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The Impact of China's Exports on African Trade Performance

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Abstract:

This study aims at filling the lack of econometric tests that remain almost nonexistent on the impact of Chinese exports upon African trade. The gravity model is constructed to solve the problems of endogeneity and simultaneity. Our main finding is that the direct-effect and third-country effect diverge: although china's exportation of manufactured goods to third countries has negative impact on African exportation to these countries, China's exportation of manufacturing goods to Africa has positive impact on African manufacturing exportation. But our results also reveal that for the sector of textile both direct-effect and third-country effect are negative. The inter-sector impact of China's equipment exportation to African exportation of manufactured goods is negative. Finally China's exportation of agricultural products and, in particular manufactured products has positive direct impacts on SS African exportation of agricultural goods.

JEL Classification: F14, F17 O55

Introduction

China's growing trade linkage with Africa has been one of the most important events in developing world. Most people positively consider the impact of this linkage and regard it as a major opportunity for African countries. This view has been expressed in two major publications by the World Bank and by the OECD (Broadman, 2007 and OECD, 2006).

China's presence in Africa is doubtlessly positive from macroeconomic point of view (the impacts on balance of payments, saving, growth rate, investment, and government budget,

etc.) In terms of the ratio of trade volume to GDP, Africa is one of the world's most open regions, just behind East Asia. According to OECD (2002), between 1950 and 2000, the share of Africa's GDP in PPP in the world fell by a third, that of exportation by two third, and that of FDI from 6% to 1%. The downward trend in Africa's share in world GDP and exportation can be largely explained by the changes in the terms of trade.

But since the mid-1990s, most African countries have realized an average growth rate of more than 4%. China's expansion helps Africa to improve its terms of trade by increasing the demand on African exporting goods, in particular on natural resource goods, and also by reducing African countries' internal inflation with its cheap manufacturing goods. Exporters and urban consumers may indeed enjoy higher purchasing power as import prices are lower compared to prices of previous import sources or domestic producers (OECD 2006).

There are, however, few studies focusing on the Chinese trade impact on African exportation and on African agricultural and manufacturing sectors. Two directions for the studies of this impact are the direct bilateral trade links between SSA and China, and the indirect impact: the impact of trade competition from China in third-country markets. Several works (World bank 2004, Edwards and Jenkins 2005, and Stevens and Kennan 2006) on the basis of sector-level studies, or on the basis of complementarity-index conclude that, except in few sectors, the importation of Chinese goods by African countries has trivial negative impact on African local producers and the Chinese exportation has small impact on African exportation in the third countries.

These studies, however, have been criticized for having too aggregated and hiding some important specific impacts which can be found only with firm-level methodologies. Kaplinsky, McCormick and Morris (2006) mentioned several studies illustrating that a high percentage domestically produced manufactures in such countries as Ghana, South Africa and Ethiopia are being downsized activity or forced into bankruptcy by imports from China.

In this study, we adopt another approach and use Comtrade data to econometrically assess Chinese trade impact on SSA exportation in the world. The idea is that we regress African exports by country by sector and by year on, among other control variables, Chinese exports of the same product and of the same year to the exporting African countries on one side, and Chinese exports of the same product and of the same year to the third countries that also import the same goods from African countries. With the first regressor, we measure the direct trade effect and with the second regressor the third-country effect. But for dealing with endogeneity problem, we should use instrumental variable technique and gravity model to construct Chinese exports variables. In parallel, we construct the same kinds of variables for

European Union (EU15, the 15 main members of European Union) and for the USA for comparative purpose.

This paper is organized as follows. Firstly we introduce African exportation in the world and Chinese trade performance in Africa. Then we present our methodology of econometric model, in particular gravity model method. Finally, before concluding, we present and analyze the results.

African exportation and China's trade performance in Africa

According to World Trade Organization (2006), in 2005, Africa's exportation and importation were 296 and 248 billion USD, and their average growth rates between 2000-2005 are respectively 15 and 14%, higher than world average rates (respectively 10%).

During recent years, China has achieved an explosive growth in trade with African country during. From table 1, we observe that between 1999 and 2006 its importation and exportation have increased respectively more than ten and six times.

Table 1 China's Trade with Africa (in million USD)

	Importation	Variation (in %)	Exportation	Variation (in %)
1999	2375	-	4115	-
2000	5555	+ 133,9	5042	+ 22,5
2001	4793	- 13,7	6007	+ 19,1
2002	5427	+ 13,2	6961	+ 15,9
2003	8360	+ 54,0	10182	+ 46,3
2004	15646	+ 87,2	13816	+ 35,7
2005	21063	+ 34,6	18683	+ 35,2
2006	28770	+42,9	26690	+36,6
2007(1-7)	19270	+ 38,7	20030	+ 41,4

Source: Ministry of Commerce of China, www.mofcom.gov.cn

Table 2 shows the shares of China, EU-15 and the USA in Sub-Saharan Africa's trade calculated on the basis of Comtrade data. China's shares relative to EU-15 and to USA have significantly increased from less than one percent in 1990 to about 15% in 2005.

Table 2 Shares of China, EU-15 and USA in SS African Trade (in %)

		1990	1995	2000	2005
Export to	China	0.01	2.34	7.95	14.68
	EU15	46.35	66.8	55.04	46.06
	USA	53.64	30.86	37	39.26
Import from	China	0.07	5.04	9.83	17.96

	EU15	62.73	80.71	75.87	69.26
	USA	37.21	14.26	14.3	12.78

Calculated with the Comtrade data. The sum of the three countries (region) makes 100%.

From Table 3, we see that with the three partners, SS African exportation of mineral goods (mainly petroleum) and other raw materials has been in increase and represented more than $\frac{3}{4}$ of its total exportation in 2005. The shares of manufactured goods and agricultural goods imported by SS Africa were in decline, and it imported mostly equipments and manufactured goods.

Table 3 The Structure of SS African Trade with the whole three Partners (in %)

		1990	1995	2000	2005
Export	Mineral and other RM	62.54	58.91	70.33	76.95
	Manufactured	5.85	10.05	10.45	8.88
	Agricultural	31.61	31.04	19.22	14.16
Import	Textile	4.47	5.28	5.91	6.88
	Equipment	51.75	46.25	48.6	48.99
	Other Manufactured	35.69	36.18	33.52	34.92
	Agricultural	8.1	12.29	11.96	9.21

Table 4 only accounts the structure of SS African trade with China. China imported even a higher proportion of mineral and other raw materials relative to the average level of the three countries (region) shown in Table 3. Inversely it imported a lower proportion of manufacturing and agricultural goods from SS Africa. In 2005, its exportation of equipments has surpassed that of textile and become the most important exporting items to SS Africa.

Table 4 Structure of SS African Trade with China (in %)

		1990	1995	2000	2005
Export	Mineral and other RM	94.78	57.71	85.57	89.62
	Manufactured	0	11.64	2.52	1.6
	Agricultural	5.22	30.64	11.92	8.78
Import	Textile	5.42	31.21	29.4	28.09
	Equipment	40.05	25.4	28.01	36.07
	Other Manufactured	53.85	37.14	32.42	32.72
	Agricultural	0.68	6.25	10.17	3.12

Data and estimation issues

As several studies have concluded, Chinese trade impacts on Africa in terms of balance of payments, saving, growth rate, investment, and government budget, etc. are very positive. Here we try to measure the impact of Chinese exportation on African trade performance. As we know, Africa is the second most opened region after Asia in term of the ratio of trade volume to GDP, and African countries' exportation is a good indicator for their production development. Thus the Chinese impact on African exportation can be to large extent interpreted as Chinese impacts on African production. To verify the assumption that African exportation is highly correlated with production, we use UNIDO industrial statistics database 2006 of 28 industrial sectors and of 17 African countries from 1976 to 2004, and get the following regressions results:

Table 5 Relation between Exportation, Importation and Industrial Added-values in African Countries

	(1)ols	(2)fe	(3)re	(4)ols	(5)fe	(6)re
	exp_tv	exp_tv	exp_tv	imp_tv	imp_tv	imp_tv
Added-values	0.386 (39.49)***	0.395 (32.31)***	0.393 (32.80)***	0.603 (37.89)***	0.548 (27.67)***	0.557 (28.92)***
Constant	12,831.250 (4.30)***	11,773.423 (3.81)***	7,471.401 (0.78)	71,661.296 (14.77)***	78,571.243 (15.67)***	68,656.301 (5.35)***
Observations	4459	4459	4459	4459	4459	4459

Absolute value of t statistics (for ols and fixed-effects regressions) and of z statistics (for random-effects regression) in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The group variable is African countries

Whenever we use OLS, fixed-effect model or random-effect model, African exportation and importation are both to significant extent explained by their industrial value added.

To assess Chinese export impacts on African exports, in what follows, we regress SS African exportation on, among others variables, Chinese exports. We distinguish Chinese exportation (by sector and by year) to the African countries and Chinese exports (by sector and by year) to third countries which also imports from African countries. The first impact reflects the direct-effect, the second reflects the third-country effect (Kaplinsky, McCormick and Morris, 2006).

From Comtrade, we gather the data of 24 products (see Annex 1) of 86 countries (including 47 of SS Africa, 12 of Asia, 15 of Europe, 2 of North America, and 10 of Pacific region) from 1988-2005.

The Comtrade data contain the reporting values of importation and exportation by country, by sector and by year. A problem arising is that often the reported values of exportation and importation are not the same and there exist omissions and under-declarations. We apply following rules to deal with this problem: 1. For the trade between African and other countries, we use the “mirror method”, that is we choose the reporting values of the other countries, but we adopt the reporting values of African countries if other countries’ reporting values are missing; 2. For the trade between the African countries, we use the higher values reported by one of the two partners. 3. For the trade between the other countries, we use the higher values reported by one of the two partners.

The second concern is about handling endogeneity and simultaneity in econometric studies. Consider the following model

$$A_{ijht} = \alpha + \beta_1 B_{ciht} + \beta_2 C_{cjht} + \beta_3 D_{ijht} + \delta_i + \delta_h + \varepsilon_{ijht} \quad (1)$$

i is one of the 47 SS African countries, j is one of the 84 countries that import (including 47 SS African countries), h is one of the 24 products, c is China. t is the time period. A reflects the exporting value of i country to j of h product at t year. B reflects Chinese exporting value to African country i of h product at t year, C reflects Chinese exporting value to j country of h product at t year. D represents the other variables that influence A , δ_i reflects a country fixed-effect to control for time-invariant factors that affects country i ’s exportation. δ_h reflects a sector fixed-effect to control for time-invariant factors that affects A , and finally ε , the error term reflects other influence on country i ’s exportation to j of h product at t year. As it is recognized, the impact of Chinese exportation on African countries’ exportation is realized through two channels: through direct exportation to the African countries (it affects their local production and then affects their exportation capability); and through exportation to third countries to which African countries export their goods (the competition effect). With this equation we intend to estimate the two effects.

The problem that arises is that the exogenous variables B and C have endogeneity nature in that they correlate and often depend on ε , the error term that reflects other influence on country i ’s exportation. In the presence of this endogeneity, the estimations with OLS method will be biased. In this case, The IV (instrumental variable) technique is designed explicitly to handle this kind of problem. That is to find one or several instruments which are

correlated with B and C, but uncorrelated with the error term. With these instruments we estimate the constructed B and C, and then we use these constructed variables into our econometric equations to measure the impact of Chinese trade on African exportation.

Another important form of endogeneity is simultaneity. This problem arises when one or more of the explanatory variables are jointly determined with the dependent variable. This is likely the case for an African country's exports and China's exports. Therefore, just using real values of Chinese exports to explain African exports risks being misleading.

To construct these variables, a generally used method is the construction of gravity model. This method consists of using some geographical variables of the trade partners to predict the trade volumes between them. In our case, we use the following equation to predict African countries' exportations (importations) to (from) China, EU-15 and the USA.

The gravity model equation:

$$\ln M_{ijt} = \alpha_{it} + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln D_{ij} + \beta_4 \ln(P_{it} \times P_{jt}) + \beta_5 \ln(A_i \times A_j) + \beta_6 Z_{ij} + \varepsilon_{it} \quad (2)$$

M is the importation value in constant price of i country from j country at t year, Y is the GDP, D the distance, P the population, A the area. They are all in logarithm. Z represents dummy variables (including four: if the importing country is landlocked; if the two trade partners have historically colonial relationship; if the two countries have the same official language, and finally if there is contiguity between import and export countries).

The data on geographic variables come from CEPII (<http://www.cepii.fr/distance/>). The data on income and on population come from *World Bank Indicators*.

We individually estimate all parameters of 24 products and then predict the importation of each country in each year of each product, and finally we merge the predicted results of all 24 products to establish the constructed variables. We choose fixed effects model since it is always preferred by Hausman tests. The group variable is African exporting countries. With this technology, we get the simulating results (ended by `_pred`) and real trade values (ended by `_real`). Their descriptive statistics is presented in Table 6.

Table 6 Descriptive Statistics of the Real and Predicted Variables

Variable	Obs	Mean	Std. Dev	Min	Max
Trade_value_real	604562	8.39e+07	7.76e+08	-2254977	8.63e+10
Trade_value_pred	581599	1.00e+08	1.56e+09	1.271417	1.24e+11

The coefficient of correlation between the real and predicted trade values is 0.4681.

The next step is to choose the explanatory and control variables. Annex 2 lists these variables. To neutralize country-size effect, we transform most variables in per-capital terms.

Findings and Analysis

In the following tables, all results are obtained with fixed-effects models. After having applied fixed-effect and random-effect methods, the Hausman tests reveal that fixed-effects models are more pertinent. Therefore we omit all results on the basis of random-effect model.

Table 7 shows the regression results with the sample of all products (manufacturing, agricultural and mineral goods) with 179197 observations. The explained variable is African export value in constant price by country by product and by year. Most explanatory variables chosen are significant and with expected signs. 1. Using the common official language between trade partners positively impacts African exportation; 2. Traditionally having colonial relationship between trade partners positively impacts African exportation; 3. Being contiguous between trade partners positively impacts African exportation; 4. The distance between trade partners negatively impacts African exportation; 5. Time trend (1988-2005) is positively significant suggesting that global SS African exportation is increasing. 6. GDP of the trade partners in global and in per-capita terms are positively significant, except per_GDP of the importing countries. GDP in global term reflect country size, and per-capita GDP reflects a country's richness. Per_GDP of importing countries insignificant reveals that the great buyers of African countries, in particular of African mineral countries are not always the rich countries. China is a good example. 7. Among the three large categories of products, mineral products are the greatest, followed by agricultural goods, and manufactured goods are smallest. 8. The USA, China and the 15 member-countries of EU are the most important importers of African goods. The coefficient of import_eu15 is lower than those of the USA and of China is because the 15 European countries are individually accounted here.

Table 7 All Products

Fixed effects model
Af country exp

comlang_off	2920984.943 (4.44)***
Colony	4763924.011 (3.60)***
landlocked_imp	-108,941.867 (0.13)
Contig	3492574.682 (3.15)***
ln_dist	-2790249.380 (5.60)***
Trend	151,040.577 (2.14)**
ln_gdp_cst_exp	3681036.315 (2.40)**
ln_gdp_cst_imp	2469149.455 (11.66)***
per_gdp_cst_exp	2,288.324 (2.24)**
per_gdp_cst_imp	6.463 (0.16)
prod_mine	47346886.839 (47.83)***
prod_manu	-3,371.240 (0.01)
import_china	9416508.353 (4.26)***
import_usa	29128418.923 (17.22)***
import_eu15	105,347.424 (0.12)
Constant	-1.264e+08 (3.75)***
Observations	179197
F Statistics	246.83

Absolute value of t statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

The above regression is not the most interesting in that it only provides some global information and basic feature on the exportation of SS African countries. In the next two tables, we enter into the topic and assess the impact of Chinese exports to African countries' exports by sector and by year in comparison with the impacts of EU-15 and of the USA. The dependent variables, African exportation by country by sector and by year are all in per-capita term. In Table 8, we regress African exports of agricultural goods (in total 14 products, see Annex 1) on, among other explanatory variables, constructed Chinese exports of the same products to the African countries and to third countries that also import from SS African countries (Third countries can also be SS African countries if the trade is intra-regional). Then we compare the Chinese impact with that of the EU-15 (in Table 8 and 9, the variables

concerning EU-15 are all at aggregate level, that is the trade values of 15 EU countries are summed up) and of the USA. Then we do the same with the manufactured goods (8 sectors see also Annex 1). We do not study their impacts on African exports of the mineral products since logically African mineral exports undergo trivial exporting impacts from the three main partners.

In table 8, the two first columns contain exactly the same regressors. The only difference is that the results in first column are obtained with the data between 1988 and 2005, and the second column gives the results with the data between 1998 and 2005. As the massive Chinese entry into Africa has started in the end of the last century, the second results reinforce the robustness of the estimations.

Firstly, among the control variables, *comlang_off*, common official language has a negative impact, but colony linkage has a positive impact on agricultural exports. Land-locked African country export less agricultural goods. There is a net decreasing time trend of exportation (except in the third column in which the sample is restrained by European exportation). *Per_gdp_exp* being significant with negative impact indicates that the poor African countries export more agricultural goods. *Per_gdp_imp* is not significant, suggesting that it is not the richer countries which import more African agricultural goods. Finally Using “other agricultural goods” as reference, among the agricultural goods, African countries export more fish and sugars. Among agricultural products, wood is significant only for EU15 and the USA, but not for China, probably implying that the first two country and region are the important destinations of African wood exportation since the samples vary in function of explanatory variables chosen. In the same way, we estimate that EU15 import more coffee and oils from SS Africa.

Now we look upon Chinese impacts on African agricultural exports in comparison with those of the EU-15 (in the third column) and of the USA (in the fourth column). We separately estimate the impacts of China, of EU15 and of the USA because the correlations between their exportations are quite strong. Firstly, consider the impact of exporting to African countries on African countries’ exportation of the same category of goods measured by *per_chn_af_pred*, *per_eu15_af_pred* and *per_usa_af_pred*. China’s impact is positively significant while the impacts of both EU15 and the USA are negatively significant. For the same kind of agricultural goods, those SS African countries that import more from China also export more. Given that China’s agricultural exportation to Africa is still relatively small in value and in proportion (see Table 4), we should be cautious in our attempt to put a reasonable interpretation. Why the impacts of the EU15 and of the USA are negative? A

careful check on their structure of exportation reveal that the main exporting agricultural goods to Africa are for the USA, grains, paper, fish and oils, and for EU15, spices, grains, paper, beverage, dairy products, fish, sugar, fruits, animals and tobacco. Except fish and sugars and fruits, they belong to the categories in which SS African countries export less. For China, the most important agricultural goods exported to SS Africa are paper, fruits, coffee, spices, grains and animals. Among them, paper is classified in the same category of “Wood, pulp, paper & furniture”, that is the most important category of exporting agricultural goods of the SS African countries on average. Fruits and coffee are also their important exporting items. These may explain in part the positive relationship between Chinese exports and African exports. But at least we can conclude with conviction that on the whole Chinese exportation of agricultural goods has not negative impact on SS African exportation of the same kind of goods. For instance, fruits and coffee are also important exporting items of African countries. If Chinese exports of fruits and coffee have little competitive effects on African exportation, most likely because their exporting products are different in sub-categories.

The third-country effect, measured by `per_chn_oth_pred`, `per_eu15_oth_pred` and `per_usa_oth_pred`, are all insignificant for three countries (region) suggesting that SS African agricultural exportation does not face competition pressure from these countries in third-country markets.

We also used the three exporting countries' market shares in importing countries as explanatory variables. The importance of exports measured in quantity (in terms of per capita value of the importing countries) and in market share of the importing countries can be quite different. In general the first measure is positively correlated with importing countries' per-GDP level. But the second measure is independent of the richness of the countries. The impact of market share reflects in a more straight way the degree of substitutivity between the importation and exportation, or the crowding-out effect of importation. If, for the same kind of goods, one country imports a lot and also exports a lot, what it imports and exports should be quite differentiated. Otherwise, the importation and exportation go in inverse sense. On direct effect, for a certain product, if China's market share in an African country has a positive impact on this African country's exportation of the same product, their products exported are more likely complemented, at least they are not to considerable extent in competition. On third-country effect, we can interpret it in the same manner. The impacts of the three countries (region)s' exportation in value can be different than that in share. The former reflects the degree of competition, but also to some extent the importing country's per-

GDP level, while the later is quit independent with this level. Only China's agricultural exports share has a weak positive impact on African agricultural exports. In the case of the EU-15, they exports more in the African countries that export less agricultural goods, however it is in those African countries that export more that European market shares are higher. This seems to indicate that those African countries that have ancient colonial relationship with European countries export more agricultural goods. It is interesting to note that on third-country effect, the share of EU-15's exportation in third countries have negative effect on African agricultural exportation. The higher the EU-15's share, the lower the African countries' exports to these countries. Presumably European agricultural exportation has a stronger competitive effect with African exportation than that of the USA.

In what we have presented there is only the intra-sector impact, that is, for example, the impact of Chinese exports of fruits on African countries exports of fruits. We are interested in inter-sector impact. In the case of African agricultural exportation, we are interested in the impact of the exports of aggregated manufactured goods by the three principal partners on African agricultural exports. Assumingly, the importation of manufactured goods, in particular of agriculture-oriented manufactured goods, could have a positive impact on agricultural production, hence on agricultural exportation. Thus we have chosen as aggressor the sum of constructed exports of all manufactured goods of the three principal partners. We find that while Chinese exports of manufactured goods, as while as those of the USA, have positive impacts on African agricultural exportation, the impact by the exports of manufactured goods of EU-15 is insignificant. Chinese impact is positive, because Chinese manufactured goods, in particular equipments are in general of lower technological level and more easily accessible by African rural producers, thus favorite the exportation of the later.

But why the USA's impact is positive whereas EU-15's is not significant? We have not enough proofs to provide a convincing explanation. We put forward two possible reasons: Firstly the USA has a higher share of exports of equipment in its total exports to Africa than EU15, and secondly, as the largest agricultural country, the USA exports a higher share of agriculture oriented of equipments and manufactured goods.

Table 8 Agriculture

	(1) 88-05	(2) 98-05	(3) 88-05	(4) 88-05
	per_tradeval	per_tradeval	per_tradeval	per_tradeval
	ue_cst	ue_cst	ue_cst	ue_cst

comlang_off	-0.350 (1.72)*	-0.408 (1.53)	-0.848 (4.01)***	-0.814 (2.59)***
colony	2.790 (9.85)***	2.720 (7.33)***	3.359 (11.31)***	3.452 (8.50)***
landlocked_imp	-0.802 (2.33)**	-0.940 (2.14)**	-0.666 (1.74)*	-0.982 (2.11)**
ln_dist	0.077 (0.28)	0.049 (0.14)	-0.681 (2.03)**	0.354 (0.94)
trend	-0.120 (5.47)***	-0.131 (2.70)***	0.109 (5.98)***	-0.145 (5.13)***
per_gdp_exp	-0.001 (3.50)***	-0.001 (3.45)***	0.000 (2.01)**	-0.001 (4.31)***
per_gdp_imp	0.000 (1.28)	0.000 (0.91)	0.000 (0.12)	-0.000 (0.91)
sector_wood	-0.283 (1.02)	-0.446 (1.23)	1.794 (5.98)***	2.137 (5.50)***
sector_fish	3.583 (10.49)***	4.639 (10.54)***	4.758 (15.49)***	6.608 (14.54)***
sector_fruit	-0.286 (0.97)	-0.301 (0.79)	0.226 (0.73)	0.240 (0.61)
sector_coffee	0.414 (1.21)	0.265 (0.58)	1.113 (3.51)***	0.680 (1.41)
sector_sugars	3.966 (8.56)***	2.939 (5.01)***	2.246 (4.80)***	1.948 (2.77)***
sector_spices	-0.313 (0.97)	-0.302 (0.71)	-0.416 (1.17)	-0.483 (1.09)
sector_grains	-0.518 (0.91)	-0.584 (0.82)	0.883 (1.41)	0.096 (0.13)
sector_animals	0.053 (0.13)	0.047 (0.09)	-0.340 (0.94)	-0.032 (0.07)
sector_oils	-0.104 (0.30)	-0.107 (0.24)	0.676 (1.91)*	0.221 (0.51)
sector_flowers	0.161 (0.46)	0.168 (0.36)	-0.335 (1.01)	-0.097 (0.21)
sector_beverages	-0.277 (0.68)	-0.352 (0.69)	-1.614 (3.78)***	-1.830 (3.43)***
sector_dairy	0.004 (0.00)	0.145 (0.10)	-1.155 (1.44)	-0.840 (0.80)
sector_tobacco	-0.465 (0.97)	-0.550 (0.91)	-0.091 (0.22)	-1.444 (2.37)**
per_chn_exp_af_m anu_pred	0.835 (13.50)***	1.262 (11.76)***		
per_chn_af_pred	9.577 (12.62)***	10.972 (12.23)***		
per_chn_oth_pred	0.093 (1.01)	0.005 (0.05)		
share_chn_af_rea l	1.137 (1.65)*	1.809 (1.65)*		
share_chn_oth_re al	0.092 (0.08)	-0.323 (0.23)		
per_eu15_af_manu _pred			-0.000 (0.11)	
per_eu15_af_pred			-0.748 (17.48)***	

per_eu15_oth_pred			-0.000	
			(0.35)	
share_eu15_af_real			3.469	
			(11.96)***	
share_eu15_oth_real			-1.927	
			(5.08)***	
per_usa_af_manu_pred				0.470
				(17.03)***
per_usa_af_pred				-1.704
				(11.63)***
per_usa_oth_pred				-0.003
				(1.39)
share_usa_af_real				0.704
				(0.98)
share_usa_oth_real				0.796
				(1.13)
Constant	0.145	0.232	4.267	-6.726
	(0.06)	(0.07)	(1.37)	(2.05)**
Observations	31522	22622	52267	34510
F Statistics	34.04	24.99	45.42	35.92

Absolute value of t statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

In table 9, we present the results of regression of African exports of manufactured goods on Chinese, the EU-15s' and the USA's exports of the same goods, and on the other control variables. The three first columns contain the results on Chinese impacts. In the two first columns, the regressors are exactly the same, and the only difference is about the time period. In third column only the data of textile products of the period 1988-2005 are used. The fourth and the fifth columns contain respectively the results on the EU-15 and the USA's impacts.

African exportation of manufactured goods seems to be highly dependent on traditional linkage: the dummy variables of common official language and colony are both positive. Furthermore, like in the regression results of agricultural goods, landlocked_imp is negative: the countries without sea coast import less African manufactured goods. There is not a clearly positive time trend of African exportation (except the exports of textile products). Unlike in the case of agricultural goods where distance is not a significant variable, in the case of manufactured goods, ln_dist positively impacts African exports. They sale more manufactured goods to the distant countries than to neighboring African countries. Also, unlike agricultural case, the per-GDP of the importing countries is significantly positive,

reflecting the fact that African countries export more manufactured goods to developed countries.

Using “electrical equipments” as reference, the most important exporting items for SS African countries are textile, transport equipments and miscellaneous manufactured goods.

To assess the impacts, a glance at the export structure of manufactured sectors is necessary. Among the SS African countries, in many periods, South Africa’s exportation of manufactured goods alone surpassed the sum of those of all other SS African countries. If excluding South Africa, since more than ten years, the first important item of exported manufactured goods is no-electric equipments, followed by textile, leather, and transport equipments. This structure is not significantly different with China’s. From Table 4, we know that in most recent period, China exports about one third textile products, one third equipment products, and finally one third other manufactured goods to Africa. Apparently there should have a competition between them.

But from Table 9, with *per_chn_af_pred*, we get a positively significant impact of Chinese exportation of 7 sub-categories of manufactured goods on SS African countries’ exportation of these sub-categories of manufactured goods. This result is robust since by shortening the period to eight most recent years where Chinese exportation to Africa has experienced exponential increase, the same conclusion holds. However, if limiting the sample to textile product alone, Chinese impact on African exportation becomes negatively significant, indicating that Chinese textile impact on African textile exportation is negative. This result is also consistent with observations from real world. However when we use these exports of EU-15 and of the USA to SS African countries as regressors (*per_eu15_af_pred* and *per_usa_af_pred*), they are both insignificant.

Why are the impacts of the three countries (region) to African exportation different? How to explain the positive direct effect of Chinese exports on African exportation? One tempting explanation is that the technological gap is smaller between China and the SS African countries than between the developed countries and the SS Africa. Chinese trade with Africa is typically south-south trade through which technological spillover impact is stronger. But as we will discuss later, a distinction between intra-sector and inter-sector impacts allows us to ascertain that Chinese positive impact only comes from intra-sector effect and technological spillover mostly comes from inter-sector effect.

On the intra-sector effect, at first, on the one hand, the entrance of cheap Chinese goods reduces market prices and directly compete with local products, hence has a negative effect on local production; On the other hand, Chinese goods as intermediate goods reduce the

production costs of local producers and thus increase their competitive power in the world. Our results show that on intra-sector effect, in overall the second positive effect dominates the first negative effect (But in textile, the first negative effect seems to be more important). We observe that in average, among the textiles and chemical products imported from China, about the half are in form of semi-manufactures. Furthermore some quantities of final manufactured goods also go into production process.

At second, doubtlessly Chinese exports hurt the African local producers that produce the same kind of goods. But the goods they export are more often differentiated. For example for the textile goods, African exports are mostly of artisanal craft clothing. This part of exportation receives modest impact from Chinese industrial textile exports.

Thirdly, giving that the intra-African trade representing about 15 to 20 percent of total African trade, an important part of this trade consists of re-exportation of Chinese products, thus imports from China can favorite African exports of the same categories of goods.

On the market share effect, Chinese exportation impact is weakly negative (but in most recent period, this impact disappeared), the EU15's impact is strongly positive, while USA's impact is strongly negative. As we have stated, the impact of exports in (per capita) quantity and in market share can be different just because the importance of exports measured in quantity and in market share can be quite different. For instance, exports of China to a developed country in terms of per capita value of this country are in general higher than the exports of China to a developing country. But it is not necessarily that China's market share is higher in this developed country than in this developing country. The impact of market share reflects in a more direct way the crowding-out effect of Chinese exports to African local production. In the African countries where China's exportation has a higher share, the local African production is lower. This market share effect is stronger in the African countries where the USA has higher market share for the goods in question. Only in the African countries where the EU15 haven higher market share, the impact to these countries' exportation is positive, implying in part that for the same categories of goods, what imported from EU15 and what exported from these African countries are quite differentiated.

While China's direct impacts on African exports are positive, its third-country effects, measured by per-chn-oth-pred, are negative. For the same products, the more China exports to a third country, the less the SS African countries export to this country. This conclusion holds with different periods and also with the sample of textile products alone. In the last case, the negative impact is the strongest. The explanation is very simple, China's manufactured goods are among the most competitive in the world and their expansion impedes the exportation of

SS Africa in third countries. This tendency is furthermore confirmed by market share effect measured by $\text{chare-chn-oth-real}$, indicating that the crowding-out effect on African products is very strong in the third-country markets.

Quantity effect and market share effect in third-country markets are just opposed for EU15 and the USA. For EU15, while per_eu15_af_pred is negatively significant, $\text{share_eu15_af_real}$ is positively significant. For the USA, while per_usa_af_pred is positively significant, share_usa_af_real is negatively significant. These divergences are not totally beyond expectation. For instance, SS African countries exports less to the countries which import more from EU15, but SS African countries export more to the countries in which EU15 have higher market shares.

Till now, we have introduced the results on intra-sector impact. To assess the inter-sector impact, we use the sum of 14 agricultural goods by country by year and the sum of 3 equipment goods (cf. Annex 1) to measure their impact on individual manufactured goods. In particular we expect that Chinese exports of equipment goods, due to their cheapness and to their technological accessibility have a positive impact on African exportation of manufactured goods. The results are, however, not as one respected. While China's agricultural exports positively impact African manufacturing exports, its equipment exports negatively impact African manufacturing exports. Our interpretation on this divergence between inter-sector impact and intra-sector impact is that the inter-sector impact and intra-sector impact are distinct in nature. The intra-sector impact is more often linked with the importation of the intermediary goods. As we have explained, the impact of this importation can be very positive in that the improvement of components of one goods improves directly the quality of the goods without necessarily purchasing the technically more efficient equipments or improving the technological procedures. This impact could be stronger for such developing countries as SS African countries where the technological learning capability is constrained by human capital and infrastructure conditions. However, the role of equipments played in exportation of manufactured goods can be different, depending on the destination of these goods. As most of the manufactured goods of SS African countries are exported to developed countries, the technologically more advanced equipments should have more positive impact on this exportation. This may explain why China's exportation of equipments negatively impacts African exportation of manufactured goods. Why the American exportation of equipments positively impacts African manufacturing exportation? The particularity of the USA's exportation structure to Africa is that the share of equipments is the highest, followed by EU15, and China has the lowest share. Traditionally China's main

exports of manufactured goods were textile, paper, footwear, etc. Only in very recent years exportation of equipments becomes significantly important. And even now, technologically simple equipments, such as bicycles and motor-bicycles, family used electrical and electronic products take a no negligible part, and these kinds of equipments products have only marginal impact on exportation performance of manufactured goods.

To sum up, China's exportation of agricultural products and, in particular manufactured products have positive impacts on SS African exportation of agricultural goods. On African exportation of manufactured products, China' intra-sector impact is positive, This conclusion is in line with world bank (2004), Edwards and Jenkins (2005), and Stevens and Kennan (2006). With different methods such as the calculation of similarity index, they find that the importation of Chinese manufactured goods has in general positive impact on African local producers. But our results reveal that the sector of textile is an exception and the third-country effect is negative. Finally the inter-sector effect of China's equipment exportation to African exportation of manufactured goods is negative.

Table 9 manufacture

	(1) 88-05 per_tradevalue	(2)98-05	(3) textile	(4) 88-05	(5) 88-05
comlang_off	0.451 (4.05)***	0.363 (2.58)** *	3.711 (6.64)* **	0.714 (6.62)** *	0.604 (5.29)* **
colony	0.586 (3.58)***	0.693 (3.33)** *	1.275 (1.48)	0.307 (1.92)*	0.557 (3.73)* **
landlocked_imp	-0.634 (3.37)***	-0.653 (2.92)** *	-2.310 (2.76)* **	-0.698 (3.86)** *	-0.566 (3.60)* **
ln_dist	0.958 (6.55)***	1.030 (5.49)** *	3.946 (4.73)* **	0.993 (5.99)** *	0.583 (4.64)* **
Trend	0.021 (1.58)	-0.016 (0.58)	0.201 (2.64)* **	0.008 (0.89)	-0.031 (3.10)* **
per_gdp_exp	0.000 (3.86)***	0.000 (2.09)**	-0.000 (0.62)	0.000 (4.15)** *	-0.000 (0.44)
per_gdp_imp	0.000 (8.32)***	0.000 (6.99)** *	0.000 (9.16)* **	0.000 (5.08)** *	0.000 (4.85)* **
sect_textile	0.953 (5.63)***	0.888 (4.12)** *		2.028 (13.69)* **	1.150 (9.11)* **
sect_leather	0.167 (1.03)	0.104 (0.50)		0.350 (2.19)**	-0.105 (0.77)

sect_chemical	0.039 (0.25)	0.231 (1.18)		0.248 (1.71)*	0.156 (1.21)
sect_transp_equip	0.445 (2.72)***	0.630 (3.04)** *		0.574 (3.79)** *	0.587 (4.38)* **
sect_no_electric_equip	-0.375 (2.61)***	-0.359 (1.97)**		0.033 (0.25)	0.144 (1.15)
sect_miscellaneous_manuf	0.647 (4.53)***	0.701 (3.89)** *		0.282 (2.16)**	0.296 (2.46)* *
per_chn_af_agri_pred	0.483 (3.35)***	0.440 (2.53)**	0.628 (0.73)		
per_chn_af_equip_pred	-2.274 (19.01)***	-1.585 (9.79)** *	-0.215 (0.26)		
per_chn_af_pred	7.625 (50.69)***	6.272 (36.14)* **	-2.592 (2.03)* *		
per_chn_oth_pred	-0.124 (6.52)***	-0.112 (5.27)** *	-0.608 (6.91)* **		
share_chn_oth_real	-1.337 (2.69)***	-0.975 (1.63)	-6.160 (3.53)* **		
share_chn_exp_af_real	-0.714 (1.79)*	0.102 (0.21)	0.559 (0.32)		
per_eu15_af_agri_pred				0.037 (1.64)	
per_eu15_af_equip_pred				0.001 (0.08)	
per_eu15_af_pred				0.002 (0.58)	
per_eu15_oth_pred				-0.000 (2.76)** *	
share_eu15_oth_real				1.073 (4.67)** *	
share_eu15_af_real				1.044 (4.38)** *	
per_usa_af_agri_cst_pred					0.155 (4.37)* **
per_usa_af_equip_cst_pred					0.068 (5.15)* **
per_usa_af_pred					0.008 (0.90)
per_usa_oth_cst_pred					0.000

share_usa_oth_real					(1.87) *
					-2.099
					(5.45) *
					**
share_usa_af_real					-1.910
					(4.75) *
					**
Constant	-9.941	-10.209	-36.315	-11.401	-5.780
	(7.46) ***	(5.89) **	(4.88) *	(7.25) **	(5.25) *
		*	**	*	**
Observations	39204	26554	6336	44321	37499
F Statistics	164.13	86.75	19.66	29.66	22.58

Absolute value of t statistics in parentheses

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

Conclusion

Our main finding is that although china's exportation of manufactured goods to third countries has negative impact on African exportation to these countries, china's exportation of manufacturing goods to Africa has positive impact on their manufacturing exportation.

We find a positive direct-effect for overall 7 sub-categories of manufactured goods: the more China's exports of manufactured goods to African countries, the more African exports of manufactured goods. In contrast, we find a negative third-country effect for manufactured goods: the more China's exports of manufactured goods to third countries, the less African exports of manufactured goods to these countries. Therefore, China's exports have differing impacts on African exports depending on the market. These results are robust: we obtain similar conclusions with the periods 1988-2005 and 1998-2005 (the later period relates to expanded China's exports to Africa). For one special sub-category: textile products, we must stress that different conclusions arise: both the direct-effect and third-country effect are negative.

Among other interesting results: 1. For the overall 14 sub-categories of agricultural products, China's direct effect on SS African countries is positive while third-country effect is insignificant. 2. China's exports of aggregated manufactured goods have a positive direct effect on African countries' agricultural exports.

Our study has doubtlessly some limits. In particular we stress on it's methodological incapability to take into account of the dynamical impact of China on African industrialisation in long time. As Kaplinsky, McCormick and Morris (2006) have rightly stated, "however, the

challenge to SSA industry is much more substantial than these current impacts might suggest. This is because for much of SSA, industry is currently poorly developed, and is often largely confined to the food-processing industry, building materials and the informal manufacturing sector. The real policy challenge is not to existing industry, but to potential industry. That is, what space is there for SSA manufacturing to expand in the future? And, what implications does this have for the growth of dynamic capabilities, learning externalities and structural transformation?”. The answers to these questions are beyond the goal established in this paper.

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Annex 1, The List of Products

Agricultural goods	Wood, pulp, paper & furniture
	Fish and fish products
	Fruit & vegetables
	Coffee, tea, mate, & cocoa
	Sugars
	Spices, cereal and other food prepared
	Grains
	Animals and products thereof
	Oilseeds, fats and oils
	Flowers, plants, vegetable materials
	Beverages & spirits
	Dairy products
	Tobacco
	Other agricultural products
Manufactured goods	Textiles & clothing
	Leather, rubber, footwear & travel
	Chemicals and photographic supplies
	Miscellaneous Manufactured articles n.e.s.
(Equipment goods)	Transport equipment
	Non-electric machinery
	Electric machinery
Mineral goods	Metals
	Minerals products and precious stones
	Petroleum

Annex 2, The List of Variables

per_af_real	Real exportation value by year and by sector by African country at constant price divided by their population
comlang_off	Dummy variable: if the two trade partners have the same official language
colony	Dummy variable: if the two partners have colony relationship
contig	Dummy variable: the contiguity between import and export countries
landlocked_imp	Dummy variable: if the importer is landlocked
ln_dist	Distance between import and export countries in logarithm form
trend	Time trend variable
per_gdp_imp	Per capita GDP of the import country
Per_gdp_exp	Per capita GDP of the export country
per_chn_af_pred	Constructed Chinese exportation to the African country by sector and by year divided by the African country's population
per_chn_oth_pred	Constructed Chinese exportation to the third country by sector and by

	year divided by this country's population
per_eur_af_pred	Constructed EU15 exportation to the African country by sector and by year divided by the African country's population
per_eur_oth_pred	Constructed EU15 exportation to the third country by sector and by year divided by this country's population
per_usa_af_pred	Constructed USA exportation to the African country by sector and by year divided by the African country's population
per_usa_oth_pred	Constructed USA exportation to the third country by sector and by year divided by this country's population
per_chn_af_agri_pred	Constructed Chinese exportation of agricultural products to the African country by year divided by the African country's population
per_chn_af_manu_pred	Constructed Chinese exportation of manufactured products to the African country by year divided by the African country's population
per_chn_af_equipment_pred	Constructed Chinese exportation of equipment products to the African country by year divided by the African country's population
per_eu15_af_agri_pred	Constructed EU15 exportation of agricultural products to the African country by year divided by the African country's population
per_eu15_af_manu_pred	Constructed EU15 exportation of manufactured products to the African country by year divided by the African country's population
per_eu15_af_equipment_pred	Constructed EU15 exportation of equipment products to the African country by year divided by the African country's population
per_usa_af_agri_pred	Constructed USA exportation of agricultural products to the African country by year divided by the African country's population
per_usa_af_manu_pred	Constructed USA exportation of manufactured products to the African country by year divided by the African country's population
per_usa_af_equipment_pred	Constructed USA exportation of equipment products to the African country by year divided by the African country's population
share_chn_af_real	The share of China in the total importation* of the African country by sector and by year
share_chn_oth_real	The share of China in the total importation of the third country by sector and by year
share_eur_af_real	The share of EU15 in the total importation of the African country by sector and by year
share_eur_oth_real	The share of EU15 in the total importation of the third country by sector and by year
share_usa_af_real	The share of USA in the total importation of the African country by sector and by year
share_usa_oth_real	The share of USA in the total importation of the third country by sector and by year

- The total importation is the sum of the exportation of all trade partners (86 less 1 countries) to the African country.