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ABSTRACT

Preferential Market Access into the Chinese Market: How Good is it for Africa?

In 2005 China provided duty-free access to 190 items from 25 least developed sub-Saharan African (SSA) countries. Three years later duty-free access was extended to 454 items from 31 SSA LDCs. We find no evidence that China's preferential market access program for the least developed sub-Saharan African countries has helped these countries gain competitive edge over other exporters into the Chinese market. While there is evidence of decreased export bundle concentration and movement up the value chain for SSA countries involved in the program, the effect differs significantly across countries.

JEL Classification: F13, F14, O24

Keywords: preferential market access, export diversity and sophistication, triple difference, China, sub-Saharan Africa

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I. Introduction

The post-1960s pattern of globalization changed the competitive dynamics of nations with the center of gravity in manufacturing production and exports shifting in favor of developing countries, and unprecedented economic growth rates in East Asia boosting the credibility of export-oriented industrialization as a winning development strategy. While the growth enhancing potential of reliance on restricted groups of not only primary, but also manufacturing, exports has been brought into question at several levels (Cline, 1982; Hunt and Tybout, 1998), there is little disagreement about the fact that economic survival and competitive edge in a world of increasing segmentation of production and rapidly changing competitive dynamics can only be achieved via continuous technological upgrading and movement of producers up the international value chain (Gereffi, 1999; Hausmann et al., 2007).

Although East Asian manufacturers have been successful in reaping the advantages of industrial production at several different skill levels and even moving towards original brand name manufacturing, Africa has lagged behind in its trade diversification efforts. Through the 1990s, 39 African countries depended for more than half of their export earnings on two primary commodities (Morrissey, 2005). National barriers in the form of poor business environment and infrastructure, on the one hand, and the international trade environment of barriers to trade and tariff escalations, on the other hand, have been cited as the two key culprits for failed diversification and technological upgrading (Collier and Venables, 2007; Morrissey, 2005). The former set of barriers made it difficult for African countries to exploit the advantages of preferential trade arrangements. For example, the absence of complementary domestic reforms reduced the ability of African countries to gain from the Multi Fibre Agreement (MFA), and only a few textile and apparel exporting countries benefited significantly from the preferential market

provisions of the African Growth Opportunity Act (Collier and Venables, 2007; Morris, 2006).

Given that complex rules of origin tend to constrain the potential of African countries to expand and diversify their exports significantly through access to industrialized countries' markets and in products of potential comparative advantage (for example, garments) they face serious challenges from Southeast Asian producers, African countries are typically encouraged to explore the export diversification and economic growth potential of south-south cooperation. Indeed, south-south cooperation is one of the priority areas of the United Nations' Development Cooperation Forum (DCF). Among the south-south cooperation venues, China's current engagement with Africa has received the largest degree of attention in both the popular and academic press. At the same time, interest has mostly centered on Chinese firms building infrastructure in Africa and China-Africa's trade has largely been ignored.

In 2005 China provided duty-free access for 190 items from 25 least developed sub-Saharan African (SSA) countries. Three years later, duty-free access was extended to 454 items from 31 SSA LDCs. Consistent with the principle of non-interference governing China's foreign engagement and to south-south cooperation's core principle of mutually beneficial exchange,[1] preferential market access is not conditioned on institutional reform and is extended to all least developed SSA countries with which China has diplomatic relations.[2]

[1] Participant countries at the 2010 DCF broadly agree that "South-South cooperation has features that set it apart from North-South cooperation, such as absence of conditionality, horizontal relationships and complementarity between parties as well as cost effectiveness." ECOSOC (2010, p. 7)

[2] This distinguishes China's preferential market access program from the African Growth Opportunity Act (AGOA, 2000) which provides duty-free access to US imports of more than 6,400 items from eligible SSA countries until September 30, 2015, but is tied to countries' progress toward a more market-oriented economy, efforts to fight corruption, and other criteria.

The key question we explore is whether preferential access to the Chinese market had significant impact on China's imports from Africa. Because China's preferential market access program is relatively new, this paper is, to the best of our knowledge, the first contribution in this area. More importantly, we move a step forward and address the important issue of whether the preferential trade arrangement with China provides any growth enhancing export diversification opportunities or whether it further entraps SSA countries in a selected number of primary export categories.

It is difficult to provide a clear ex-ante answer to these questions. On the one hand, the complementary export structures of the two sets of countries, with Africa's comparative advantage in primary resources and China's comparative advantage in manufacturing products, gives good grounds for successful trade relations, though ones potentially further entrapping Africa into reliance on primary exports (Jenkins and Edwards, 2006; DFID, 2005). On the other hand, movement of China up the international value chain (Rodrik, 2006), opens new opportunities for export diversification and growth of Africa in a fashion similar to that of the "flying geese phenomenon" in East Asia, whereby technological upgrading of more advanced countries such as Japan and South Korea opened export diversification and technological upgrading opportunities to their Southeast Asian trade and production partners (Yusuf et al., 2003).

The rest of the paper is organized as follows. Section I outlines briefly the history of China's preferential access program and backs it up with descriptive statistics. Section II discusses the empirical methodology. The empirical results and implications of our findings are discussed in Sections III and IV respectively. Section V concludes.

II. China-Africa Trade Relations: Background, Data, and Descriptive Statistics

The Forum on China-Africa Cooperation (FOCAC) has been the main venue for collective dialogue between China and the 49 African member states since its founding in 2000. Duty-free access was first promised at the 2nd FOCAC Ministerial Conference in 2003, and on January 1, 2005, 190 items from 25 SSA LDCs were allowed to enter China duty-free.[3] In what follows, we will refer to this as Phase I of the preferential trade arrangement. On July 1, 2007, duty-free treatment was extended to 254 additional items to 26 SSA LDCs. A year later, six additional least developed SSA countries received preferential market access into the Chinese market for all 454 items. Since only a few months separate these two phases, we collapse them into one and refer to this as Phase II below (see Appendix A for details). At the 4th Ministerial Conference in 2009, China pledged to provide duty-free access to 95% of least developed SSA countries' exports. By July 1, 2010, duty-free access was granted to more than 4,700 items, covering 60% of the exports of SSA LDCs (see China State Council, 2010).[4] Since this latest phase is only three years old, our analysis of the trade effects of China's preferential market access program ends prior to it.

We use trade data at the six-digit Harmonized System (HS) codes level from the United Nations Commodity Trade Statistics (UN Comtrade) database, collected between 2002 and 2010, thus covering the years prior to and after the implementation of China's preferential market access program. For brevity, the six-digit HS codes will be referred to as products below. We break the data into three periods: 2002-2004 (pre-program), 2005-2007 (Phase I), and 2008-2010 (Phase II).

[3] The number of items is based on eight-digit 2007 Harmonized System codes.
[4] This latest phase is also extended to several Asian LDCs such as Afghanistan, Bangladesh, and Nepal.

HS codes for 2002 are used as this provides more information compared to data reported using 2007 HS codes.[5]

Table 1 highlights the number of products included in Phases I and II of China's preferential market access program. We see that by Phase II, the number of products receiving preferential treatment increased dramatically. While in categories with existing SSA comparative advantage, such as Food and Live Animals and Other Primary Products, the number almost doubled, in Textiles and Apparel, the products receiving preferential market access increased from 36 items in Phase I to 124 items in Phase II. In Other Manufactures, the increase was from 59 items in Phase I to 148 in Phase II, while in Chemicals, Machinery and Transport Equipment, the number approximately tripled from 29 items to 78 items.

Table 1 here

To put things in perspective, Table 2 highlights the structure of Chinese imports by product groups and groups of countries, differentiated by income. Not surprisingly, Chemicals, Machinery and Transport Equipment dominate China's imports from high income countries, while Other Primary Products dominate China's imports from low income countries, and in particular SSA countries. In 2002-2004 (pre-program period), the average annual share of Other Primary Products in China's imports from the 31 SSA LDCs is 97.9% and goes down to 92.9% in 2008-2010 (Phase II). However, the sheer size and continued dominance of primary products casts some doubts on the ability of SSA countries to reap significant advantages from the preferential trade arrangement, at least in the short run. In what follows, we focus on providing rigorous answers to the research questions posed at the outset.

[5] We should note that the items receiving zero-tariff treatment are listed using eight-digit HS codes whereas available trade data are at the six-digit HS level. This might cause some overestimation of the trade effects. Another possible source of overestimation is the conversion of 2007 HS codes into 2002 HS codes when the correspondence is not one-to-one.

Table 2 here

III. Empirical Methodology

A. Measuring the Trade Growth Implications of the Preferential Trade Arrangement

One of our main objectives is to explore whether the Chinese preferential trade arrangement had significant impact on the amount of Chinese imports from the SSA countries, involved in the program. Note that the impact of the program varies along three different dimensions: (i) between time periods (before and after program implementation), (ii) across products (those included and those not included on the preference list), and (iii) across countries (those given and those not given preferential treatment). To avoid biases in the estimation of the trade effects, for example an increase in Chinese imports of products included in the preference list from SSA countries for reasons other than the implementation of preferential trade arrangement, the core of our empirical analysis involves performing triple difference estimation a la Frazer and Van Biesebroeck (2010). Following Frazer and Van Biesebroeck (2010), we estimate equation (1) below:

$$\begin{aligned} lnIMP_{cpt} = {} & \beta_1 \left(i.country1_c * i.product1_p * i.prd1_t\right) + \\ & \beta_2 \left(i.country2_c * i.product2_p * i.prd2_t\right) + \\ & country/product_{cp} + product/year_{pt} + country/year_{ct} + \varepsilon_{cpt}, \end{aligned} \tag{1}$$

where $lnIMP_{cpt}$ is the natural log of China's imports from country *c* of product *p* at period *t*;[6] *i.country1* (*i.country2*) = 1, if country *c* receives preferential market access from China in the first (second) phase; *i.product1 (i.product2*) = 1, if product *p* is included in the preference list in the first (second) phase; *i.prd1* = 1 for 2005-

[6] Throughout, we follow common practice of using a country's imports rather than partners' exports to the country as import data are generally more reliable. In our exposition, we also refer to Chinese imports from SSA countries as SSA exports to China.

2007, and *i.prd2 = 1* for 2008-2010. The coefficients of the triple interaction terms (*i.country*i.product*i.prd*) give the unbiased trade effects of the two phases of China's preferential market access program for the least developed preference-eligible SSA countries, after accounting for the possibility of non-random selection of both countries and products in the preferential list. The last three terms in equation (1) are a series of interactive fixed effects (country-product, product-year, and country-year) which Frazer and Van Biesebroeck (2010) argue replace double-interaction terms (e.g., *i.country1*i.product1*) and uninteracted variables (e.g., *i.country1*).[7] These interactive fixed effects allow for heterogeneity in the base level of Chinese imports. For example, the country-product interactive fixed effects account for heterogeneity in Chinese imports of any product from any country.

Note that the coefficients of the interactive fixed effects are not actually estimated (as they number in the millions). Instead, following Frazer and Van Biesebroeck (2010) we sequentially de-mean the variables in equation (1) along two dimensions, first along the country-product dimension, then by the product-time dimension and finally by the country-time dimension. The interactive fixed effects drop out of equation (1) after this sequential de-meaning process and, equation (2) below is the model estimated:

$$lnIMP^{*}_{cpt} = \beta^{*}_{0} + \beta^{*}_{1}\left(i.country1_{c} * i.product1_{p} * i.prd1_{t}\right)^{*} + \beta^{*}_{2}\left(i.country2_{c} * i.product2_{p} * i.prd2_{t}\right)^{*} + \varepsilon^{*}_{cpt}, \quad (2)$$

[7] Equation (1) involves triple differencing (double treatment model) which is an extension of the difference-in-difference (single treatment) model. In the current context, difference-in-difference (double differencing) will be appropriate if analysis is limited to only countries receiving preferential market access and differencing is done along the product-period dimension. Products receiving preferential treatment are in the treatment group and products not receiving preferential treatment are in the control group. Alternatively, if analysis is limited to only products receiving preferential treatment, differencing occurs in the country-period dimension. Countries receiving preferential treatment are in the treatment group and countries not receiving preferential treatment are in the control group.

where asterisks indicate de-meaned variables and their corresponding coefficients. The coefficient of the de-meaned triple interaction terms is positive if the preferential market access program is successful in increasing Chinese imports of preference-eligible product *p* from a preference-eligible country *c* when the preference program is in effect in period *t.*

It is important to note that zeroes are retained in all the estimations as "observed zeros contain valuable information which should be exploited" (Felbermayr and Kohler, 2006, p. 644). Following common practice (see e.g. Felbermayr and Kohler, 2006; Eichengreen and Irwin, 1995), import data are adjusted by $1; thus, when the natural logarithm of these adjusted trade values are obtained, zero values are retained in the estimations. We have a balanced panel of 193 countries and 5,215 products, for nine years (2002-2010).

B. Export Diversification and Moving up the Value Chain

We follow the same methodological route to answer the question of whether trade between China and sub-Saharan Africa, after the preferential trade arrangement, improves the export sophistication and diversification potential of the African partners or whether it further entraps them into primary resource-based production and exports. Given that variation in this case is only along the country and period dimensions, we only include the interaction terms between *i.country* and *i.prd* in the following fixed effects model:

$$lnEXPY_{ct} = \alpha_c + \theta_1(i.country1_c * i.prd1_t) + \theta_2(i.country2_c * i.prd2_t) + \kappa' Z + \mu' PDUM + v_{ct}, \quad (3)$$

where $EXPY_{ct}$ is the export sophistication index, which has now become stylized in the literature (Rodrik, 2006; Hausmann, et al.,2007 and Xu, 2010).[8] The matrix $\boldsymbol{Z}$

[8] For any given period *t*, $EXPY_{ct}$ is defined as

includes countries' real per capita GDP, population (proxy for country size), and rule of law while ***PDUM*** includes a set of period indicators.[9] The inclusion of controls over and above the interaction terms between *i.country* and *i.prd* is consistent with Hausmann et al (2007). We use the same model to study the product concentration (HHI_{ct}) of countries' export bundle.[10]

IV. TRADE GROWTH IMPLICATIONS OF THE PREFERENTIAL TRADE ARRANGEMENT

A. Empirical Results

We start our empirical analysis by first looking at the trade growth implications of the preferential trade arrangement. The estimates of equation (2)

$$EXPY_{ct} = \sum_{p \in P_t} s_{pct} PROD_{pt}$$

where s_{pct} is the share of product p in country c's exports, P_t is the set of all products exported by country c, and $PROD_{pt}$ measures the sophistication of product p in period t. A product's sophistication is weighted by the income of all countries exporting the good to China and is calculated as:

$$PROD_{pt} = \sum_{i \in C_{pt}} \frac{s_{pit}}{\sum_{k \in C_{pt}} s_{pkt}} PCY_{it}$$

where C_{pt} is the set of all countries that export product p and PCY_{it} is the real per capita income of country i in period t. The key idea behind the $EXPY_{ct}$ index is that higher income countries export more sophisticated products. Thus, an increase in $EXPY_{ct}$ over time indicates increasing sophistication in country c's exports to China.

[9] To include a full set of period dummies, only countries with complete data for all nine years (2002-2010) are considered. This provides a sample of 156 countries with 25 (out 31) preference-eligible countries. Real GDP per capita and population are from The World Bank Development Indicators database while rule of law is from The World Bank's Worldwide Governance Indicators, 2013 Update.

[10] Once again, we use the stylized index of exporter product concentration index (HHI_{ct}):

$$HHI_{ct} = \sum_{p=1}^{m} \left(\frac{IMP_{cpt}}{IMP_{ct}} \right)^2$$

where IMP_{ct} is China's total imports from country c in period t and IMP_{cpt} is China's import of product p from country c in period t. HHI_{ct} falls between 0 and 1, with 1 indicating that all imports from country c in period t is in one product.

are reported in Table 3. The first two rows of Table 3 contain the estimated triple interaction terms for Phases I and II of China's preferential market access program for SSA LDCs with estimations performed for the sample as a whole (column (1)) as well as for the samples of middle and low income (column (2)) and low income countries (column (3)). Both coefficient estimates are negative and statistically significant with p-values < 0.01 regardless of whether the control group consists of all countries, middle and low income countries, or only low income countries. The coefficient estimates are larger in magnitude when the control group consists of middle and low income countries than low income countries alone, possibly indicating that preference-eligible SSA countries find it more difficult to compete with middle income than low income countries.

Table 3 here

The results above mask potential differences across product groups; thus, we repeat the exercise by replacing the triple interaction terms in equation (2) with five sets of triple interaction terms, one for each product group.[11] The coefficient estimates, which are also highlighted in Table 3, show heterogeneity in the trade effects across both product and control groups.[12]

Consider the estimates for the full sample, column (1). We see that for both phases of the program, the triple interaction coefficients are negative in the case of

[11] We create five product groups based on the Standard International Trade Classification (SITC) and HS classification schemes: Food and Live Animals; Other Primary Products; Textile and Apparel; Chemicals, Machinery and Transport Equipment; and Other Manufactures. Food and live animals (SITC=0); Other Primary Products includes beverages and tobacco (SITC=1), crude materials, inedible, except fuels (SITC=2), mineral fuels, lubricants and related materials (SITC=3), animal and vegetable oils, fats and waxes (SITC=4); Textile and Apparel includes textiles (SITC=6 and items belonging in HS's Chapters 50-63) and apparel (SITC=8 and items belonging in HS's Chapters 50-63); Chemicals, Machinery, and Transport Equipment includes chemicals and related products (SITC=5) and machinery and transport equipment (SITC=7); Other Manufactures includes manufactured goods classified chiefly by material (SITC=6) and miscellaneous manufactured articles (SITC= 8 but not in HS's Chapters 50-63).

[12] We also estimate a linear probability version of equation (2) and obtain qualitatively similar results. These are available upon request.

Textile and Apparel, Chemicals, and Machinery and Transport Equipment. The coefficient is positive for the Other Primary Products category and insignificant for the Food and Live Animals category. In other words, we find some preliminary indication that the preferential trade arrangement may have led to further entrapment of SSA countries into primary exports. A similar conclusion is reached when SSA countries are compared to middle and low income countries (see column (2) of Table 3). However, when SSA LDCs are compared to only low income countries, the triple interaction terms for Other Primary Products lose their statistical significance. Thus, the level of Chinese imports of Other Primary Products from SSA LDCs is comparable to the country's imports of these items from other low income countries. Since the triple interaction terms for Textiles and Apparel and Chemicals, Machinery and Transport Equipment remain negative in column (3), we can conclude that China's preferential market access program does not give an advantage to the SSA countries on the preference list vis-à-vis other low income countries in these product groups.[13]

B. Discussion and Potential Explanations

Our estimates indicate that except for the category of Other Primary Products, the preferential trade arrangement failed to contribute to the expansion of China's imports from SSA countries included in the program. We consider several

[13] It is possible that the trade increasing effect of the preference program depends on the MFN duty rates of the products included on the preferential list. On average, the preference margin enjoyed by the preference-eligible SSA countries compared to other exporters of the same products to China is 10%, see Table 1. Following Frazer and Van Biesebroeck (2010), we multiply the triple interaction terms in equation (2) with MFN duty rate categories as follows: category 1 is $0 \leqslant MFN < 5\%$; category 2 is $5 \leqslant MFN < 10\%$; category 3 is $10 \leqslant MFN < 15\%$; category 4 is $MFN \geqslant 15\%$. For the most part, we obtain negative coefficients for the interactions between the MFN duty categories and the triple interaction terms except for Other Primary Products. This means that the preference margins enjoyed by the preference-eligible SSA countries matter only in this product group. This margin effect, however, disappears when these countries are compared to other low income countries.

possible explanations of this rather counter intuitive finding. On the one hand, it is possible that political economy considerations led to the inclusion in the preference list of products in which entitled countries did not have expansion potential, possibly on account of the fact that they were perceived as a competitive threat to Chinese products. Alternatively, it is possible that despite the preferences granted, SSA countries lack the capacity to compete against alternative exporters to the Chinese market. In the context of our model, the negative triple interaction term could for instance capture a situation whereby the Chinese imports from countries not included in the list and products not included in the list expanded faster during the preference periods than those included in the preference list.

We start by exploring the determinants of a product's inclusion on China's preferential list. We argue that a product might have been selected if local (Chinese) competition is either non-existent or small, and/or the anticipated export increasing effect from the SSA countries is negligible. We use trade-based revealed comparative advantage (RCA) as a proxy for the presence of local competition. China's RCA (*CHRCA*) measures the share of product *p* in China's total worldwide exports relative to the share of product *p* in the world's total exports. Higher index values indicate greater competition from local Chinese producers. SSA countries' RCA (*SSARCA*) measures the share of product *p* in these countries' total worldwide exports relative to the share of product *p* in the world's total exports. Higher index values suggest greater comparative advantage for SSA countries.

Political economy concerns explain the product inclusion choice if the probability of inclusion decreases with China's RCA and with SSA's RCA in these products. Positive coefficients for both RCA indices suggest that product inclusion choice is less likely due to political economy considerations. We estimate the following probit model to test these hypotheses:

$$i.product_{pt} = \alpha + \gamma_1 CHRCA_{pt-1} + \gamma_2 SSARCA_{pt-1} + \delta' GRP + \varepsilon_{pt}, \quad (4)$$

where *i.product* = 1, if product *p* is included in the preference list at period *t*, equal to zero otherwise; $CHRCA_{pt-1}$ and $SSARCA_{pt-1}$ are respectively China's and preference-receiving countries' revealed comparative advantages in product *p* pre-program (2002-2004). We also include a set of qualitative indicators to differentiate major product groups' probability of inclusion with Other Primary Products as reference group. We estimate equation (4) for Phases I and II of China's preferential market access program.

The probit regression estimates are reported in Table 4. For both Phases I and II of China's preferential market access program, the coefficients of the two RCAs are positive and significantly different from zero with p-values < 0.05. The coefficient estimates of the product group indicator variables suggest that products belonging in Other Primary Products (base group) have the highest probability of inclusion, while products in the Chemicals, Machinery, and Transport Equipment group have the lowest probability of being included in the preference list. Interestingly, the probability of inclusion of Textile and Apparel products is higher relative to the reference group in Phase II of the preference program. Altogether these results do not grant obvious support to the hypothesis that product inclusion was driven by political economy concerns on China's part, although in general there appears to be certain preference for including Other Primary Products more than other product categories.

Table 4 here

Next we turn towards our alternative hypothesis related to capacity constraints for SSA beneficiaries from the preferential arrangement to expand their exports to China. To begin with, in Table 5, we compare the growth rates of Chinese imports of preference-eligible products with preference-ineligible products and of preference-eligible countries with preference-ineligible countries. While on average, preference-eligible countries and products experienced higher export growth than that those not included in the preference list, there are a number of

important examples of the opposite. For instance, while China's imports of preference-eligible Textile and Apparel products from preference-eligible countries declined by 80% in the first phase of the program, imports of non-preference products increased by 1,777%. Non-preference products in this product group continued their higher growth in Phase II. Similarly, the growth rate of China's imports of non-eligible Chemical and Machinery products from preference-eligible countries in Phase I was 2,597% while the corresponding growth rate of preference-eligible products was 531%. The dominant growth of non-preference eligible products in this product group continued through Phase II. Overall, China's imports from preference-eligible countries increased faster than those from non-preference eligible countries except for products in the Food and Live Animal group, and in Textile and Apparel in Phase I. These results are also consistent with our main findings in Table 3, whereby preference-eligible products and countries experienced an obviously higher growth rates only in the Other Primary Products category.

Table 5 here

Finally, we take into account the fact that four scenarios are embedded in our analysis of Chinese imports of product *p* pre- and post- program implementation: (zero, zero), (zero, positive), (positive, zero), and (positive, positive) where the first entries pertain to Chinese imports of product *p* from country *c* pre-program (2002-2004) and the second entries pertain to either Phase I (2005-2007) or Phase II (2008-2010). Our estimation approach does not make a distinction among these four possibilities.

Table 6 provides details on China's imports from the preference-eligible SSA countries for the four scenarios described above and compares them with the same situations for non-preference eligible products. Six cells describe a product group. The lower right cells contain the positive import values pre- and post-program and the growth rates of these values. Among items on the preference list,

those that start with zero trade pre-Phase I (2002-2004), either remain at zero (e.g., all items in Textile and Apparel) or increase by a small amount upon program implementation in 2005-2007 (e.g., Food and Live Animals at US$13,490). By Phase II of the program, the situation improves somewhat, but once again imports of Other Primary Products experience the largest increase at US$38.5 million.

Note that China's imports of some items on the preference list also declined. For example, imports dropped to zero for some eligible Chemicals, Machinery, and Transport Equipment items with a combined US$635 thousand worth of imports pre-Phase I. The fourth scenario, characterized by positive trade values both before and after the implementation of the preferential arrangement, includes two possibilities: an increase in trade (e.g., Other Primary Products) and a decline in trade (e.g., Textile and Apparel in Phase I). In addition, import growth rates for preference-eligible products are not always higher compared to ineligible products. For example, China's imports of preference-eligible Textile and Apparel products dropped from US$1.8 million (pre-Phase I) to US$435 thousand (Phase I) whereas products not on the preference list experienced a growth rate of more than 400% in these two periods.

Moreover, our results indicate that China's imports from preference-eligible SSA countries of some items in relatively higher value product groups like Chemicals and Machinery and Transport equipment went down from positive to zero after the implementation of the program. For example, Chinese imports in 2005-2007 declined from about US$635,000 to zero in 15 product items belonging to this product group. About 106 non-preferential product items experienced a shift from zero to positive Chinese imports during the preference period with a combined value of US$15.7 million while no item on the preference list in this product group went from zero to positive. Overall, these results reveal a mixed picture, though not one supporting explicitly the view that increasing exports from zero to a large

positive number appears to be easy or that growth rates of preference-eligible exports to the Chinese market dominate preference-ineligible products.

Table 6 here

To get clearer and more rigorous view of the situation, we re-estimate equation (2) by excluding zero observations sequentially as follows: first, we omit all zero values pre-program (2002-2004); second, we omit all remaining zero observations thereby keeping only those with positive trade values. Table 7 contains the triple interaction terms for these cases. The triple interaction terms for the first and second phases of the program become positive when we only consider observations with positive values. In other words, countries included in the arrangement were only able to expand their exports to China in product groups in which their exports to the Chinese market were already positive to begin with. This is consistent with the supply-side constraint argument in that positive exports is indicative of non-binding supply-side constraints, and if supply-side constraints are non-binding, the preference program does lead to increased trade.

Table 7 here

V. Export Diversification and Movement up the Value Chain

So far, we found that except for a few product categories, most notably Other Primary Products China's preferential market access program has not had the intended effect of increasing imports from low income SSA countries included in the preferential arrangement. Our descriptive statistics in Figures 1 and 2 further indicate that, compared to non-preference countries, preference eligible countries' export bundle is less sophisticated and more concentrated. However, there is some indication that the export bundle of some preference-eligible SSA countries to China has increased in sophistication and has become less concentrated since the start of China's preferential market access program in 2005 (See Figure 3).

Figures 1-3 here

Table 8 contains the estimates of countries' export sophistication and concentration indices against the country-time interaction terms and various country characteristics using three different specifications in each of the two cases. All else equal, there is no change in the sophistication of preference-eligible SSA countries' export bundle to China during the preference period as both interaction terms are insignificant at the 5% level of significance in all three specifications. However, these interaction terms are statistically significant with a negative sign in the export concentration regressions. This means that the export bundles of the preference-eligible countries have become less concentrated during the preference period.

Table 8 here

Individual countries' experiences are obviously heterogeneous. In Table 9 we highlight the shares of China's imports from preference-eligible SSA countries. Take for instance Angola and Sudan, the countries with the largest shares of China's imports both overall and of non-preferential products. These large shares are explained by the disproportionately high imports of crude petroleum, which although not included in the preference list, do enter duty-free. This is also consistent with the insignificant changes in product concentration and zero-to-negative changes in these two countries' export sophistications.

Table 9 here

By contrast, let us look more closely into the three countries with the largest shares of Chinese imports of preference-eligible products in 2008-2010: the Democratic Republic of Congo (DRC), Zambia, and Ethiopia. Of these three countries, only DRC has achieved a significant increase in product diversification; however, both DRC and Zambia have experienced significant increase in product sophistication. Among preference-eligible countries, both DRC and Zambia have

attracted the largest amounts of foreign direct investments from China.[14] These might have contributed to their upward movement in the non-ferrous metals value chain. In particular, both countries are important sources of copper cathodes, accounting for 9% of the product's share in the Chinese market in 2010. Cathodes have become DRC's top export to China, accounting to a third of DRC's exports to China in 2010. Reliance on cathodes has led to diversification of DRC's export structure out of cobalt ores and has signaled its recent capacity to add value to its copper resource.[15] Similarly, copper cathodes and anodes are currently Zambia's top exports to China accounting for close to half of the country's exports to China. However, these items have historically been Zambia's top export to China. Since the MFN duty rate for this item is only 2%, the preferential market access program merely preserved Zambia's reliance on its copper resource by giving Zambian exporters a slight price advantage.

While Ethiopia's export diversification and export sophistication have both declined upon implementation of the program, the country's share of Chinese imports of products receiving preferential treatment is also not negligible at 6.9% during Phase II. In 2010, 85.0% of China's imports from Ethiopia were sesame seeds, up from an 18.1% share in 2002. Indeed, Ethiopia's share increased dramatically from less than 4% in 2002-2004 to more than half of China's total

[14] In 2010, the stock of Chinese outward FDI in the DRC reached US$630.9 million, up from US$15.7 million in 2004 (earliest available data), see Editorial Board of the China Commerce Yearbook (2011). The stock of Chinese FDI in Zambia increased from US$147.8 million in 2004 to US$943.7 million by 2010, the largest among countries receiving preferential market access. This is mostly due to investments in the Zambia-China Economic and Trade Cooperation Zone (ZCCZ) which started in 2007. ZCCZ is China's first overseas economic and trade cooperation zone in Africa and was developed by China Nonferrous Metal Mining Group Co. Ltd. Chambishi Park is located in Zambia's Copperbelt and metal processing is the leading activity in the park.

[15] In 2002, the DRC passed a "Mineral Law" encouraging foreign firms to explore and develop DRC's mineral deposits. These firms were also encouraged to export mineral products from the DRC. Although the entry of foreign firms weakened local monopolies, in 2006, the DRC prohibited the export of raw ores, and this partly explains the pattern of exports observed, see http://www.sicomines.com/2009/10-28/1256716300129.html.

imports of the item in 2005. This product is included in China's preference list and is a clear example of the trade advantage that duty-free access (as opposed to a 10% MFN duty rate) accords to low income SSA countries. Although duty-free access has increased Ethiopia's market share in this product, the preference program has also contributed to Ethiopia's exports to China becoming concentrated in this one item. However, with the opening of the Chinese Eastern Industrial Zone in 2010 in Ethiopia, the composition of China-Ethiopia trade may change in the future.

In sum, while preferential trade arrangement increased the potential of preference-eligible SSA countries to diversify their export basket (Table 8), it did not lead to a dramatic improvement of their comparative advantage vis-à-vis comparable middle and low income countries and did not result in a dramatic overall increase of aggregate exports to China (Table 3). A possible explanation is the persistent legacy of primary exports of either non-eligible products such as oil (as in Angola and Sudan). We do find indications that preference-eligible countries experienced larger diversification and sophistication of their export baskets (Figure 3), though with certain exceptions as in the case of Ethiopia, whose share of preference-eligible products increased, but the diversification and sophistication of its export basket to China went down. While our regression analysis indicates that (on average) the preference program contributed to greater diversification, we do not find a significant impact of the program on sophistication.

VI. Concluding Remarks

In 2005 China provided preferential market access to 190 items from 25 least developed sub-Saharan African countries. Three years later, duty-free access was extended to 454 items from 31 SSA LDCs. In this paper, we explore the ability of preference-eligible countries to benefit from the preferential trade arrangement by looking at their export expansion to China, as well as at the concentration and sophistication of their export baskets. There is no convincing evidence that the

preferential trade arrangement has helped preference-eligible countries gain competitive edge over other exporters into the Chinese market. A plausible explanation is the existence of capacity constraints that prevent African countries from benefiting significantly from the preferential arrangement. We do find that the export baskets of preference eligible countries have become in general less concentrated and more sophisticated, although we do not find statistically significant association between the increase in sophistication and the inclusion of the country in the preference arrangement. The effect of the preferential program on individual countries is heterogeneous, with countries such as the DRC and Zambia benefiting in terms of both diversification and sophistication, less so in the case of Zambia, which experienced some degree of sophistication even prior to the program, while countries like Ethiopia experienced a decrease in diversification and sophistication and others (namely Angola and Sudan) were never able to diversify out of selected primary product exports.

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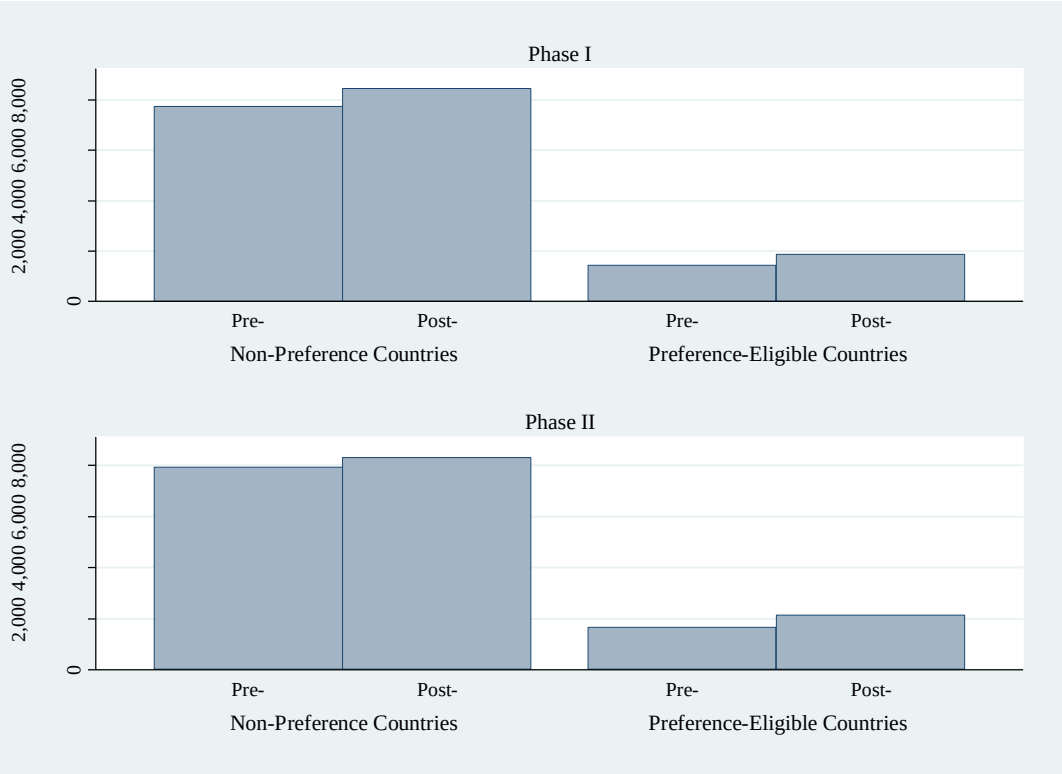
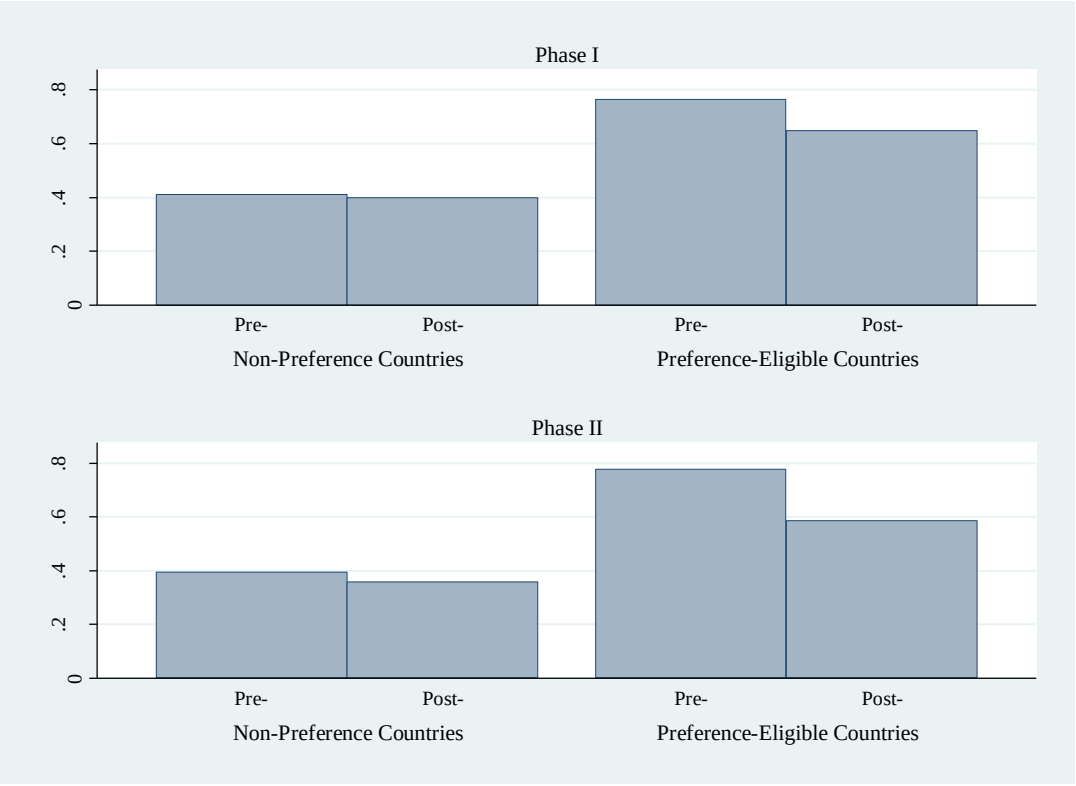
FIGURE 1. MEAN EXPORT SOPHISTICATION INDEX
BY PREFERENCE-ELIGIBILITY STATUS



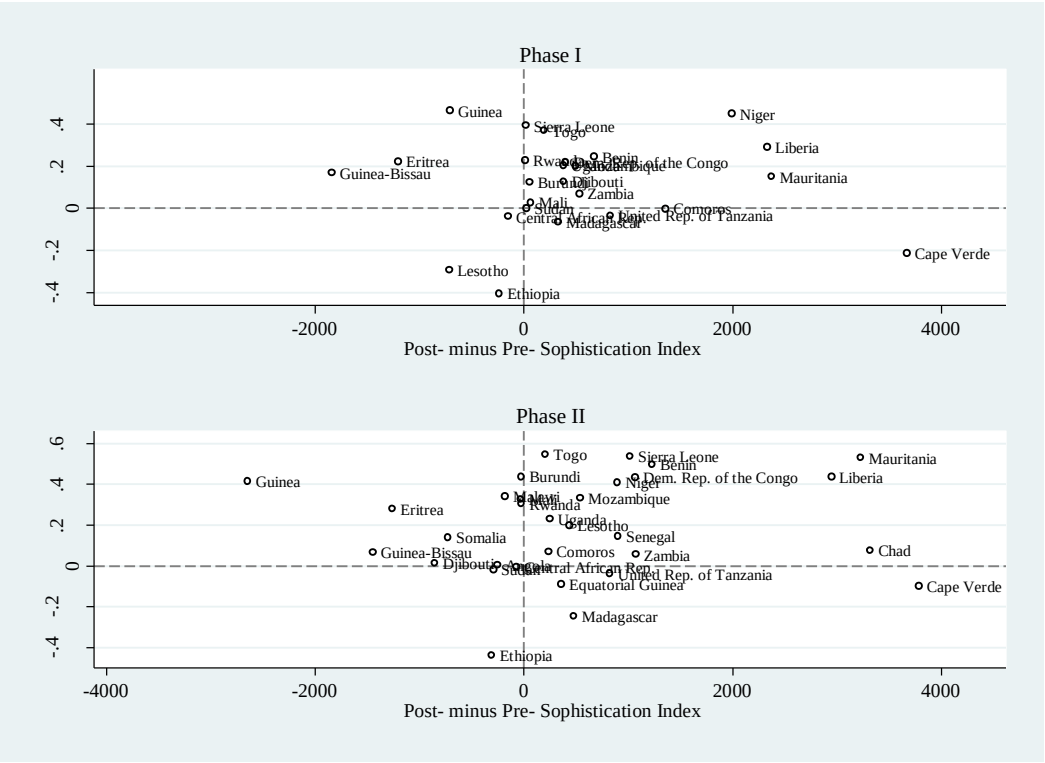
Note: Larger values indicate a more sophisticated export bundle.

FIGURE 2. MEAN EXPORT CONCENTRATION INDEX
BY PREFERENCE-ELIGIBILITY STATUS



Note: Smaller values indicate a more diversified export bundle.

FIGURE 3. CHANGE IN PRODUCT CONCENTRATION AND EXPORT SOPHISTICATION INDICES



Note: Positive values for the vertical axis indicate a less concentrated export structure while positive values for the x-axis indicate increased export sophistication post-program implementation.

TABLE 1. NUMBER OF SIX-DIGIT HARMONIZED SYSTEM ITEMS RECEIVING PREFERENTIAL MARKET ACCESSS

Product Group [a/]	Number [b/]		MFN Duty Rates, % (Mean)	
	Phase I	Phase II	Phase I	Phase II
Food and Live Animals	24	44	11.38	12.93
Other Primary Products	32	62	6.16	6.27
Textile and Apparel	36	124	12.44	11.98
Chemicals, Machinery, and Transport Equip.	29	78	8.11	8.04
Other Manufactures	59	148	10.14	11.48
All items	180	456	9.73	10.46

Notes: [a/] Other primary products includes beverages and tobacco; crude materials, inedible, except fuels; mineral fuels, lubricants and related materials; and animal and vegetable oils, fats and waxes. Other manufactures include manufactured goods classified chiefly by material (except textiles) and miscellaneous manufactured articles (except apparel and clothing). [b/]Number of six-digit 2002 Harmonized System codes.

TABLE 2. SHARE OF CHINESE IMPORTS BY PRODUCT AND INCOME GROUPS IN PERCENT

	Income Group [a/]			
Product Group	High	Middle	Low	31 SSA LDCs
Annual Ave. Share 2002-2004				
Food and Live Animals	1.52	3.34	1.74	0.41
Other Primary Products	10.39	40.12	68.27	97.93
Textile and Apparel	3.67	0.43	4.70	0.02
Chemicals, Machinery, and Transport Equip.	64.68	40.77	14.36	0.01
Other Manufactures	19.73	15.35	10.92	1.63
All items	100.00	100.00	100.00	100.00
Annual Ave. Share 2008-2010				
Food and Live Animals	1.46	2.19	1.84	0.07
Other Primary Products	18.89	56.92	80.10	92.89
Textile and Apparel	1.47	0.33	2.22	0.01
Chemicals, Machinery, and Transport Equip.	59.13	30.28	7.74	0.03
Other Manufactures	19.05	10.29	8.10	7.00
All items	100.00	100.00	100.00	100.00

Source of data: UN Comtrade database. See notes in Table 1. [a/] Based on the World Bank's income classification scheme in 2002.

TABLE 3. REGRESSION COEFFICIENT ESTIMATES: TRIPLE INTERACTION TERMS

	Full Sample	Middle and Low Income Countries	Low Income Countries
	(1)	(2)	(3)
*i.country1*i.product1*i.prd1*	-0.0989***	-0.1142***	-0.0707***
	(0.025)	(0.023)	(0.024)
*i.country2*i.product2*i.prd2*	-0.0884***	-0.1308***	-0.1124***
	(0.027)	(0.023)	(0.022)
Phase I: triple interaction terms			
Food and Live Animals	-0.0096	-0.0319	-0.1124
	(0.075)	(0.073)	(0.091)
Other Primary Products	0.1577**	0.1401*	0.0985
	(0.078)	(0.073)	(0.070)
Textile and Apparel	-0.2347***	-0.2497***	-0.1557***
	(0.038)	(0.040)	(0.041)
Chemicals, Machinery, and Transport Equip.	-0.2354***	-0.2286***	-0.1482***
	(0.051)	(0.052)	(0.044)
Other Manufactures	-0.0755*	-0.0947***	-0.0247
	(0.041)	(0.034)	(0.038)
Phase II: triple interaction terms			
Food and Live Animals	0.0560	0.0581	-0.0573
	(0.053)	(0.049)	(0.059)
Other Primary Products	0.2080***	0.1668**	0.0887
	(0.074)	(0.071)	(0.086)
Textile and Apparel	-0.2277***	-0.2844***	-0.2620***
	(0.040)	(0.041)	(0.043)
Chemicals, Machinery, and Transport Equip.	-0.2763***	-0.2884***	-0.1271***
	(0.062)	(0.051)	(0.037)
Other Manufactures	-0.0320	-0.0917**	-0.0750**
	(0.051)	(0.039)	(0.034)
Interactive fixed effects	yes	yes	yes
Observations	9,058,455	6,805,575	2,956,905

Notes: Numbers in parentheses are robust standard errors allowing for within six-digit HS product group correlation. ***, **, * significant at the 1, 5, and 10% levels, respectively.

TABLE 4. PROBABILITY OF PRODUCT INCLUSION ON THE PREFERENCE LIST: PROBIT REGRESSION ESTIMATES

	Phase I	Phase II
CHRCA	0.0596***	0.0517***
	(0.014)	(0.009)
SSARCA	0.0100**	0.0195*
	(0.005)	(0.010)
Food and Live Animals	-0.2209***	-0.2858***
	(0.030)	(0.018)
Textile and Apparel	-0.1933***	0.1178**
	(0.058)	(0.051)
Chemicals, Machinery, and Transport Equip.	-0.5453***	-0.5094***
	(0.065)	(0.051)
Other Manufactures	-0.2440***	-0.1583***
	(0.056)	(0.048)
Constant	-1.6625***	-1.2588**
	(0.073)	(0.054)
Pseudo R-squared	0.063	0.052
Observations	5,215	5,215

Notes: Numbers in parentheses are robust standard errors with product group clustering. ***, **, * significant at the 1, 5, and 10% levels, respectively.

TABLE 5. GROWTH RATES OF CHINESE IMPORTS BY COUNTRY- AND PRODUCT- PREFERENCE ELIGIBILITY IN PERCENT

Product Group	Phase I Growth Rate (2002-2004 to 2005-2007)			Phase II Growth Rate (2002-2004 to 2008-2010)		
	All Products	Preference-Eligible Products	Non-Preferential Products	All Products	Preference-Eligible Products	Non-Preferential Products
Preference-Eligible Countries						
Food and Live Animals	2.16	6.55	-30.43	18.46	0.24	272.55
Other Primary Products	138.23	817.58	130.58	489.40	1,746.70	484.45
Textile and Apparel	1.21	-79.86	1,777.38	481.46	326.74	27,000.42
Chemicals, Machinery, and Transport Equip.	1,356.68	530.99	2,597.28	1,565.79	1,133.87	3,270.80
Other manufactures	257.29	257.23	283.41	2,555.75	2,563.98	1,234.24
All items	143.15	328.13	130.80	522.38	2,065.03	484.56
Non-Preferential Countries						
Food and Live Animals	55.63	75.22	52.92	155.25	106.61	178.89
Other Primary Products	152.00	136.77	154.19	369.01	271.42	384.24
Textile and Apparel	11.56	4.17	13.02	16.57	11.04	21.01
Chemicals, Machinery, and Transport Equip.	72.90	86.85	72.55	133.08	143.27	132.14
Other manufactures	67.09	100.79	62.42	136.36	220.76	119.48
All items	85.86	103.81	84.53	176.97	173.96	177.40

Source of data: UN Comtrade database. Note: Growth rates are based on trade values summed over three-year periods (2002-2004; 2005-2007; 2008-2010).

TABLE 6. CHINESE IMPORTS FROM PREFERENCE-ELIGIBLE SUB-SAHARAN AFRICAN COUNTRIES, BY PRODUCT GROUP AND PRODUCT-PREFERENCE ELIGIBLITY
IN THOUSANDS OF US DOLLARS

Product Group		Phase I: Preference-Eligible Products		Phase I: Non-Preferential Products	
		2005-2007		2005-2007	
	2002-2004	zero	positive	zero	positive
Food and Live Animals	zero	0	13.49	0	506.89
	positive	364.93	30,785.71	3,457.31	742.21
			33,178.02		2,414.88
	growth rate, %		7.77		225.36
Other Primary Products	zero	0	-	0	71,644.85
	positive	234.91	59,285.24	47,122.33	5,244,102.06
			546,142.78		12,129,112.08
	growth rate, %		821.21		131.29
Textile and Apparel	zero	0	-	0	1,521.86
	positive	360.45	1,803.51	35.33	63.45
			435.81		332.50
	growth rate, %		-75.84		424.07
Chemicals, Machinery, and Transport Equip.	zero	0	-	0	15,686.44
	positive	635.06	314.65	240.32	391.77
			5,992.51		1,362.75
	growth rate, %		1,804.52		247.85
Other Manufactures	zero	0	23.18	0	1,837.65
	positive	213.10	259,679.54	431.48	124.79
			928,399.34		295.16
	growth rate, %		257.52		136.53

TABLE 6, CONTINUED.

Product Group		Phase II: Preference-Eligible Products 2008-2010 zero	Phase II: Preference-Eligible Products 2008-2010 positive	Phase II: Non-Preferential Products 2008-2010 zero	Phase II: Non-Preferential Products 2008-2010 positive
	2002-2004				
Food and Live Animals	zero	0	40.12	0	11,375.31
	positive	785.06	50,435.59	3,442.64	230.93
			51,304.29		2,310.71
	growth rate, %		1.72		900.60
Other Primary Products	zero	0	38,525.13	0	318,147.62
	positive	5,935.01	54,363.67	11,821.42	15,313,595.07
			1,075,011.96		89,251,300.77
	growth rate, %		1,877.45		482.82
Textile and Apparel	zero	0	3,673.32	0	3,578.07
	positive	329.69	1,933.26	13.20	-
			5,983.48		-
	growth rate, %		209.50		-
Chemicals, Machinery, and Transport Equip.	zero	0	1,564.31	0	4,164.25
	positive	1,006.38	292.53	115.90	213.15
			14,462.52		6,927.27
	growth rate, %		4,843.93		3,150.00
Other Manufactures	zero	0	12,908.81	0	20,306.01
	positive	205.88	260,535.81	0.70	1,624.97
			6,933,210.54		1,384.24
	growth rate, %		2,561.14		-14.81

Source of data: UN Comtrade database. Note: Trade values are summed over three-year periods (2002-2004; 2005-2007; 2008-2010).

TABLE 7. REGRESSION COEFFICIENT ESTIMATES: TRIPLE INTERACTION TERMS

	Omit zero observations pre-program (1)	Omit remaining zero observations (2)
*i.country1*i.product1*i.prd1*	-0.1011***	0.2629*
	(0.033)	(0.136)
*i.country2*i.product2*i.prd2*	-0.0828***	0.6930***
	(0.022)	(0.144)
Observations	6,300,168	846,233

Notes: Numbers in parentheses are robust standard errors allowing for within six-digit HS product group correlation. ***, **, * significant at the 1, 5, and 10% levels, respectively.

TABLE 8. PRODUCT SOPHISTICATION AND CONCENTRATION REGRESSIONS

	Dependent Variable: nat. log EXPY			Dependent Variable: HHI		
	(1)	(2)	(3)	(4)	(5)	(6)
*i.country1*i.prd1*	0.1447	0.1616*	0.1523	-0.1277***	-0.1226***	-0.1317***
	(0.096)	(0.094)	(0.094)	(0.041)	(0.041)	(0.041)
*i.country2*i.prd2*	0.1518	0.1591	0.1512	-0.1861***	-0.1839***	-0.2035***
	(0.128)	(0.126)	(0.126)	(0.051)	(0.050)	(0.052)
nat. log real GDP per capita		0.4696*	0.4516		0.1429	0.1803**
		(0.256)	(0.288)		(0.090)	(0.079)
log population			0.0880			0.2415
			(0.300)			(0.173)
rule of law			0.1422			0.0148
			(0.150)			(0.044)
Country-specific fixed effects	yes	yes	yes	yes	yes	yes
Period-specific fixed effects	yes	yes	yes	yes	yes	Yes
R-squared, overall	0.019	0.709	0.731	0.027	0.192	0.308
F-statistics	3.990***	3.820***	4.600***	2.750***	2.930***	3.070***
Observations	1,404	1,404	1,404	1,404	1,404	1,404
Number of countries	156	156	156	156	156	156

Notes: Numbers in parentheses are robust standard errors with country clustering. ***, **, * significant at the 1, 5, and 10% levels, respectively.

TABLE 9. COUNTRY SHARE IN CHINA'S IMPORTS FROM PREFERENCE-ELIGIBLE SUB-SAHARAN AFRICAN COUNTRIES PRE- (2002-2004) AND POST- (2008-2010) PHASE II OF THE PREFERENTIAL MARKET ACCESS PROGRAM
ANNUAL AVERAGE RATES, IN PERCENT

	Pre-Phase II		Post-Phase II	
Partner	Preference-eligible Products	Non-preferential Products	Preference-eligible Products	Non-preferential Products
Angola	0.2674	49.1483	1.7105	66.4393
Benin	0.3497	1.1727	0.8622	0.3023
Burundi	0.0033	0.0205	0.0055	0.0046
Cape Verde	0.0002	0.0000	0.0000	0.0000
Central African Rep.	0.0000	0.0582	0.0000	0.0679
Chad	0.0159	0.9412	0.0037	0.6325
Comoros	0.0000	0.0000	0.0002	0.0000
Dem. Rep. of the Congo	1.4932	0.7164	36.1088	2.7338
Djibouti	0.1478	0.0000	0.0361	0.0008
Equatorial Guinea	0.0004	11.8055	0.0000	4.3960
Eritrea	0.0803	0.0000	0.0843	0.0000
Ethiopia	4.2219	0.0386	6.9297	0.0626
Guinea	0.0986	0.2766	0.0310	0.0876
Guinea-Bissau	0.0000	0.0001	0.0000	0.0075
Lesotho	0.0004	0.0000	0.0040	0.0082
Liberia	0.0005	1.0576	0.0099	0.0330
Madagascar	4.7122	0.1390	0.2443	0.2310
Malawi	0.0000	0.0075	0.0102	0.0635
Mali	0.1381	0.6684	0.5749	0.1352
Mauritania	8.4228	0.1812	0.2221	3.2467
Mozambique	0.0342	0.6545	2.5537	0.3806
Niger	0.0000	0.0000	0.0028	0.0001
Rwanda	0.0001	0.1821	0.0204	0.1037
Senegal	0.8580	0.0575	0.2188	0.0996
Sierra Leone	0.0008	0.0084	0.0448	0.0277
Somalia	4.5450	0.0002	0.0254	0.0000
Sudan	6.3454	31.7670	1.4781	19.6960
Togo	0.8008	0.4042	0.3648	0.1148
Uganda	2.6878	0.0741	0.8926	0.0053
United Rep. of Tanzania	3.8182	0.4813	2.4465	0.6047
Zambia	60.9571	0.1390	45.1148	0.5150

Source of data: UN Comtrade database.

APPENDIX A: China's Preferential Market Access Program for Least Developed sub-Saharan African Countries

a) 2005 Phase

The list containing the 25 least developed SSA countries and the 190 items receiving zero-tariff treatment effective January 1, 2005 can be found at http://www.customs.gov.cn/publish/portal0/tab637/module18166/info38559.htm (In Chinese). The 25 countries are Benin, Burundi, Cape Verde, Central African Republic, Comoros, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Guinea, Guinea-Bissau, Lesotho, Liberia, Madagascar, Mali, Mauritania, Mozambique, Niger, Rwanda, Sierra Leone, Sudan, Tanzania, Togo, Uganda, and Zambia. Angola and Equatorial Guinea have not finished all necessary procedures at the end of 2004 (see China Commerce Yearbook 2005).

b) 2007 Phase

The list of 26 least developed SSA countries and the complete 454 items (=190+254) receiving zero-tariff treatment effective July 1, 2007 can be found at http://www.mofcom.gov.cn/aarticle/b/e/200707/20070704859371.html (In Chinese). The following countries now receive zero-tariff treatment: Chad, Equatorial Guinea, and Somalia, but excludes Comoros and the Democratic Republic of the Congo.

c) 2008 Phase

Duty-free treatment for the same 454 items is extended to all least developed SSA countries with which China has diplomatic relations by July 1, 2008. This brings the total to 31 least developed SSA countries. In addition to Comoros and the Democratic Republic of the Congo, Angola, Malawi, and Senegal are added to the list of countries receiving preferential market access from China. See http://gss.mof.gov.cn/zhuantilanmu/ziyoumaoyiqu/200806/t20080625_50715.html (In Chinese).