Volume: 2, Issue: 2
Page: 260-272
2018

ISSN 2520-4750 (Online) & ISSN 2521-3040 (Print)

International Journal of Science and Business

The Impact of China – African trade on economic growth of African countries

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Abstract:

There is no doubt that trade play a major role in economic growth and development of the country. But this notion has met with critical debate and controversies on the influence of trade on improving economic growth between countries, with some studied arguing that trade can actually harm the economy of at least one of the two countries. The trade between china and Africa is no exception to this. Therefore to clear this debate, this study empirically analyzed the impact of trade between china and Africa on the economic growth of African countries. The panel data involving 41 African countries spanning 24 years (1992-2016) were collected and analyzed through pooled OLS, fixed effect and Arellano-Bond/Blundell-Bond models. The results showed that in all estimation techniques African trade with china appeared to benefit the former on improving its economic growth through import related gains by lowering import prices and widening varieties of commodities which boost economic diversification and exposure to new markets and thus, as the China –African trade predicted to grow in the coming years, this study argue for more trade but also improving physical capital, domestic investment and infrastructure.

Keywords: Trade, China, Africa, Economic growth, Panel data, GMM

IJSB
Accepted 16 May 2018
Published 18 May 2018
DOI: 10.5281/zenodo.1250316

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1. Introduction

China is Africa's largest source of imports and the main export market. For the past 15 years, the trade between china and Africa accounts for about 16 per cent of total trade in Africa and about 5 per cent of total trade in china, where high-tech products and high value-added is just about half of China's exports to Africa (Romei, 2015). Industrial commodities from African such as copper and steel products have started entering the Chinese market. The trade pattern differs from country to country in Africa whereby some countries are more exposed to the Chinese market than others. China accounted for 40 per cent of their total exports for seven countries including Angola, Eritrea, Sierra Leone, Sudan and Republic of Congo, while some 16 countries have their 20 percent of their exports with china. But the question whether the trade between Africa and china increases economic growth on Africa economies is controversial, such that the study conducted by (AfDB, 2012) showed that this trade has its risks in the continent. One of the risks is that as Chinese economy starts to slowdown, Africa becomes vulnerable to this economic shock. According to IMF, Chinese economy has been slowing down since 2013 from 9% in previous years to 8%, and with the economic ties between the two parties, Africa will face fiscal problems and tension in their current account should the Chinese demand of commodities from Africa falls[1]. According to China-Africa research initiatives at john Hopkins, from 2014 to date the value of African exports has declined (due to decrease in china demand and weakening of commodity prices) whereby from October 2015, the china imports from Africa reduced by 13 per cent while the china export to Africa has remain the same. The reduction in imports is steeper for South Africa, Angola, Republic of Congo, Zambia and Equatorial Guinea. Also the inflow of China`s small scale private firms has no support from the Chinese government, such that farmers form Zambia and Ethiopia has accused theses Chinese companies acquiring large piece of their land at their expense. The conference organized by World Bank recognized China as the main land grabber in Africa and has been accused of conducting unfair competition with local firms which hinder the transfer of technological knowledge to the domestic firms (AfDB, 2012). But on the other hand some study like (Calabrese, 2016) argue that the Africa–china trade relationship play a crucial role in promoting economic growth in Africa. This trade has influence economic diversification which increases competitiveness in the market; Chinese has invested heavily in infrastructure project which helps African countries to widen its opportunities for diversification and expanding the new activities in the market. Therefore this study aims to empirically analyze this controversy or debate on trade and economic growth in 41 African countries from 1992-2016. This study will provide a clear picture on this issue and provide the recommendations on which trade policies in Africa can be formulate when trading with china by answering the fundamental question on whether this trade between Africa and china promotes economic growth in Africa or not.

2. Literature review

2.1 Theoretical framework

According to David Ricardo book of 1816, two countries can gain from trade if they each specialize on the commodities that produces with low costs compared to other countries and exchange with those commodities that cannot produce with lower opportunity cost. The

[1] AfDB. (2012). *The Expansion of Chinese Influence in Africa - Opportunities and Risks.*

Heckscher-Ohlin theory (1933) suggested that the trade between countries depends on the factor endowment such that the trade will be beneficial if these countries have wide differences in terms of factor endowment and technology as compared to china and Africa. Countries with the same level of technology and resources have little chance of benefiting by trading with each other; this is often termed as 'North-South" trade pattern (Jones, 2016). For example a country which have abundant capital and land but insufficient labor, that means commodities with intensive capital and land will be cheaper to produces but labor intensive commodities will be expensive to produce therefore this county will be better off import those commodities and that capital is exogenously determined. Ricardo `s comparative advantage theory of trade is based on difference production technology which vary from country to country while in Heckscher-Ohlin model, the technology does not need to vary between countries. Therefore in H-O model there is a constant technology everywhere and introduces the capital endowment, but for according to David Ricardo, labor will have no comparative advantage if not for the difference in level of technology. But this H-O theory has met with criticism from Wassily Leontief (1954)[2] whereby he argued that a country with capital abundant found to be exporting more in commodities involving intensive labor, and this complication was termed as Leontief paradox. Other model as a result of the paradox has emerged, for example Linder hypothesis argued that it is a constant demand side factors rather the difference in supply side that the commodities are traded.

2.2 Empirical review

Generalized method of moments (GMM) econometrics estimation was used by (Lee, 2015) on panel data whereby, variables like trade openness, export growth, foreign direct investment and export diversification were tested in a single framework. The results found that there is no guarantee of economic growth through trade openness expect when this openness leads to the export growth which needs investment in firm's capability building and innovations. (Matthias Busse J. K., 2012), examined the contribution of trade to economic growth by arguing that the dynamic panel estimations on relationship between trade and growth depends on the specification of trade such that the preferred one is the volume of exports and imports as a share of lagged total GDP. (Luqman, 2014), empirically estimated the relationship between international trade and economic growth through human capital accumulation using the panel data set of Asian countries from 1972 to 2012. The Neo-Classical growth model was used to test the hypothesis and the results suggest that the international trade facilitate human capital accumulation and influence economic growth. (Okim, 2017), analyzed the influence of trade on economic growth through empirical evidence from ECOWAS countries. The pooled OLS, Random & Fixed model and dynamic panel data regression techniques was employed on 15 countries from 1990 to 2013. The results showed that in all estimates, exports, exchange rate and investment were significant determinants of per capita real income growth. Exports were consistently positively related to growth, thus confirming the hypothesis of trade having a significant positive impact on economic growth in ECOWAS countries. (Keho, 2017), analyzed the impact of trade on economic growth in ivory coast from 1965 to 2014, this time series data was analyzed by using autoregressive distributed whereby cointergration and Granger causality tests was used. The result showed that trade openness has significant positive impact in economic

[2] An economist famous for his work on input-output (I-0) model and how different sectors in the economy relate on another.

growth through positive relationship with capital formation. (Ulaşan, 2015), used augmented Mankiw`s neoclassical growth model (1992) for first difference and system GMM to analyze the relationship of trade barriers and economic growth with the sample period of 1960 to 2000. The results showed that higher growth is not associated with trade barriers. (Zafar, 2007), found that the trade pattern between China and Africa involved oil and metal export to China from Africa and manufactured commodities to Africa from China. However China poses a threat to Africa in terms of macroeconomic management because of Dutch disease on commodity booms. Therefore his study concluded that it is both an opportunity and a challenge for Africa to be trading with China given the fact that in 2006, trade between Africa and China was more that 50 billion dollars. (Kummer-Noormamode, 2014), used panel data for 37 African countries spanning 27 years (1985-2012). The result shows that there is a significant positive impact of trade between Africa and China on African economic growth (GDP), but this happened during the last decade of the period. The result also suggest that the trade between Africa and China is has more economic impact on Africa than the trade with European Union (EU).

3. Data, Model and Methodology

3.1 Data and model

This study uses a panel data which gives more variability; it is more informants, less collinearity, more degrees of freedom and provides estimates which are more efficient that time series or cross section analysis. It also allows individual dynamic and allow controlling for individual unobserved heterogeneity. The data will comprise of 41 African countries spanning 24 years (1992-2016)[3]. Using the Solow growth model (1959) where output depends on the rate of population growth, capital stock and technical change, the following is the standard production function:

$$Y = F(A, K, L) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where, Y is the output, A is technological progress, K is capital stock and L is labor force. Cobb Douglas specification will be used to model this production function in equation (1) as follows:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The above equation has a constant return to scale, where technology (A) grows at a constant rate "g" that is $A_t = A_0 e^{gt}$ as Mankiw (1992) suggested that while the technological growth rate is constant for all countries but the level of technology depends on the initial level of technology in every country (A_0).

The Solow model in augmented version is measured by the difference between period t and the initial period of output per worker ($\ln y_t - \ln y_0$) is influenced by the rate of saving (s_k), rate of depreciation (δ), the convergence rate to the steady state (λ), technology level (A_t),

[3] See Appendix 2 for the countries included in the sample

technological progress rate (g), labor force growth rate (n), initial output per worker (y_0) and human capital investment (s_h). The model is shown as follows:

$$\ln Y_t - \ln Y_0 = \left(1 - e^{-\lambda t}\right)\ln A_t + \left(1 - e^{-\lambda t}\right)\frac{\beta}{1-\alpha-\beta}\ln s_h + \left(1 - e^{-\lambda t}\right)\frac{\alpha}{1-\alpha-\beta}\ln s_k - \left(1 - e^{-\lambda t}\right)\frac{\alpha+\beta}{1-\alpha-\beta}\ln(n+g+\delta) - \left(1 - e^{-\lambda t}\right)\ln y_0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

To capture the influence of trade on economic growth, the technology level of specific country (A_{it}) is expressed in terms of trade as follows:

$$A_{it} = A_0 e^{gt} e^{\varphi_j x_{ij}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

X_{ij} is trade which act as the determinant of technology development where by substituting it in equation (3) we get the following model:

$$\ln Y_t - \ln Y_0 = \left(1 - e^{-\lambda t}\right)(\ln A_0 + gt) + \left(1 - e^{-\lambda t}\right)\frac{\beta}{1-\alpha-\beta}\ln s_h + \left(1 - e^{-\lambda t}\right)\frac{\alpha}{1-\alpha-\beta}\ln s_k - \left(1 - e^{-\lambda t}\right)\frac{\alpha+\beta}{1-\alpha-\beta}\ln(n+g+\delta) - \left(1 - e^{-\lambda t}\right)\ln y_0 + \left(1 - e^{-\lambda t}\right)\varphi_j X_{ij} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

This model can be transformed (specified) into more econometric regression equation linear form as follows:

$$\ln y_{it} = \alpha + (\beta_1 + 1)\ln y_{it-1} + \beta_2 \ln s_{n,it} + \beta_3 \ln s_{k,it} + \beta_4 \ln(n_{it} + g + \delta) + \varphi_j X_{j,it} + \sigma_i + \tau_t + \omega_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Whereby σ_i is the country specific effect, τ_t is the time specific intercept and ω_{it} is the error term.

The equivalent baseline model to that in equation (5) with other control variables can be expressed as follows:

$$\ln \Delta y_{it} = \alpha + \beta_1 \ln \Delta y_{it-1} + \beta_2 \ln(EDUC)_{it} + \beta_3 \ln(POP)_{it} + \beta_4 \ln(CAF)_{it} + \beta_5 \ln(TRADE)_{it} + \beta_6 \ln(FDI)_{it} + \beta_7 (LEXP)_{it} + \beta_8 (INFRAS)_{it} + \beta_9 \ln(M2)_{it} + \beta_{10} (INDUSTRY)_{it} + \sigma_i + \tau_t + \omega_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Whereby, the dependent and independent variables are described in the table below.

Table 1: Variable name, definition, and source and priori hypothesis

Variable	Definition	Source	Priori expectations
GDP (Y)[4]	GDP per capital (current US$)	World Bank(WDI)	
Trade	The sum of exports and imports between China and Africa (US$ million)	UNComtrade	+
Gross capital formation(CAF)	Gross capital formation (% of GDP)	World Bank(WDI)	+
Education (EDUC)	Gross enrollment ratio, primary, both sexes (%)	World Bank(WDI)	+
Population growth (POP)	Population growth (annual %)	World Bank(WDI)	-
Infrastructure (INFARS)	Proxy by Mobile cellular subscriptions (per 100 people)	World Bank(WDI)	+
Life expectancy (LEXP)	Life expectancy at birth proxy of health condition	World Bank(WDI)	+
Money supply (M2)	Broad money (% of GDP)	World Bank(WDI)	+
FDI	Foreign direct investment inflow (% of GDP)	UNCTAD	+
Industry	Industry, value added (% of GDP)	World Bank(WDI)	+

Note: σ_i is the country specific effect, τ_t is the time specific intercept and ω_{it} is the error term

3.2 Methodology

This study will test the model using the following methodology: pooled OLS (with robust standard errors), fixed and random effect model, difference and system GMM. OLS is simple to estimate but since our independent variables might be endogenous, as a result the standard OLS estimator might be bias and inconsistent. Also although fixed and random models take into account country specific heterogeneities, the difficulty arises when the lagged variables are correlated with the error term. To reduce these problems we employ

rellano-Bond/Blundell-Bond[5] estimator which addresses the problem of omitted variable bias, endogeneity and unit root effects in the choice of the instruments (Bond, 1998).

4. Empirical results

[4] GDP per worker was used by Solow model instead of GDP per capita. But the latter is important due to the fact that dependency ratios vary might across countries. Other book authors like Islam (1995) used per capital while Mankiw (1992) used per worker. But according to Hoeffler (2002), the results do not depend on either choice.

[5] Arellano- Bond estimator is the generalized method of moments estimator used to estimate dynamic panel data model (includes lagged level of dependent variables as regressors), was first proposed by Manuel Arellano and Stephen Bond in 1991. Blundell and Bond estimator was proposed by Blundell and Stephen bond in 1998 which make use of additional level information besides differences, often referred as system GMM.

4.1 Summary statistics of the variables used in the study

Table 2 below shows the summary statistics of various variables used in empirical analysis in this study. There are 1024 observations for GDP per capital variable with mean value of 1827.3$ and a minimum rate at 102.6$, maximum rate at 22742.4$. The trade openness with china variable has 1025 observations with mean value of 1415$ million. Human capital variable has 911 observations with lowest and highest value recorded at 27.5 and 152 respectively. The capital formation has 1007 observations with minimum and maximum value of 1.7$ million and 219$ million respectively. Population growth sample has 1025 observations with lowest growth recorded at -6.2 and the highest at 7.9. Other control variables such as life expectancy, industry, money supply, FDI and dummy variable (income level & landlocked) are also included in the table below.

Table 3 shows the correlation between variables and the results shows that there correlation is normal such that there is no variable which are highly correlated to one another, with the correlation between GDP and trade being 0.2106 and the highest being 0.7286 between money supply and life expectancy.

Table 2: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP	1024	1827.294	2829.532	102.6448	22742.38
Capital formation	1007	22.11708	16.40886	1.525177	219.0694
Population	1025	2.470181	1.00503	-6.185	7.918
Infrastructure	1020	30.08246	40.18871	0	171.375
Education	911	93.31874	25.78144	27.50392	152.2515
Life expectancy	1025	57.00236	8.180234	27.61	76.078
Income level	1025	.5121951	.5000953	0	1
FDI	1025	507.36	295.2362	1	1018
Trade	1025	1415.12	5148.72	0	65219.21
Landlock	1025	.2926829	.4552162	0	1
Money supply	986	33.95759	23.95878	2.857408	151.5489
Industry	898	28.89038	14.77563	9.224226	84.28298

Table 3: Correlation results

	GDP	capital	pop	infras	educ	lexpe	inclevel	FDI	Trade	landlock	m2	industry
GDP	1.0000											
Capital	0.3174	1.0000										
Pop	-0.3059	-0.0192	1.0000									
infras	0.4797	0.3330	-0.2176	1.0000								
educ	0.1703	0.1895	-0.1239	0.2389	1.0000							
lexpe	0.4169	0.4011	-0.4430	0.4885	0.3448	1.0000						
inclevel	0.4962	0.1764	-0.4837	0.2321	0.1253	0.4388	1.0000					
FDI	0.0361	0.1122	-0.0298	-0.0131	-0.0361	0.1506	0.0957	1.0000				
Trade	0.2106	0.0366	-0.0974	0.3849	0.0553	0.0995	0.1591	0.0250	1.0000			
landlock	-0.2031	-0.0434	0.1422	-0.1414	-0.1110	-0.4491	-0.4243	-0.2002	-0.1553	1.0000		
m2	0.3965	0.2734	-0.6375	0.4401	0.1109	0.7286	0.5005	0.1609	0.2284	-0.3850	1.0000	
Industry	0.3939	0.2045	-0.1200	0.1101	0.1867	0.1860	0.5090	0.1537	0.1026	-0.1941	0.0856	1.0000

4.2 Estimation results and discussion

Results are presented in Tabel-4, whereby the first four columns represent the results from our basic empirical model (augmented Solow model). Starting with pooled OLS, the results shows that trade with china has a positive and significant impact on economic growth of African countries which abide with priori expectation of the study and the positive coefficient implies that, under ceteris paribus one percent increase in trade between china and African countries, increases economic growth in Africa by about 0.14 per cent. Coefficient of physical capital (proxy by gross capital formation) and education also are positive and statistically significant by 5% and 1% respectively, indicating that capital formation and skilled labor plays an important role in economic growth. Fixed effect model in column 2 also abide with priori hypothesis of importance of trade with china on our continent economic growth with coefficient of 0.07 and statistically very significant (at 1% level). Shifting to more powerful estimators difference and system GMM, the scenario remains the same with trade coefficient being positive and statistically significant at one per cent implying that trade African countries trading with China benefits in terms of economic growth such that one percent increase in the trade between china and African countries, increases economic growth by 0.06 per cent for Africa under ceteris paribus. Other variables in the same two column are significant with the exception of education, whereby capital formation share the same positive sign but differ in the variable for population with negative for difference GMM (as Solow growth model hypothesis) and positive for system GMM. From column 5 to 8 in Table-4, which includes other control variables that may also influence the economic growth, the results shows that the coefficient of trade is still positive and statistically significant (at one percent level) from all estimators, this shows that trading with china is important in increasing economic growth for African countries and the positive coefficient suggest that there is an increase of 0.11% and 0.095% in economic growth for African economies when the trade with china increases by 1 per cent difference and system GMM estimator respectively.

Table-5 showed how trade with china affects African economic growth when is interacted with other key variables. Starting with pooled OLS, the results show that three interaction variables are statistically significant with the interaction between trade and industry being the only positive and statistically significant coefficient which means the positive impact of trade with china on African economic growth increases with the increase of industries in the economy, this suggest that those countries highest number of industries, have the upper hand in trading with china in terms of improving economic growth than others in the continent. As pooled OLS , the fixed effect and difference GMM shows the interaction of trade with many variables have no significant impact on African economic growth but that is not the case for the most superior estimator (system GMM) which shows all interactions have influence on economic growth in one way or another such that, the interaction between trade and capital formation is statistically significant impact on African economic growth and the positive coefficient implies that one percent increase in physical capital in the country increase the benefit of trading with china on African economic growth by about 0.02 per cent under ceteris paribus. The interaction between trade and industry also is very significant statistically (at 1% level) and positive coefficient suggesting that the positive impact of trade with China on African economic growth increases with the increase of industrialization in the

economy. When trade is interacted with the national income level dummy, its coefficient is statistically significant and positive which means for those African countries with higher or middle income level (such as South Africa and Angola) benefits more from the trade with China in terms of economic growth compared to those with lower income level (such as Malawi). The coefficient of the interaction between trade and landlocked dummy is statistically very strong and negative in sign implying that, the economic growth benefit from trading China decreases when the country is landlocked compared to non-landlocked African countries. The other interaction variables might be significant but their coefficient signs do not abide with the priori expectations and hypothesis.

Table 4: log of GDP per capital against trade and other control variables

Variable Name	OLS1	Fe1	DGMM1	SYSGMM1	OLS2	Fe2	DGMM1	SYSGMM2
ln(trade)	0.14	0.07	0.06	0.06	0.05	0.07	0.11	0.095
	(0.01)***	(0.01)***	(0.004)***	(0.003)***	(0.01)***	(0.007)***	(0.007)***	(0.0063)***
ln(caf)	0.28	- 0.01	0.004	0.03	0.15	0.04	0.062	0.12
	(0.04)**	(0.01)	(0.003)*	(0.005)***	(0.04)***	(0.02)**	(0.012)***	(0.0114)***
Pop	0.01	0.02	-0.01	0.01	-0.02	-0.004	0.0078	.0199978
	(0.02)	(0.01)***	(0.004)***	(0.002)***	(0.03)	(0.013)	(0.004)**	(0.005)***
Educ	0.002	-0.001	-0.0002	-0.0001	-0.001	-9.12	-0.002	-0.0015
	(0.001)***	(0.001)	(0.0003)	(0.0003)	(0.001)	(0.001)	(0.0004)***	(0.0004)***
Infrastructure					0.01	0.001	0.0016	0.00047
					(0.001)***	(0.0002)***	(0.0003)***	(0.00027)*
ln(fdi)					-0.012	0.001	-0.0023	-0.0011
					(0.01)	(0.005)	(0.004)	(0.003)
lexp					0.012	0.0005	0.0095	-.0026
					(0.003)***	(0.003)	(0.002)***	(0.0024)
Money supply					-0.08	-0.23	-0.26.	-0.151
					(0.05)	(0.029)*	(0.021)***	(0.0236)***
Industry					0.016	0.003	-0.0004	0.0016
					(0.003)***	(0.001)**	(0.001)	(0.0009)*
lnGdp(t-1)	-0.15	0.77	0.76	0.80	-0.29	0.73	0.432	0.656
	(0.02)***	(0.03)***	(0.01)***	(0.01)***	(0.02)***	(0.02)***	(0.018)***	(0.015)***
Hausman		182.51				192.16		
Prob>chi2		0.0000				0.0000		
Autocorrelation(vif)	1.29				1.95			
Hausen test			1.0000	1.0000			1.0000	1.0000
AR(2)			0.8066	0.8149			0.0671	0.0331
Observations	871	711	779	834	739	711	656	711
Instruments			254	277			256	279
Countries	41	41	41	41	41	41	41	41

Notes: The dependent variable is log of GDP per capital. Significance at the 1%, 5%, and 10% are indicated by ***, **, * respectively. Standard errors in parentheses.

Table 5: log of GDP per capital estimation against trade with interaction variables

Variable Name	OLS1	Fe1	DGMM1	SYSGMM1
ln(trade)	0.076	0.0598	0.112	0.0812
	(0.014)***	(0.01)***	(0.025)***	(0.028)***
ln(inv)	0.12	-0.0024	0.031	0.058
	(0.042)***	(0.019)	(0.02)**	(0.0123)***
educ	0.00066	-0.0004	-0.0001	-0.0017
	(0.0007)	(0.00054)	(0.0008)	(0.00058)***
Infrastructure	0.0078	-0.00022	0.0008	0.00082
	(0.0007)***	(0.0003)	(0.0004)**	(0.000313)***
Industry	0.012	0.0024	-0.0028	-0.00524
	(0.0025)***	(0.0013)*	(0.0011)**	(0.0014)***
ln(trade)*ln(inv)	-0.00496	-0.0032	0.016	0.02178
	(0.015)	(0.0061)	(0.005)***	(0.0041)***
ln(trade)*educ	-0.001	-0.00024	-0.0002	-0.00036
	(0.00039)**	(0.00014)*	(0.00012)	(0.00012)***
ln(trade)*infrastucture	-0.00028	0.000059	-0.00013	-0.000495
	(0.00021)	(0.0001)	(0.00017)	(0.00017)***
ln(trade)*industry	0.0031	0.000148	0.0016	0.0015
	(0.001)**	(0.00031)	(0.0005)***	(0.00036)***
ln(trade)*inclevel dummy	-0.057	0.015	-0.02	0.065
	(0.019)***	(0.0097)	(0.034)	(0.0316)***
ln(trade)*landlocked dummy	0.023	-.00134	-0.033	-0.069
	(0.0199)	(0.009)	(0.033)	(0.0337)**
ln(trade)*money supply			-0.003	-0.046
			(0.01)	(0.0104)***
lnGdp(t-1)	-0.35	0.76	0.62	0.713
	(0.034)***	(0.024)***	(0.04)***	(0.023)***
Hausman		106.4		
Prob>chi2		0.0000		
Autocorrelation(vif)	2.50			
Hausen test			1.0000	1.0000
AR(2)			0.014	0.015
Observations	764	734	711	656
Instruments			282	259
Countries	41	41	41	41

Notes: The dependent variable is log of GDP per capital. Significance at the 1%, 5%, and 10% are indicated by ***, **, * respectively. Standard errors in parentheses.

5. Conclusion and recommendations

This study aimed to empirically analyze whereby the trade between china and African countries improves economic growth in Africa. According to the classical and neo classical theories of trade, the economic growth can be influenced by international trade through number of ways such as stimulating utilization of idle resources (human and physical), it can act as a source of foreign income and exchange also stimulate investment in the country. The results from all four estimators (pooled OLS, fixed effects, difference and system GMM) support this case whereby the trade coefficient appeared to be positive and statistically very significant even with interactions. But as Africa continent is looking forward to trade even more with China in the coming years, some factors need to taken into account such as the African continent needs to add more value to their commodities through industrialization so as it produces and export more final goods. This will improve their trade balance as for now many African countries are in trade deficit with China which is not good for the economy. The

results also implied that African countries should improve their physical capital and domestic investment if the countries want to benefit more through economic growth by trading with China. Trade influence on economic growth is also revealed in higher and middle income level such that African countries which are regarded as lower income countries (Tanzania, Zimbabwe and Uganda) benefit less compared to countries like Angola which are higher and middle income countries. Therefore these findings are crucial for policy makers in African countries to formulate policies which put their countries in a good position of gaining benefit when trading with china.

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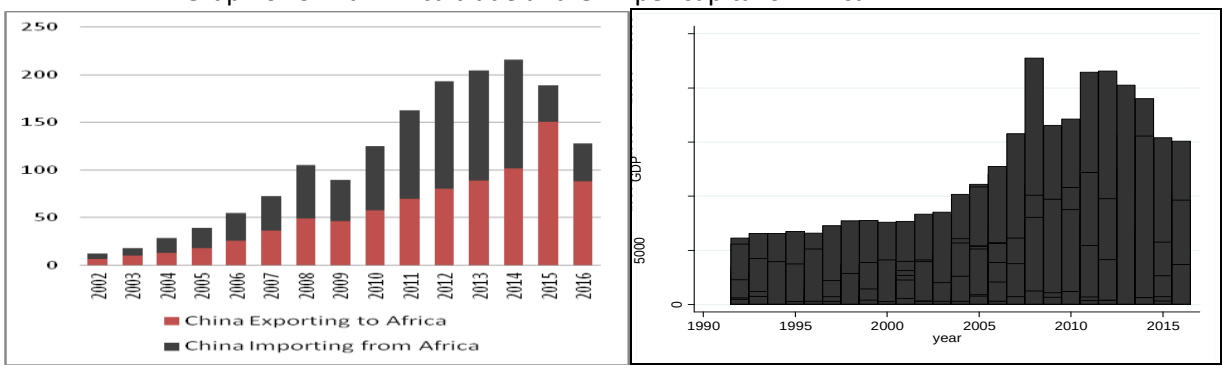
APPENDIX 1: Graph of China- Africa trade and GDP per capital of Africa



Source: John Hopkins University & Authors

APPENDIX 2: List of countries in the sample

Country		
Algeria	Djibouti	Morocco
Angola	Equatorial Guinea	Namibia
Benin	Egypt	Niger
Botswana	Gambia, The	Nigeria
Burkina Faso	Gabon	Rwanda
Burundi	Guinea	Senegal
Cameroon	Guinea-Bissau	Seychelles
Cote d'Ivoire	Kenya	South Africa
Central African Republic	Madagascar	Swaziland
Chad	Mali	Tanzania
Comoros	Mozambique	Togo
Congo, Dem. Rep.	Malawi	Tunisia
Congo Rep	Mauritania	Uganda
	Mauritius	Zimbabwe

Source: Authors

Cite this article

Mwakalila, E., AKA, J. E., & Mukazhi, T. L. C. (2018). The Impact of China – African trade on economic growth of African countries. *International Journal of Science and Business, 2*(2), 260-272. doi: https://doi.org/10.5281/zenodo.1250316

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