

PAPER • OPEN ACCESS

Dynamic Relationship between Chinese FDI, Agricultural and Economic Growth in West African: An Application of the Pool Mean Group Model

To cite this article: Kankou Hadia Fofana *et al* 2018 *J. Phys.: Conf. Ser.* **1060** 012066

View the [article online](#) for updates and enhancements.

You may also like

- [The Dynamic Linkages between CO2 Emissions, Energy Consumption and Economic Factors in ASEAN Countries](#)
N A M Azmin, Z Ahmad, R Mahmood *et al.*
- [High-range-resolution imaging using frequency domain interferometry with stabilization techniques for real-time vascular ultrasound](#)
Hirofumi Taki, Kousuke Taki, Makoto Yamakawa *et al.*
- [Approach to Impact of Human Capital and Foreign Trade on Regional Economy Based on Threshold Estimation](#)
J Huang and F Li



ECS
The
Electrochemical
Society
Advancing solid state &
electrochemical science & technology

DISCOVER
how sustainability
intersects with
electrochemistry & solid
state science research

Dynamic Relationship between Chinese FDI, Agricultural and Economic Growth in West African: An Application of the Pool Mean Group Model

Kankou Hadia Fofana^{1,*}, Enjun Xia² and Mamadou Bado Traore³

¹PhD student, School of Management and Economics Beijing Institute of Technology

²PhD Professor School of Management and Economics Beijing Institute of technology

³PhD student, Food Technology Beijing Forestry University

*fofanakankouhadia@yahoo.fr

Abstract. This study is an attempt to test the long run relationship between Chinese foreign direct investment (FDI), agricultural and economic growth in host countries is known to have an important role in economic literature suffering from unemployment problems, food security and lack of technological progress. This paper examines this issue for West Africa by applying Pool Mean Group (PMG) and panel-Granger causality Models over the period of 2003 to 2015. The Pool Mean Group tests suggest cointegration between China FDI, economic growth, domestic investment and land agricultural used. The article indicates that Chinese FDI, domestic investment and land agricultural spur economic growth contrary to some studies, which found that China FDI does not cause economic growth. The results also show that there is no significant Panel-VECM Granger causality from China FDI to economic growth, from economic growth to Chinese FDI, from agricultural to economic growth and from economic growth to agricultural. This implies that the increment in Chinese FDI inflows would definitely lead to increasing the economic growth, domestic investment and agricultural land in West Africa.

1. Introduction

The most important issue in this economic research is how to accelerate West Africa's economic growth; since this growth can have many impacts on its development. Indeed, the agricultural sector and FDI inflows have been widely recognized as very important factors in the economic growth process. The agricultural has played a crucial role for raises revenues, generates employment opportunities, the achievement of national objectives as regards food security, regional equilibrium, and social cohesion. The [1] observed that the important effect of agricultural development not only enhances the agricultural sector but also triggers overall economic growth. Recently, it is generating about 35% of the total GDP and 65% of the employment opportunities of the West African. The impact of Agricultural on economic growth can be positive and significant mainly due to the accumulation of employment as much as to earn export earnings and malnutrition. Inward Chinese FDI is of crucial importance for the reorganization of agricultural sector in the host country by offer of funds. Moreover, China FDI can increase African's export capacity and augment its foreign exchange earnings. The researchers of the majority of past empirical studies dealt with both Chinese FDI inflows and trade interaction on economic growth [2] or the relationship between China FDI and economic growth [3] and the relationship between agricultural and economic growth [4]. Completely these studies concluded



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

that both Chinese FDI inflows and agricultural promote economic growth. However, these studies argue that the impact of China FDI by multinational enterprises (MNEs) on growth is complex in particular in many developing countries. The growth enhancing effects from FDI inflows and agriculture vary from country to country and over time. For some countries, agricultural sector and FDI can even affect economic growth negatively[5]. The study is also relevant because West Africa is an interesting case study for other Africa countries which have applied incentive programs in order to attract China FDI.

The rest of the paper is structured as follows; Section 2 presents a theoretical and empirical literature review. Section 3 describes the model and the data, while Section 4 deals the methodology and the empirical analysis of the results. Conclusion and accompanying recommendations are presented in the final section (section 5).

2. Review of the literature

Over the past decade, a number of studies have found how Chinese FDI inflows can contribute to the growth of a host country's economy[2],[3]. In general, these studies show that the impact of China FDI by trade, investments and aid on growth is complex.

Regarding the empirical economic literature existing studying China FDI-led growth have found that china FDI promotion can greatly benefit host countries through the introduction of new technologies and skills, new jobs, surging domestic competition, foreign exchange earnings, and expanding access to international marketing networks.[2]found that china FDI may affect growth positively due to concentration of sectors in the Manufacturing, Building & Construction and General Trade of the economy of Ghana for the past five years. Relying on a sampling technique of 30 persons regressions for testing the impact of china FDI on per capita GDP in Kenya,[6] found that China FDI promotes economic growth by through human capital development, employment, and capital supply.By estimating a panel data model that allows for study the Chinese FDI flows to Africa between 2003 and 2008,[7] found that the causal relationship between African GDP and Chinese FDI was bi-directional, while uni-directional relationships were established between Chinese FDI and African infrastructure and corruption, respectively. They justified these results by the domestic investment, market size, agricultural potential and oil are important and significant determinants of Chinese FDI.For example, by using time series data and Johansen and Juselius multivariate Cointegration and Granger causality model,[8]evaluated the effect of China FDI, trade and its effects on agricultural sector development in Nigeria for 1980-2009. The article indicates that both foreign direct investment and exports spur economic growth contrary to some studies, which found that FDI does not cause economic growth. The article found that Chinese FDI and trade spur Nigeria' agricultural sector, which found that Labor Force and China FDI inflow into Nigeria, has no causal relationship with agricultural output. Also the result shows that Labor Force and China foreign direct investment inflow into Nigeria has no causal relationship with agricultural output.[9]studied the effect of Nigeria's industry process on economic growth by investigating a vector-regressive model relationship between industry, China FDI and economic growth during the period 1988-2008 on an Annual time series data. They found that there is evidence that more Chinese investments are highly needed in the Nigerian textile industry to make it internationally competitive.[10] investigated the quantitative effect of Chinese FDI on economic growth in Africa using a panel data model with fixed effects for a sample of 20 African countries from 2003 to 2012. They showed that china FDI increases Africa's gross domestic product (GDP) growth. Nevertheless, Granger Causality results in Africa suggested that unidirectional causality between GDP growth and China FDI. Over the past decade, studies examined the impacts of agricultural sector and China FDI on economic growth within the same model has also delivered ambiguous results.[11]found that the impact of China investment on economic growth is positive while there is an increase of FDI through manufacturing and service sector in Kenya. This result implies that China FDI appears to bring about close to a one-for-one increase loans to Kenya for hospital and schools construction in less developed areas and the impact of loans fall below those of the other flows.

3. Data sources and description of variables

3.1 Data sources and Model construction

The main objective of the present paper is to investigate the annual time series data on economic growth, Chinese FDI, agricultural sector, labor and capital stock covering the 2003 – 2015 period have been used in this study. The data of all variable was used and collected from World Development Indicator (WDI)(<http://www.worldbank.org>), except China foreign direct investment in West Africa (CFDI) variable was accumulated from ASE (www.pairault.fr/sinaf/index).

$$\begin{aligned} \ln CFDI_t = & \beta_1 + \delta_2 \ln CFDI_{t-1} + \delta_3 \ln Y_{t-1} + \delta_4 \ln Agri_{t-1} + \delta_5 \ln Lab_{t-1} + \delta_6 \ln DI_{t-1} \\ & + \delta_7 \ln LAND_{t-1} \\ & + \sum_{i=1}^p a_i \ln Y_{t-i} + \sum_{i=1}^p \alpha_2 \ln CFDI_{t-i} + \sum_{i=1}^p \alpha_3 \ln Agri_{t-i} + \sum_{i=1}^p \alpha_4 \ln Lab_{t-i} + \sum_{i=1}^p \alpha_5 \ln DI_{t-i} + \sum_{i=1}^p \alpha_6 \\ & \ln LAND_{t-i} + \varepsilon_t \end{aligned} \quad (1)$$

Economic growth is measured by the increase of real GDP per capita in each successive time period. The proxy real GDP per capita is noted by (Y.) It is expressed in constant 2000 dollar America (us). FDI is the value of real gross foreign direct investment inflows to GDP ratio. China FDI is the prime source of human capital and new technology to acquire a lasting management interest in an enterprise operating in an economy other than that of the investor. Agricultural sector (Agic) is the total sum of major crops, minor crops, livestock, fishing and forestry divided by GDP; Lab is measured as the volume of the total labour force; capital investment (DI) is measured by the real value of gross fixed capital formation (GFCF constant 2000 us) For the construction of the CFDI, conventional neo-classical production function was used to test the impact of FDI on growth, but added foreign direct investment as an additional variable because FDI is the prime source of human capital and new technology.

3.2. Methodology specification

Several steps of the methodology were used, to examine the relationship between Chinese FDI, agricultural sector and economic growth in West Africa. First, we use the conventional augmented Fisher Augmented Dickey–Fuller (ADF) and the Phillips–Perron test following [12](ADF), and [13][to detect the level of stationarity either at I(0) or I(1) therefore is an rule for ARDL bounds test. In econometric analysis, stationarity tests are effectuated to determine the stationarity of variables. Second, we investigate the long-run relationships and short-run dynamic interactions among the variables. After, we apply the autoregressive distributed lag (ARDL) cointegration technique, which is used to capture cointegrating non-stationary time series. For so doing, the ARDL modelling approach was used for first by [14] and extended by [15]. However, ARDL model has advantages over the conventional methods of [16, 17].

4. Results and discussion

Table 1 presents the descriptive statistics results of the variables used in the current paper. According to the Jarque–Bera test, these statistics reveal that all the series such as (agricultural sector, Chinese FDI, labor, capital investment, exchange rate and economic growth) have normal distributions.

4.1. Stationary and co-integration tests

Table 2 shows the results of Fisher ADF and P.P unit root tests indicate that all the variables set are integrated of I(0) or I(1) (see Table 2). The results clearly indicated that the H0 of unit root tests are rejected at 1%, 5% and 10% significance levels. Therefore, if all the variables are stationary at I(0), I(1) or both, the bounds testing approach would be used and are the major advantages of using the ARDL estimators. Generally, none of the data series are I(2) or above. Table 3 shows the results pointed out there are co-integration relationships between the variables in West Africa. The result shows that the H0 of no co-integration among all variables in the models are rejected at 5%

significance level, evidencing a variables strong correlation in long run. of sections to divide the text of the paper is optional and left as a decision for the author. Where the author wishes to divide the paper into sections the formatting shown in table 2 should be used.

Table 1 Descriptive statistics and correlation matrix results

Variable	$LAND_t$	Lab_t	$CFDI_t$	DI_t	Y_t	$AGRI_t$
Mean	1.4367	1.6523	6.4745	21.5824	1.2834	1.2925
Median	1.4464	1.6888	6.5824	2.2477	1.3000	1.4424
Maximum	1.7626	1.9000	7.7423	390.35	1.9999	2.0110
Minimum	0.8849	1.2545	5.2333	-195.94	0.0000	-1.6923
Std. dev.	0.1926	1.1656	0.5435	58.83	0.3145	0.5723
$LAND_t$	1000					
Lab_t	0.5507	1000				
$CFDI_t$	0.3214	0.5812	1000			
DI_t	-0.2567	-0.1003	-0.0370	1000		
Y_t	-0.1204	-0.0758	-0.0698	0.2542	1000	
$AGRI_t$	0.4621	0.3035	0.1251	-0.2260	-0.5871	1000

Table 2: Pedroni and Kao panel cointegration tests

Test	Intercept	Intercept and trend	None	Kao
$Y_t, K_t, Lab_t, FDI_t, EXP_t, EXR_t$				
Panel-v	-3.2645	-4.3734	-3.7220	0.0002
Panel-rho	4.2432	5.9467	3.6689	
Panel-PP	-3.5023	-5.4898	-5.6024	
Panel-ADF	-2.6034	-2.1332	-7.0110	
Group-rho	5.1723	6.3432	4.5445	
Group-PP	-14.5243	-17.64 43	13.2723	
Group-ADF	-8.5034	-8.0222	-8.9220	

Note: *, **, *** indicate 10%, 5% and 1% level of significance.

4.2. Long-run relationship analyses

Table 4 presents the estimated coefficients of the long-run relationship report that there is a positive relationship between China FDI, economic growth, agricultural land and domestic investment at 1% significance level, which means that an increase of Chinese FDI inflows would definitely lead to increasing the economic growth, agricultural land and domestic investment as well in the West Africa economy. In the endogenous growth model theory reported FDI inflow has positive spillover effects on the scarce economy through capital accumulation, technological advance and management skills. [18, 19]. Moreover, the results is similar with the recent empirical studies, for example ,[20]for Vietnam; [21]for Nigeria; which confirms the FDI-led growth hypothesis. It shows a significance long-run relationship among the variables at 1% and 10% levels. On the contrary, the relationship between China FDI and real agricultural GDP is negative at 1% significance level. Even though there is a widespread belief that FDI to positively impact agriculture for the host country, our empirical results fail to confirm this belief for the case of West Africa .Furthermore, several studies argued that FDI to positively impact agriculture for the host country[22], while[23]show a negative relationship between FDI and agricultural sector. Thus, the Low FDI is found to be responsible for the negative economic implications in countries with very fast growing population[24].Therefore, the results recorded that the relationship between economic growth and the labor force is positive at 1% significance level, means that the rising of economic growth affects labor force positively. These results are consistent with the findings of[25].Furthermore, the results recorded corrected relationships between domestic investment and real agricultural GDP at 1% significance level. Also, these results

are consistent with the findings by [24, 26], who hypothesized a similar significant relationship through the effects of domestic investment variables on real agricultural GDP.

Table 3. Long-run ARLD result

Variable	Coefficient	SE	T-ratio	Prob
Constant	29.8324	6.2619	4.7641	0.000
$AGRI_t$	-0.905	0.858	-1.0544	0.294
lab_t	-12.26	1.580	-7.761	0.000
$LAND_t$	9.425	1.884	5.001	0.000
DI_t	1.724	0.379	4.548	0.000
Y_t	4.724	0.935	4.566	0.000
Diagnostic test statistics (p-values)				
χ^2 (normality)			0.2234	
χ^2 (heteroscedasticity)			0.8134	
χ^2 (functional form)			0.1902	
χ^2 (serial correlation)			0.6345	

4.3. Short-run and ECMt – 1 analyses

After the long run estimates, the short-run ECMt – 1 model in (4) is estimated and the results are presented in Table 4. These results indicated that at 1% significance levels, the agricultural land variables, real GDP per capita and capital are positively associated with Chinese FDI model. In addition, the coefficients of ECMt – 1 are significant with appropriate signs for all models implies a relative speed of achieving the long-run equilibrium. Specifically, Chinese FDI, real GDP per capita and agricultural models reported the highest ECMt – 1 coefficient in absolute value among other models with –56%, –25% and –70% respectively. This implies that these models are corrected from the short-run towards the long-run equilibrium by 56%, 25% and 70%. Also, this means that the long-run would be shortly corrected back by 12 months for the China FDI, agricultural and real GDP per capita models.

Table 4. Short-run and ECMt – 1 ARLD result

Variable	Coefficient	SE	T-ratio	Prob
$\Delta AGRI_t$	-2.2160	3.2487	-0.066	0.9471
ΔLab_t	69.6389	42.009	1.657	0.100
$\Delta LAND_t$	86.004	83.894	1.025	0.308
ΔDI_t	-1.784	7.594	0.378	0.705
ΔY_t	2.876	38.3333	-0.4128	0.6802
ECM_{t-1}	-0.5693	0.1121	-5.074	0.0000

4.4. Granger causality analyses

The results further indicated that there is no significant Granger causality from Chinese FDI to economic growth, from economic growth to China FDI, from agriculture to economic growth and from economic growth to agriculture. However, these results are consistent with the findings of [27] for Tunisia; [28] for China; [29] for Ghana.

5. Conclusion and Policy Implications

The current study examines the dynamic causal relationship among the series of economic growth, Chinese foreign direct investment, agricultural, land agricultural used, labor, and capital investment in west Africa for the period of 2003– 2015. The Pool Mean Group (PMG) test suggested that there is cointegration among the variables specified in the model when FDI is the dependent variable. In addition, the associated equilibrium corrections are significant with appropriate signs for all models confirming the existence of long-run relationships. The equilibrium correction is fairly fast and is restored by the first quarter of the year. The results indicate that Land agricultural, capital investment

and economic growth are important in promoting foreign direct investment in West Africa in the long run. Finally, the Panel-VECM causality indicates that there is no significant Granger causality from china FDI to economic growth or from economic growth to china FDI in the short run. The study detected that there is no significant Granger causality from Chinese FDI to economic growth, from economic growth to China FDI, from agriculture to economic growth and from economic growth to agriculture. The topic merits special attention due to the possible interrelations among the series with implications for economic growth.

Even though there is a wrong impression about Chinese FDI can generate positive productivity externalities for the host country, our results confirm the China FDI-led growth this belief for the case of West Africa. Chinese FDI and Domestic capital investment is the main driver of agricultural growth in West Africa. From the results, a policy can generate important implications and recommendations for policymakers in West Africa. It has to improve its attraction of China FDI through a series of more ambitious structural policies (regional integration such as activating the ECOWAS, WAEMU Union, reforming its educational and financial system, and developing its infrastructure).

The results current of this paper could be very interesting for many developing countries to learn the lesson that the attraction of china FDI is important to promote economic growth, but not sufficient. One may wonder about the effectiveness of china FDI to promote economic growth, which depends on the level of FDI, its nature, the sectors of investment, etc. The positive FDI effect which is consistent with past studies, confirms the agricultural sector Chinese FDI dominance which does generate direct growth impacts on the wider economy. Attracting export-oriented China FDI into the food industry and mining sector of the economy of West Africa is of paramount importance. Unfortunately, the major handicap here is the availability of data, which are still lacking.

Acknowledgments

The authors would like to thank the China Scholarship Council (CSC) for their technical and financial supports of this research. Hospitality of the Department of Management and Economics is gratefully acknowledged.

References

- [1] World Bank, "Annual Report, World Bank, Washington, DC and New York, NY," 2009.
- [2] D. Tang and K. B. Gyasi, "China – Africa Foreign Trade Policies: the Impact of China's Foreign Direct Investment (FDI) Flow on Employment of Ghana," *Energy Procedia*, vol. 16, Part A, pp. 553-557, // 2012.
- [3] A. G. Ross, "An empirical analysis of Chinese outward foreign direct investment in Africa," *Journal of Chinese Economic and Foreign Trade Studies*, vol. 8, pp. 4-19, 2015.
- [4] H. Eddine Chebbi, "Agriculture and economic growth in Tunisia," *China Agricultural Economic Review*, vol. 2, pp. 63-78, 2010.
- [5] S. K. Frimpong, "Research on relationship between China and Ghana: Trade and foreign direct investment (FDI)," *Journal of Economics and Sustainable Development*, vol. 3, pp. 51-61, 2012.
- [6] R. N. Gathaiya, J. Kinyua, P. Machuki, and V. Keraro, "The Impact of Foreign Direct Investments by Chinese Companies in Kenya," *International Journal of Management & Business Studies*, vol. 4, pp. 9-17, 2014.
- [7] C. Claassen, E. Loots, and H. Bezuidenhout, "Chinese Foreign Direct Investment in Africa," *African Journal of Business Management*, vol. 6, pp. 11583-11597, 2012.
- [8] O.-O. Izuchukwu, H. Huiping, A. S. Abubakar, and E. A. Olufemi, "FDI Trade and Its Effects on Agricultural Development in Nigeria: Evidence From Time Series Analysis," *International Journal of Management Science and Business Administration*, vol. 1, pp. 28-40, 2014.
- [9] M. A. Eneji, I. J. Onyinye, D. N. Kennedy, and S. L. Rong, "Impact of foreign trade and investment on Nigeria's textile industry: The case of China," *Journal of African Studies and Development*, vol. 4, p. 130, 2012.
- [10] I. Doku, J. Akuma, and J. Owusuafriyie, "Effect of Chinese foreign direct investment on economic growth in Africa," *Journal of Chinese Economic & Foreign Trade Studies*, pp. 00-00, 2017.

- [11] K. M. B. Ombaba, P. A. Arogo, P. Bii, and L. Ongeru, "A Study on the Impact of China's Investments in Africa: The Case of Kenya," *Journal of Emerging Trends in Economics and Management Sciences*, vol. 3, p. 529, 2012.
- [12] P. C. Phillips and P. Perron, "Testing for a unit root in time series regression," *Biometrika*, pp. 335-346, 1988.
- [13] D. A. Dickey and W. A. Fuller, "Likelihood ratio statistics for autoregressive time series with a unit root," *Econometrica: Journal of the Econometric Society*, pp. 1057-1072, 1981.
- [14] D. F. Hendry, *Dynamic econometrics*: Oxford University Press on Demand, 1995.
- [15] M. H. Pesaran, Y. Shin, and R. J. Smith, "Bounds testing approaches to the analysis of level relationships," *Journal of applied econometrics*, vol. 16, pp. 289-326, 2001.
- [16] C. W. J. Granger, "Some recent development in a concept of causality," *Journal of Econometrics*, vol. 39, pp. 199-211, 1988/09/01 1988.
- [17] S. Johansen and K. Juselius, "Maximum likelihood estimation and inference on cointegration—with applications to the demand for money," *Oxford Bulletin of Economics and statistics*, vol. 52, pp. 169-210, 1990.
- [18] E. Borensztein, J. De Gregorio, and J.-W. Lee, "How does foreign direct investment affect economic growth?," *Journal of international Economics*, vol. 45, pp. 115-135, 1998.
- [19] L. D. Mello, "Foreign direct investment-led growth: evidence from time series and panel data," *Studies in Economics*, vol. 51, pp. 133-151, 1999.
- [20] S. Anwar and L. P. Nguyen, "Foreign direct investment and trade: The case of Vietnam," *Research in International Business and Finance*, vol. 25, pp. 39-52, 1// 2011.
- [21] B. B. Oloyede, "IMPACT OF FOREIGN DIRECT INVESTMENT ON AGRICULTURAL SECTOR DEVELOPMENT IN NIGERIA,(1981-2012)," *Kuwait Chapter of the Arabian Journal of Business and Management Review*, vol. 3, p. 14, 2014.
- [22] S. Chaudhuri and D. Banerjee, "FDI in agricultural land, welfare and unemployment in a developing economy," *Research in Economics*, vol. 64, pp. 229-239, 2010.
- [23] S. Pilgrim and S. Iyare, "Foreign direct investment (FDI) and the global food crisis. A study of the Windward Islands' agricultural sector," *Economics Bulletin*, vol. 3, pp. 1-15, 2008.
- [24] E. Ogbanje, O. Okwu, and S. Saror, "An Analysis of foreign direct investment in Nigeria: The fate of Nigeria's agricultural sector," *Production Agriculture and Technology Journal*, 2010.
- [25] O. Tasseven, *The Relationship Between Economic Development and Female Labor Force Participation Rate: A Panel Data Analysis*: Springer International Publishing, 2017.
- [26] J. G. Djokoto, Y. Francis, Srofenyoh, and K. Gidiglo, "Domestic and foreign direct investment in Ghanaian agriculture," *Agricultural Finance Review*, vol. 74, pp. 427 - 440, 2014.
- [27] M. Belloumi, "The relationship between trade, FDI and economic growth in Tunisia: An application of the autoregressive distributed lag model," *Economic Systems*, vol. 38, pp. 269-287, 2014.
- [28] M. S. Z. L. Miao, "Foreign direct investment and agriculture security empirical analysis based on the crowding-out effect on domestic investment and employment," *Journal of International Trade*, vol. 4, p. 12, 2012.
- [29] J. G. Djokoto, "OPENNESS AND AGRICULTURAL PERFORMANCE IN GHANA " *Journal of Science and Technology*, vol. 33, pp. 24-36 2013.