

Chinese Technical Transfer, FDI and Trade on Sub-Saharan Africa's Economic Growth: Panel Data Approach

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Abstract

The purpose of this research is to identify an effect of Chinese technical transfer on five (5) Sub-Saharan Africa's countries during the period 2003 to 2015. Panel approach is employed for investigating a four-variate model of FDI, Trade, Technical transfer and GDP. According to the results, the technical transfer is predicated is positive and not significant at 5% level of significance. This will allow for more individual consideration of what the government should support and directive the technical transfer on Sub-Saharan Africa to avoid this case and look for what helps the economy has developed.

Keywords: Technical transfer, FDI, Trade, Panel Data approach

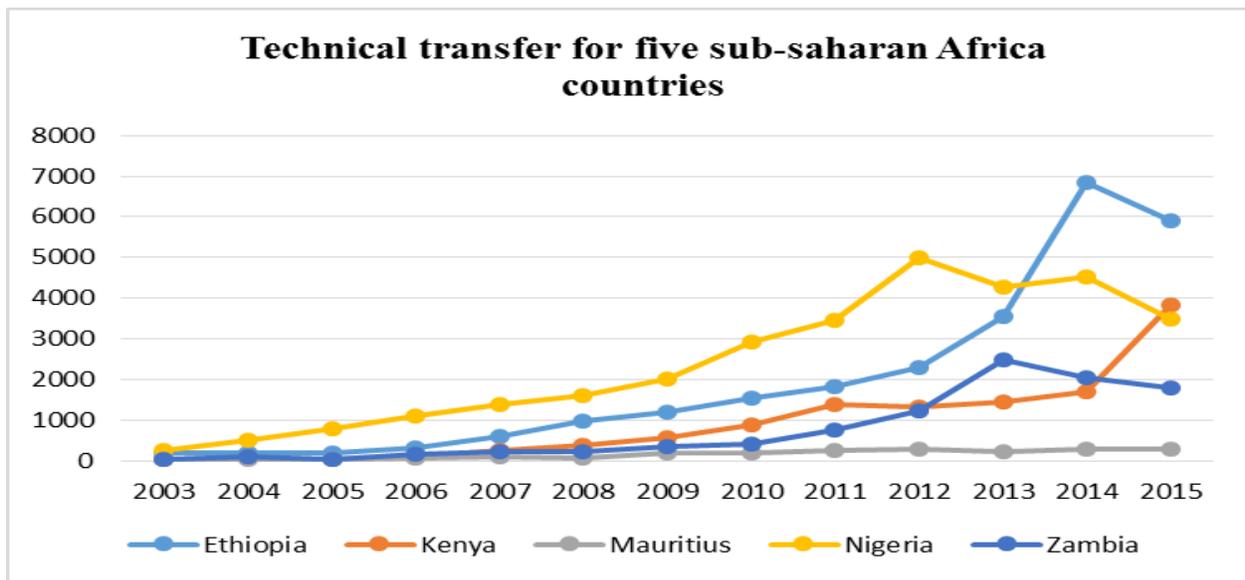
1. Introduction

There are certainly enough money changing hands to boost Africa's industrial competitiveness by transferring technology. In 2011, trade between China and Africa was worth a staggering US\$166 billion. The Financial Times estimated that in 2009, 800 Chinese corporations were doing business in Africa. But China has been criticized for doing business with corrupted regimes, not investing in local industrial capacity, and failing to create business opportunities for ordinary Africans.

Foreign direct investment (FDI) is an investment made by a firm or individual in one country into business interests located in another country. Generally, FDI takes place when an investor establishes foreign business operations or acquires foreign business assets, including establishing ownership or controlling interest in a foreign company, while Trade involves transfer of goods or services from one person or entity to another, often in exchange for money. A system or network that allows trade is called a market. Technology transfer, is about spreading inventions and technical from one geographic area to another, from one discipline to another or from one sector of the economy to another. Technology transfer is the process of transferring skills, knowledge, technologies, manufacturing methods, manufacturing samples and facilities between governments or universities and other institutions to ensure that scientific and technological developments are accessible to a greater number of users who can then develop and exploit the technology in new products, new processes, new applications, new materials or services.

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The graph that we see above show the evolution of technical transfer for five Sub-Saharan Africa countries (Ethiopia, Kenya, Mauritius, Nigeria and Zambia) from China to them. It's about transfer of knowledge by contracts between China and the five Sub-Saharan Africa countries studied in this case. According to the graph, we can see that the evolution of Ethiopia's curve is very high about 6832.03 in 2014 meaning that Ethiopia received the largest number of Chinese contracts in 2014. And the evolution of Mauritius curve is very flat since 2003 until 2015 because Mauritius doesn't have a strong relation with China. In 2012, the number of Chinese contracts in Nigeria was the highest but because of civil war after 2012, Nigerian's cooperation with China dropped until 2015. Kenya's cooperation with China still increased until 2015 whereas Zambia's cooperation with China increased until 2013, decreased at 2014 and 2015 cause of political problems.

The aim of this study is to analyze the effect of Chinese technical transfer, FDI and Trade on Sub-Saharan Africa's economic growth, to study the relationship between China and Sub-Saharan Africa countries by identifying the rate that China has on sub-Saharan Africa Trade, FDI, Technical Transfer, determining the impact of China in sub-Saharan Africa by foreign direct investment, trade and technical transfer. This study allows to help readers to improve what is already study and decision-makers, politicians or governments to take measuring upgrading their relationship and to help rapid development and sustainable.

Most of studies talking about the relationship between China and Sub-Saharan Africa examine how Chinese extracts and imports mines from Sub-Saharan Africa or how Sub-Saharan Africa imports infrastructure materials and machinery from China. Here, we study the transfer of knowledge from China to Sub-Saharan Africa by established contracts.

Rakotoarisoa Manitra, A.Fang, Cheng (2015) discuss Trade between China and Sub-Saharan (SSA) which is characterized by China's importing mining and extraction from SSA and SSA's importing manufactured goods from China. And Awosusi, Omojola Omowumi, Olawumi Dele (2014) discuss about Foreign direct investment in Nigeria is determined by market size, a stable macroeconomic policy, openness to trade, available human capital and other prospects.

For this study, we process with panel data method, by using three models: Pooled regression model (PRM), fixed effect model (FEM) and random effect model (REM). To identify what is better to be used in the analysis between these three models, we apply two tests: the first test is used to choose between (PRM), (FEM) or (REM), the second test, Hausman test (1978), for choosing between (FEM), (REM). The study is structured as follows: first we present the review of the literature, analytical framework and conclude.

2- Literature review

Many of the different studies are based on the transfer of manufactory or machinery looking for the relationship between FDI, trade and technology transfer on economic growth. So, working on this problem is always necessary.

Danquah, Michael (2018) show: stochastic frontier analysis is employed to examine the role of technology transfer and absorption of technology, as well as the interaction between technology transfer and absorption in explaining cross country differences in efficiency of nations in sub Saharan Africa over the period 1970–2010. The findings of the study indicate that trade openness, machinery imports, human capital and relative research and development have no empirically apparent effect on efficiency of nations in sub Saharan Africa. However, the interaction term for trade openness and human capital, and that of machinery imports and relative research and development play a significant and quantitatively important role in explaining national efficiency in sub Saharan Africa. The findings imply that policy initiatives to boost national efficiency in sub Saharan Africa must focus on the development of domestic capacity to absorb technology.

Borojo, Dinkneh Gebre Jiang, Yushi (2016) use two-step system GMM estimator we analyze the impact of Africa China trade openness on TFP and economic growth for 38 African countries for the periods 1995-2013 after controlling for endogeneity. The findings of this study reveal that Africa-China trade openness has robust positive effect on GDP growth of African countries. When Africa-China trade openness is interacted with the institutional quality and human capital of Africa, its effect on TFP is positive and significant. Hence, it needs strong domestic absorptive capacity of Africa to reap technology improvement effect of trade with China. These findings, therefore, provide evidence that Africa-China trade openness is an important contributor of economic growth for Africa.

Rakotoarisoa, Manitra A.Fang, Cheng (2015) discuss Trade between China and Sub-Saharan Africa (SSA) is characterized by China's importing mining and extraction from SSA and SSA's importing manufactured goods from China. We perform accounting and simulation exercises to analyze how trade policy and productivity shocks will reduce SSA's dependency on raw material export to China. Scenarios include tariff elimination by China, common external tariff in SSA, and free regional trade in SSA. We also include shifts in labour productivity in SSA's agriculture and manufacturing sectors and simulate technology spillover from SSA imports from China. Results show that tariff elimination by China increases SSA's employment and welfare. Raising tariffs on manufactured goods from China reduces welfare and employment by harming consumers and the agriculture sectors dependent on intermediate goods from China. Increase in labour productivity and technical progress in SSA's manufacturing sectors improves welfare but will not alter the high share of mining and extraction export to China.

Awosusi, Omojola Omowumi, Olawumi Dele (2014) discuss about Foreign direct investment in Nigeria is determined by market size, a stable macroeconomic policy, openness to trade, available human capital and other prospects. The study seeks to investigate the relationship between foreign direct investment and economic growth in Nigeria, whether there is a relationship between foreign direct investment and economic growth, and if Nigeria is benefiting from foreign direct investments. Secondary data was used in conducting the research and the study made use of Minitab Student version statistical analysis. The results revealed that there is a significant relationship between foreign direct investment and economic growth and that foreign direct investment contributes positively to economic growth. While exchange rate, exports and external reserves have a positive effect on economic growth, balance of payments and foreign trade had a negative effect. There was need for strong macroeconomic policies and security for further foreign investment to take place in Nigeria.

Elu, Juliet U. Price, Gregory N. (2010) show that trade between China and sub-Saharan Africa results in productivity-enhancing technology transfers to sub-Saharan African manufacturing firms. As trade flows between countries potentially results in interactions that lead to technological improvements in the production of goods and services, we parameterize the level of total factor productivity for African manufacturing firms as a function of foreign direct investment flow, and for the country in which it operates, trade openness with China, and its interaction with foreign direct investment. With micro-level data on manufacturing firms in five sub-Saharan African countries, we estimate the parameters of firm-level production functions between 1992 and 2004. Our parameter estimates reveal that across the firms and countries in our sample, there is no relationship between productivity-enhancing foreign direct investment and trade with China. In addition, increasing trade openness with China has no effect on the growth rate of total factor productivity. To the extent that total factor productivity and its growth is a crucial determinant of economic growth and living standards in the long run, our results suggest that increasing trade openness with China is not a long-run source of higher living standards for sub-Saharan Africa.

Ofodile, Uche Ewelukwa (2008) talk about the interest of the People's Republic of China (China) in Africa has grown steadily since 2000. Trade between China and Africa has grown exponentially. China-Africa trade volume increased from \$10 billion to \$18 billion between 2000 and 2003.

In 2005, total trade between Africa and China surged to \$40 billion, and in 2006 China-Africa trade was valued at \$55.5 billion. A third of China's crude oil imports come from Africa. In the West, reaction to China's involvement in Africa has bordered on suspicion and paranoia. Policy makers and analysts are concerned that China could gain control over Africa's vast and untapped natural resources. The current struggle over Africa's resources evokes worrying memories of an earlier scramble for pieces of the continent. This Article examines the opportunities and pitfalls that Sino-African trade relations present for Africa. Instead of paranoia, this Article calls for guarded optimism regarding the deepening relationship. While there is much that Africa could gain from the relationship, African leaders and Africans must guard against imperialism of any sort and shy away from arrangements that threaten sustainable development or undermine respect for human rights. Most important, African leaders must push past Beijing's rhetoric of anti-hegemonism and develop clear policies to guide the continent's engagement with China. Drawing on the rich but sad lessons from the scramble for Africa in the nineteenth century, African leaders must avoid the economic, political, and legal pitfalls of the past and position the continent to benefit from strategic relations with countries that could become future partners.

3- Analytical Framework

In this study, the panel data method has used, and we will use three models: Pooled regression model (PRM), fixed effect model (FEM) and random effect model (REM). To know the best models to use in the analysis, two tests will be applied: the first test (LM test) Lagrange multiplier proposal from Preusch and Pagan in (1980). This test is used to choose between (PRM), (FEM) or (REM), the second test is Hausman test (1978), to choose between (FEM), (REM). Using a variety of studies applied to different models in the estimation of LFDI, LTRD and LTCT on LGDP in addition to the use of different methodologies, accordingly, the standard model in this study, the general equation is as follows:

$$GDP = (FDI + TDR + TCT) \quad (1)$$

Thus, our growth function becomes:

$$GPD_t = C + \beta_1 FDI_t + \beta_2 TRD_t + \beta_3 TCT_t + \varepsilon_t \quad (2)$$

Where:

GDP_t: Economic growth (proxy for Gross domestic product in period t, (constant 2010 US\$);

FDI_t: Foreign direct investment in period t, (constant 2010 US\$);

TRD_t: Openness trade in period t, (constant 2010 US\$);

TCT_t: Technology Transfer in period t, (constant 2010 US\$);

The selection of countries and time periods is limited by data availability. In addition, some countries are excluded due to negative values in FDI data. Natural logarithm has been applied to all the data; the natural logarithms of FDI, Trade, TCT and GDP are denoted as LFDI, LTRD, LTCT and LGDP respectively. We used Eviews for investigation and data analysis. By taking the ln to GDP, the equation becomes:

$$LGDP_t = C + \beta_1 LFDI_t + \beta_2 LTRD_t + \beta_3 LTCT_t + \varepsilon_t \quad (3)$$

The pooled OLS regression model

Table 1: Pooled Regression Model results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI	0.079631	0.187084	0.425644	0.6718
LTRD	2.073574	0.244286	8.488303	0.0000
LTCT	-1.303024	0.301546	-4.321147	0.0001

Source : Author's calculation

From the Table 1, for we see that the five countries are not the same. We see that the p-value of the LFDI is more than 5%, meaning the variable cannot explain the GDP at level of 0.05. While, the variables LTRD and LTCT are statically significant at 5% level. But for the time being, we shall not accept the result of this pooled regression model. Then now, we shall develop Fixed Effect model and we are assuming that our five countries have different intercept.

Fixed effect or LSDV model**Table 2: Fixed effect or LSDV Model results**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.137557	0.102547	59.85089	0.0000
LFDI	0.000627	0.014229	0.044089	0.9650
LTRD	0.138004	0.028961	4.765122	0.0000
LTCT	0.024968	0.025160	0.992378	0.3252
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.994727	Mean dependent var		7.281549
Adjusted R-squared	0.994080	S.D. dependent var		1.065482
S.E. of regression	0.081980	Akaike info criterion		-2.049856
Sum squared resid	0.383085	Schwarz criterion		-1.782239
Log likelihood	74.62031	Hannan-Quinn criter.		-1.944264
F-statistic	1536.238	Durbin-Watson stat		0.409755
Prob (F-statistic)	0.000000			

Source: Author's calculation

We can easily say our model is acceptable and fitted, also all coefficients of the model are equal to zero, because our Prob (F-statistic) = 0.000000 less than 5%. The probability of LFDI variable is 0.9650 more than 5% and the probability of LTCT variable is 0.3252 more than 5%. Its means that LFDI and LTCT are not statistically significant. LFDI is statically significant. The p-values of LTRD is 0.0000 less than 5% meaning statistically significant. Then LFDI and LTCT are all big than 5%, meaning not significant to explain the variable LGDP, except LTRD is less than 5% can explain the variable LGDP.

Random effect model**Table 3: Random effect Model results**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.138982	0.605315	10.14180	0.0000
LFDI	0.001015	0.014226	0.071379	0.9433
LTRD	0.138144	0.028955	4.771058	0.0000
LTCT	0.024337	0.025154	0.967503	0.3371
Effects Specification				
			S.D.	Rho
Cross-section random			1.333971	0.9962
Idiosyncratic random			0.081980	0.0038
Weighted Statistics				
R-squared	0.809455	Mean dependent var		0.124095
Adjusted R-squared	0.800084	S.D. dependent var		0.182443
S.E. of regression	0.081574	Sum squared resid		0.405914
F-statistic	86.37802	Durbin-Watson stat		0.385827
Prob (F-statistic)	0.000000			
Unweighted Statistics				
R-squared	-0.086761	Mean dependent var		7.281549
Sum squared resid	78.95986	Durbin-Watson stat		0.001983

Source : Author's calculation

From table 3, the outcomes results of the probability value of the F-statistic is equal to 0.000000 less than 5%, meaning our model is well fitted and acceptable. As we see also that the variable LTRD is 0.0000 less than 5% meaning statically significant. However, LFDI is 0.9433 and LTCT is 0.3371, all big than 5% are not significant to explain to GDP.

Hausman Test

The Hausman test allows choosing between the fixed effect model and the random effects model. The null hypothesis is that the preferred model is the random effects model vs the alternative which is the fixed effects model. It essentially tests whether the unique errors (u_i) are correlated with the regressions; the null hypothesis is that they are not.

Hausman test results

Null Hypothesis: Random effect Model is appropriate

Alt Hypothesis: Fixed effect Model is appropriate

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.396815	3	0.4942

Cross-section random effects test comparisons:				
Variable	Fixed	Random	Var (Diff.)	Prob.
LFDI	0.000627	0.001015	0.000000	0.1469
LTRD	0.138004	0.138144	0.000000	0.8218
LTCT	0.024968	0.024337	0.000000	0.2270

Source: Author's calculation

Probability of Cross-section Random is $0.4942 > 5\%$ so, we cannot reject the null hypothesis. Its means in our results, Random effect Model is appropriate. Our study considers the results of random effect models:

$$LGDP_{it} = 6.138 + 0.001 LFDI_{it} + 0.138 LTRDR_{it} + 0.024 LTCT_{it}$$

Above equation, the results show that influence of LTCT as predicated is positive and not significant at 5% level of significance. Which means that LTCT negatively influence economic growth in five sub-Saharan African countries' economies.

4- Conclusion

The study purposed to estimate the effect of Chinese technology transfer on five (5) Sub-Saharan Africa's countries during the period 2003 to 2015. through a form of panel data which includes economic growth measured by LGDP as the dependent variable, and a number of independent variables, which included Foreign Direct investment (LFDI), Openness trade (LTRD), and Technical transfer (LTCT) on five (5) Sub-Saharan Africa's countries. As results, the study finds that influence of the technical transferis predicated is positive and not significant at 5% level of significance. So, the technical transfer has negative influence on economic growth in five sub-Saharan African countries' economies. In general, the effect of the transfer of technology must be positive because it can help the economy to grow giving a lot of opportunity to the receiving country but in our case here the transfer of technology from China has a negative impact because the most of the graduates of china do not want to return to their home country to work or the Chinese workers do not want to leave the know-how in the receiving country to return again by earning money.

Governments of sub-Saharan African countries need to motivate young graduates of China by giving them opportunities in their home country, manage and direct the transfer of technology to productive activities to avoid the effects negative on GDP. They should develop their economies faster by fighting corruption and giving more investor incentive. So, efforts should be directed towards policies that will enhance economic growth, such as the business environment, and openness, in order to have a greater impact on imports, which plays a role economic growth.

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