

**THE IMPACT OF AGRICULTURE ON ECONOMIC GROWTH
IN SUB-SAHARAN AFRICA**

By

ALEMU, Wuletaw Andargie

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
for the degree of

MASTER OF DEVELOPMENT POLICY

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Committee in charge:

Professor Shun WANG, Supervisor



Professor Sang Moon HAHM



Professor Kye Woo LEE



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Abstract

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By

Alemu Wuletaw Andargie

Agriculture is considered as an important for economic growth through supply of excess labor, supply of food, supply of intermediate input for agro processing industries, opening a market to industries, accumulation of capital to invest on industry and increase foreign exchange. Nevertheless the impact of Agriculture on economic growth in developing countries has been a controversial issue among different scholars for several years. Recent empirical results of some scholar's shows that agriculture is the mechanism of economic growth and prerequisite for industrialization while some other scholars argue differently. This paper deals the impact of agriculture on economic growth on 21 selected Sub-Saharan African countries with fixed effect model of the panel data set from 2000 to 2013. The result suggests that agriculture enhances the economic growth of Sub-Sahara African countries.

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Table of content

1. Introduction	1
1.1 Background	1
1.2 Objective of the Study.....	3
1.3 Significant of the Study.....	3
1.4 Research Question.....	3
1.5 Scope and Limitation	3
2. LITERATURE REVIEW.....	4
2.1 General Significance of Agriculture to a given Economy.....	4
2.2 Empirical Literatures.....	5
3. Data and Model Specification.....	9
3.1 Data.....	9
3.2 Model Specification.....	14
4. Result and Discussion.....	15
5. Summary and Conclusion Remarks.....	22
REFERENCES.....	23

List of Tables

Table 3.1 shows the summary statistics of variables.	13
Table 4.1 Fixed Effect regression Estimates for Three Restricted Models.....	16
Table 4.2 Fixed Effect regression Estimates for Three Unrestricted Models.....	18

List of Figures

Figure 3.1 shows scatter plot of economic growth and Agriculture value added per worker.....	10
Figure 3.2 Shows scatter plot of GDP per capital and Agriculture value added per worker.....	11
Figure 3.3 shows scatter plot of economic growth and Agriculture value added per worker.....	12

1. INTRODUCTION

1.1 Background

Agriculture is considered as an important for economic growth through supply of excess labor, supply of food, supply of intermediate input for agro processing industries, opening a market to industries, accumulation of capital to invest on industry and increase foreign exchange. Nevertheless the impact of Agriculture on economic growth in developing countries has been a controversial issue among different scholars for several years. Recent empirical results of some scholar's shows that agriculture is the mechanism of economic growth and prerequisite for industrialization while some other scholars argue differently. Titus O.Awokuse, 2009 argue that agriculture is the engine of economic growth and trade openness has a positive effect on GDP growth. Terry L.Roe, 2001, investigates the result that the size of industrial sector is determined by the agriculture. Dennis and Iscan, 2011, analyzed agricultural distortion, change in structure, and growth of economy by using time series data sets with absolute assessment of agricultural taxation and reached that how the convergence in income per capita, structural change and economic growth is determined by the distortionary agricultural policy. *Houssein Eddine Chebbi* , 2010, found that weak exogeneity for agriculture and sectorial co-integration. Even though he realized that agriculture is an engine of the growth of other non-agricultural sector and may be convenient only to the agro-food processing industry sub sector. Xinshen Diao, 2007, came over with agriculture is important for most low-income African countries. Block, Steven A. 1999, deal with the nexus between agriculture and economic growth by using growth multipliers from a four-sector simulation mode to calculate the growth multipliers of agriculture, service and industry and Realized that agriculture should depend on the inter-sectorial linkage.

Agriculture have significant role for economic growth, alleviation of poverty and food security in Sub-Saharan Africa (SSA). This shows how agriculture sector is important for the livelihood of the society live in rural part of sub-Saharan African countries. It is also accounts on average more than 25% of GDP. Almost half of the GDP also comes from the agriculture sector because of agribusiness subsector which contributes a lot to the GDP of sub-Saharan African countries. The diversification of the economy of in several SSA countries can be also achieved by improving this sector. The improvement of Sub-Saharan African agriculture has been seen as a mechanism of alleviating global food crises. But the development of the agricultural sector is very backward and failed to enhance agricultural productivity due to low investment, lack of infrastructure, distorted price policy, weak land tenure system and lack of strong institution; Import is greater than export which makes SSA to be easily affected by world price.¹

So the existing contention of the relevance of agriculture to economic growth necessitated for my empirical work for further Investigation on whether agriculture has an impact on economic growth of sub-Saharan African countries in which their economy is depends on agriculture.

¹ Claire Schaffnit-Chatterjee (2014), Agricultural value chains in Sub-Saharan Africa, Deutsche Bank research, April 14, 2014.

1.2 Objective of the Study

The objective of this study is to analyze the impact of agriculture on economic growth in sub-Saharan African countries.

1.3 Significant of the Study

The result of this paper has its own contribution by explicitly explaining the impact of agriculture to economic growth. It will be important for policy makers and researchers especially for developing countries in which their economy is dominated by agriculture.

1.4 Research question

The concern of this paper is does agriculture really matters to economic growth in Sub-Saharan Africa since it is the major source of income and it is better to know its importance to focus on it for better investment for economic growth. To achieve the objective of this study, this paper would address the question how agriculture affects economic growth in sub-Saharan African countries?

1.5 Scopes and Limitation

The study is conducted on the impact of agriculture on economic growth based on the secondary data from 2000 – 2013 for 21 sub-Saharan African countries and not able to cover the whole countries even if there are 49 sub-Saharan African countries , and cannot able to see its impact before 2000. This is because many sub-Saharan African countries have no data.

LITERATURE REVIEW

In this Chapter the literature on the role of agriculture to economic growth is reviewed to show the significance of agriculture on economic growth.

2.1 General Significance of Agriculture to a given Economy

Previously, agriculture was related to with production of basic food crops. Currently, agriculture is expanded to different farming systems, by including, agriculture value chain. So that agriculture accredits post-harvest activities until the product reaches to the consumer. And also this entire processes include a lot of stockholders using this job opportunity so can increase the country's economy.

Agriculture is the major source of income to many countries. This is due to the lack of sufficient nonagricultural sectors to allow this huge percentage of population to take part in and the weak backward and forward linkage between other sectors to transfer labor. The basic supply of income of many developing countries is coming from agriculture even if the ratio is low. It is the main source of consumption. It is also important for the country's foreign exchange by increasing the production of cash crops.

The improvement of the agricultural sector increases the market and helps to the expansion of small enterprises and agro processing industries. Those industries also use the agriculture sector

as a supply of inputs for production. So agriculture is also important for saving for the accumulation of capital in addition to food security².

2.2 Empirical Literatures

Agriculture is considered as an important for economic growth through supply of excess labor, supply of food, supply of intermediate input for agro processing industries, opening a market to industries, accumulation of capital to invest on industry and increase foreign exchange. Nevertheless the impact of Agriculture on economic growth in developing countries has been a controversial issue among different scholars for several years. Recent empirical results of some scholar's shows that agriculture is the mechanism of economic growth and prerequisite for industrialization while some other scholars argue differently. Thus, it is interesting to know if agriculture really the engine to improve economic growth, which is the main purpose of this study. This section reviews some of the existing literatures on agriculture and economic growth.

Block S. A. (1999), deal with the nexus between agriculture and economic growth by using growth multipliers from a four-sector simulation mode to calculate the growth multipliers of agriculture, service and industry and Realized that agriculture should depend on the inter-sectorial linkage.

Terry L.R, (2001), investigates the contribution of agriculture to economic growth using Arthur Lewis argument on Engel's Law that articulates industrial sector function of agricultural productivity. Moreover the study analyzed the trickle-down effect of agriculture to industries

² <http://agriculturegoods.com/the-importance-of-agriculture/>, The Importance of Agriculture, Posted on February 25, 2013 by admin in Agriculture

stated by Ramsey genre inter temporal model. Finally he has found the result that the size of industrial sector is determined by the agriculture. Xinshen D. (2007), assessed the development impact of agriculture for Sub-Saharan Africa and came over with agriculture is important for most low-income African countries. Titus O.A. (2009), assesses the role of agriculture on economic growth by using time series econometrics methods on national data from developing countries. He uses one of the agricultural development models (neoclassical) that explains agriculture as an engine of economic growth and autoregressive distributed lag (ARDL) error correction model to carry out the backward and forward impact between agriculture and economic growth and found that agriculture has a beneficial effect on economic growth. *Houssein E. C.* (2010), assess the co-integration among sectors of Tunisians economy and solve the spurious regression problem and non-causality between agriculture and the rest of other sectors. He found that weak exogeneity for agriculture and sectorial co-integration even though he realized that agriculture is an engine of the growth of other sector and especially convenient only to the agro processing industry sub sector. Dennis and Iscan, (2011), analyzed agricultural distortion, change in structure, and growth of economy by using time series data sets with absolute assessment of agricultural taxation. They investigate how the convergence in income per capita, structural change and economic growth is determined by the distortionary agricultural policy. Syed Ali Raza, et al, (2012), put to the test the contribution of agriculture to economic growth by using simple regression model applied to secondary data from 1980 to (2010) and identified that agriculture has a significant relationship with economic growth. Tolulope O. and Chinonso E. (2013), examined the role of agriculture to Nigerian economic growth by using growth accounting framework and time serious data from 1960 to 2011. They found that the beneficial effect of agriculture on economic growth.

Unlike ALG view point, Jorgensen (1961), Lewis (1954), Hirschman (1958), and Ranis and Fei (1961), argue that there is no relationship between agriculture and other sectors. Matsuyama (1992) accounts the argument of comparative advantage to contradict the claim that agricultural productivity is a trigger of economic growth theoretically, which leads the developing countries to propose a policy against agriculture. Okonkwo (1989); Schiff and Valdez (2002), articulate the role of the manufacturing sector as the propound source of economic growth which tends them to believe the case of growth-led agricultural (GLA) development. Yao (2000) examined that agriculture is affected by high taxation in developing countries.

Contestation still persists even though deferent researches have investigated the theoretical relationship between agriculture and economic growth.

In a critique of Titus O. A. (2009) in their empirical analyses on the impact of agriculture in economic growth, Tsakok and Gardner (2007) find out that the previous researches have not able to get precise results due to the significant limitation on econometric examination of cross-sectional data for a panel of countries. This is because most of those who used ordinary least square (OLS) regression and simple correlation coefficient examination might have the incorrect specification problems because they failed to account for the data's dynamic time-series behaviors. Also, the results are limited to show the direction of causality rather only showing that agriculture and GDP growth are correlated.

Furthermore, the difference in the level of technology across different countries leads the contained hypothesis of a similar production activity across distinct types of economies to be impossible.

Currently, Tiffin and Irz (2006) have found the causality correlation between agriculture value added and economic growth by using bivariate Granger causality tests for a panel of countries. They have examined strong clue for the impact of agriculture on economic growth for developing countries, even though it is ambiguous for developed countries. Meanwhile this study is advanced on earlier studies by cross sectional inquiry because improved time-series models like co-integration and error correction model are employed even though the failed to control other key factors which affects economic growth. So that this paper inspects the impact of agriculture on economic growth by including different determinant factors of economic growth by using fixed effect model analysis of panel data of cross countries.

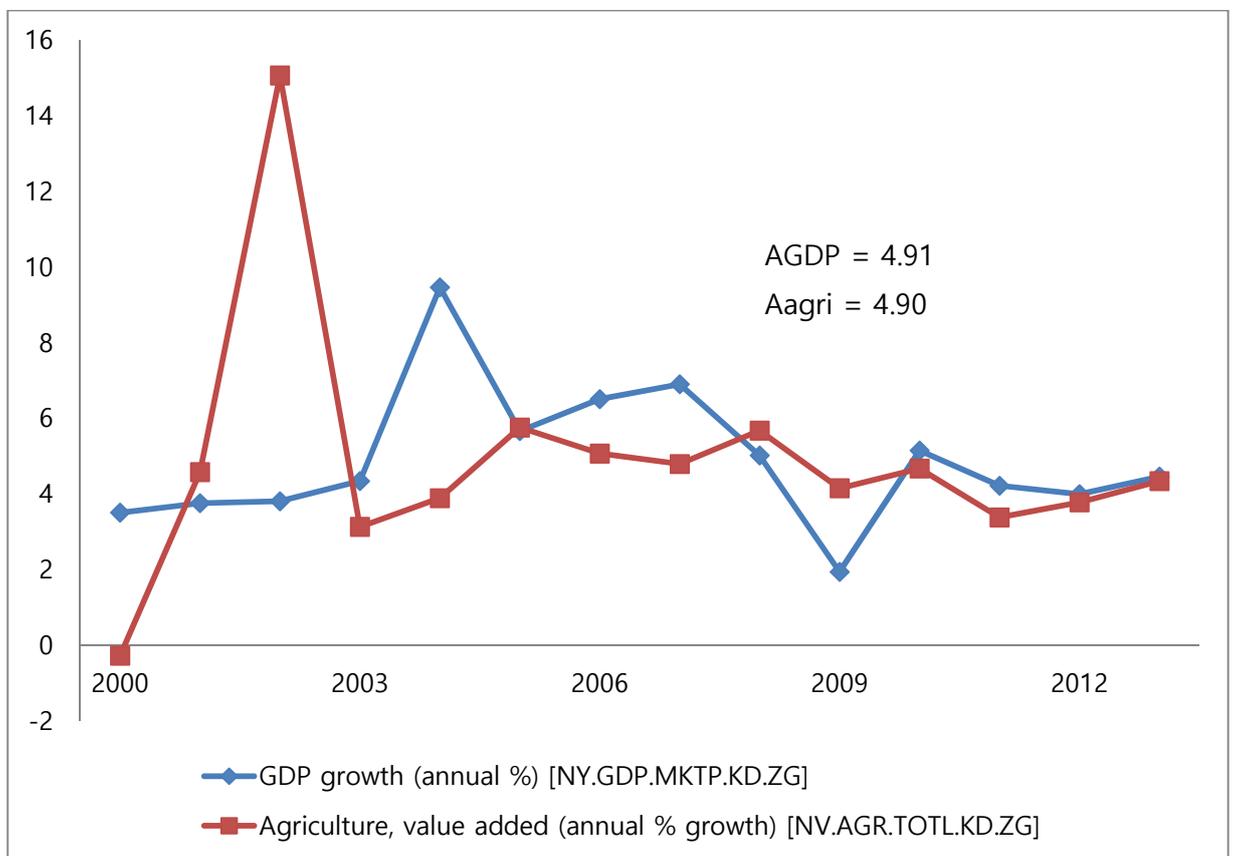
3. Data and Model Specification

3.1 Data

To explore whether agriculture would enhance economic growth of Sub-Saharan Africa, the dataset consists of 21 Sub-Saharan African countries and is taken from the World Bank's World Development Indicators (2014). Agriculture, denoted as agriculture value added per worker, is measured as agriculture value added per worker (constant 2005 US\$) during the period 2000-2013 and it is in natural log form. The economic growth, denoted as Real GDP per capita, a real GDP per capita constant 2005 US\$ during the period 2000-2013 and it is in natural log form.

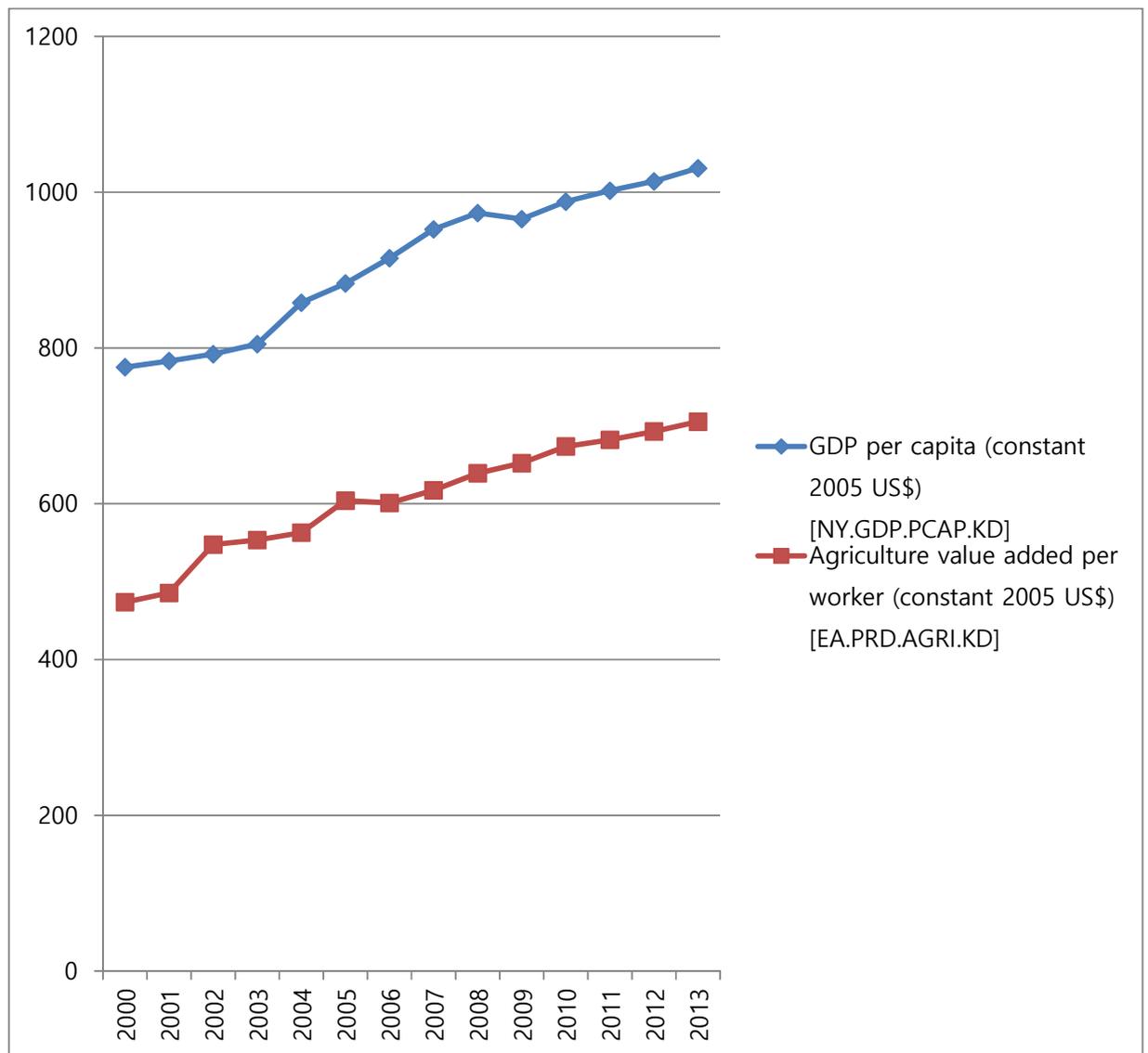
The paper also includes control variables to mitigate the effect of omitted variables. These are Investment denoted as a gross capital formation (constant 2005 US\$) account for the potential growth effect of physical capital, export denoted as exports of goods and services (constant 2005 US\$), credit denoted as domestic credit provided by financial sector (% of GDP), natural Resource denoted as total natural resources rents (% of GDP), ODA denoted as net ODA received (% of GNI) and FDI denoted as foreign direct investment, net inflows (% of GDP) to capture the total inflow of capital to the country, and debt denoted as total debt service (% of GNI). Except for the domestic credit provided by financial sector, total natural resource net ODA*FDI, and debt, all control variables are in natural log forms.

Figure 3.1 scatter plot of economic growth and Agriculture value added per worker.



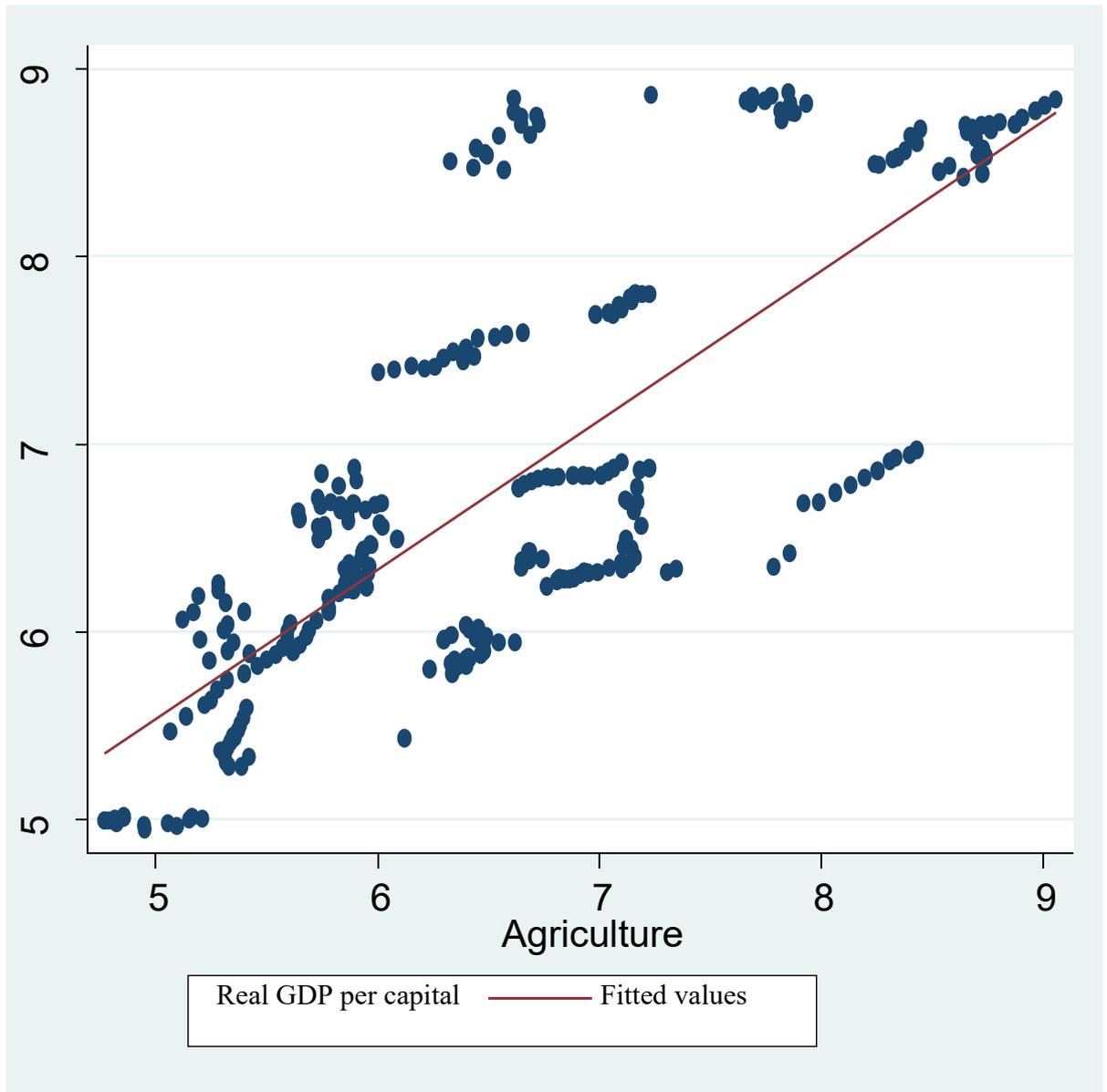
As the graph indicates the average economic growth rate and agricultural growth rate are almost the same.

Figure 3.2 scatter plot of GDP per capital and Agriculture value added per worker.



So the graph of GDP per capital and agricultural value added per worker shows the same trend.

Figure 3.3 scatter plot of economic growth and Agriculture value added per worker.



As the scatter plot of economic growth and agriculture value added per worker, which is positively sloped, shows agriculture has positively related with economic growth. So increases in agriculture have a beneficial effect on economic growth of sub-Saharan Africa.

Table 3.1 the summary statistics of variables.

Variable	Observation	Mean	Std. Dev.	Min	Max
Real GDP per capital	294	6.784	1.102	4.947	8.875
Agriculture value added per worker	292	6.561	1.045	4.770	9.057
Gross capital formation	294	5.149	1.410	2.783	8.542
Export of Goods and Services	293	5.523	1.725	1.895	8.801
Domestic credit by financial sector	294	25.699	40.428	-70.378	192.660
total natural resource rent	294	14.924	16.990	0.003	77.293
ODA*FDI	294	30.689	76.835	-20.528	643.745
Total Debt Service	294	2.413	3.450	0.062	30.561

3.2 Model Specification

To check whether agriculture would affect economic growth, the paper estimates the following regression model:

$$growth_{it} = \beta_1 + \beta_2 Agriculture_{it} + \beta_3 Investment_{it} + \beta_4 Export_{it} + \beta_5 Credit_{it} + \beta_6 Naturalresource_{it} + \beta_7 ODA * FDI_{it} + \beta_8 Debt + v_{it}$$

(1)

Where, $i = 1, 2, \dots, n$ which is a country index. Growth is the real GDP per capita constant 2005 US\$. Agriculture is an indicator of agriculture value added per worker (constant 2005 US\$). Investment is a gross capital formation (constant 2005 US\$). Export is an exports of goods and services (constant 2005 US\$). Credit is a domestic credit provided by financial sector (% of GDP), Natural resource is total natural resources rents (% of GDP), ODA*FDI is the interaction of ODA denoted as net ODA received (% of GNI) and FDI denoted as foreign direct investment, net inflows (% of GDP). Debt is total debt service (% of GNI), and u_{it} is the disturbance term. It I expect that $\beta_2 > 0$: the higher production and productivity of agriculture, the higher the economic growth ; $\beta_3 > 0$: the larger the investment, the higher the economic growth; $\beta_4 > 0$: the greater export, the higher the economic growth; $\beta_5 > 0$: the larger the domestic credit, the higher economic growth rates, $\beta_6 > 0$: higher natural resource, the higher economic growth, : $\beta_7 > 0$: the higher inflow of capital to the countries, the higher the economic growth: $\beta_8 < 0$: the higher the debt has an impeding effect on economic growth.

4. Results and Discussion

Table 4.1 reports the estimated regression results with Fixed Effect estimators. The first three columns display the estimates using the whole sample countries with Column (1) considering Agriculture value added per worker, Column (2) adding Gross capital formation (Investment) into the picture, and Column (3) including Exports of goods and services.

In the Column (1) regression, the study shows that the coefficient estimate ($\beta_2 = 0.477$) of Agriculture value added per worker is Positive and significant at 1% significance level. It is also noted that $\bar{R}^2 = 0.359$ meaning that the model's explanatory power is about 35%.

In the Column (2) regression, the study shows that the coefficient estimate ($\beta_2 = 0.303$) of Agriculture value added per worker is positive and significant at 1% significance level; the coefficient estimate ($\beta_3 = 0.227$) of gross capital formation is positive and significant at 1% significance level. It is also noted that $\bar{R}^2 = 0.564$ meaning that the model's explanatory power is about 56%.

In the Column (3) regression, the study shows that the coefficient estimate ($\beta_2 = 0.349$) of agriculture value added per worker is positive and significant at 1% significance level; the coefficient estimate ($\beta_3 = 0.105$) of Gross capital formation is positive and significant at 1% significance level; the coefficient estimate ($\beta_4 = 0.206$) of exports of goods and services is positive and significant at 1% significance level. It is also noted that $\bar{R}^2 = 0.719$ meaning that the model's explanatory power is about 71%.

Table 4.1 Fixed Effect regression Estimates for Three Restricted Models.

Real GDP per capital	1	2	3	4
Agriculture value added per worker	0.477*** (0.095)	0.303*** (0.09)	0.349*** (0.05)	0.344*** (0.049)
Gross capital formation		0.227*** (0.033)	0.105*** (0.032)	0.088** (0.034)
Exports of goods and services			0.206*** (0.033)	0.206*** (0.032)
Domestic credit provided by financial sector % GDP				0.002** (0.001)
Total natural resources rents (% of GDP)				
Net ODA*FDI %GDP				
Total Debt service %GNI				
Constant	3.645*** (0.622)	3.619*** (0.533)	2.804*** (0.3)	2.893*** (0.28)
No of Observation	292	292	292	292
adj. R-sq.	0.359	0.564	0.719	0.732
No of clusters	21	21	21	21
Year dummy	No	No	No	No
Standard errors in parentheses				
Notes: The standard errors are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10%, respectively				

In the Column (4) regression, the study shows that the coefficient estimate ($\beta_2 = 0.344$) of Agriculture value added per worker is positive and significant at 1% significance level; the coefficient estimate ($\beta_3 = 0.088$) of Gross capital formation is positive and not significant at 5% significance level; the coefficient estimate ($\beta_4 = 0.206$) of Exports of goods and services is positive and significant at 5% significance level; the coefficient estimate ($\beta_5 = 0.002$) of Domestic credit provided by financial sector % GDP is positive and significant at 5% significance level. It is also noted that $\bar{R}^2 = 0.732$ meaning that the model's explanatory power is about 73%.

Table 4.2 also reports the estimated regression results with fixed effect estimators. The rest four columns display the estimates using the whole sample countries with Column (1) considering Agriculture value added per worker, Gross capital formation, Exports of goods and services, and Domestic credit provided by financial sector % GDP, and Total natural resources rents (% of GDP), Column (2) adding Net ODA*FDI %GDP, and column (4) the last unrestricted model including year dummy to control the effect of other variables.

Table 4.2 Fixed Effect regression Estimates for Three Unrestricted Models.

Real GDP per capital	1	2	3	4
Agriculture value added per worker	0.327*** (0.048)	0.326*** (0.049)	0.328*** (0.048)	0.273*** (0.0613)
Gross capital formation	0.090** (0.033)	0.090** (0.033)	0.087** (0.034)	0.0399 (0.0441)
Exports of goods and services	0.219*** (0.038)	0.218*** (0.038)	0.218*** (0.037)	0.203*** (0.0306)
Domestic credit provided by financial sector % GDP	0.002** (0.001)	0.001** (0.001)	0.002** (0.001)	0.00116* (0.000654)
Total natural resources rents (% of GDP)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.00299* (0.00151)
Net ODA*FDI %GDP		0.000 (0.000)	0.000 (0.000)	4.06e-05 (3.54e-05)
Total Debt service %GNI			-0.001 (0.002)	-0.000220 (0.00116)
Constant	2.953*** (0.240)	2.966*** (0.244)	2.963*** (0.248)	3.647*** (0.405)
No of Observation	292	292	292	292
Adjusted. R-sq.	0.736	0.736	0.736	0.773
No of clusters	21	21	21	21
Year dummy	No	No	No	yes
Standard errors in parentheses				
Notes: The standard errors are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10%, respectively				

In the Column (1) regression, the study shows that the coefficient estimate ($\beta_2 = 0.327$) of agriculture value added per worker is significant at 1% significance level and positive; the coefficient estimate ($\beta_3 = 0.090$) of gross capital formation is significant at 5% significance level and positive; the coefficient estimate ($\beta_4 = 0.219$) of exports of goods and services is significant at 5% significance level and positive; the coefficient estimate ($\beta_5 = 0.002$) of domestic credit provided by financial sector % GDP is positive and significant at 5% significance level. The coefficient estimate ($\beta_6 = -0.002$) of Total natural resources rents (% of GDP) is not significant at 5% significance level and negative. It is also noted that $\bar{R}^2 = 0.736$ meaning that the model's explanatory power is about 73%.

In the Column (2) regression, the study shows that the coefficient estimate ($\beta_2 = 0.326$) of agriculture value added per worker is significant at 1% significance level and positive; the coefficient estimate ($\beta_3 = 0.090$) of investment is significant at 5% significance level and positive; the coefficient estimate ($\beta_4 = 0.218$) of exports of goods and services is significant at 5% significance level and positive; the coefficient estimate ($\beta_5 = 0.001$) of domestic credit provided by financial sector % GDP is significant at 5% significance level and positive. The coefficient estimate ($\beta_6 = 0.002$) of total natural resources rents (% of GDP) is negative and not significant at 5% significance level; the coefficient estimate ($\beta_7 = 0.000$) of Net ODA*FDI %GDP is not significant at 5% significance level and positive. It is also noted that $\bar{R}^2 = 0.736$ meaning that the model's explanatory power is about 73%.

In the Column (3) regression, the study shows that the coefficient estimate ($\beta_2 = 0.328$) of agriculture value added per worker is significant at 1% significance level and positive; the coefficient estimate ($\beta_3 = 0.087$) of gross capital formation is positive and significant at 5% significance level; the coefficient estimate ($\beta_4 = 0.218$) of exports of goods and services is significant at 5% significance level and positive; the coefficient estimate ($\beta_5 = 0.002$) of domestic credit provided by financial sector % GDP is significant at 5% significance level and positive. The coefficient estimate ($\beta_6 = 0.002$) of total natural resources rents (% of GDP) is not significant at 5% significance level and negative; the coefficient estimate ($\beta_7 = 0.000$) of Net ODA*FDI %GDP is positive and not significant at 5% significance level. The coefficient estimate ($\beta_8 = -0.001$) of Total debt service %GNI is and not significant at 5% significance level and negative. It is also noted that $\bar{R}^2 = 0.736$ meaning that the model's explanatory power is about 73%.

In the Column (4) regression, the study shows that the coefficient estimate ($\beta_2 = 0.273$) of Agriculture value added per worker is significant at 1% significance level and positive; the coefficient estimate ($\beta_3 = 0.0399$) of gross capital formation is not significant at 5% significance level and positive; the coefficient estimate ($\beta_4 = 0.203$) of exports of goods and services is significant at 5% significance level and positive; the coefficient estimate ($\beta_5 = 0.00116$) of domestic credit provided by financial sector % GDP is significant at 5% significance level and positive. The coefficient estimate ($\beta_6 = 0.00299$) of total natural resources rents (% of GDP) is significant at 10% significance level and negative. The coefficient

estimate ($\beta_7 = 4.06e-05$) of Net ODA*FDI %GDP is positive and not significant at 5% significance level. The coefficient estimate ($\beta_8 = -0.000220$) of Total Debt service %GNI is negative and not significant at 5% significance level. It is also noted that $\bar{R}^2 = 0.736$ meaning that the model's explanatory power is about 73%.

As a result, in all seven regressions the main variable, Agriculture value added per worker, remains significant despite adding more control variables. This implies a 1 % increase in agriculture value added per worker, GDP per capita will increase by 0.328%; a 1 % increase in export, GDP per capital will increase by 0.218%; a 1 unit increase in total natural resource rents (%GDP), GDP per capital will decrease by .0299% which indicates the natural resource curse; and a 1 unit increase in domestic credit, GDP per capital will increase by 0.2%.

5. Summery and Concluding Remarks

Agriculture is considered as an important for economic growth through supply of excess labor, supply of food, supply of intermediate input for agro processing industries, opening a market to industries, accumulation of capital to invest on industry and increase foreign exchange. Nevertheless the impact of Agriculture on economic growth in developing countries has been a controversial issue among different scholars for several years. Recent empirical results of some scholar's shows that agriculture is the mechanism of economic growth and prerequisite for industrialization while some other scholars argue differently.

The study tends to reveal whether agriculture, have significant positive or negative impact on economic growth. All the regressions show that agriculture has positive effects on economic growth of Sub-Saharan African countries. This study would guide government policies to take appropriate actions to manage the productivity of agriculture. Using data on 21 Sub-Saharan African countries over the period 2000 - 2013, this paper find that agriculture has significant effects on economic growth in Sub-Saharan African countries. But even if I can see for a 1 % increase in agriculture GDP will increase by 0.328% but I cannot able to find the details how it is important because of lack of data and time which may be leads to a further study.

In conclusion, the study suggests that policy towards supporting the agricultural sector is an effective tool for enhancing economic growth of Sub-Saharan African countries. In addition to this agriculture based economies should diversify economy to more sustainable and non-agricultural production sector.

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