140,246 | 140,246 | 140,246 |
| R2 | 0.681 | 0.683 | 0.656 | 0.657 |

Note: *Quota* equals one if the average quota fill rate over the 2001-2008 period is greater or equal to 0.9, zero otherwise. All regressions include country-year and country-product fixed effects. Standard errors clustered at the product level.
*** significant at 1%, ** significant at 5%, * significant at 10%.

Table 4: Some Robustness checks

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Values | | | | Quantities | | | |
| | No double zero | LPM | +0.001 | HK re-exp | No double zero | LPM | +0.001 | HK re-exp |
| FR | 0.129* | 9.63e-05 | 0.0129 | -0.0241** | 0.554*** | 0.000342 | -0.000175 | -0.0339* |
| | (0.0700) | (0.00277) | (0.0613) | (0.0119) | (0.145) | (0.00277) | (0.0569) | (0.0176) |
| Third × FR | 0.0635 | 0.0117** | 0.509*** | 0.127*** | -0.0873 | 0.0119** | 0.517*** | 0.179*** |
| | (0.131) | (0.00533) | (0.162) | (0.0319) | (0.234) | (0.00531) | (0.156) | (0.0444) |
| CH | -0.0547*** | -0.00557* | -0.00572 | -0.0134** | -0.114*** | -0.00577* | -0.00407 | -0.00574* |
| | (0.0142) | (0.00321) | (0.00436) | (0.00606) | (0.0178) | (0.00318) | (0.00344) | (0.00319) |
| FR × CH | -0.0402** | 0.00408*** | 0.00389 | 0.0109 | -0.0889*** | 0.00165*** | 0.00297 | 0.00641 |
| | (0.0183) | (0.00122) | (0.00729) | (0.00783) | (0.0200) | (0.000561) | (0.00593) | (0.00446) |
| Third × CH | -0.00191 | 0.00603 | 0.0113 | 0.0235** | 0.000946 | 0.00593 | 0.00848 | 0.0121* |
| | (0.0267) | (0.00704) | (0.00777) | (0.00963) | (0.0248) | (0.00739) | (0.00696) | (0.00678) |
| Third × FR × CH | 0.0843** | 0.0193* | 0.0418** | 0.0589*** | 0.0823** | 0.0208* | 0.0352** | 0.0396** |
| | (0.0362) | (0.0117) | (0.0200) | (0.0226) | (0.0345) | (0.0124) | (0.0173) | (0.0167) |
| Obs | 23,553 | 140,069 | 140,246 | 140,069 | 23,553 | 140,069 | 140,246 | 140,069 |
| R2 | 0.831 | 0.535 | 0.622 | 0.682 | 0.832 | 0.535 | 0.612 | 0.656 |

Note: All regressions include country-product and country-year fixed effects. In Columns (2) and (6), the dependent variable is a dummy equal to one if we observe non-zero US imports, and the variable CH is a dummy equal to one if we observe Chinese exports. In Columns (3) and (7), we add 0.001 to US imports before taking logs. Standard errors clustered at the product level. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 5: RoW Falsification test

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Belgium | | France | | India | | Italy | | South Korea | | Turkey | |
| | Values | Quantities | Values | Quantities | Values | Quantities | Values | Quantities | Values | Quantities | Values | Quantities |
| FR | -0.0256* | -0.0363* | -0.0346** | -0.0471** | -0.0303** | -0.0431** | -0.0296** | -0.0401** | -0.0217 | -0.0310 | -0.0214 | -0.0299 |
| | (0.0135) | (0.0195) | (0.0145) | (0.0213) | (0.0136) | (0.0195) | (0.0136) | (0.0198) | (0.0134) | (0.0193) | (0.0137) | (0.0195) |
| CH | -0.0429* | -0.0306 | -0.0315* | -0.0123 | -0.0403** | -0.0127 | -0.0217* | -0.0126 | 0.00802 | 0.0135 | -0.00353 | 0.00555 |
| | (0.0247) | (0.0219) | (0.0164) | (0.0119) | (0.0190) | (0.0132) | (0.0118) | (0.0132) | (0.00797) | (0.0117) | (0.00961) | (0.00808) |
| Third × FR | 0.221*** | 0.304*** | 0.249*** | 0.345*** | 0.229*** | 0.310*** | 0.224*** | 0.309*** | 0.201*** | 0.276*** | 0.220*** | 0.306*** |
| | (0.0499) | (0.0704) | (0.0535) | (0.0752) | (0.0510) | (0.0703) | (0.0500) | (0.0697) | (0.0454) | (0.0637) | (0.0477) | (0.0664) |
| FR × CH | 0.0387 | 0.0318 | 0.0523** | 0.0401** | 0.0526** | 0.0312* | 0.0257 | 0.0177 | 0.0297** | 0.00733 | -0.0465*** | -0.0372*** |
| | (0.0286) | (0.0257) | (0.0258) | (0.0188) | (0.0229) | (0.0169) | (0.0162) | (0.0178) | (0.0135) | (0.0121) | (0.0177) | (0.0140) |
| Third × CH | 0.219** | 0.111* | 0.0276 | 0.0152 | -0.0188 | -0.0377* | -0.0303 | -0.0364 | 0.0459* | 0.00798 | 0.00526 | -0.0314 |
| | (0.0932) | (0.0610) | (0.0199) | (0.0220) | (0.0237) | (0.0218) | (0.0256) | (0.0225) | (0.0264) | (0.0217) | (0.0297) | (0.0298) |
| Third × FR × CH | -0.232** | -0.133* | -0.0624** | -0.0539 | 0.0511 | 0.0540 | 0.0140 | 0.0247 | 0.00643 | 0.0254 | 0.0360 | 0.0425 |
| | (0.105) | (0.0755) | (0.0301) | (0.0330) | (0.0524) | (0.0390) | (0.0450) | (0.0426) | (0.0387) | (0.0312) | (0.0510) | (0.0363) |
| Obs | 137,384 | 137,384 | 116,014 | 116,014 | 127,582 | 127,582 | 118,366 | 118,366 | 135,308 | 135,308 | 132,312 | 132,312 |
| R2 | 0.677 | 0.652 | 0.679 | 0.657 | 0.684 | 0.658 | 0.689 | 0.666 | 0.684 | 0.659 | 0.689 | 0.666 |

All regressions included country-product and country-year fixed effects. Standard errors clustered at the product level. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 6: What share of US imports is Made in China?

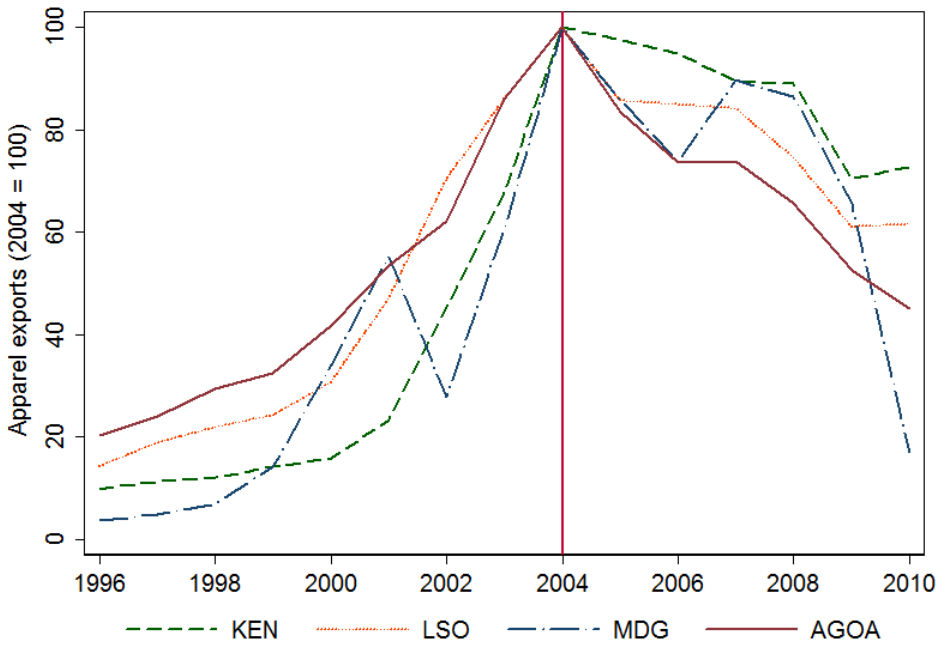
| | Exports ($ '000) | Share due to 3rd-country rule | Share due to MFA quotas | Share due to MFA and 3rd rule |
|---|---|---|---|---|
| Botswana | 139490 | 45% | 38% | 64% |
| Ethiopia | 30836 | 30% | 25% | 45% |
| Kenya | 1636288 | 30% | 24% | 45% |
| Lesotho | 2758955 | 13% | 11% | 23% |
| Madagascar | 1730829 | 22% | 18% | 35% |
| Mozambique | 9678 | 24% | 20% | 37% |
| Mauritius | 888118 | 3% | 1% | 4% |
| Malawi | 140929 | 17% | 14% | 28% |
| Namibia | 226295 | 15% | 13% | 25% |
| Tanzania | 15619 | 31% | 25% | 46% |
| Uganda | 15066 | 38% | 32% | 55% |
| South Africa | 499783 | 0% | 2% | 2% |

Table 7: Do AGOA countries import the required inputs from China?

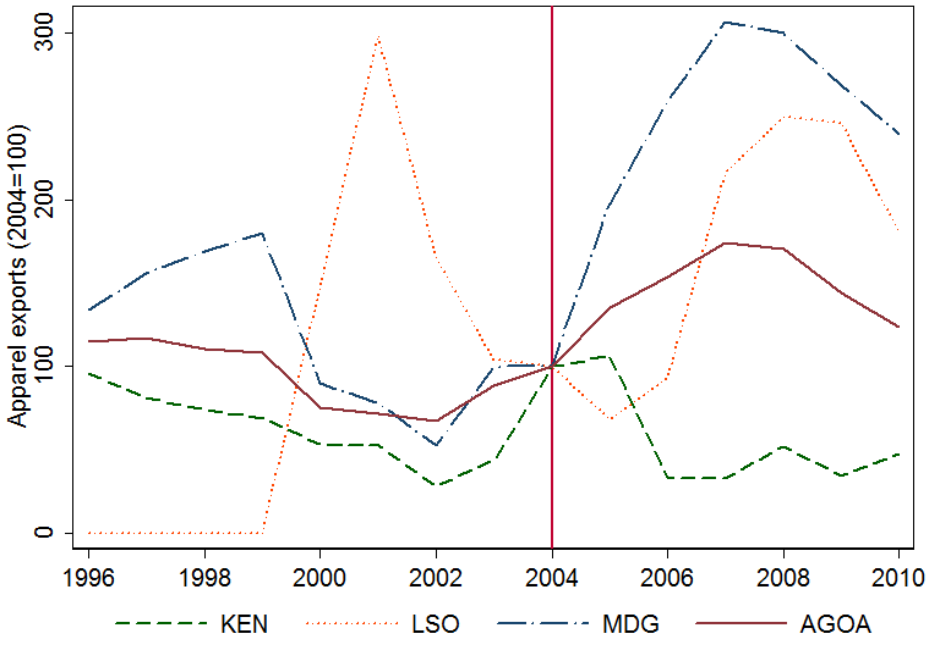
| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Inputs required for all US imports | | | Inputs required for quota-bound US imports | | |
| Required inputs | -0.0359*** | -0.0361*** | -0.0400*** | -0.0351*** | -0.0354*** | -0.0392*** |
| | (0.00820) | (0.0104) | (0.0136) | (0.00807) | (0.0103) | (0.0134) |
| Required inputs × Third | | 0.000444 | -0.00969 | | 0.000554 | -0.00974 |
| | | (0.0152) | (0.00815) | | (0.0153) | (0.00813) |
| Required inputs × Pre-AGOA | | | 0.0125 | | | 0.0126 |
| | | | (0.0140) | | | (0.0142) |
| Observations | 230,784 | 230,784 | 230,784 | 230,784 | 230,784 | 230,784 |
| R-squared | 0.710 | 0.710 | 0.710 | 0.710 | 0.710 | 0.710 |

All regressions included country-product and country-year fixed effects. Standard errors clustered at the product level.
*** significant at 1%, ** significant at 5%, * significant at 10%.

Figure 1 Rise and fall of AGOA apparel exports to the US

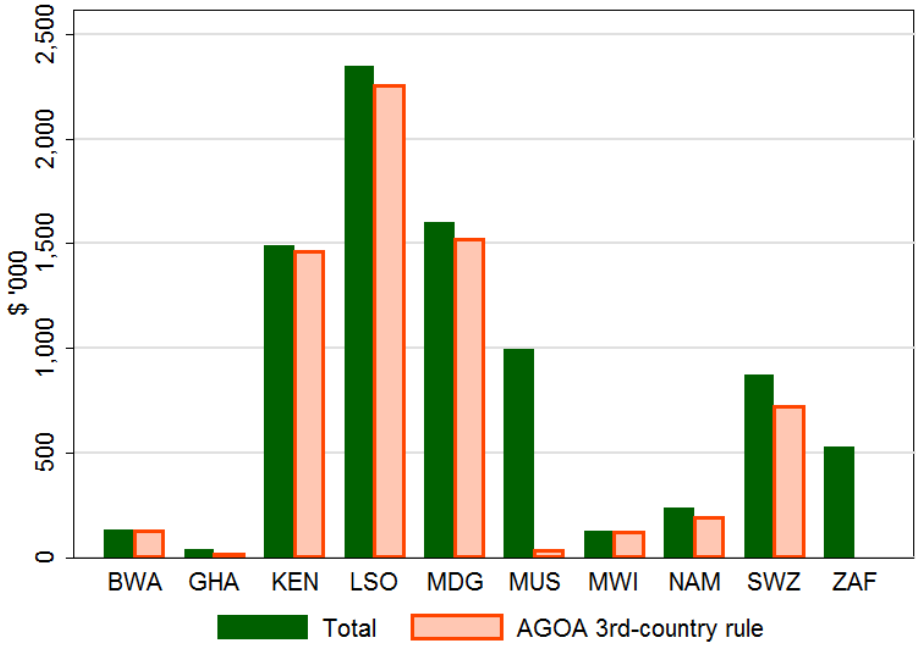



AGOA apparel exports to the EU




Note: Kenya, Madagascar and Lesotho were the three biggest exporters of apparel to the US among AGOA countries during 2000-2004. AGOA started in October 2000 and the MFA ended on 1 Jan 2005.

Figure 2 US apparel imports from the top 10 AGOA countries (2003-2008)




Note: Data from agoa.info available from 2003 onwards only.

Figure 3 AGOA 3rd-country rule eligibility, US imports, and Chinese export

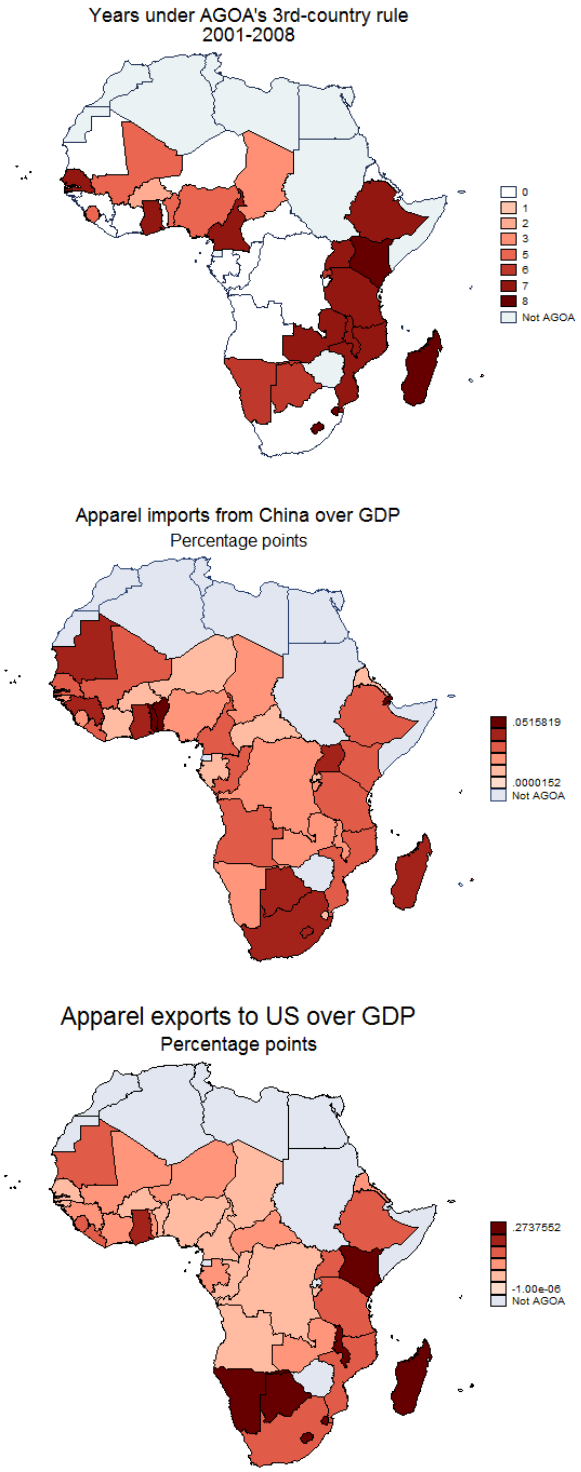


Figure 4 Distribution of US quota fill rates on Chinese apparel products

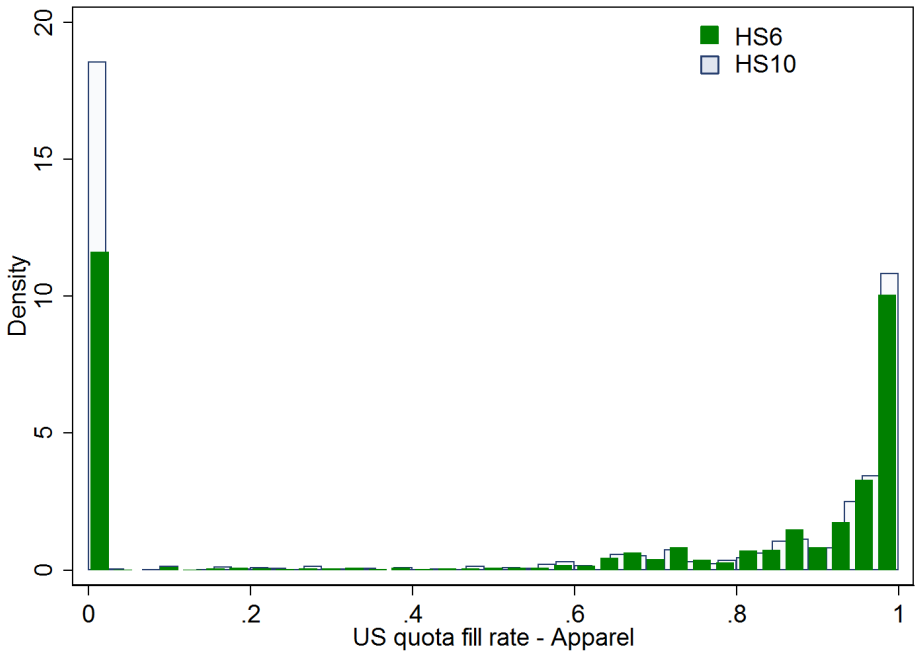



Figure 5 Transhipment elasticities

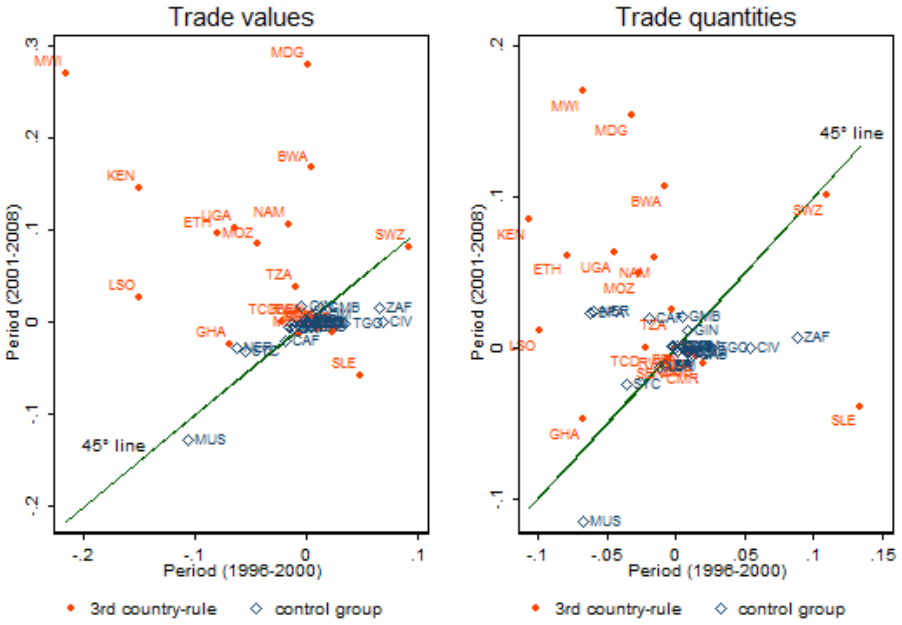


Figure 6 Transhipment elasticity vs. quota fill rate

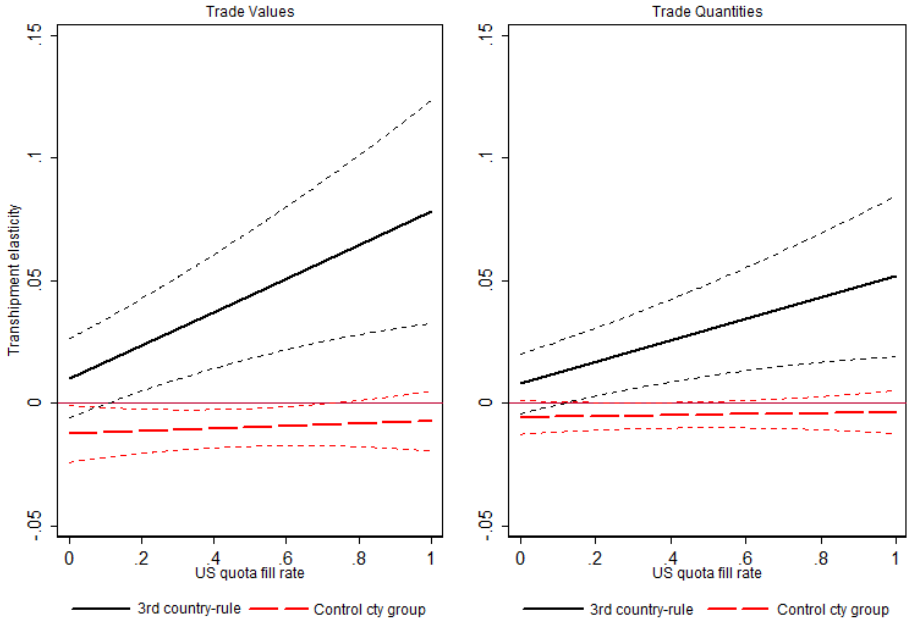



Figure 7 Transhipment elasticities: Across product and country groups

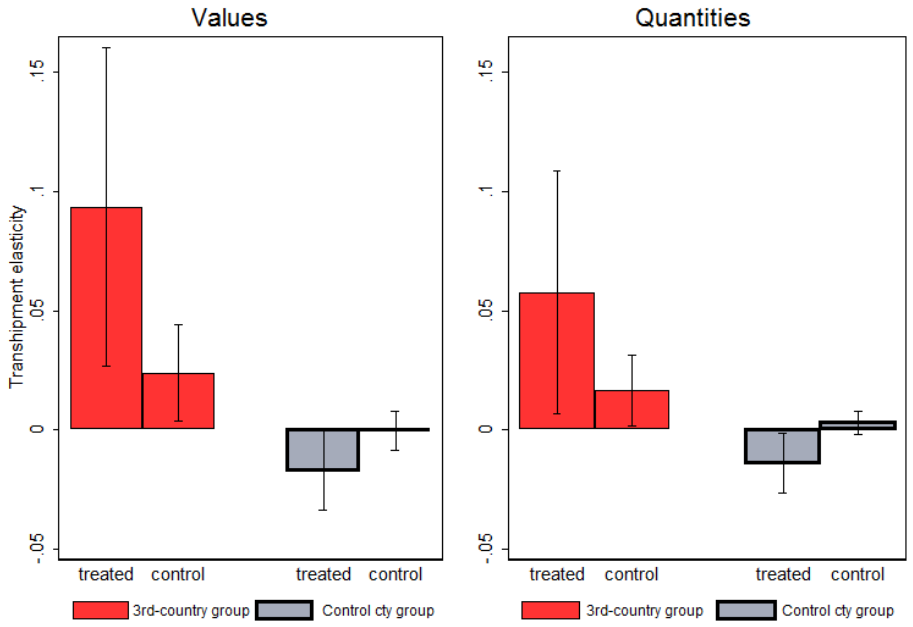


Figure 8 Missing-inputs distributions