The Role of Agriculture in Economic Growth: The Case of China

Fon Sebastian Suh

Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Master of Science
in
Economics

Eastern Mediterranean University
September 2017
Gazimağusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

Assoc. Prof. Dr. Ali Hakan Ulusoy
Acting Director

I certify that this thesis satisfies the requirements as a thesis for the degree of Master of Science in Economics.

Prof. Dr. Mehmet Balcılar
Chair, Department of Economics

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Economics.

Assoc. Prof. Dr. Kamil Sertoğlu
Supervisor

Examining Committee

1. Assoc. Prof. Dr. Hasan Güngör

2. Assoc. Prof. Dr.Kamil Sertoğlu

3. Asst. Prof. Dr. Kemal Bağzıbağlı

ABSTRACT

This thesis empirically examines the role of agriculture in China's economic growth using time series data from 1984 to 2015, specifically investigating the influence of: interest rate, agricultural imports, agricultural exports, and agricultural output on China's growth of GDP. The study employed Augmented Dickey-Fuller (ADF) unit root tests revealed the above variables are all non-stationary at levels but stationary at first difference. By running the Johansen co integration test, the results show existence of long run relationship among the variables. The vector error correction estimates indicatesthe relationship between the role of agriculture in china's economic growth and its determinants in the short run. This result shows that the speed of adjustment of the variables towards long run equilibrium path is quite low but it is still an important force for the growth of other sectors. Based on our findings, it is recommended that policies aimed at increasing productivity, quality, imports and exports of agricultural products should be implemented, as it will lead to a higher rate of sustainable economic growth in China.

Keywords: Economic growth, agriculture, China.

ÖZ

Bu çalışma ampirik olarak, Çin Halk Cumhuriyeti'nin ekonomik büyümesinde tarımın rolünü; özellikle faiz oranı, tarımsal ithalat, tarımsal ihracat ve tarımsal üretimin ekonomik büyüme üzerine etkisini 1984-2015 zaman serisi verilerini kullanarak analiz etmektedir. Çalışmada kullanılan Genişletilmiş Dickey- Fuller (ADF) birim kök testi sonuçları yukarıdaki bütün değişkenlerin seviyede durağan dışı, fakat birinci farkı alındığında bütün serilerin durağan olduğunu göstermektedir. Johansen eş bütünleşme testi sonuçları değişkenler arasında uzun dönemli ilişkiniz varlığını göstermektedir. Vektör hata düzeltme modeli de (VECM) tarımsal üretimin Çin'in ekonomik büyümesindeki kısa dönem etkilerini göstermektedir. Bu sonuca göre değişkenlerin uzun dönemdeki yakınsama hızı oldukça düşük olmakla beraber, halen diğer sektörlerin büyümesinde önemli bir güç olarak karşımıza çıkmaktadır. Ampirik bulgular ışığında gelecekteki politikaların verimliliği artırması, ürün kalitesinin artırılması ve tarımsal ürünlerin ihracat ve ithalatına önem verilmesi Çin'in ekonomik büyümesinin sürdürülebilirliğine önemli katkılar koyacağını belirtilmek mümkündür.

Anahtar kelimeler: Çin, ekonomik büyüme, tarım.

To My Parent

Mr. & Mrs. Nde

They taught me that there is greatness in knowledge.

ACKNOWLEDGMENT

My sincere gratitude goes to my able and sound supervisor Assoc. Prof. Dr. Kamil for his encouragement, support, constructive criticism and suggestion for improvement and quality toward the finishing of this work. Special thanks also go to Prof. Sevin Uğural for being wonderful as course adviser and for her esteemed support and sound advice during my program. May God bless and reward you (Amen).

I would like to appreciate my family for their invaluable support and encouragement throughout my studies. I am also indebted to my friends who stood by me in the likes of Besong Besong, Seyi Saint Akadiri, Borelle Domguia, T. Mary, Sharon, Lionel, Nelson alias Zalakapointe, Muluh alias Sumangouru and host of others that I cannot remember, may God in His infinite mercies, bless you all.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Agrgdp	Agriculture output
AgrExp	Agricultural exports
AgrImp	Agricultural imports
ADF test	Augmented Dickey-Fuller test
AIC	Akaike Information Criteria
ECM	Error Correction Mechanism
ECT	Error Correction Term
GDP	Gross Domestic Product
Int	Interest Rate
PP test	Phillips-Perron test
SIC	Schwartz Information Criterion
VAR model	Vector Auto Regressive model
VECM	Vector Error Correction Model

Chapter 1

INTRODUCTION

1.1 Background to the study

The People's Republic of China is a great and growing nation whose total population is estimated to be of 1.3 billion, and agriculture is regarded as a strategic sector which could alleviate the country and appease the people. In 1978, when Deng Xiaoping introduced the reform policy and opening up, it became a spinning peak for her agricultural development in her market-oriented country reforms. These reforms bust the restrictions of the long-established system, rapid rural economic expansion and owning less than 9% of the world cultivable land, she has successfully been able to nourish about 21% of the world's total population. Furthermore, the rural reforms facilitated by and large reforms of China's economic system and prompted fast growth of the Chinese nation. From the time when she united with the China has amplified the wideness of her agricultural sector WTO (2002).

There exist several debates on the relationship between agricultural sector and economic development. This has caught the interest of several authors in recent hypothetical and observed literature by examining determinants such as: interest rate, agricultural population, agricultural output and total export and imports in the sector. Quite a lot of results and opinions exist regarding the impacts of agriculture on economic expansion which varies according to the techniques applied, countries analyzed and from time period to another. China has witnessed several economic

cycles of ups and downs but it is attractive to make a note of that, the majority ups were certainly linked to additional favorable agricultural policies, while all the bad years were depressinglyassociated to insufficientruralperformance, the Chinese incident proofs that agriculture has been the most significant force of the economy since 1949, although its contribution to output in GDP has been waning stridently across time.

1.2 Scope and objectives of study

This study seeks to examine the role of agriculture on China's economic growth, basically concentrating on the determinants of the agricultural sector that sets or causes the economy of China to grow. For a proper analysis, it is necessary to determine the scope of this study which is ranged from the periods 1980 to 2015. The choice of this study period is based on the availability of data.

1.3 Research hypothesis

In a glow of achieving the aforementioned objectives of this study, we develop a key hypothesis alongside some detailed assumptions such as: there is a positive and significant relationship between agriculture and economic growth in China. Inthe same vein, the research hypothesis would be in an optional way as: There is a positive and significant relationship between the determinants of agriculture and economic growth in china.

1.4 Methodology of the study

With regards to this study, the vector error correction model (VECM) is used and three type of analysis were applied to the chosen variables. To begin with, Augmented Dickey-Fuller (ADF) and Philip-Perron (PP) test was carried to determine unit root, co-integration test andGranger causality test is applied.

1.5 Structure of thesis study

Chapter 1 entails the introductory part of the study, in which the motivation and scope of this study is stated, with details of the study subsequent chapters; Chapter 2 reviews the relevant literature associated to agriculture and economic growth. Chapter 3 focuses on China's economy (overview of economic history, present economic structure and the position of agriculture in the current economy). The methodology and the variables employed for the study are discussed in Chapter 4. Chapter 5 consists of interpretation and empirical results obtained from running various test. In Chapter 6, the study provides a conclusion, brief recommendations and discusses some suggestions future studies.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

This part provides the theoretical urging which have habitually been affirmed in support of the role of agriculture to the growth of a nation. By examining the direct contribution that the agricultural sector is likely to offer based on: its share in national output; through its relationship with other sectors on output basis as well as factor markets; and its effects on the macroeconomic environment.

For steady economic growth (Lewis, 1954) agricultural revolution was vital and essential as a precondition which is backed by the lessons of economics growth theories containing these facts. Agricultural growth economists are of this view that the agricultural sector has a very imperative role in the economic growth process of a country and strongly recommending that agricultural efficiency is essential for a consistent growth policy, (Lewis, 1954; Rostow, 1960). Lewis believed industrialization relies on the agricultural development and output whereby the manufacturing and agrarian revolutions mutually associate. Furthermore, for innovation and industrialization of the domestic economy, the agricultural sector which may perhaps be linked to Mellor (1979), where he explains how inter related and multiplying result that exist among supply of food and industrialized activities (labor,capital, investment and purchasing power).In addition, Abayomi (1992)

realized that an increase agricultural output has been most important for successful industrialization.

Nevertheless, past experiences revealed that emerging countries and precisely Asian countries such as China,Japan, India,Malaysia,and Korea achieved their economic development byupgrading theiragriculture. Commencing with the research carried out by Oyetade and Oluwatoyese (2014), on the impacts of the agricultural sector as the determinant of economic growth, by means of the time series econometric model from 1980 to 2011 covering period of 30 years. The study used the following agriculture sector variables namely food/crop production, fishery, forestry, as the explanatory variables against the dependent variable, gross domestic product (GDP). The study revealed a positive relationship between the agricultural sector and economic growth.

Tiffin and Irz (2006) approved agriculture is capable of causing augmentation of gross domestic products, for emergent countries precisely and by means of panel time series tested the: unit root, co-integration, and performed Granger causality on 85 counties. Moreover, Konyaand Singh (2009) examined the fundamentallinkbetween home based output and global trade paying attention on Indian agriculture and industrialized sectors from the periods 1950-2003. The studyperformed unit root test, co-integration test and Granger causality on the bases of the model (VECM). To wrap it up, this researchfirmly established that agriculture thus contributes to the economic development in the case of India.

In addition, Montalvo and Ravallion (2009) discovered that the agricultural sector as a primary sector is essential in fighting poverty in China than the secondary

andtertiary sectors. The thought of anexchange among these sectors on the basis of general growth against deficit in China is controversial; regarding some slightfacts they discovered effects of poverty from the non-agricultural sector development. Ligon and Sadoulet (2008) in their analysis, using a panel data, investigated the contribution and impact of the agricultural sector and non-agricultural sector on gross domestic product (GDP). Ligon and Sadoulet (2008) findings agree with other researchers that the agricultural sector is significantly a stimulant for the growth and development of an economy about other sectors.

Generally, most opinion in relation to the position of agriculture as key factor of economic growthisusually examined astrade component. Hypothetical point of views are in favors of the existence of connection linking agriculture and economic growth which is also connected to exports and imports (trade) whichThornton (1996) in his research affirm that export was vital for economic growth in certain countries, such as Italy, Norway, Sweden and Mexico.

Similarly, Love and Chandra (2005) analyzed the relationship between trade and economic development by applying three techniques on the time series data (unit root test, co-integration test and Granger causality). The findings for Nepal, India and Maldives showed that export as a factor augments economic growth and so were that of Bangladesh and Bhutan. Thungsuwan & Thompson (2003) study on Thailand and Olanipekun, Akadiri, Osundina, Bekun and Alola (2017) affirm that export-led economic growth.

In China, lots of economic oscillations have occurred consisting of ups and down. However, it is worth mentioning that the years of ups weredefinitelylinked to better

agricultural policies, impacts of intensification in globalization such as, changes in global trade, increase number of corporations, drop off in approbation expenses which have change agricultural remuneration and those years of recession were attributed pessimistically to insufficientagricultural efficiency. It is fair to mention that economic growth is not solely gritty to agricultural production, but the China's case shows that agriculture has been the backbone of the economy since 1949.Though the output contribution to the GDP of the nation has been waning sharply as time goes by.

2.2 The role of agriculture in an economy

One of the most important roles of agricultural sector is to provide raw materials for either emerging or infant industries and to the developed (established) industries which in return provides food for her inhabitants. A well-developed agriculture in an economy ensures industrial supportgiven that agriculture has a role in providing raw materials for the industrial sectors. From this perspective, not just are considering a growth in the export sector but also ensuring that the domestic demand is attained by the agricultural output. It is fair to say that developing countries must be aware thatimmenseventures into the industrial sectors should cause asky-scraping rate in the agriculturalyield.

Also, being a major redeemer against unemployment in several countries some economists in recent studies (see Olanipekun, Akadiri, Olawumi and Bekun, 2017) deem that econometric evidence makes a precise and obvious connection regarding the role of agriculture in economic growth; agriculture alone is responsible for over 70% of employment in developing countries, thus accepting the responsibility of agriculture in the development of countries. Based on their econometric analysis, the

response into the inquiry of what role agriculture has to play on (GNP) national growth and reduction of poverty in a country is reflected as consumers impact on agriculture output, whereby externalities is not exposed by contribution or yield directly. Finally, the application of this econometrics precisely specifies the method and shows some relations involving the industries and output from agricultural sector.

Nevertheless, the role of agriculture goes far beyond providing food and basic fiber. Moving from a customary society to a highlydeveloped economy, the contribution made by the agriculture to the whole economy generally reduces. The role played by agriculture is complex but all leading towardsgrowth procedure: producing much more above survivalpoints offoodstuff and fiber at a least cost. According to Johnston and Mellor (1961),they listed five role played by agriculture to economic growth;

i) An increase in food supply,
ii) An increase in agricultural exports,
iii) An increase in the transfer of labor resources,
iv) Formation of capital increase.
v) An increase in purchasing power as a due to an increase in the level of income.

Research conducted by Kuznets (1961), regarding the contribution of agriculture to economic growth stipulated that agriculture has a direct role to play on the growth of national output by increasing the total output and when agricultural products are traded within the sectors of the economy and neighboring economies, it plays a

market role. Finally, agriculture has a factor role when there are the transfers of capital and labor resources. Nevertheless, with a development in agricultural efficiency, this will cause growth in Research and Development. Since, R&D exhibit huge impacts on food supply and at various market prices, which is affordable for all leading to a reduction in poverty.

2.3 Agriculture and economic growth

Gunner Myrdal (1984) argued that the long term struggles of economic growth is won or lost in the agricultural sector. For this reason, some economists like Hirschman (1958), Fei and Ranis (1961) Arthur Lewis (1954), acknowledged that agriculture relates to economic growth of a country. They believed that unlimited labor supply in the sector could be transferred to the industrial sectorand her huge resources to other sectors, leads to economic growth. It is important to set institutional barriers which will implement and ensure smooth running in the sector, thereby stabilizing the investment intensity in the sector which in long run stimulates economic growth as well. A well invested agricultural sector is primary for the economy because it provides basic necessities to human life and is a precondition that has be established prior to take off into a self-continuous economic growth.

The contribution from the agricultural sector to an economy is judge base on the value of quantity of output in the Net National Product (NNP). The value from the agricultural sector productivity does only show the nature of the economy but also the stage in the economic growth.Simon Kuznets (1961)observed that an increase in the net output of the agricultural sector is, in and of itself, sum of the increases in the net products of the other sectors.

2.4Agricultural trade and its relationship to economic growth

Several studies have been made to understand the relationship of agricultural trade (exports and imports) on the economic growth in a country. Dawson (2005) carried out a study from1974 – 1995on developing countries to determine the impact of agricultural export on the economic growth. In this analysis, two theoretical models were used whereby based on agricultural production function (considering nonagricultural exports and agricultural exports as inputs); and the dual economy model.From this study, emphasis was made on the contribution of agricultural exports to the growth of an economy.

With the use of time series data, of eight different Asian countries from 1960 to 1997 was used to examine the impact of primary produce export to that of manufactured exports on economic growth by Levin and Raut (1997).From their study they affirm that there exist a two way direction of causality between growth in export and economic growth for all the countries studied except for Malaysia. Levin and Raut (1997) affirm the existence of long run Granger causality in the examined countries.

2.5 Agriculture and its connection with other sectors in the economy

Here, we throw more light on the direct contribution the agricultural sector has aided for other sectors in an economy basically considering: its contribution to national output; its links with non-farm sectors from an output and factor markets perspective; and on the macroeconomic milieu. Based on backward and forward linkages, its link to other sectors would either be provision of inputs for the farming industry (backward linkages whereby demand for goods and services by other sectors, in on an increase. For example transport and fuel thereby inducing growth to this sectors) or the agricultural sector provides (forward linkages example is food processing sector, increases agricultural output). The growth in agriculture enables growth in an economy through a multiplier effect on sectors linked to agriculture.

Consumption by households expresses the impact agriculture has on the entire economy since with an augmentation in agricultural output, if related with rising incomes, shall cause more spending by households thereby generating a demand in non-agricultural sectors. As a result of this increase in non-agricultural sectors, the demand in the economy increase which steams growth more, thus leading tothe term ‘multiplier effect’. The output factor is not the only means through which the agriculture sector is related with other sectors. There exist the factor markets which are linked to the national economy. By employing some factors of production, precisely labour, this is required by other sectors. Some literature review from Rostow (1960) and Lewis (1955), mention the availability of surplus labor in the agricultural sector having shadow wages. Chikwama (2010), studied Zimbabwe agriculture and suggested farm production is not obstructed withexcesslabor in agriculture and growth of the non-farm sector.Schultz (1953), acknowledged that several poor economies have food difficulties with low incomes and a large portion of this income been spent on food till they satisfy their subsistence need, their modern economic growth process is retarded

Chapter 3

CHINA'S ECONOMY

3.1 Overview of china's economy

It is evident that from the 1978 market reforms initiated in China, She has drastically drifted the nation from a central-planned based economy to a market-based economy in which we have noticed tremendous, speedy socio-economic development. Facts are China's GDPhas increase on average almost attaining 10 percent yearly which is the highestcontinuousincrease by any big economy in records. It is worth mentioning that in 2015, China attained all the Millennium Development Goals (MDGs) and contributed greatly to global attainment of the MDGs. (United Nations Report on China's Implementation of the Millennium Development Goals, 2000-2015)

Today's statistics from the World Bank (WB) has it that China population of about 1.3 billion, is the second largest economy with very consistent and vital contribution in the worldwide economy. Nevertheless, China is ranked among the developing countries where its per capita income stands at a portion of those in advanced countries with incomplete market reforms. Reports on from the WB on China's current poverty statistics shows that the rural net income per capita is estimated at RMB 2,300 yearly in 2010 constant prices. Several and serve challenges is accompanied with swift economic growth such as high quick urbanization; difficulties of supporting the environmental challenges; external imbalances and high level of disparity. It is with no doubt that history has explicitly shown that a

transition from middle-income to high-income rankproves to be more easier said than done as rising up to middle income from a low income status.

In a bit to address this issue of transiting to high income level, China establish a five year plan and from 2011-2015 was 12th Five-Year Plan, with the 13th Five Year Plan from 2016-2020 newly approved. At the end of the 12th Five Year Plan a 7 percent annual growth rate which was as objective was attained, while the forecasted growth rate for of 13th Five Year Plan is 6.5 percent, not failing to rebalance the economy and pay attention on the growth quality attained by 2020 while doubling the GDP. China also faces demographic pressures related to an aging population and the internal migration of labor there were 70.17 million poor in rural areas in 2014.

3.1.1 The current state of chinese economy

A successful three decades of reforms has seen China attain critical junctures, in the economic, socio and political, technological, intellectual, and foreign policy development. With diminishing economic returns setting in from the reform program of Deng Xiaoping in 1978, cannot sustain china modernization in the next decade (David Shambaugh, 2016). Having an anti-liberal leader, Xi Jinping, he has ensured the personalization, centralization of control and intensified the repression evident from 2009. Xi Jinping ensured a swath of newly invasive regulations and laws regarding national security, cyber security, terrorism, and non-governmental organizations have been enacted, not forgetting to mention the unprecedented anti-corruption campaign which created fear on the party, state and military.China is today more repressive than at any time since the post-Tiananmen (1989–1992) period.

The Chinese are now more aware of their needs and which goes far beyond their borders, ideas and markets, raw materials and investments, with some foreign sinologist believing their country cannot become fully modern under a one party system. China in recent years continues to seek greater power in the world as a substitute for basic changes at home and if she fails to apply these changes, her power will continue to look hollow, unattractive and threatening, and its neighbors will continue to cling to the coat-tails of Uncle Sam. Based on statistics, Niu Li (2017) mentions the expected GDP growth to be around 6.7% while the demand of both external and internal markets is low. Private and fix asset investment increase by 8.3% and 3.1% respectively.

Based on consumer prices and industrial prices rose enormously with 2016 to 2.0% and the supply of industrial product market fell pass the demandwith a positive PPI dropping by 2.0%, a 3.2% point narrower compared to the previous year. In the course of the 2016, employment witnessed stability with over 12.49 million jobs created in urban areas attaining the objective for the year. Thus David Shambaugh(2016)believe more can be attained with a balance political liberalization or semi democracy by opening up which will move the economy forward or maintain its current path with continuous economic stagnation, increased social tensions.

3.1.2 Characteristics of china agricultural sector

With a glance to some statistical review of agriculture's contribution to the economic growth of China, data reveal that in 1978, contributed to 28.1% of GDP while creating 70.5% employment opportunities with an average annual growth rate of 9.7% in real terms from the initiation of the reforms to 2006. As a result, severe structural changes and transformation hit the Chinese economy. Agriculture has an

essential role in China economic growth, so by examining certain aspects of the agric-sector to effectively see its contribution to China's modern agriculture. These selected aspects for this study are: landownership, land use, fertilizer usage, agricultural production, agricultural population, increased agricultural investment, which this study considered essential.

Agricultural Output: for China to be able to feed it population, this is estimated to be above 143 score by 2020. Thus, by developing her agriculture, she decided to ensure that her cultivable land under no reason should be less than 120million hectares.Based on statistics of 2007 China cultivated a land area of about123.7 million hectares, of which she dedicated 105.5 million hectares of land for food grains production. The output gotten of food grains cultivated was estimated at 501.5 million tons indicating that the output of food grains per hectare of land in China is higher than 8,752 Kg. without a specific value of the cultivable land area for this year for tobacco and tea, its total production was estimated at 2.39 millions of tons for tobacco and 1.14million tons for tea. Other produce such as fruits and vegetables in rural areas kept on increasing due to the change in food consumption patterns. A graphical representation of China's cultivated land and output over the years from the periods 1961 to 2014. (Sourced: Factsanddetails.com)

Land Use: In relation to Deng Xiaoping who introduced the reform process and considering that she has the responsibility of keeping a consistent high rate of growth, China had to induce extreme measures on managing the land Pressure which was naturally on an increase due to the rising population and the occurrence of natural disasters within the country. Figures have it that 188,300 hectares of farmland was used for nonagricultural purposes in 2007. More farmland was lost caused by

disasters worth 17,900 hectares.(Sourced: Factsanddetails.com).There was a conversion of nonfarm land into use farmland estimated at 195,800 hectares. While for the purpose environmental preservation 25,400 hectares of farmland was used. Gradually, 4,900 hectares of land has been wasted in the process and a sharp cut in the farmland by 40,700 hectares.

Fertilizer Use: The agricultural department initiated a policy between 2005 and 2007 whereby for fertilizers and micro-nutrients to be used, soil testing was necessary. With the establishment of soil testing laboratories in over 2000 counties, the objective of the Department of Agriculture is to elevate the utilization of fertilizer from 3 to 5 percent and raise the productivity level by 5 percent enabling a recycle and reclamation of 40 to 50 percent of the fertilizers contained in the soil. By adopting new techniques, the Agriculture Department believes that fertilizer usage could decrease by 11.7 million tons by 2030 despite the fact that the production of food grains will increase to 640 million tons. Huge scale initiatives were considered before the implementation of other methods. (Sourced: Factsanddetails.com)

The use of biogas method will see a reduction in fertilizer usage by 42 percent. The fight against pollution was a severe issue thus a fall in the nitrogen pollution in air by 20 percent and a 30 percent fall in water pollution. A pledge of chemical fertilizer free in 2001 was made by Miyun County. Several actors in the economy emphasized that within 5km from the city, it is forbidden to use chemical fertilizers and pesticides. There was an increase domestic chemical fertilizer use of 487 million tons in 2007 followed by sharp rise in fertilizer prices, fertilizer subsidy was introduced to compensate for the increase.(300 and 450 Yuan per hectare 2006 and 2007 respectively). (Sourced: Factsanddetails.com)

Population in Agriculture:China alone has the world's largest number ofpeoplewhereby approximately 35 percent of her population labor force is based in the agricultural sector as compared to the United States whose 2.5 percent of her population is in the sector (source:factsandetails.com). Some years ago, about 60 percent of china population (700million) was into agriculture but 425million persons are involve in the agricultural sector revealed from a most recent statistics. Based on Facts and details on china, a farmer selling wheat, canola, rice pigs and four acres of land he rents from the state earns 5000Yuan annually. A deduction for Taxes and fees is estimated at 4,000 Yuan. The cost related to housing is negligible except the farmer is interested in buying possessions and grows their domestic consumption. National Geographic reported the words of a farmer, in an industrialized society, farmers find difficulties surviving. Some farmers desire to work in the factories, but switch is difficult and a small number of them adjust due to inadequate skills, the lack education and most often is short of the learning attitude. They do lack time consciousness of living by the clock. With mass exodus of workers from low earning jobs to higher earning jobs in mega cities, the agricultural sector is left in the hands of the old who is widely seen as a dying breed in China.

Increase Agricultural Investment: A 20% increase in expenditure on agricultural production was a decision announced in March 2009, accompanied by warnings of hurtful impacts of food shortages and changes in climate. Prime Minister Wen Jiabao's at the Great Hall of the People made a speech regarding his annual budget had an extra 121 billion Yuan which would be spent to increase agricultural output and elevates rural incomes. (Source: Jonathan Watts, the Guardian, March 5, 2009). By raising overall domestic consumption while stressing on intensive agriculture, handling the effects of economic crisis affecting farmers and a swell in prices of

grain as an enticement for farmers to expand the agricultural yields was the government's aim.

An environmental economist, Lei Ming(2009) believes and affirmed that extra increment in agricultural budget was for preventive motive and since the effects brought by climate change on agricultural produce are doubtful, since it might go up, but its worst case event will be immense food shortages. Therefore, to avoid such an event, we must be ready. Several environmental groups welcomed the initiative and believe if this budget was not well spent; adverse effects will be the results. Sze Pangcheung, Greenpeace campaign director believes increasing the subsidies on chemical fertilizers would be costly though it could beneficiary to both farmers and the environment but requires a "big paradigm shift." Now our days, China is funds and focuses more on maintaining an intensive agriculture system and genetic engineering.

3.2 Role of agriculture in china

Just like in any other nation, agricultural contribution to growth or its percentage share to GDP, employment and/or international trade do change overtime. For instance, it has a relatively more crucial spot when such nation is principally agrarian. The share of China agricultural output in GDP seems to decrease consistently overtime. Therefore, agricultural contribution to the economy at large declines. Though, most of the industrialized countries of the world today have experienced and passed through this phase of economic structural transformation. Developing countries, however, did not experience the economic structural transformation not until the 1950s, while the speed of this structural transformation differs significantly among nations.

Due to poor foresight and unrealistic economic policy, policymakers and government of the developing countries have been working hard to industrialize their nations in such a way that, agricultural development is being entirely wiped out, leading to poor economic performance and low efficiency in industries.

Table 1: Share of agriculture in GDP, Employment and Trade for China (1960–2015)

Year	% share in GDP	% share in Employment	% share in Trade
1960	23.18	82.12	8.74
1965	37.55	81.60	6.83
1970	34.80	80.77	4.95
1975	31.95	77.17	9.55
1980	29.63	68.75	19.90
1985	27.93	62.42	22.49
1990	26.58	60.10	31.99
1995	19.60	52.20	38.24
2000	14.68	50.00	39.15
2005	11.64	44.80	62.20
2010	9.53	36.70	48.75
2015	8.83	28.30	35.73

Source: World Bank Database (2017).

Most of the developing and developed countries, real policy outcomes have been found to contradict the primary policy objectives. The idea behind the industry-biased strategic policy is built on their view of agriculture's relevance. Meanwhile, China is a valid example in terms of country that embarked on this policy strategy. Consequently, the industrialization policy strategy leads low efficiency of the local-industrial sector and weak agricultural production. By putting in place, affordable price system, marketing incentives and sound institutional reform, particularly by ending the era of the commune ideology, China achieved significantly industrial efficiency and recommendable agricultural growth since the 1970s.

One crucial reason that account for their achievement during the openness and economic reform is that economic policies are tailored towards adjusting the uneven growth framework between industry and agriculture sector and to promote farm production. In addition, prices of various agricultural products were hike to encourage people to embark on agricultural activities. Meanwhile, the rigid administrative control introduced in the previous commune system was eradicated to give farmers choice and freedom in production and marketing agricultural products. China like any other countries has experienced several economic cycles, however, it is worthy to know that, the boom periods were positively associated with favorable agricultural policies, while all doom periods were negatively associated with insufficient agricultural performance. Nevertheless, economic growth of this nation has not totally been determined by increase in agricultural activities; however, the China experience implies that agricultural production has been the most crucial engine of the economy since the 1940s, though its contribution towards the GDP has been decreasing overtime.

Table 2: Annual Growth Rates of China's Agricultural Products (%)

	1950-1969	1970-1977	1978-1984	1985-1998	1999-2003	2004-2006
Grain	2.5	2.4	5.0	2.3	-4.1	2.96
Paddy	2.9	2.3	4.5	1.3	-5.1	0.97
Wheat	3.4	5.0	8.5	1.9	-6.6	6.59
Corn	3.1	5.9	4.6	5.8	-2.5	5.67
Soybean	0.1	-2.6	4.2	2.9	1.9	-4.1
Cotton	6.0	-1.5	19.3	0.6	6.1	3.44
Vegetable	-1.8	3.1	7.5	7.8	10.0	2.92
Fruit	5.4	6.1	7.0	12.6	23.5	6.07
Meat	14.7	4.2	9.0	8.3	4.2	5.42
Aquatic products	6.3	5.7	4.9	14.1	3.4	3.49

Source: NBSC, China Statistical Yearbook (All issues).

In 1999, China witnessed a low trend in the production of grain due to the structural changes in the supply and demand for agricultural products. Table 2 above shows grain produced reached 4% which urged the Chinese government to set in place measure that elevated the rate by 2.96% annually within the 2004-2006 periods. Rice production was unchanged, a decrease in soybeans and that of wheat and corn increased. (Guoqiang Cheng 2006)

3.2.1Sectoral distribution

China agricultural sector in year 2011, contributed almost about 9.3%, economic value added of about 44.4% obtained from the industry sector and the service sector of about 46.4% to the GDP respectively. In addition, with the increase in China national economy at a significant annual growth rate of about 9% for over three (3) decades, they had become the 2nd largest economy in the year 2010, overtaking other economies of the world, except the United States. Though, with a moderate GDP growth afterwards, China's economy was still growing at almost three-folds compare to that of the United States in the year 2012. The proportion of industry and agriculture in China's GDP when compared to other developed countries, are significantly higher. In spite of the fact that, agriculture is the main industry in the

US, it had only contributed about 1% to the GDP as of 2013, while the service sector in most developed countries had accounted for about 70% of the economy. However, the growth of the tertiary sector in China has been hindered by focusing only on manufacturing industries. Figure 1 depicts the sectoral distribution of the China economy from year 2006-2016 respectively.

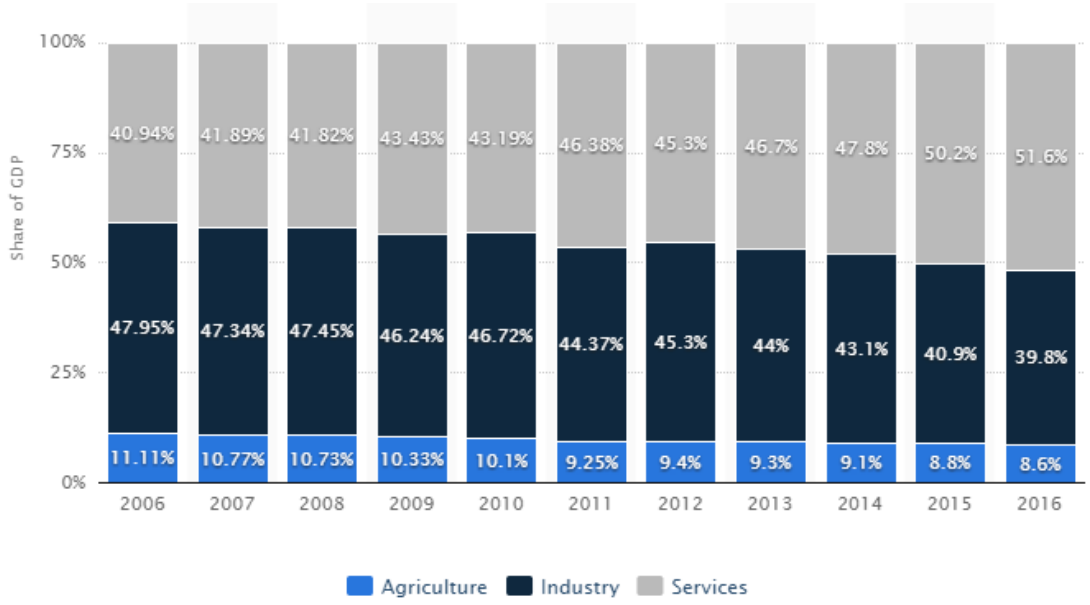

Fig. 1: Graphical illustration of China's sectoral distribution.

3.2.2 Agricultural employment

Furthermore, according to Felipe, Bayadan-Dacyycuy and Lanzafame (2016) China's agricultural employment share has decline between the periods 1962 to 2013 from the highest figure of 82% to the lowest of 31%, to be precise about 240 million workers are presently into agricultural related activities. From Figure 2 below, one can observe that, up to mid-2000s, agricultural employment level in China was still increasing, though the percentage share in aggregate employment fall out over decades ago. Both agricultural employment and its share in the GDP have been declining starting from the year 2008, which according to Felipe et al (2016) has

been as a result of reduction in domestic credit among others to facilitate agricultural production.

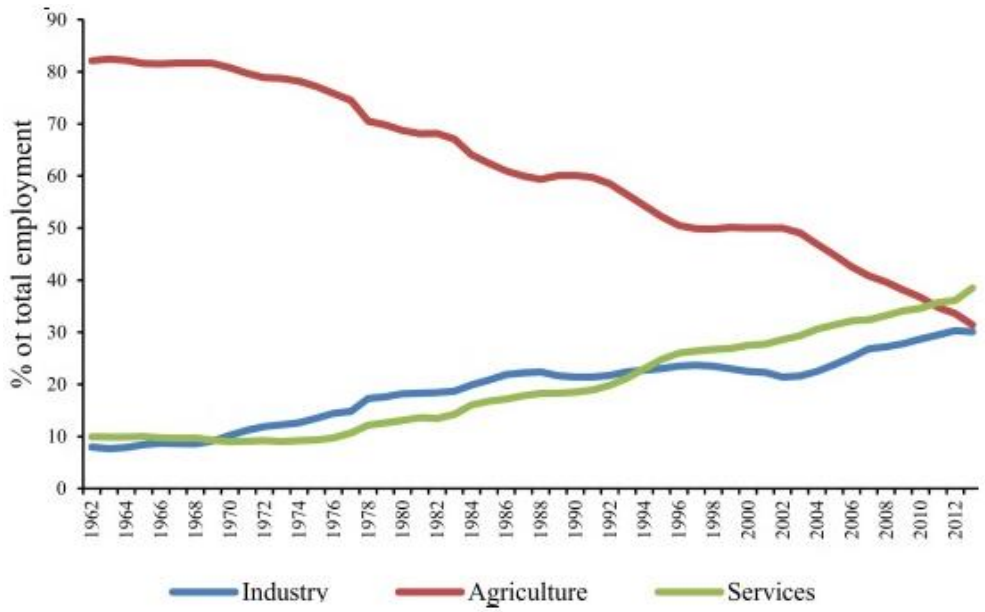

Fig. 2: Sectoral agricultural employment plot, sourced from Felipe et al (2016).

3.2.3 Chinaagricultural trade

Since her uniting with WTO, china has benefited from a stable growth in the 21 century by opening up her markets. Based on data from China Business Insight 2014 regarding her trade, on average she witnessed a drop by 15.2% in her agricultural tariffs while her total trade volume augmented by 27.9billion USD in 2001 to 175.7billion USD in 2012having a growth rate of 18.2% on average. Her agricultural exports and agriculturalimports were 22.4% and 13.2% respectively annually. In 2013, she suffered a trade deficit of 51.04% as she saw her agricultural exports attain 67.83billion USD and agricultural imports 118.87 billion USD. China foreign trade witnessed significant increase in trade dependency and in absolute value. Below is a table for a vivid comprehension.

Table 3: China's Agricultural Trade (2000-2012)

	Unit	2000	2005	2010	2012
Agricultural GDP	$ Billion	176.7	281.6	611.7	829.7
Export	$ Billion	15.60	27.60	48.9	63.3
Import	$ Billion	11.20	28.70	71.9	112.5
Net Import	$ Billion	4.40	-1.10	-23.04	-49.19
Export dependency ratio	%	8.8	9.8	8.0	7.6
Import dependency ratio	%	6.3	10.2	11.8	13.6
Trade dependency ratio	%	15.2	20.0	19.7	21.2

Source: China's Customs Statistical Yearbooks and China's Statistical Yearbooks, multiple years.

Based on products, China in 2013 had the following as top 5 export products; fisheryproducts, vegetables, livestock products, fruits and oilseeds While for imports had as top 5 in volume; oilseeds, livestock products, edible oil, fishery products and Cotton.It is worth mentioning that in 2012, top 5 countries for china's agricultural exports was; Japan, USA, Hong Kong, South Korea and Malaysia contributing 51% of the total value for export while her imports came from USA, Brazil, Australia, Canada and Argentina accounting for 58.1%.

3.3 China's strategy regarding agriculture.

Food sufficiency will continue to be the top goal for china's government. In 2003, the International Center for Agricultural and Rural Development (ICARD) was introduced by the Chinese Academy of Agricultural Science (CASS) and the International Food Policy Research Institute (IFPRI). Having introduced CAAS and IFPRI, the ICARD is rightly placed to encourage evidence-based, pro-poor decision making in China, and also to promote mutual learning and policy dialogue between China and other developing nations. The research institute solely pays attention to capacity strengthening, policy research, and communication to support the design and implementation of agricultural and rural development policy strategies in order to enhance food security, reduce hunger that would generally enhance China's economic growth. China's 13th five year plan continues on its previous theme of

modernization of her agricultural sector but now includes restructuring her agricultural sector, introducing improved technology, and effective socialization to the service. This current five year plan has objectives as;

i) Increase grain productivity to ensure food security.
ii) An increase in farmers' income and exploring additional sources of rural incomes.
iii) Increase in subsidies for agricultural scientific research.
iv) Ensure a proper development of harmless agricultural products.
v) Encouraging the restructuring and modernization of the agricultural sector.
vi) Improvement in the price mechanisms.
vii) Encouraging the integration of agriculture and e commerce.
viii) Creation of modern seed industry.

Source: Central Compilation & Translation Press

3.4 Major challenges faced by china's agriculture.

There exist numerous problems facing the Chinese agricultural sector which can't go unnoticed since these problems persistently trigger the growth rate provided by the sector to the entire economy as a whole. Shortlisted challenges are;

i) Land: China alone feeds 20% of the world's population with just 8% of arable land surface which shows that about 0.09ha per person. A redline of 120mn ha of farm land was china policy goal which was acknowledged in 2014 in and called 'No.1 Document' which emphasis on the redline policy. The purpose for this policy was because she loses farmland consistently due to construction, urbanization, and land degradation.

Based on statistics published last year of a national survey conducted in 2009,arable land was estimated to be at 135mn ha without deducting land for restoration or pollution implying arable land value will be slightly above 120mn ha.(Suwei Jiang and Richard Ferguson, 2015). Land degradation by pollution has in recent times been a major source of concern for the Chinese government. In 2015, Wang shiyuan Chinese vice minister for land and resources voiced out that 3.3mn ha of land was polluted and that heavy metals from the soil polluted over 12mnt of grains each year with economic losses of above US $2.5bn.(Suwei Jiang and Richard Ferguson, 2015).

ii) Challenges from joining the WTO. Since her opening to international trade, with the hope of increasing the growth between 0.7~1% annually her domestic companies rather witnessing pressure competing with imported products based on price and quality. (Yongxin Quan and Zeng-Rung Liu 2002).China before her entry into the WTO did not depend much on international milieu for the success of self-sufficient agriculture to satisfy her domestic demands. Imported products with low prices consumed a portion of the market share from domestic market creating an excess of the product. Also with an advent of low prices of imported goods, farmers income is threaten and their jobs.

iii) China's environmental problem seriously affects her agricultural sector. It ranges from the natural disasters frequently happening on large scales. Going down history lane, two severe floods from the Yangtze River caused enormous damage to her agriculture. Droughts have persistently affected the sector and water source. One seventh of her farmland

suffered from soil erosion from sand winds. Over 30,000 tons of sand fell to the sand during the Beijing sand storm (Yongxin et al, 2002). A major source of environment problem is caused by pollution from the domestic industries either by air, waste and water disposal, lack of regulation and proper supervision, all these affects the available cultivable farmland which later affects the agricultural output and huge cost to the government. The 1998 flood in the south caused the government over US $10billion. (Yongxin, et al, 2002).

Chapter 4

DATA AND METHODOLOGY

4.1 Data type and source of data

The study employed time series data to empirically investigate the objective of study. The data period is from 1984-2015. We employ five (5) variables to analysis the growth in the Chinese economy contributed by the agricultural sector. These variables are; real gross domestic product, real effective interest rate, agriculture output, agricultural exportsand agricultural imports. These statistics were sourced from the publications of the World Bank data base and the National Bureau of Statistics of China (2015) on annual basis. To estimate the growth effects all variables are altered into the natural logarithm in the econometric analysis.

4.2 Methodology

The methodology starts with testing the unit roots of the variables chosen by applying the Augmented Dickey Fuller (1981) and Phillips-Perron tests. Secondly, we carried out Johansen (1988) co integration test to examine the long-runrelationship that exists between variables. In order to better examine the direction of causality among these variables, Granger-causality tests were applied and the Vector Error Correction Model (VECM) approach is engaged in the study to capture the possible disequilibrium in the short run and the speed of adjustment of the variables towards their long run path.

4.3 Model specification

To investigate the role of agriculture in the economic growth of China, we express functional relationship of the model as given below;

$GDPW_t = \beta_0 + \beta_1 INTR_t + \beta_2 AgrIMP_t + \beta_3 AgrEXP_t + \beta_4 AgrGDP_t + \varepsilon_t$ …… (1)

By standardizing all the variables and inferring them, we obtain consequential partial coefficients as elasticities and we rewrite the form of the equation for the long-run relationship estimated by the Johansen test and short run relationship is estimated respectively:

$\ln RGDPW_t = \beta_0 + \beta_1 \ln INTR_{t-1} + \beta_2 \ln AgrIMP_{t-1} + \beta_3 \ln AgrEXP_{t-1} + \beta_4 \ln AgrGDP_{t-1} + \varepsilon_t$ ..... (2)

$\Delta \ln RGDPW_t = \beta_0 + \beta_1 \Delta \ln IR_{t-1} + \beta_2 \Delta \ln AgrIMP_{t-1} + \beta_3 \Delta \ln AgrEXP_{t-1} + \beta_4 \Delta \ln AgrGDP_{t-1} + \varepsilon_t$ ..... (3)

where, RGDPWis the output estimated in real GDP perworker (dollars); IR is interest rate(measured in percentage); AgrIMP is Agricultural Imports; AgrEXP represents Agricultural exports;$\beta_0$is the constant term,$\beta 1$,β_2,β_3 and β_4, are estimated parameters while $\boldsymbol{\varepsilon_t}$ is the serially uncorrelated random error term.

4.4 Error correction model

An error correction model (ECM) belongs to a group of multiple time series models most primarily used for data where the underlying variables have a long-run equilibrium stochastic trend known as co integration. ECMs are a theoretically-driven method that are useful for examining both short- and long-term impacts of one time series variable over another. The term error-correction is associated with the last-periods deviation from a long-run equilibrium, that is, the "error" affects its short-run dynamics. Therefore, ECM directly evaluates the speed at which the dependent variables return to their long run equilibrium after a given short

rundynamics of thevariables. With the assumption that all variables areco-integrated at first order, i.e., I(1), the ECM equation is given as follow:

$$\Delta Y_t = \mu + \sum_{=1}^{a} \alpha \Delta X_{t-1} + \pi ECT_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

where, $Y_t$is the dependent variable, μ is the intercept, ȧ is the short run coefficients, while Δ is the first difference operator, πECT_{t-1} is the ECT ,in its natural logarithm, π is speed of adjustment term.

Chapter 5

RESULTS AND EMPIRICAL DISCUSSIONS

5.1 Unit root test results

In this chapter we report the empirical estimation results and discuss the findings. We carry out unit root test, Johansen co integration test and VECM model. The unit root tests were estimated to confirm the stationary properties of the time series, through ADF (1981) and PP (1988). This is estimated to prevent the possibility of making spurious conclusions. We estimated Johansen co integration test to examine if long-run dynamic equilibrium relationship exists between the variables of interest. Subsequently, the ECM is estimated to analyze the short-run and long rundynamics of the variables and their speed of adjustment to their long run equilibrium.

Table 1 results show that the variables were not stationary in their level form. Under the individual intercept and individual intercept and trend, we could not reject the null hypothesis of no stationary. This necessitates us to evaluate the first differencing for the variables. At first difference, the null hypothesis of no stationary was rejected for ADF and PP unit root tests, while based on their t- statistics, the variables were all significant at 1 percent, 5 percent and 10 percent respectively. Therefore, we conclude that, the time series variables are integrated at first order or I(1).

Table 4: ADF and PP unit root tests

Variables	ADF		PP	
Level	t^{tt}	^{T}t	t^{tt}	^{T}t
LNGDP	-0.844	-3.894	-0.975	-2.046
LNINT	-0.895	-2.359	-0.956	-2.377
LNAGR_IMP	-2.409	-4.372	-2.288	-3.187
LNAGR_EXP	-1.316	-0.780	-1.316	-0.941
LNAGR_GDP	-1.329	-1.896	-1.656	-2.094
Δ	t^{tt}	^{T}t	t^{tt}	^{T}t
LNGDP	-3.557**	-3.564*	-2.896*	-2.8460
LNINT	-4.668***	-4.695***	-4.561***	-4.599***
LNIMP	-6.440***	-6.307***	-7.711***	-7.483***
LNAGR_EXP	-4.503***	-4.588***	-4.502***	-4.588***
LNAGR_GDP	-5.216***	-5.155***	-5.487***	-5.601***

Note: variables are all significant at first difference at 0.01 ***, 0.05 ** and 0.10 *, t^{tt} represent unit root tests under intercept term, while ^{T}t depicts unit root tests under intercept and trend respectively. Δ shows results at first difference.

We proceed to investigate whether there is a possible co-movement relationship among the variables of interest.

5.2Co-integration test

One necessary and sufficient condition for a co-integration analysis is that, the variables must be integrated at the sameorder. Since this condition has been satisfied, we c with the Johansen (1988)co-integration test. In Table 2 we report the co integration test results for both trace statistic test and maximum Eigen value statistic test. These tests are expected to have same conclusions.

Table 5: Johansen co-integration test

No. of co integration	Trace Stat.	P-value	Max-Eigen Stat.	P-value
None	90.9765	0.0004*	47.3073	0.0076*
At most 1	43.6691	0.1171	22.4762	0.0394*
At most 2	21.1929	0.3457	14.3602	0.2031
At most 3	6.83276	0.5972	4.25086	0.6279
At most 4	2.58191	0.1081	2.58191	0.2670

Significant at * at 0.05 percent level. At least 1 co integrating vector

From the results, we discovered that at least there exist one (1) co-integrating equations. We were able to reject the null hypothesis of no co integrating vector against its alternative. Therefore, we conclude that, there is an existence of long-run equilibrium relationships among the variables of interest. Even if these variables wander in the short-run, they will converge towards a common path in the long-run. By implication, there exists a long-run relationship between agricultural productivities and economic growth of a developed economy of China.

5.3 Vector error correction (VEC) model

Since the condition of co integration is met, we proceed to evaluate (VECM). The purpose of this model is to evaluate short-run dynamic causality and the speed of adjustment of the variables towardstheir long-run dynamic equilibrium relationships. The coefficient estimate of the ECT unlike what people assume may not always or necessarily be negative. Positive ECT coefficient estimate simply means there is a divergence, while negative means such variables are still far from their steady state, so if all things being equal, there is a tendency for converging towards steady state or equilibrium level. Below are the results from the analysis.

Table6: VEC results

Vector Error Correction Estimates					
CointegratingEq:	CointEq1				
LNGDP(-1)	1.000				
LNINTR(-1)	0.015				
	(0.152)				
	[0.102]				
LNAGRI_IMP(-1)	1.756				
	(0.349)				
	[5.035]				
LNAGRI_GDP(-1)	-0.542				
	(0.528)				
	[-1.028]				
LNAGRI_EXP(-1)	0.640				
	(0.235)				
	[2.725]				
C	-11.541				
Error Correction:	D(LNGDP)	D(LNINTR)	D(LNAGRI_IMP)	D(LNAGRI_GDP)	D(LNAGRI_EXP
CointEq1	-0.034	-0.087	-0.541	0.046	-0.038
	(0.019)	(0.197)	(0.116)	(0.041)	(0.146)
	[-1.842]	[-0.443]	[-4.67]	[1.116]	[-0.265]
D(LNGDP(-1))	0.607	2.281	-2.040	-0.873	2.599
	(0.194)	(2.061)	(1.213)	(0.431)	(1.534)
	[3.129]	[1.106]	[-1.680]	[-2.024]	[1.693]
D(LNGDP(-2))	-0.411	-2.371	-1.411	1.395	0.731
	(0.225)	(2.387)	(1.406)	(0.499)	(1.777)
	[-1.832]	[-0.993]	[-1.004]	[2.793]	[0.411]
D(LNINTR(-1))	0.010	-0.034	0.253	0.147	-0.237
	(0.024)	(0.255)	(0.150)	(0.053)	(0.190)
	[0.418]	[-0.133]	[1.685]	[2.756]	[-1.248]
D(LNINTR(-2))	0.031	0.094	0.125	-0.022	-0.334
	(0.029)	(0.307)	(0.181)	(0.064)	(0.228)
	[1.091]	[0.308]	[0.696]	[-0.346]	[-1.462]

D(LNAGRI_IMP(-1))	-0.002	0.106	-0.125	-0.028	-0.503
	(0.026)	(0.275)	(0.162)	(0.058)	(0.205)
	[-0.069]	[0.386]	[-0.768]	[-0.492]	[-2.455]
D(LNAGRI_IMP(-2))	-0.019	-0.169	-0.121	-0.095	-0.155
	(0.028)	(0.305)	(0.179)	(0.063)	(0.226)
	[-0.691]	[-0.557]	[-0.675]	[-1.501]	[-0.686]
D(LNAGRI_GDP(-1))	-0.020	-0.693	1.247	-0.138	1.272
	(0.088)	(0.935)	(0.550)	(0.195)	(0.697)
	[-0.229]	[-0.740]	[2.264]	[-0.709]	[1.826]
D(LNAGRI_GDP(-2))	0.099	-0.069	0.937	-0.021	0.108
	(0.083)	(0.887)	(0.522)	(0.185)	(0.660)
	[1.181]	[-0.078]	[1.795]	[-0.115]	[0.164]
D(LNAGRI_EXP(-1))	0.004	0.092	1.097	-0.047	0.271
	(0.039)	(0.415)	(0.245)	(0.087)	(0.309)
	[0.104]	[0.221]	[4.479]	[-0.539]	[0.878]
D(LNAGRI_EXP(-2))	-0.008	0.475	0.809	0.078	0.487
	(0.038)	(0.413)	(0.243)	(0.086)	(0.308)
	[-0.205]	[1.149]	[3.322]	[0.912]	[1.583]
C	0.077	0.009	0.560	-0.093	-0.293
	(0.027)	(0.291)	(0.171)	(0.060)	(0.216)
	[2.822]	[0.034]	[3.266]	[-1.531]	[-1.352]
R-squared	0.771	0.3178	0.803	0.695	0.495
Adj. R-squared	0.623	-0.123	0.675	0.497	0.166
Sum sq. resids	0.004	0.408	0.141	0.017	0.225
S.E. equation	0.014	0.154	0.091	0.032	0.115
F-statistic	5.223	0.720	6.306	3.521	1.512
Log likelihood	89.221	20.689	36.045	66.056	29.246
Akaike AIC	-5.324	-0.599	-1.658	-3.728	-1.189
Schwarz SC	-4.759	-0.033	-1.092	-3.162	-0.623
S Mean dependent	0.091	-0.021	-0.011	-0.038	-0.085
S.D. dependent	0.023	0.146	0.160	0.046	0.126
Determinant	1.78E-13				

resid covariance (dof adj.)					
Determinant resid covariance	1.23E-14				
Log likelihood	258.6463				
Akaike information criterion	-13.35492				
Schwarz criterion	-10.29029				

In Table 6 shows the estimatedcoefficients which is as expected. Theoretical expectations regarding the signs which depicts the possible relationships of the explanatory variables with the dependent variable is achieved. The ECT or speed of adjustment reported is negative and statistically significant at 1% significance. This implies that, deviation from the long-run path of growth per year wascorrected 3.4% annually. The goodness of fit of the model is found to be 77% which is a normal rate for time series data. The model is also found to be overall statistically significant given the F- statistics having a p-value <0.01.

5.4 Granger causality

We report in Table 7 the results for Granger causality test. The Pair wise causality test is hypothesizing such that, let sayX Granger causes a variable let say Y, If X granger causes Y, it means that the previous values of X contains information necessary for prediction of changes in Y, above what is contained in the previous values of Y (Engle & Granger, 1991). When it comes to lag length criterion selection(see Pindyck, 1991). For the study, Schwartz information criteria (SIC) are selected for a sequential procedure.

The results showmixed causality results. We found unidirectional, bi-directional and a non-Ganger causalityrelationships exist among the variables. Bi-directional causality relationship exists between agricultural import and Agricultural export, while we have a unidirectional causality relationships exist between Agricultural import and GDP; agricultural output and Interest rate; agricultural output granger causes agricultural import. The other variables as shown in results could not be forecasted. By implication we inferred that, agricultural import, interest rate, GDP and agricultural outputare useful predictor of economic growth of China. From this standpoint, it is clear beyond doubt that, the role agriculture development plays in the level of growth and development of a developed economy of China cannot be overemphasized. Our results show that agricultural productivity is an important factor for the economic growth of china.

Table 7: Pair wise Granger Causality

Null Hypothesis:	F-Stat.	Prob.	Causality	Direction
LNINTR↔ LNGDP	1.736	0.419	*No*	*None-*
LNGDP ↔ LNINTR	1.395	0.497	*No*	
LNAGRI_IMP ↔ LNGDP	5.155	0.075*	*Yes*	*Uni*
LNGDP↔LNAGRI_IMP	0.477	0.787	*No*	
LNAGRI_EXP↔ LNGDP	3.705	0.156	*No*	*None*
LNGDP↔ LNAGRI_EXP	0.072	0.964	*No*	
LNAGRI_GDP↔LNINTR	7.666	0.021**	*Yes*	*Uni-*
LNINTR↔LNAGRI_GDP	0.549	0.759	*No*	
LNAGRI_EXP↔ LNAGRI_IMP	6.163	0.045**	*Yes*	*Bi-*
LNAGRI_IMP↔LNAGRI_EXP	24.446	0.000***	*Yes*	
LNAGRI_GDP↔LNAGRI_IMP	2.343	0.309	*No*	*Uni-*
LNAGRI_IMP↔LNAGRI_GDP	7.799	0.020**	*Yes*	
LNAGRI_GDP↔LNAGRI_EXP	1.548	0.461	*No*	*None*
LNAGRI_EXP↔ LNAGRI_GDP	3.334	0.188	*No*	

Note: Uni- and Bi- indicates, there are either unidirectional causality relationships or bi-directional causality relationships.Significant at 0.01***, 0.05 **, and 0.10 * respectively.

Chapter 6

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Conclusion

The objective of this study is to unravel is the factors that contribute to agricultural growth and the role this sector play in economic growth of China. For sound empirical analysis purposes, we make use of time series econometrics techniques examine the existence of a short – run and long – run dynamic causality equilibrium relationships among the dependent variable and the explanatory variables. The study coverage periodis restricted to periods of 1984 to 2015 precisely 31 years based on data availability.

In order to have and work with a more stable model, we conducted time series unit root test of ADF and PP respectively. Study series were integrated of first order, which is a necessary and sufficient condition for a co integration vector analysis. We carried out Johansen co integration test which give room for a multivariate model, and found the existence of long-run dynamic equilibrium relationships among the variables of interest. At least, one co integration vector equation was estimated, which prompt us to estimate, vector error correction model (VECM) to evaluate the speed at which the variables moves from the short-run to the long-run equilibrium. We found a negative and significant 0.034 speed of adjustment towards the long run equilibrium in case of an economic shock in the agricultural sector. This is a good

measure of economic growth for China. This finding is in agreement with the study ofTang (2008) for China.

6.2 Policy Recommendations

With the discovery of the people's republic of China in 1949, she has witnessed major structural changes from the state owning all farm land and marketing farm output to the period where land was now being assigned to household shows the desire the government had visualized for the sector but more has to and can still be done in the following areas:

i) The study revealed that agricultural exports and agricultural imports bilaterally cause each other which indicate the history of one of this variable is a good predictor for the other; we recommend that better efficient trade policies be put in place to increase the growth in the economy.

ii) Also considering the log values of variable in the short run, there exist a positive statistical relationship between GDP and agricultural outputimplying that agriculture is viable source of economic growth in China, there more efficient measures and government expenditures geared towards increasing productivity be examined.

REFERENCES

Arthur, B. M. (1964). The role of agriculture in economic growth and Development.Oxford University Press.*Illinois Agricultural Economics.* Vol. 4, No. 3, pp. 1-10.

Carter, C. A. (2011). China's Agriculture: Achievements and Challenges. Update 14(5):5-7. University of California.Giannini Foundation of Agricultural Economics.

China Business Insight (2014).China's agricultural trade.Member of the Confederation of European Business.(Business Europe).*www.tusiad.org*

Cheng, G. (2005).China's Agricultural policies and rural development.

Chikwama, Cornilius. (2010) The role of rural off-farm employment in agricultural development among farm households in low-income countries: Evidence from Zimbabwe. *African Journal of Agricultural and Resource Economics.* 4.1: 1-22.

Dethier,J. J.&Effenberger,A. (2012).Agriculture and development: A brief review of the literature.*Economic System.*doi:10.1016/j.ecosys.2011.09.003.

Dekle, R.&Vandenbroucke, G. (2012). A Quantitative Analysis of China's Structural Transformation. *Journal of Economic Dynamics and Control*. 36, 119-135.

David, S.(2016).Contemplating China's Future. *The Washington Quarterly*. 39:3 pp. 121–130.

Dawson, P. J. Agricultural exports and economic growth in less developed countries.*Agricultural Economics.* 33.2 (2005): 145-152.

Dickey, David A., & Wayne A. Fuller (1981) "The Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root," *Econometrica.* 49, 1057-1072.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society*, 1057-1072.

Engle, R. F. & Granger, C. W. J. (1987) Co-integration and Error Correction: Representation, Estimation and Testing, *Econometrica.* 55, 251–276.

Felipe, J., Connie B. D, &Matteo L. (2016).The declining share of agricultural employment in China: How fast? Structural Change and Economic Dynamics 37, 127-137.

Granger, C. W. J. (1981) Some Properties of Time Series Data and Their Use in Econometric Model Specification, Journal of Econometrics, 121-130.

Gollin, D. (2010). Agriculture productivity and economic growth. In Handbook of Agricultural Economics, Burlington: Academic Press.

Guoqiang, C. (2007). China's agricultural trade: Issues and prospects. *International Agricultural Trade Research Consortium.*Chap 4, pp.81-104.

International Journal of Economics and Business Research 1.1 (2009): 61-75.

Justin, Y. L. (1992). Rural reforms and agricultural growth in China.*The American Economic Review.*Vol.82, No.1 pp. 34-51.

Johansen, S. &Juselius, K. (1990) Maximum Likelihood Estimation and Inference on Cointegration – with Applications to the Demand for Money, Oxford Bulletin of Economics and Statistics, 52, 2, 169–210.

Johnston, B. F., & John W. M. (1961)The role of agriculture in economic development. The American Economic Review 51(4), 566-593.

Johansen, S. (1988) Statistical analysis of cointegrationvectors.Journal of Economic Dynamics and Control. 12, 231-254.

Kamil, S., Sevin, U., & Festus, V. B. (2017).The contribution of agricultural sector on economic growth of Nigeria. *International Journal of Economics and Financial Issues*. 2017, 7(1), 547-552.

Katircioglu, S. T., (2006). Causality between agriculture and economic growth in a small nation under political isolation*International Journal of Social Economics.*Vol. 33 Issue 4 pp. 331 - 343.

Kuznets, S. (1966). Modern Economic Growth. New Haven: Yale University Press.

Kang, H. C., & Javier, A. B.(2013).Agricultural productivity, structural change, and economic growth in post-reform China. *Journal of Development Economics*. 104 (2013) 165–180.

Konya, Laszlo, & Jai Pal Singh.Causality between international trade and gross domestic product: the case of the Indian agricultural and manufacturing sectors.

Kuznets, S. (1961)Economic growth and the contribution of agriculture: notes on measurement. *International Journal of Agrarian Affairs* 3(2).

Ligon, E. &Sadoulet, E. (2008). Estimating the Effects of Aggregate Agricultural Growth on the Distribution of Expenditures,Background paper for the World Development Report.

Love, J. & Ramesh, C. (2005)Testing export-led growth in South Asia.*Journal of Economic Studies*. 32(2), 132-145.

Lewis, W. A. (1954)Economic development with unlimited supplies of labor.The Manchester school 22(2), 139-191.

Levin, A. & Lakshmi K. R. (1997)."Complementarities between exports and human capital in economic growth: evidence from the semi-industrialized countries." *Economic Development and Cultural Change* 46.1: 155-174.

Myrdal, G. (1984) International inequality and foreign aid in retrospect.Pioneers in development.151-165.

OECD Economic Surveys CHINA.(2015).OECD.www.wto.org

Olanipekun, I. O., Akadiri, S. S., Osundina, O., Bekun, F. V. &Alola, A. A. (2017) Investigating the influence of oil price, oil export on foreign reserve: Evidence from a panel of OPEC countries.*International Journal of Advanced Biotechnology and Research (IJBR)*. 8(1), 138-148.

Olanipekun, I. O., Saint Akadiri, S., Olawumi, O., &Bekun, F. V. (2017). Does Labor Market Hysteresis Hold in Low Income Countries? *International Journal of Economics and Financial Issues*, *7*(1).

Phillips, P. C. &Perron, P. (1988) "Testing for a Unit Root in Time Series Regression" *Biometrica*. 75, 335-346.

Rostow, W. W. (1960)the process of economic growth. No. HB199 R65 1960.

Ravallion, M. & Jose G. M.(2009). "The pattern of growth and poverty reduction in China."

Shujie, Y. (2000): How important is agriculture in China's economic growth? Oxford Development Studies, 28:1, 33-49.

Schultz, T. W. (1953).The economic organization of agriculture. No. HD1411 S43. 1953.

Tiffin, R. &Irz, X. (2006). Is agriculture the engine of growth? *Agricultural Economics.*35(1), 79-89.

Thornton, J. (1996) "Cointegration, causality and export-led growth in Mexico, 1895–1992." *Economics Letters.* 50(3),413-416.

Thungsuwan, S. & Thompson, H.(2003) "Exports and economic growth in Thailand: An empirical analysis." Notes 1.5.03, 1.

United Nation (2015) "The Millennium Development Goals Report", available at: www.un.org/millenniumgoals/pdf/mdg2015.pdf

Yan, W., &Yudong, Y. (2003). Sources of China's economic growth 1952–1999: incorporating human capital accumulation. *China Economic Review.*Vol. 14. Pp. 32–52.

Yongxin, Q.&Zeng-Rung, L. Y. (2002). An analysis of current problems in China's agriculture.

Zhang, L. X. (2000). Agricultural and Rural Development in China.Chinese Academy of Sciences.