Analysis of China's Foreign Direct Investment in Senegal's agriculture from 1990 to 2012

Abstract:

Since 2000 China has started to strengthen its agricultural co-operation with Africa in trade and other commercial activities. China has increased its agriculture investment in Africa, because of the rapid economic rise of China in many African developing countries. China's investment has developed and opened many opportunities against a backdrop of closer economic ties with many African countries and particularly in Senegal. Although agricultural growth has increased in Senegal in recent years, food security remains a severe challenge. Despite international and local concerns, China's investment in Senegal in infrastructure and agricultural technology and training could facilitate agricultural growth in Senegal. Our paper is to analyze China's FDI in Senegal's agriculture. Our research focuses in Senegal's agriculture for a period of 22 years from 1990 to 2012. A time series data is used to get the empirical results for our paper and the estimation's results show that China's FDI is an important element in Senegal's agriculture will increase employment creation, high productivity, access to the finance and markets for smallholders, technology transfer enforcement of production standards and farmers can access more to bank credit.

Keywords: FDI, Agricultural, China, Senegal

I. Introduction

China's involvement in Africa since the turn of the century is increasingly attracting the attention of many African countries such as Senegal. Chinese interest in Sub-Saharan countries is of course not a new phenomenon, but increased cooperation, especially on the economic front, has added a new level of intensity and geopolitical significance to this interest.

We analyze the development cooperation instruments used by China in Senegal; we can see that China is using a wide range of initiatives that are characteristic of their activities in Africa. The People's Republic is clearly trying to develop a good relationship with the country. The relations of partnership China-Senegal is a model of new type in the international relations, which must be strengthened, developed, concretized and ordered. These relations are based on the possibilities of developing the cooperation at the highest level in business and economy, in science and technique.

The People's Republic is also supporting the Senegalese government with grant aid for agriculture. Since November 2006, China has been funding a group of agricultural scientists who are advising on rice cultivation, predominantly in Podor in northern Senegal. In Sangalkam,

around 30 kilometres from Dakar, Chinese agricultural advisors run an agricultural training center. Since 2007 they have been offering various training programmers to promote subsistence farming and to increase the yields of small farms.

In addition to these training programmes the Chinese also donate materials for projects such as “Grande Offensive Agricole pour la Nourriture et l’Abondance (GOANA)”. This program was set up to promote the cultivation of Chinese sesame in Senegal. Up to the beginning of 2009, the People’s Republic had donated agricultural equipment to a value of 1.1 million Euros. In 2010, Senegal began operating multi-purpose food preparation equipment donated by China. The development of Senegalese agriculture is a fundamental stake for the population, still with rural majority: the farming sector represents 15 % of the GDP and occupies 70 % of the working population. The country is however far from having reached the food and continuous auto sufficiency to import 70 % of its rice.

Generally, during the last decades, the Senegalese agricultural production had a balance in halftone. The economists evoke even a situation of gloom, with the stagnation, even a falling trend, of the production, the cultivated surfaces, and returns for the most part of cereal, with the exception of the rice. If, between 1945 and 1960, the growth of the agricultural production posted rates superior to 4 %, it stagnated after 1960. It's the same for the cultivated surfaces, which decrease since the end of 1960s. Between 2008 and 2010, the country still imported 69 % of its rice, the basic food of a population which lives, for 54 %, below the poverty line.

The objective of our paper is to analyze the Impact of China’s FDI in Senegal’s agriculture. However, our paper presents an analysis of China’s FDI in Senegal’s agriculture, and projects the policies necessary to maximize the development of China FDI in Senegal’s agriculture. The rest of the paper is organized as follows section 2 provides the literature review, the third section introduces the methodology, and data used in the research. Section fourth discusses the empirical results, and finally the last section five concludes the paper.

II. Literature Review

Our research is focused in most recent literature, analyzed and discussed the development of FDI impact agriculture. We found they have limited discussion on the potential implications of FDI boosts and contributes to Developing countries Agriculture through economic growth for expanding new cultivable land, raising the productivity of currently cultivated land from the perspective of recipient countries, particularly in regions such as Africa.

According to our research several reasons are focusing on FDI impact agriculture in Africa. Firstly, despite the fact that agricultural FDI accounts for less than 5 per cent of overall FDI in Africa, it has grown on average by 17 per cent during 2003-10 period showing an upward trend (Rakotoarisoa 2011, World Bank 2011).

Msuya (2007) studied the impact of FDI on productivity in the agricultural sector and poverty reduction in Tanzania and observed that productivity growth in the agricultural sector is impacted positively by FDI. The observation of the study was however based on the review of existing literature as opposed to empirical and statistical modeling

Mlachila and Takebe (2011) show in their paper China has become a major investor in Africa through infrastructures, mining, resource industries and the investment has been destined for agriculture, manufacturing and service industries. Recently China's FDI in African agriculture has ranged from poultry industry in Ghana to coffee in Kenya, Peanut in Senegal, sugar in Madagascar to cotton in Mali, Uganda and Zambia. The China-Africa Development Fund (which encourages Chinese private enterprises to make direct investment in Africa) has been increasingly facilitating equity financing in priority areas including agriculture in Africa in recent years (Mlachila and Takebe 2011).

The most important and the key investment in African Agriculture is the support of technology generation and dissemination by means of agricultural R&D, technology transfer and extension. (Fan and Zhang 2008) in their research about investment in agriculture R&D offers the greatest potential for enhancing productivity and reducing poverty). According to analysis by Thirtle, Lin, and Piesse (2003) shows that for every 1 per cent increase in yield brought about by investments in agricultural R&D, two million Africans can be lifted out of poverty.

Analysis by Fan and Zhang (2008) shows that policies and programs promoting fertilizer use, for example will have considerable agricultural productivity and poverty-reduction effects.

Nigeria's economy is one of the largest economies in Africa developed by many sectors oil, agriculture and raw materials. Agriculture has became the most important sector boost economy through FDI providing employment and source of livelihood for the increasing population and accounting for over half of the GDP of the country. The study of Fasminrin and Braga (2009) ascertained that the main reason for the slow of agricultural development in Nigeria despite the volumes of scientific information to engender improvement is due to poor policy formulation and implementation by the federal government, which implies that they should be a strategy to guide the formulation of polices and the implementation of activities that will lead to a set goal.

III. Methodology and data

The model is based on the endogenous growth theory as developed the impact of China's FDI in Senegal's agriculture, the effect of China's FDI in the host economy are normally believed to increase agriculture growth and technology, to reduce poverty and eradicate hunger. Our model is based on the assumption that FDI contributes to economic growth through agriculture. In this study the data covers from to 1990 to 2012. To measure our

To test the hypothesis empirically, the effect of FDI on economy growth through agriculture, the model used can be specified as follows:

$$\log FDI_t = \beta_0 + \beta_1 agrimac + \beta_2 labor + \beta_3 K + \beta_4 aid + \beta_5\ eduexp + \beta_6 tradeop + \epsilon_{it}$$

Where:

FDI: Foreign Direct Investment
Lab: Labor
Aid
Trad-op: Trade openness
Agri-mach: Agriculture machinery
K: Capital
Edu-exp: Education expenditure

The data for our analysis are obtained from many web sites: International Monetary Finance (IMF) World Development Indicators (WDI) database. The WDI database, published by the World Bank and International Monetary Fund, includes variables such as FDI, agriculture machinery, labor, Capital, aid, education expenditure and trade openness.

IV. Empirical result

We estimate the regression model, which provides an estimate of the impact of China's FDI in Senegal's agriculture.

4.1 Simple regression:

The econometric result for the regression model, where FDI is the dependent variable and others are independent variables it presented in table 3.

Fdi	coef	Std.Err	T	P>/t/
Agrimac	786902.5	398879.5	1.97	0.066
Lab	34.19109	34.15737	1.00	0.332
K	.1389253	.0369965	3.76	0.002
Aid	.2080535	.1182682	1.76	0.098
eduexp	-.5261491	.1891534	-2.78	0.013
tradeop	-.0368841	.0115229	-3.20	0.006
-cons	-5.25+08	2.31e+08	-2.27	0.037

Prob>F =0.0000

R-squared=0.9183

When looking at table e, the coefficient of determination, R2 has a high value which is 91, 83% , it indicates that 91, 83% of the variance in FDI can be explained by agri-mac, labor, k, aid, edu-expand trade-op. However, the good fit is most likely due to a highly linear relationship between FDI and the other variables.

The coefficient estimate for agriculture and machinery is significant at 10% because the p-value is less than 0.06. This means the coefficient estimate indicates that if agriculture and machinery increases by one US dollar, FDI will increase 786902.5 US dollar, ceteris paribus. We can say the P-value of K is 0.002 is less than 5% that's means if the coefficient estimate indicate of .1389253 it increases on Us dollard FDI by.1389253. Education is significant to the level of 5% so that's means if education decreases -.5261461 it will affect FDI. Furthermore, table 3 shows that the coefficient estimate for the independent variable of interest, trade openness the P-value is less than 5% so it significant if trade openness increase by on US dollard FDI will increase by 1.958178. The p-value of labor and aid are more than 5% so these variables are not significant to the dependent variable FDI. According to our results the variables (agrimac, k, eduexp and tradeope) all are significant and influence the FDI variable; so these variables are meaningful and have an impact on FDI. These variables have a positive impact on economic growth, if they increase by one unit, FDI will increase by one unit and the expectation for exchange rate and political instability will be satisfied.

4.2 Lag Selection Test :

Varsoc: fdi agrimac labor K aid eduexp tradeop
Selection-order criteria
Sample: 1994-2012 Number of obs =19

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-2291.34				2.8e+96	241.931	241.99	242.279
1	-2110.37	361.95	49	0.000	3.8e+90	228.039	228.51	230.823
2	-1043.13	2134.5	49	0.000	3.7e+45*	120.856	121.74	126.076
3	1495.66	5077.6	49	0.000		-143.438	-142.319	-136.827
4	1949.42	907.52*	49	0.000		-191.202*	-190.084*	-184.591*

Endogenous: fdi agrimac labor K aid eduexp tradeop
Exogenous: _cons

We can say lag selection will help us to know how many lags we are going to use for our Johansen co integration test and vector error correction model (VECM). Here the result shows that lag (4) is the better lag for our futures tests.

4.3 Johansen Co-integration test:

Johansen tests for co-integration

Trend: constant Number of obs=21
Sample:1992 – 2002 Lags=2

Maximun Rank	parms	LL	eigenvalue	Trace statistic	5%critical value
0	30	-1591.9081		88.0886	68.52
1	39	-1571.4829	0.85705	47.2383	47.21
2	46	-1558.5748	0.70752	21.4221*	29.68
3	51	-1552.0617	0.46222	8.3957	15.41
4	54	-1549.6799	0.20294	3.6322	3.76
5	55	-1547.8638	0.15883		

Maximun Rank	parms	LL	eigenvalue	Max statistic	5%critical value
0	30	-1591.9081		40.8503	33.46
1	39	-1571.4829	0.85705	25.8162	27.07
2	46	-1558.5748	0.70752	13.0264	20.97
3	51	-1552.0617	0.46222	4.7635	14.07
4	54	-1549.6799	0.20294	3.6322	3.76
5	55	-1547.8638	0.15883		

H0: Null hypothesis no co-integration

H1: Alternative hypothesis there is co-integration

4.3.1 Trace statistic:

According to our result of Johansen co integration test we are going to say:

The rank 0 means there is no co integration model in this system among FDI, agrimac , labor, aid and trade op. The guide line show us when the trace statistic (88.0886) is more than the critical value (68.52). So we reject the null hypothesis and accept the alternative hypothesis.

For the rank 1 there is one co integration equation, here we can say the trace statistic (47.2383) is more than the critical value (47.21) means we can reject the null hypothesis and accept the alternative hypothesis.

The rank 2 means they have two co integration equations, the trace statistic (21.4221) is less than (29.68) the critical value so we can't reject null hypothesis weather we accept null hypothesis meaning there is 2 error term and means our variables FDI, agrimac , labor, aid and tradeop are co integrated so they have long run association ship.

The rank 3 means they have three co integration equations, the trace statistic (8.3957) is less than the critical value (15.41), so we can't reject null hypothesis weather we accept null hypothesis meaning there is 3 error term and means our variables FDI, agrimac , labor, aid and tradeop are co integrated so they have long run association ship.

And finally the rank 4 means means they have three co integration equations, the trace statistic (3.6322) is less than the critical value (3.76), so we can't reject null hypothesis weather

we accept null hypothesis meaning there is 4 error term and means our variables FDI, agrimac , labor, aid and tradeop are co integrated so they have long run association ship.

4.3.2 Max statistic:

The 0 rank meaning there is no co integration among FDI, agrimac , labor, aid and tradeop. We can say the max statistic (40.8503) is more than the critical value (33.46). So we reject the null hypothesis and accept the alternative hypothesis.

The rank 1 is there is one co integration equation, here we can say the max statistic (25.8162) is less than the critical value (27.07) means we can't reject null hypothesis weather we accept null hypothesis meaning there is 2 error term and means our variables FDI, agrimac , labor, aid and tradeop are co integrated so they have long run association ship.

Te result for rank 2 means they have two co integration equations, the max statistic (13.0264) is less than (20.97) the critical value so we can't reject null hypothesis weather we accept null hypothesis meaning there is 2 error term and means our variables FDI, agrimac , labor, aid and tradeop are co integrated so they have long run association ship.

Rank 3 means they have three co integration equations, the max statistic (4.7635) is less than the critical value (14.07), so we can't reject null hypothesis weather we accept null hypothesis meaning there is 3 error term and means our variables FDI, agrimac , labor, aid and tradeop are co integrated so they have long run association ship.

And finally the rank 4 means means they have three co integration equations, the max statistic (3.6322) is less than the critical value (3.76), so we can't reject null hypothesis weather we accept null hypothesis meaning there is 4 error term and means our variables FDI, agrimac , labor, aid and tradeop are co integrated so they have long run association ship.

We can conclude for our decision all variable are we have seen in trace statistic and max statistic the variables (FDI, agrimac , labor, aid and tradeop) are co-integrated . Those two tests have the same results so our variables (FDI, agrimac , labor, aid and tradeop) are co integrated they have long run association ship or in the long run these variables move together. So we are going to run Vector Error Correction Model (VECM)

4.4 Unit Root Dickey fuller model:

Unit Root Dickey fuller model is a test for the null hypothesis of a unit root is present in a time series sample. The alternative hypothesis is different depending on which version of the test is used, but is usually stationary or trend-stationary. It is an augmented version of

the Dickey–Fuller test for a larger and more complicated set of time series models. Here the hypotheses to be tested are:

Ho: Null hypothesis variable isn't stationary

H1: Alternative hypothesis is stationary

4.4.1 The first model is Intercept only

$$Delta * Y_t = \beta_1 + dy_t - 1 + ai + e_t$$

Dickey-fuller test for unit				
Z(t)	**Test Statistic**	**1%critical Value**	**5% critical value**	**10%critical value**
	-128	-3.750	-3.000	-2.630
Mackinnon approximate p-value for z(t)=0.6479				
D.fdi	**Coef**	**Std.Err**	**T**	**P>/t/**
Fdi L1.	-.1579907	.1255398	-1.26	0.223
-cons	3.21e+07	2.43e+07	1.32	0.202

Here the absolute value (test statistic) is 1.258 is less than the 5% critical value 3 so we can not reject the null hypothesis rather we accept the null hypothesis meaning that FDI is has unit root because we can't reject the null hypothesis.

This model is valid and has intercept because the coefficient is -.1579907 has a negative sign so t FDI has unit root.

4.4.2 The second model is trends and intercept

$$Delta * Y_t = \beta_1 + \beta_2 + dy_t - 1 + ai + e_t$$

Dickey-fuller test for unit				
Z(t)	**Test Statistic**	**1%critical Value**	**5% critical value**	**10%critical value**
	-2.638	-4.380	-3.600	-3.240
Mackinnon approximate p-value for z(t)=0.2626				
D.fdi	**Coef**	**Std.Err**	**t**	**P>/t/**
Fdi L1.	-.5096224	.1931734	-2.64	0.016
-trend	9201049	40737752	2.26	0.036
-cons	-2.46e+07	3.34e+07	-0.73	0.471

We can say Test statistic is 2.6 is less than 5% critical value of 3.6 so we can not reject the null hypothesis rather we accept the null hypothesis meaning that FDI is has unit root because we can't reject the null hypothesis.

This model is valid and has trends and intercept because the coefficient is -.5096224 has a negative sign so t FDI has unit root.

4.4.3 The third model mo intercept and no trends He is equation is

$$Delta * Y_t = dy_t - 1 + ai + e_t$$

Dickey-fuller test for unit

Z(t)	Test Statistic	1%critical Value	5% critical value	10%critical value
	-0.434	-2.660	-1.950	-1.600

D.fdi	Coef	Std.Err	t	P>/t/
Fdi L1.	-.0382951	.0883071	-0.43	0.669
-trend	9201049	40737752	2.26	0.036
-cons	-2.46e+07	3.34e+07	-0.73	0.471

Finally for our last model the absolute value (test statistic) is 0.434 is less than the 5% critical value 1.95 so we can not reject the null hypothesis rather we accept the null hypothesis meaning that FDI has unit root because we can't reject the null hypothesis.

This model is valid and has intercept because the coefficient is -.0382951 has a negative sign so t FDI has unit root.

For the unit root we can conclude all our models are telling the same thing FDI variable has unit root meaning our variable isn't stationary.

V- Conclusion

The main objective of our paper was to analysis the impact of China's FDI in Senegal's agriculture. Our results showed these variables as capital, education expenditure and trade openness are all significant determinants variables to the dependant variable FDI at 5%. We can say the aspiration of Senegal's government to improve his agricultural sector will be influenced by several factors. These include substantial domestic public expenditure programs for agriculture, adequate aid allocations for the sector, growth in FDI in agriculture, and good policy and adequate governance and improved infrastructure. We found China's FDI increase the development of Senegal's agriculture and accelerate its economic growth positively.

Our recommendations in our analysis are if Senegal's government would like to increase flow of FDI it should adopt suitable policies. Reduce the high levels of governmental corruption in most of the region might limit the positive effect of FDI on economic growth. The government and private institutions should provide incentives and undertake efforts for greater trade openness, higher domestic investment and low debt. Further, effective steps should also be taken to reduce the internal as well as external imbalances. Last but not the least, there seems to be no substitute for improved political environment to attract FDI.

The effectiveness of agricultural FDI in developing countries, particularly in Senegal will be influenced by several factors: investing in agricultural technology; fostering of local comparative advantage; assessing technical and socio-economic feasibility of proposed FDI arrangements in a transparent and robust manner; making improvements to the existing weak institutional frameworks for land governance; enhancing and small holder competiveness.

The government should verify that the existing policies, regulations and institutions are adequate in order to maximize the positive impacts of international investment while minimizing the risks. Determine the appropriate tax rate that attracts investors without foregoing too much tax revenue.

Invest in Research and development (R&D) through agriculture result than make new innovation to attract more investors.

Private and financial sector should give more bank credit to the farmers to access of a good harvest result who may influence the agro-Business in African developing countries can accelerate economic growth .

Foreign Direct Investment is one of the good points for African countries to stimulate their economic growth through long term growth, employment generation and productivity enhancement. Increase the development of Human capital resources. So Africa needs to attract more productive FDI to diversify its economy and benefit technology transfers and spill-over effects.

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