이화여자대학교 국제대학원

2012 학년도

박사학위 청구논문

The Role of Agriculture for Pro-Poor Growth and Long-Term Structural Change in Myanmar

국 제 학 과

THAN, SHWE MAR

2013

The Role of Agriculture for Pro-Poor Growth and Long-Term Structural Change in Myanmar

by
Shwe Mar Than
Department of International Studies

A Dissertation
Submitted to the faculty of the
Graduate School of International Studies
of Ewha Womans University
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in International Studies
April 2013

Accepted by the faculty of the
Graduate School of International Studies
of Ewha Womans University
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy
in International Studies

Director of Thesis: Young-sook Nam _____

Faculty Committee: Eun Mee Kim _____ _____

Jai S. Mah _____ _____

Mi-kyung Yun _____ _____

Jinhwan Oh _____ _____

Young-sook Nam _____ _____
(Name and Signature) (Date)

Dedicated to my late parents
and
my dearest brother and sister

ကွယ်လွန်သွားကြပြီဖြစ်သော ကျေးဇူးရှင်မိဘနှစ်ပါးကို

ဤပါရဂူဘွဲ့ကျမ်းဖြင့်

ရိုသေစွာ ရှိခိုးကန်တော့အပ်ပါသည်။

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDIX 1 (TABLES)

LIST OF APPENDIX 2 (FIGURES)

LIST OF ABBREVIATIONS

ADB	Asia Development Bank
ASEAN	Association of Southeast Asian Nations
CSO	Central Statistical Office
DAP	Department of Agricultural Planning
IPRCC	International Poverty Reduction Center in China
IRRI	International Rice Research Institute
ISIC	International Standard for Industry Classification
LDC	Less Developing Countries
MAPT	Myanmar Agricultural Produce Trading
MNPED	Ministry of National Planning and Economic Development
MOAI	Ministry of Agriculture and Irrigation
SAMB	State Agricultural Marketing Board
SIDA	Swedish International Development Cooperation Agency
UIS	UNESCO Institute for Statistics
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programs
UNFPA	The United Nations Population Fund
UNICEF	United Nations International Children Emergency Fund
UOBAMB	Union of Burma Agricultural and Marketing Board
WB	World Bank
WTO	World Trade Organization

ACKNOWLEDGEMENTS

I would like to acknowledge the following people and institutions for giving me the wonderful opportunity to study at such a prestigious university as Ewha Womans University and to obtain the highest academic degree, a PhD. Without them I would not be standing where I am today.

First of all, I would like to express my deep gratitude to former Pro-Rector of Yezin Agricultural University, Dr. Khin Lay Swe, for encouraging me to apply for the scholarship offered by the Korean Government. Next, my gratitude goes to the National Institute of International Education Development, NIIED for offering me a full scholarship from the language learning period until the successful completion of my degree. Without their generous financial support, studying in the Republic of Korea would have remained as a dream for me. I would also like to thank the Myanmar Government for allowing me to pursue a doctoral degree abroad.

Let me show my deepest gratitude to my academic advisor and the dissertation director, Professor Young-sook Nam, for her kindness, encouragement, professional guidance and invaluable support throughout my academic journey in Ewha Womans University. She never failed to write the countless recommendations I requested. But most importantly, this dissertation would not have been realized without her untiring efforts and consistent supervision of my research and writing. I am so indebted to her. I would also like to express my sincere gratitude to Professor Jai S. Mah, for his kindness, wisdom

and great contribution to the methodology of my dissertation. He was always available to answer any of my questions and give very constructive comments. In addition, let me extend my deep gratitude to Professor Eun Mee Kim for her willingness to serve as the chair of my dissertation screening committee considering her busy schedule and many responsibilities as dean of the Graduate School of International Studies (GSIS). Her great professionalism, constructive comments, enthusiastic encouragement, and trust in me inspired me so much.

In addition let me reveal my sincere appreciation for Professor Mi-kyung Yun of Catholic University for her willingness to serve as an external examiner in my dissertation screening committee. I was so impressed by her great wisdom, comprehensive comments and constructive suggestions and questions. All of which were very beneficial to the successful completion of my dissertation. I would also like to thank Professor Jinhwan Oh for his interest in Myanmar and kind comments and suggestions to improve my dissertation as much as possible. I am so indebted to all of the committee members in my dissertation screening committee. Without their wisdom, kindness and cooperation, I would not have finished my work in time.

Let me also mention a few of my very good friends in Korea. Life would have been so difficult without their love, kindness, sympathy, support and encouragement during my emotional and eventful experiences in Korea. They were beside me when my mother got very sick and when she passed away. Through happiness and sorrow my friends have stuck by me and supported me.

These special companions are Lilly Kip Lee, Lay Lay Mon, The The Wyne Chit, Mr. Jeong Hyung Won, Mr. Cho Young Kwan, Mr. Kim Seok-ryong, and Mr. Song In-seong. I also do not want to forget to thank my classmates Kim Jin Kyung, Ha Jee Hae, Jun Hanna, and Wang Nana for always standing by me. My deep thanks go to the members of YAU Alumni in Korea (YAIK) for their love and companionship throughout my study. Additionally, I would like to thank all my Facebook friends for cheering me up online. Without this kind of communication in this modern era, I don't know how I would have survived.

My sincere appreciation goes to the office staff from the office of global affairs (OGA) and from the GSIS, especially Ms. Yoon-hee Lee, for always keeping me on track in each step of writing my dissertation. I would also like to thank the English Language editor, Professor Esther Hilsenrad of Chung-Ang University, for her speedy and professional work. Without her fast-paced editing I would not have submitted the second draft in time. And, I heartily thank my very first friend in Ewha GSIS, Gi-Young Alice Rhee, for her care and loving kindness and translation of my abstract to Korean.

Last, but not least, I would like to thank my family. My dearest brother and sister, Win Htut and Hin Hin Aye, for giving me endless love, support, care, and encouragement, without which, I would not have survived and successfully finished my studies. And finally I am very much indebted to my late parents for raising me to be the person I am today.

ABSTRACT

The role of agriculture in the economic development of less developed countries (LDCs) has drawn a great deal of attention from development economists as well as policy makers. The economy of Myanmar has been characterized by long-term stagnation, prevalent poverty and the structural stickiness towards agriculture for more than half a century. After a long period of international seclusion and economic stagnation, Myanmar has recently embarked on a series of reforms aimed at restoring democracy and putting the country on a sustained economic growth path. However, the government faces the daunting challenges of promoting industrialization for long-term economic growth, while at the same time achieving poverty reduction in the context of MDGs.

The objective of this dissertation is to investigate the role of agriculture in pro-poor growth and long-term structural change in the economic development of Myanmar. It attempts to make a unique contribution to the field by bridging the relationship between poverty reduction with agricultural productivity growth in the short-term and structural change in the long term for Myanmar's economic development. In particular, this study constructs the conceptual framework which delineates the processes of structural change and pro-poor growth and conducts econometric analyses to test the empirical models drawn from the conceptual framework.

The empirical analysis of this study consists of two parts. The first part of the study is devoted to the importance of agriculture in shorter-term policy goal of achieving poverty reduction and pro-poor growth. In particular, it tests the proposition that improvement in agricultural productivity contributes to poverty reduction in Myanmar. The factors contributing to agricultural productivity growth are also examined in this part. Time series data were obtained from the world rice statistics online data base from the International Rice Research Institute (IRRI). The study period was from 1965 to 2010.

The empirical models are tested by using simple regression analysis and some extension of the autoregressive distributed lag (ARDL) and vector autocorrelation (VAR) approaches to investigate the short run and the long run relationship among the value of lag periods and time effects. The results suggest that the agricultural productivity per hectare growth is a contributing factor for GDP per capita growth and they have both short run and long run relationships. Empirical evidence of this study supports the argument that enhancing agricultural productivity should be the focal point of designing development policy for poverty reduction.

In the second part, a comparative study was conducted to examine whether structural change contributes to economic growth of Myanmar and other economics in Asia. The sample countries were carefully chosen from ASEAN plus three nations and they are Myanmar, China, Indonesia, South Korea, Malaysia,

the Philippines, Thailand and Vietnam. Econometric analyses were conducted by utilizing time series data obtained from the UNCTAD online database. The study periods differ according to data availability and the stationarity of the time series. Therefore, data from 1991-2010 for Myanmar, 1985-2010 for Vietnam and 1980-2010 for the other six countries were taken into account.

The conceptual framework is constructed based on Lewis's dual economy model, incorporating Rostow's linear-stages-of-growth theory and neoclassical growth models. Myanmar is considered as being in the stage of the "pre-conditions for take-off". Four empirical models are constructed to examine the impact of structural composition on economic growth in Myanmar and other selected economies. The key structural change variables were the share of agricultural GDP growth (SAR), the share of industrial GDP growth (SIR), and the share of agricultural labor in total labor force (CALAR). The models support the hypothesis of increasing in the share of industrial GDP share matters on economic growth in the cases of Indonesia and Korea.

The two key structural change variables of SAR and SIR are significant for Myanmar but with opposite signs, which reflects Myanmar's structural stickiness towards the agricultural sector. In other words, the results imply that the reason for economic stagnation in Myanmar was not having the structural transformation during the study period. The statistically significant results for the importance of structural change for economic development in South Korea and

Indonesia can be used for the development policy implication for the long-term economic development in Myanmar.

This study suggests that structural change towards the industrial sector could be a key to achieving longer-term economic development and initiating the catching up process. At the same time, however, it is crucial to implement pro-poor or balanced growth policies to attain sustainable growth. Agricultural productivity development is the immediate solution to achieving this policy goal.

Key words: pro-poor growth, structural change, agricultural productivity growth, economic development, multiple regression, ARDL, VAR.

Chapter I. Introduction

The role of agriculture in the economic development of less developed countries (LDCs) has drawn a great deal of attention from development economists as well as policy makers. On the one hand, the experiences of most advanced countries suggest that countries should move away from the agriculture sector towards industry and services in order to achieve sustained economic growth. This structural change has been observed not only in advanced countries but also in other developing countries such as China and Vietnam which have achieved rapid economic growth in recent years. On the other hand, however, agriculture is viewed as a key sector to develop if a country with a vast majority of the poor residing in rural areas, wishes to attain pro-poor growth. In particular, the global effort to achieve poverty reduction in the context of Millennium Development Goals (MDGs) has highlighted the importance of the role that can be played by the agricultural sector in LDCs.

The objective of this study is to investigate the role of agricultural sector for pro-poor growth in the short term and the importance of structural change in the long-term economic development process of Myanmar. It attempts to make a unique contribution to the field by bridging the relationship between poverty reduction with agricultural productivity growth in the short-term and structural change in the long term for Myanmar's economic development. After a long

period of international seclusion and economic stagnation, Myanmar has recently embarked on a series of reforms aimed at restoring democracy and putting the country on a sustained economic growth path. The civil government which was inaugurated in March 2011 has been receiving strong support from the international community. The country is certainly at a critical juncture of economic reform. But the success of its reforms will depend to a large extent on the soundness of policies in addition to actual implementation.

One striking fact about the economy of Myanmar is that there has been very little structural change for over half a century. The share of GDP in agriculture has remained about 40 percent since 1937.[1] Despite its abundance in natural resources, Myanmar has remained as the poorest country among ASEAN members in terms of GDP per capita and stood at the position of 164th out of 185 countries in the world with 1,325 US dollars in 2011 (IMF). Booth (2000) observes that Myanmar's economic and structural stagnation over seven decades has been a unique phenomenon among the Asian economies.

The development process in LDCs has been explained by different theories within the discipline of development economics. Structural change theories view industrialization as a process of structural change, which deals with policies targeted at the economic structures of developing countries. The linear-stages-of-growth model, formulated by W. W. Rostow (1956), posits that there are five

[1] See in Appendix Table (2). Source: Booth, 2000:21, and MOAI, 2011:56

consecutive stages of development which all countries must go through with various lengths during the process of development. Rostow's model postulates five different stages: traditional society, transitional stage or pre-conditions for take-off, take-off, drive to maturity and age of high mass consumption. The main driving force underlying this process is the accumulation of capital as a means of spurring investment. The model was greatly inspired by the success of the Marshall Plan,[2] however, this theory has been criticized for its assumption that the conditions found in developing countries are similar to those found in Europe after World War II.

Arthur Lewis' seminal work of the dual sector model (1954) assumes two distinct sectors - the traditional or agricultural and the modern or manufacturing sectors – and views that the traditional sector consists of large amounts of surplus labor which can be utilized to spur the development of the modern sector. Lewis's dual sector model has been used to explain the economic development of China, Japan, Taiwan, and South Korea, among others. Fei and Ranis (1961) further developed a new model by incorporating the dual sector model and Rostow's linear-stages-of-growth theory to explain the development of the agricultural sector. In their model, agricultural commercialization point between phase II and III is Lewis' turning point, which is determined by the marginal productivity of

[2] The Marshall Plan (officially the European Recovery Program, ERP) was the American program to aid Europe where the United States gave monetary support to help rebuild European economies after the end of World War II in order to prevent the spread of Soviet Communism.

labor.[3]

Neoclassical growth models explain the conditions necessary to achieve long run economic growth, including productivity, capital accumulation, and technological change. They build on the Harrod-Domar model (1946) that highlighted the importance of productivity growth. Solow's growth model (1957) employed Cobb-Douglas production functions with two factors of production: labor and capital. The residual of the Solow model, total factor productivity (TFP), was shown to account for virtually all economic growth, highlighting the importance of technical progress.

While these theories explain the process of industrialization or economic development, they do not necessarily provide clear policy guidelines for a country like Myanmar which lacks many of the elements of pre-conditions for economic take-off. In general, transitional stage or pre-conditions for take-off include: economic change initiated by external demand for raw materials; development of more productive, commercial agriculture and cash crops not consumed by producers and/or exported; widespread and enhanced investment in the physical environment to expand production (i.e. irrigation, canals, ports); increased utilization of technology; and changing social structure and increasing individual social mobility.

[3] See detailed demonstration in Appendix Figure 2.

About 70 percent of the population dwells in rural areas and around 63 percent of the total work force relies on the agricultural sector in Myanmar. The modern sector, largely dominated by inefficient state-owned enterprises (SOEs), needs to go through difficult reform and a restructuring process. While the privatization of SOEs started in the late 1990s, there still remain a large number of inefficient SOEs. Meanwhile, boosting agricultural productivity is certainly likely to contribute to poverty reduction by increasing the rural household income. Indeed many studies have suggested that high agricultural growth rate has a direct impact on rural poverty alleviation (Binswanger and von Braun, 1991; Timmer, 1992; Johhson 1998). Strong agricultural growth lowers food prices for consumers, increases income for growers, and generates more jobs for rural workers. Therefore, the role of agriculture needs to be carefully examined and this study endeavors to contribute to Myanmar's development efforts in this regard.

This dissertation draws on the two strands of literature on the role of agriculture and structural change to construct a conceptual framework which not only accounts for longer term structural change but also the transition process in which agricultural sector plays a key role in achieving poverty reduction and pro-poor growth of Myanmar (see Figure 4.1 in Chapter IV and 5.1 in Chapter V). Underlying the conceptual framework is the proposition that in order to drive Myanmar's economy to achieve pro-poor, balanced and sustainable economic growth, all components of agriculture, industrialization, and trade and export

promotion should play their respective roles.

The empirical analysis of this study consists of two parts. In the first part, the study devoted to the shorter-term policy goal of achieving poverty reduction and pro-poor growth. In particular, it tests the proposition that improvement in agricultural productivity contributes to poverty reduction for the period between 1965 and 2010. The factors contributing to growth in agricultural productivity are also examined in this part. The empirical models are tested by using simple regression analysis and some extension of the autoregressive distributed lag (ARDL) approach to investigate the value of lag periods and time effects. The long run causality is checked by using the vector autoregression (VAR) model.

After examining the role of agriculture for shorter-term pro-poor growth in Myanmar the study examined the importance of structural change for longer-term economic development for Myanmar by taking evidence from the economic development process among sample countries. The comparative study is conducted to examine whether the structural change contributes to economic growth of Myanmar and other selected economies in Asia. Empirical models are constructed based on Timmer and Szimai (2000) which incorporate Lewis's dual economy model and neoclassical growth model. Econometric analyses are conducted by utilizing time series data for eight countries such as Myanmar, China, Indonesia, South Korea, Malaysia, the Philippines, Thailand and Vietnam. These countries are carefully selected from ASEAN plus three countries. The

study periods differ according to data availability and the stationarity of the time series. Therefore, data series of 1991-2010 for Myanmar, 1985-2010 for Vietnam and 1980-2010 for six other countries were taken into account for this study. A more detailed descriptive analysis is conducted for the cases of South Korea, China, and Vietnam in addition to Myanmar.

This study suggests that policy makers should drive the economy with faster pace agricultural growth while preparing it to meet necessary pre-conditions for take-off. After gaining some speed, there should be a gradual shift to labor intensive industrialization by developing value added agricultural or food industry and other labor intensive manufacturing. The development of agricultural productivity and increase in rural household income will reduce rural poverty, while creating job opportunities in urban areas through this process of new industrialization will increase the income of the rural population and ultimately lead to increase in per capita GDP in the long term.

Although many studies have suggested that importance of agriculture in economic development of low income countries, the question of how it contributes is still not well understood and remains much debated. This study attempts to fill the gap in the literature by constructing a conceptual framework and empirically testing its elements for the relationship between agricultural productivity growth and GDP per capita growth in Myanmar. This dissertation attempts to make a contribution to the field of economic development of LDCs in

two ways. First, this study puts the objective of pro-poor or shared growth at the center of the economic development process of LDCs highlighting the role of agriculture in short term economic development to attain the goal of poverty reduction. Second, the study emphasizes how agricultural sector can be served as a stepping stone for structural change and long-term economic development.

While structural change theories provide elaborate explanations of how economic development occurs in the long run, they do not pay much attention to the issues such as income inequality, poverty alleviation and inclusive development which are the focus of the current international efforts to achieve MDGs by 2015. The conceptual framework of this study puts agriculture at the heart of the economic development process of LDCs so as to achieve pro-poor growth. This study thus sheds lights on the prospect of inclusive economic development for many low income countries with a large share of agriculture in their economies.

This dissertation consists of six chapters which are organized as follows. After Chapter I, Chapter II presents a literature review on the role of agriculture in the development process and theories of economic development of LDCs, including empirical researches and findings. Chapter III provides a description of the economic situation of Myanmar with a particular focus on its agricultural sector and rural poverty. Chapter IV presents the empirical analysis for the relationship between agricultural productivity growth and poverty reduction in

Myanmar. Chapter V presents the importance of structural change in long-term economic development of Myanmar and other selected economies. Both Chapter IV and V include the conceptual framework, data, empirical models, results of econometrical analyses and discuss the main findings and their implications. Finally, Chapter VI presents a brief summary of the study and the main conclusions with policy recommendations that can be drawn from the findings of the study.

Chapter II. Literature Review

A. The Role of Agriculture in Pro-Poor Growth

The dominance of the agricultural sector is a common feature in most LDCs and has been a major determinant of economic growth in those countries. It accounts for between 30 to 60 percent of the gross domestic product (GDP) among the LDCs, employs more people than any other sector as much as 70 percent in most cases (UN, 2007). There has been a century long debate concerning the importance of agriculture in the economic development of a country regarding how it contributes to economic development process. There are two roles of agriculture in an economy: the traditional economic role and the non-traditional economic role (Stringer, 2001). The traditional economic role of agriculture in brief is to supply food for farm families and consumers, to employ labor, to supply raw materials to other industries and to earn income for the economy. In this role agriculture directly contributes to the economy and is easily measurable. The non-traditional economic role of agriculture, such as that of a public good or externality, and value added contribution to rural viability via tourism, is often neglected by governments and policymakers.

There are several engine of growth hypotheses in development economics such as agriculture as an engine of growth, export-led growth, trade as an engine of growth, industrialization as an engine of growth and so on. This study sought

how agricultural sector can serve as a link between pro-poor growth and structural change in the long-term. The study contributes not only for the case of Myanmar's economic development but also has significant implication for other LDCs.

Agriculture is important and will ever be important for the supply of food to feed the increasing population of the world. The world's population has reached seven billion as of October 2011. The world population is increasing by 100 million per year on average so that the world will have to feed 8 billion people by 2020 (WB, 2011). Furthermore, Ohkawa (1956) described that the demand for food is measured by the formula of $D = \rho + \eta g$, where ρ, g, and η are the population growth rate, income growth rate and income elasticity of agricultural products. Income elasticities of agricultural products are usually less than one because of their nature. However the income elasticity is relatively larger in developing countries than in developed countries. For example, poorer households spend more of their additional income on food for nutritional purposes, while wealthier households spend less of their additional income on food because they are already well nourished and the amount of their income is quite huge compared to their food expenditure. Whichever the case may be, if the population is growing, the demand for food will grow.

Increase in agricultural productivity improves the economic development of an economy. Studying the role of agriculture is important for balancing growth

between the agricultural sector and the non-agricultural sector. Most industrialized countries and newly industrialized countries had successful stories of agricultural development before they moved to the next economic development stage of industrialization.

Based on Fei-Ranis-Lewis model, there are three phases of agricultural development: pre-conditions for agricultural development, expansion of labor-intensive and capital-saving technologies, and expansion of capital-intensive and labor-saving technologies (Johnston and Mellor, 2011). Meeting the pre-conditions for agricultural development is crucial for the next step of adoption of capital-saving labor-intensive technologies. The pre-conditions are: sustaining a land tenure system, land reform, farmers' awareness to technological improvement, adult literacy, and access to the market and market information.

Developing the agricultural sector implies improving living standards of rural farmers and its spillover to agricultural traders, agricultural based manufacturers and consumers. Timmer (1995) and Johnston and Mellor (2011) described that increase in agricultural output and productivity contribute to over-all economic growth in five ways: i) substantial increase in demand for agricultural products could lead to economic development but fail to supply the demand which could lead to serious problems for economic growth; ii) agricultural export expansion could be a promising source of foreign exchange income for the nation; iii) the surplus labor from the agricultural sector could be

transferred to the non-agricultural sector; iv) net savings from the agricultural sector could become investment in the non-agricultural sector; and v) the rising net cash income of farm population could stimulate industrial expansion. Yao (2000) also mentioned similar data and added that agriculture has a passive role for development of the non-agricultural sector.

Yao has used the Vector Autoregressive Model (VAR) to analyze the importance of agriculture in China's economic growth. There were 45 observations and time series data of GDP indices in constant price of the five sectors of economy from 1952 to 1996. Yao hypothesized that the growth in the agricultural sector can create growth in other sectors, but the growth of other sectors cannot cause agriculture to grow. The five sectors she took into account in her model were agricultural, industrial, construction, transportation and service.

According to the VAR model results, Yao draws two important conclusions. Although share of agriculture in GDP decline sharply overtime, it is still an important force for the growth of other sectors, but the growth of the non-agriculture sector has little effect on agricultural growth. In her empirical research, the author questioned whether a proposed policy against agriculture was good or bad for the economic development of China. The results suggested that a pro-agriculture policy was still important to China's transforming economy.

Another key point is that the labor and land abundant country may utilize their resources for productive agriculture. Agriculture accounts for more than 20

percent of economic growth in most African countries (Awokuse, 2009). However, one interesting fact is that the large share of agriculture in GDP is only found in poor countries. For example, Myanmar has had about 40 percent of agricultural GDP share for about half a century (MOAI, 2012). Agricultural led growth (ALG) advocates suggest that creations of infrastructure and knowledge investment in agriculture are preconditions for agricultural growth (Schultz, 1964; and Timmer, 1995, 2002).

Matsuyama (1992) contested Schultz and Timmer's argument and claimed that agriculture is an engine of economic growth according to the comparative advantage concept. However, the comparative advantage concept is static in a sense and is not powerful enough to explain the dynamic features of economy. Importance of industrialization in the process of economic development does not mean that the role of other sectors is not important. The balanced growth path theory has emphasized that a dynamic agricultural sector is crucial to successful industrialization.

As long as there are differences between the level of agricultural and manufacturing productivity, according to Kaldor's third law (Mamgain, 1999), we are led to believe that if labor is moving into the manufacturing sector, the overall productivity of the economy will rise. In Kaldor's study, the rate of growth in the manufacturing sector *does* increase the growth rate of the non-manufacturing sector.

Awokuse (2009) has examined the role of agriculture as an “engine of growth” by analyzing data from 15 developing and transition economies in Asia, Latin America and Africa. Five countries from each region were selected. They are China, India, Indonesia, Malaysia and Thailand from Asia; Brazil, Chile, Colombia, Mexico and Venezuela from Latin America; and Kenya, Nigeria, Senegal, South Africa and Zambia from Africa.

The key interest lies in the relationship between the real GDP growth rate and agricultural productivity. However, Awokuse put forth four exogenous control variables: gross capital formation per capita as a proxy for capital, population as a proxy for labor, real exports, and inflation rate as a proxy for macroeconomic stability. The key variables are real GDP per capita and agricultural value added per worker. The Autoregressive Distributed Lag (ARDL) approach and co-integration and error correction models (ECM) were employed as econometric tools. The results from empirical analysis strongly indicated agriculture as an engine of economic growth. The results also suggested that openness in trade has a positive effect on per capita GDP growth. Although export has had a positive effect on GDP growth in Asian and Latin American countries, it is found to have a weak relationship for African countries.

Malaysia, a growing economy in ASEAN, also transformed its economy from a primary good dependent economy to an industrialized nation. Since the agricultural and industrial sectors have a complementary relationship, Gemmell

et al. (2000) examine how far agricultural output in Malaysia has been affected by inter-sectoral spillovers. The results suggest that expansion of manufacturing output, though associated with reduced agricultural output in the short-run, is associated with agricultural expansion over the long-run. They used the vector autoregressive (VAR) model to analyze the interdependence between the agricultural and manufacturing sectors. The empirical results found that a one percent increase of the manufacturing sector share in GDP contributes 0.67 percent increase in the agricultural sector share of GDP in the long run. On the other hand, the service sector has an inimical effect to agriculture both in the short run and long run sectors. According to the VAR model results, a one percent increase in the service sector share will reduce 0.47 percent of the agricultural sector share to GDP.

Jatuporn *et al.* (2011) study about the long run relationship between agricultural growth and economic growth in Thailand. They used time series data from 1961 to 2009 and conducted the Granger causality approach to test the short run relationship between agricultural sector growth and economic growth. Later, Wald (χ^2) test is used to detect the long run relationship between these two variables. They conducted the five step unit root model after testing whether the variables had unit root. The steps ran the model without constant and time effect, with constant, with constant and time effect, and then bi-variate model of testing the effect of agriculture on GDP and GDP on agricultural growth.

Another interesting study done by Brückner (2012) was the relationship between economic growth and size of the agricultural sector of a nation. His research area was Africa and he pooled data from 41 African countries from 1960 to2007. He used the rate of urbanization to reflect the structural change in economies. The other instrumental variables which reflected the change are the amount of rainfall, and the international price indices of agricultural commodities and natural resources. His estimated model utilized the changes of the logs of GDP per capita and agricultural value added share, the changes in logs of international price index of natural resources, and the level of rainfall and rainfall squared, and ran the model by using 2SLS, GMM, LS and the Fuller test.

Brückner (2012) found that the increase in the international price of natural resources decreases the share of the agricultural sector in the economy. If there is enough rainfall, he observed an increase in agricultural productivity and a lower rate of urbanization. His results also support the common view in development economic literature that an increase in per capita income significantly increases the rate of urbanization shifting out of agriculture. Echevarria (1997) and Laitner (2000) also supported these findings.

Tiffin and Irz (2006) tested the hypothesis of agriculture as an engine of growth for 52 developing economies. Agricultural value added per worker and GDP per capita are key variables to test this hypothesis. After investigating the non-stationary of the data series they conducted the Granger causality test to find

out the causality and non-causality for the variables. There is pair wise cointegration between GDP per capita and agricultural value added in all of the countries except for those omitted due to lack of data in the series. The striking feature of these results is that for the vast majority of cases, the evidence points to the fact that agricultural value added is causal of GDP.

Hussain and Khan (2011) also worked on the relationship between agricultural and GDP growth rate in Pakistan for 1961-2007 and looked for the short run and long run causality between agricultural growth rate and GDP growth rate. They used the ARDL model by using Akaike Information criteria to determine the optimal lag. The Johenson cointegration test was conducted to test the long run relationship between variables. The method of Ordinary Least Square has been used to show the contribution of agriculture growth rate towards GDP growth rate. The results revealed that a 1% increase in the agriculture growth rate brings 0.34% increase in GDP growth rate.

Most of the development economists emphasize the importance of the role of the agricultural sector in early stages of economic development. This study also argues that agriculture is a starter engine of economic growth. However, agriculture is not powerful enough to drive the economy to move with desired speed. In the long run, we need a more powerful non-agricultural engine to drive the economy faster or to catch up to the growth of other economies. No country has ever achieved rapid economic growth at the early stages of development

without substantial growth in the agricultural sector except for select city or island states, such as Hong Kong and Singapore (Hazell *et al.*, 2007).

Although many scholars support the fact that agriculture is a key player in the economic development of low-income countries, the question of how it contributes is still under debate. It seems to be a paradox in the economic development of a country. Most of the developing countries have been actively involving in price intervention in their agricultural sector, which results in low output, slow agricultural growth, and ultimately slow economic growth. Timmer (1995) suggested moving agriculture in the direction of free trade and avoiding agricultural pricing to drive the agricultural sector on the right path.

Market signals are important in a market economy. Historically, markets have been signaled by three classic features about the role of agriculture in economic development: the declining share of agriculture in total GDP in the long run structural transformation of the economy; the decline in real prices of agricultural produce – for example, the real price of rice has been declining by $5 per ton every year if it is calculated with 1980 dollars; and the sharp instability in agricultural produce prices because of weather abnormalities and scarcity. The declining share of agriculture in the long term suggests relatively less importance of the sector compared to other sectors of the economy in the long-term economic development.

Pro-poor growth has been broadly defined as growth that leads to significant reductions in poverty (UN, 2000; OECD, 2001). The relative definition of pro-poor growth requires that increase in the income share of the poor. The simple version of this definition states that growth is pro-poor if inequality falls (White and Anderson 2001; Kakwani and Pernia 2000). The other definition is "growth is pro-poor when the distributional shifts accompanying growth favor the poor" (Klasen, 2004; Kakwani and Pernia, 2000; McCulloch and Baulch, 1999; Kakwani and Son, 2003). This definition states that growth is considered to be pro-poor if and only if poor people benefit in absolute terms, as reflected in some agreed measure of poverty (Ravallion and Chen, 2003; Kraay, 2003).

The first target of the Millennium Development Goals (MDGs) is to decrease the extent of extreme poverty by one-half by the year 2015. Poverty remains a predominantly rural problem with a majority of the world's poor located in rural areas (Dercon, 2009). According to the *Rural Poverty Report* published by International Fund for Agricultural Development (IFAD) in 2001, more than 350 million rural people have lifted themselves out of extreme poverty. But a recent report in 2011 noted that global poverty remains a massive and predominantly rural phenomenon – with 70 per cent of the developing world's 1.4 billion extremely poor people living in rural areas (IFAD, 2011).

Since the vast majority of the poor resides in the rural sector and relies mostly on agriculture, increasing the household income by boosting agricultural productivity is a very clear solution to the problem. Many studies suggest that a high agricultural growth rate has a direct impact on rural poverty alleviation (Binswanger and von Braun, 1991; Timmer, 1992; Johhson 1998). Strong agricultural growth lowers food prices for consumers, increases income for growers, and generates more jobs for rural workers. It also has the spillover effect of reducing internal migration. A World Bank study in 1996 notes that the rural poverty will be reduced by one percent if agricultural growth rates exceed more than 3 percent a year.

Bresciani and Valdes (2007) served as editors to a group of well known authors in the book, Beyond Food Production: Role of Agriculture in Poverty Reduction. They conducted six case studies of countries from three different continents. Chili, Mexico and South Africa represented upper-middle-income economies and India, Indonesia and Ghana portrayed the lower-middle-income countries. Different authors use different methodologies to measure the effect of agricultural performance on poverty reduction in different country case studies. The research emphasized the links among agricultural growth to poverty in terms of labor market, farm income and food prices. They argued that it is impossible to evaluate all the possible ways in which agricultural growth could affect poverty levels due to the multi-dimensional nature of poverty and that there is no magic

pill to cure poverty.

The study about Chile concluded that agricultural growth significantly improves all measurements of poverty, and changes in food prices and labor income are the most important factors related to poverty reduction. Lopez and Anriquez (2007) evaluated how agricultural growth affects real unskilled worker wages, employment levels and real food prices using this information on changes in household income so as to measure the impact of agriculture growth on the incidence and severity of poverty. In the study for Mexico, the authors adapted the Foster, Greer and Thorbecke (FGT) poverty index to estimate the effect of rural and urban growth on poverty. The empirical results showed that both rural and urban growth influenced poverty reduction; however, the former seems to display a relatively stronger effect. In addition, they argued that rural growth also has a positive effect on decreasing income inequality in urban areas, while urban growth seems to have the opposite effect. The results for Indonesia showed that agricultural growth has the highest impact on poverty reduction in all estimated models.

The study about Ghana utilized the FGT poverty index to decompose poverty trends during the 1990s. Al-Hassan and Jatoe (2007) then estimated the linkages between four sectors of the economy and poverty reduction. The results showed that growth in the non-farm sector has a higher impact on poverty alleviation than growth in the farm sector. The experience from South Africa is

explored using an error correction model to estimate the determinants of food prices, and found a significant correlation between food production growth and lower food prices. Kirsten *et al.* (2007) concluded that agricultural growth has a positive effect on poverty reduction through real income effect. In addition, based on secondary studies, the authors argued that agricultural growth also reduces poverty by decreasing unemployment levels. Generally it can be concluded that the contribution of agricultural growth to poverty reduction was consistently greater than to agriculture's share to GDP.

Christiaensen *et al.* (2011) studied the spillover effect of growth of agriculture to the other sectors and they argued that the poverty reduction effect of growth in a particular sector may differ for two reasons: one sector may be bigger than the other and/or the marginal effect on overall poverty of an additional percentage point of overall GDP growth originating in one sector may be bigger if one sector employs more of the poor.

Datt and Ravallion published several studies on poverty issues especially concerning India. In one study of Datt and Ravallion (1998) they compared and contrasted two time series data set for 1958-78 and 1976-94. They found that during the former period real consumption per capita went down by 0.93 percent while poverty increased by 1.18 percent per year. During the latter period the average increase in real consumption of 1.96 percent had an effect on poverty reduction of 1.91 percent per year. They found the relationship between higher

agricultural growth and reduction in poverty in one of their studies in 1996. They related changes in crop yields to poverty and showed reduction in poverty is a result of growth within the (agricultural) sector. They found another striking finding, while agricultural growth and service sector growth have a major effect on poverty reduction, but, growth in manufacturing sector does not have effect on poverty reduction. Yield of crops has a major effect on real wage and it is eight times larger in the long run than in the short run, which implies that the poverty reduction needs some time to occur.

Datt and Ravillion (1998) showed there were three variables to find relationships between the agricultural sector growth and poverty reduction. They found that rural wage rate, food prices and poverty rate were closely related and had large effect on each other. Nominal wage rates reflect the income of farmers and food prices reflect agricultural productivity. Higher productivity gives a higher wage rate and causes higher income for farmers. Higher productivity again reduces the food prices in general so that higher productivity results in poverty reduction (Schnieider and Gugerty, 2011). In fact, India has the strong and long enough data sets for poverty studies amongst nations. The data on income distribution in various poverty related variables are available for India. Many studies point out there is no sign of upward pressure on overall inequality because of higher growth (Bruno, Ravallion and Squire, 1996).

Huppi and Ravallion (1990) found that wage earnings of poor self-

employed farmers grew faster than earnings from other sources and was the major cause of poverty reduction. Ravallion (1989) showed that the poor had a disadvantage from increases in agricultural prices in the short run, but not in the long run. This fact is consistent with the theory that increase in price stimulates increase in demand for labor via increase in agricultural production in the long run. Data clearly showed the growth in agriculture reduced poverty, but it is not growth in general.

Timmer (1997) studied poverty and purchasing power for 35 developing countries. In countries under the study, agriculture shared 25 percent of total GDP on average and employed 51 percent of labor force. He found that a one percent growth in agricultural GDP per capita led to a 1.61 percent increase in per capita income of the bottom quartile of the population.

Christiaensen and Demery (2007) find that growth originating from agriculture is on average significantly more poverty reducing than growth originating from non-agriculture. Montalvo and Ravallion (2009) also found that the primary sector rather than the secondary, manufacturing, or tertiary sectors was the real driving force of the strategy for China's fight against poverty. There is a common finding that the poverty reducing power of agriculture declines as countries get richer (Christiaensen and Demery, 2007). Poverty analysis for China done by Ravallion and Chen (2007) estimated that agricultural growth has four times greater impact on poverty reduction than growth in the secondary and

tertiary sectors.

There are non pro-poor agricultural growth findings in empirical studies as well. Warr (2002) conducted research by using pool data from Indonesia, Thailand, Malaysia, and the Philippines. The study found that the service sector has the greatest effect on poverty reduction in those four ASEAN[3] countries. According to Warr and Wang's (1999) study on Taiwan, industrial growth was the most poverty reducing factor.

Poverty incidence in the Kyrgyz Republic was as high as 44.4 percent of absolute poverty and 13.8 percent of extreme poverty in 2002. Two thirds of people and three quarters of the poor reside in rural areas. However, poverty incidence declined due to better performance in agriculture. The government of Kyrgyz has done land reform and reallocation to farmers. Land rights have been secured. As a result, the agricultural productivity has grown, reducing the poverty incidence of rural people (ADB, 2004).

The countries in Greater Mekong Subregion (GMS)[4] have various poverty head count ratio level from 10-40 percent and ADB believes that by increasing agricultural productivity poverty could be reduced (ADB, 2003). To meet the set

[3] An organization of ten countries in Southeast Asia – Indonesia, Malaysia, the Philippines, Thailand, Singapore, Myanmar, Laos, Cambodia, Brunei and East Timor - set up to promote cultural, economic and political development in the region.

[4] The Greater Mekong Subregion is not a geological region, but rather, a development project formed by the Asian Development Bank in 1992 that brought together the six states of the Mekong River basin, namely Cambodia, Laos, Myanmar, Thailand, Vietnam, and the Yunnan Province of China.

goal, the working group on agriculture emphasized animal health of livestock trading, effective use of agricultural biotechnology, upgrading sanitary and phytosanitary standards, extension education for women farmers, increased use of information technology, postharvest management of rice crop, education on soil nutrition management, and a study on demand and supply of key agricultural produce.

In conclusion, the study adopts the framework of Schneider and Gugerty (2011) and modified to serve as conceptual framework for the first part of dissertation, the role of agriculture in poverty reduction. The role of agriculture for poverty reduction and to serve as a stepping stone for industrialization is unquestionably important in a low income country like Myanmar with abundant unskilled labor, favorable weather, and large area of arable land.

B. Importance of Structural Change during the Economic Development Process

This section presents the development theories and relevant empirical studies for economic development of LDCs and also serves as the theoretical framework for the empirical study of the second part of this dissertation. Growth economics is concerned with full employment in advanced economies and development economics focuses on the initiation and acceleration of economic

growth in less developed economies (Ruttan, 1998). There were three waves of growth theories after the late nineteenth century: Harrod-Domar, Solow-Swan and Romer-Lucas.[5] However, structuralists assume that the resources are not fully utilized especially labor in most of LDCs' cases.

1. First Generation Structural Change Theories

Structural change theories view industrialization as a process of structural change and deal with policies targeted at the economic structures of developing countries.[6] Arthur Lewis' seminal work of the dual sector model (1954) tries to explain how a developing country moves from a traditional agricultural base to a modern manufacturing-led economy. The model assumes two distinct sectors, i.e., the traditional or agricultural and the modern or manufacturing sectors and views that the traditional sector can be utilized to spur the development of the modern sector. There is a large amount of labour surplus in the agricultural sector assuming the marginal product of labour is zero. The modern or manufacturing sector offers higher wages than the agricultural sector, thus attracting surplus labour from the agricultural sector. The internal labour transfer will stop when the wage rate in both sectors is equalized.

---

[5] See Harrod [1939: 14-33; 1948], Domar [1946: 137-47; 1947: 343-55], Solow [1956: 65-94], Swan [1956: 343-61], Romer [1983; 1986: 1002-37], and Lucas [1988: 3-42].

[6] The term industrialization is somewhat ambiguous. In the international standard of industrial classifications (ISIC), the industrial sector includes not only manufacturing but also mining, construction, and utilities. However, the term usually refers to the expansion of the manufacturing sector. This paper uses it in the latter sense.

It is also assumed that the wage offer in the manufacturing sector is fixed. The manufacturing sector will make a profit because they charge a price above the fixed wage rate. The dual sector model assumes that these profits will be reinvested in the business in the form of more fixed capital. The process continues until all surplus labour from the agricultural sector has been employed. As a result the manufacturing sector will grow and the economy will have moved from a traditional to an industrialized one.

Lewis' model has been criticized on a number of grounds: the wages are not fixed because there is upward pressure from labour unions resulting in the manufacturing sector not making much profit; the profits they generate may not necessarily be reinvested in the form of fixed capital; and the labour transfer from the agricultural to the manufacturing sector may not be easy because a vast majority of the workforce have low education and are unskilled. It was also criticized for lacking details on the types of surplus labour and wage determination mechanism, which can cause difficulties in actual policy formulation (Brown; 2006, and Fields 2006, Wang and Piesse; 2009). Although the conceptual framework of the model is inspiring, it has been difficult to conduct empirical work. Wang and Piesse (2009) defined two types of surplus labour: absolute surplus labour (ASL) and relative surplus labour (RSL). Other social and institutional problems arise when there is a mass movement of rural labour to the urban area, namely, laborers seeking higher wages when

urbanization plans have not yet been realized.

Lewis' dual economy theory is considered as the single most influential contribution to development economics as an academic discipline (Karkpatrick and Barrientos, 2004). After more than 50 years since the publication of Lewis' work, there still remain questions regarding how to transform the agrarian structure. Lawrence (2004) suggests that the transition to development implies the promotion of large-scale agriculture, land reform and other policies which assist the development of small scale agriculture. In fact, Lewis' discussion of the model (Lewis 1954, 1958 and 1979) says very little about the specifics of agricultural development. Leeson (1979: 199) proposes to name the two economic sectors of the Lewis model as 'subsistence' and 'capitalist' rather than agricultural and industrial. With this adaptation the model becomes applicable to plantations and other large-scale agricultural models as a capitalist sector within the rural area, which relies on a supply of labour from the rural population, while the small-scale agriculture is to be considered as the subsistence sector of the economy (Beckford, 1972, Lawrence, 1975).

While Lewis takes his model from the supply side of the economy only, the other development models suggest economic growth from the demand side of the economy. The "vent-for-surplus" theory, which was developed by Burmese economist Myint (1958), explains the rapid expansion of agricultural exports in certain land-surplus developing countries during the latter half of the nineteenth

and early twentieth centuries. Myint accepts all the assumptions of the Lewis model. While Lewis works with a closed economy, Myint's theory is based on an open economy. The key question is how to make use of surplus capacity. The function of trade in an open economy is to allocate resources more efficiently between the domestic and export sectors. The model assumes considerable flexibility in domestic production and consumption and a great degree of mobility among factors of production. Thus, Myint considered the economy both from the demand side and the supply side (Fuglie, 1991).

"Linear-stages-of-growth" theory is one of the most well-known structural models of economic growth developed by W. W. Rostow (1956). The model postulates that all economies must go through five consecutive stages of development, of varying length: the traditional society, the preconditions for take-off, the take-off, the drive to maturity, and the age of high mass consumption. The main driving force underlying this process is the accumulation of capital as a means of spurring investment.

Rostow's model was greatly inspired by the great success of the Marshall Plan, however, the model has been criticized for its assumption that the conditions found in developing countries are the same as those found in Europe after World War II. It has also been criticized for not recognizing that capital accumulation is not a sufficient condition for economic development.

In Rostow's model, the "traditional society" is characterized by subsistence agriculture. The "preconditions for the take-off" stage are reached when there are economic changes initiated by external demands for raw materials; development of more productive, commercial agriculture and cash crops not consumed by producers and for export; widespread and enhanced investment in the physical environment to expand production (i.e., irrigation, canals, ports); increased utilization of technology; and changing social structures which increase individual social mobility, develop the national identity and create shared economic interest. The "economic take-off" begins when the manufacturing sector expands to fulfill the demand in both domestic and export sectors. The economy is at the "drive to maturity" stage when large-scale industrial diversification and investment in social infrastructure such as schools, universities, and hospitals occur. The economy is at the stage of "high mass consumption" when consumers have disposable income beyond all basic needs and for other additional goods, which leads to widespread consumption of high-value-luxury goods.

The continuing importance of the agricultural sector in many poor economies today suggests that it is crucial to understand the determinants and specificities of structural change. Alvarez-Cuadrado and Poschke (2010) studied the structural change patterns of 12 countries by using data from the nineteenth century. A declining share of agricultural employment in total labor force was a key feature of the economic development for those countries under study. There

are two main drivers. Improvement in agricultural technology, combined with Engel's Law, releases resources from agriculture (labor push), while improvement in industrial technology attracts labor out of agriculture (labor pull). The study concluded that the 'pull' factor dominated until about WWII and the 'push' factor dominated afterwards. It was also found that the 'pull' factor matters more in the beginning of structural change.

Echevarria (1997) studied the changes in sectoral composition associated with economic growth. She studied time series data in OECD countries for 15 years. She utilized the dynamic equilibrium method which indicates that the sectoral composition explains 22 percent of variation in growth per capita. According to her model the development is realized when the share of agriculture in national product falls from 26 percent to 12 percent while manufacturing share arises from 53 to 60 percent and the service sector increases from 21 to 28 percent.

Yaghmaian (1994) suggested that export led growth in LDCs contributes more when pre-conditions such as structural changes meet and the manufacturing sector contributes more to the export sector and to overall economic growth. Masters and McMillan (2001) used pool data of 132 temperate and tropical countries and found that the higher income of temperate countries are because of transition of their economies from agriculture to industrialization and service economies because of unfavorable weather for agriculture.

2. Second Generation Structural Change Theories

Ranis and Fei (1961) formalized Lewis's theory by combining it with Rostow's "linear-stages-of-growth" theory and explained the developmental stages in the agricultural sector. They disassembled Lewis's two-stage economic development into three phases, defined by the marginal productivity of agricultural labour. They assume the economy to be stagnant in its pre-conditional stage. When the creation of an infant non-agricultural sector starts, the economy enters into phase one. The agricultural labour starts to be reallocated to the non-agricultural sector. Due to the abundance of surplus agricultural labour, its marginal productivity is extremely low and average labour productivity defines the agricultural institutional wage.

When the redundant agricultural labour force has been reallocated, the agricultural marginal productivity of labour starts to rise but is still lower than the institutional wage. This marks the shortage point or Lewis' 'turning point' at which the economy enters phase two of development. During the phase two stage, the remaining agricultural unemployment is gradually absorbed. At the end of this process, the economy reaches the commercialization point and enters phase three where the agricultural labour market is fully commercialized.

Kaldor's and Verdoorn's Laws also considered the economy from the demand side and supported industrialization as an engine of growth. Kaldor's first

law states that the growth rate of an economy is positively related to the growth rate of the manufacturing sector. The second law of Kaldor-Verdoorn states that an increase in the rate of growth of manufacturing output leads to increases in labour productivity of that factor. The third law states that productivity in the non-manufacturing sector increases as the rate of growth of manufacturing output increases. Kaldor might have based his law on the Lewis model in which labour moves from the rural subsistence sector to the capitalist sector (Mamgain, 1999). Verdoorn's law (Verdooorn, 1966: 289) pertains to the relationship between the growth of output and the growth of productivity. It states that faster growth in output increases the productivity due to increasing return.

Mamgain (1999) tested the applicability of Kaldor-Verdoorn Laws in the selected East Asian NIEs. The results showed that high growth rates in manufacturing did not translate to high labor productivity rates in Singapore, Indonesia, and Thailand. However, it was true in the case of South Korea, but resulted in a negative outcome for Malaysia. According to the study, analyzed data revealed that the level of productivity in the manufacturing sector is consistently higher than that of agriculture in all NIEs.

Timmer and Szirmai (2000) examined the structural bonus hypothesis for the manufacturing sector of Asian economies. They examined the role of structural change in explaining aggregate productivity growth in the manufacturing sectors of four Asian countries - India, Indonesia, South Korea and

Taiwan - over the period of 1963-1993. They used the conventional shift-share analysis and assumed the increasing returns to scale described in Verdoorn's Law. The results do not support the structural-bonus hypothesis, which states that during industrial development factor inputs shift to more productive branches.

Chenery and Strout (1966) provided the conceptual foundation to remove the constraints for raising savings and investment. They developed the model of foreign aid and investment required for developing countries. It was consistent with achieving sustained economic growth. The intervention policies are needed for allocation of increased savings and investment from both local and abroad to more productive sectors of the economy.

In the second wave of economic development theories, Robert Solow (1956) and his followers assumed the economy at the full employment level and they implicitly assumed the advances in technological change were free and for the public good which was not feasible in reality. A major short coming of these theories was lack of consideration of technological change as an exogenous variable. They emphasized long run economic growth, which is not suitable to apply to the case of LDCs because most LDC economies are looking for immediate economic change. Solow accepted all of Harrod-Domar's assumptions except that of the constant rate of fixed proportion of capital required per unit of output.

Solow employed the Cobb-Douglas production with two factors of production: labor and capital (L and K), assuming the model is homogenous of degree one which implies diminishing returns to capital accumulation because the second derivative of the factor K is negative.[7] In the Solow growth model, the Solow residual which is total factor productivity (TFP) virtually accounts for all economic growth. Solow states that the economies gradually converge to their steady state growth path in the long run. Steady state growth path is attained when capital and output growths are growing with constant rate.

Neoclassical economists emphasized the fundamental causes of growth and development such as economic, political, social institutions, governance, corruption and so on. However, they stated that the prime mover and main driving engine of living standard is technological progress along with human capital formation. Prescott (1988) employed the Solow growth model to explain the growth of the US economy from 1909-49 and the results pointed out that four-fifths of the growth in the US economy was due to the technological change coefficient, which completely reversed the earlier implications of Harrod-Domar.

Along the Solow's balance growth path (BGP), capital and labor shares of income are constant by construction according to the Cobb-Douglas production

[7] Solow's growth model: $Y=AK^{\alpha}L^{\beta}$, where Y=Total output, A=Unchanged level of technology, K=Capital, L= Labor. $\alpha+\beta=1$ implies the model is homogenous of degree one and two inputs: capital and labour are substitutable one for another. $\alpha<1$ means second derivatives of capital resulted negative value, which implies the decreasing return on capital.

function. It implies the growth rate of output per worker is constant overtime, and the capital income and capital efficient labor ratios are also constant, which leads to a steady growth state (He, 2007. P.81). The Ramsey-Cass-Koopmans model[8] also assumes the savings rate is exogenous and a constant and the return to capital or real interest rate is also a constant in the long run (Pio, 1994).

During the economic development process, the reallocation of labor from the low per capita output sector to the higher per capita productivity sector occurs (Timmer and Szirmai, 2000). It is very important to allocate scarce labor to optimize productivity and to maximize per capita returns to labor across industries. Industrialization is viewed as a process of structural change. According to convergence theories, investment in capital goods is the main vehicle for convergence because low capital-labor ratio countries will give higher marginal returns to investment, which enhances rapid growth (Szirmai and Verspagen, 2011).

There are success stories and evidence in newly industrialized East Asian economies such as in Taiwan, Singapore, Korea, and Hong Kong. Baumol (1967) argued that the poor countries with low capital per labor ratio grow faster than that of the rich countries, which makes convergence in the long-run. There is a

[8] $Y_t=F_t(K,L) = K^{\alpha} (A_tL)^{1-\alpha}$; The economy has perfectly competitive production sector that uses Cobb Douglas aggregate production function. $L\infty/L$ is growth in labor supply and exogenously determined at a constant rate. A is index of labor productivity that grows at $\approx$A constant rate. [RCK model of the Ramsey (1928), Cass (1965) and Koopmans (1965)]

converging club in OECD countries but no universal catching up of LDCs is observed.

Azariadis (1996) pointed out the conditions for prolonged poverty in LDCs such as institutional and political failures, weak law enforcement, insufficient protection of property rights, confiscatory taxation, corrupt bureaucracy, disincentive to enterprises and capital accumulation, and unproductive rent-seeking behavior. He suggested democracy and good political institutions can be expected to foster the economic development of a less developing country. He proposed other exogenous factors, which are geography of a country, natural resource endowment, climate, topography, culture, and ethnic diversity.

Tyler (1980), Yaghmaian (1994), Sachs and Warner (1995), and Radelet *et al.* (1997) studied the effect of the openness to the growth of economy. During the 1970s, the conventional wisdom of export promotion policies was widely accepted and it was found that countries which discriminated the export sector were likely to have lower economic growth rates. Findings from their empirical studies supported the export-led growth hypothesis.

Bosworth *et al.* (1995) studied 88 LDCs and industrialized countries from 1960 to 1992. They found that the TFP effect on growth is surprisingly small for LDCs, while trade openness has a positive effect and large budget deficit has a negative effect on growth. Otkulu and Ozdemir (2004) also found similar results

in their study on the economic growth of Turkey.

Tyler (1980) studied the relationship between development policies and the growth of 55 different countries from 1960-1977. Tyler did the Pearson and Spearman rank correlations between the GDP growth rate and various other economic variables such as growth rate of manufacturing output, growth rate of manufacturing good export, growth rate of export, growth rate of FDI inflows, growth rate of domestic investment, and growth rate of net barter terms of trade. Among all variables, the correlations between the growth rate of manufacturing output and GDP growth rate were found with the highest value.

Sachs and Warner (1995) found open economies show faster growth in their study of 111 closed and open economies. Michaely (1977) focused on the experience of developing countries and he found a significant positive relationship between proportional per capita income growth and the proportional increase in the ratio of exports to GNP in 41 developing countries.

Radelet *et al.* (1997) focused on why East Asia economies grows faster than rest of the world and they noted that it is because of export led growth policies together with macroeconomic stability, convertible currencies, innovative institutions, establishment of export processing zones, duty exemption schemes and incentives to attract foreign direct investments. They also pointed out that well developed social infrastructures are very important for economic growth

when treated as endogenous factors to explain why the US has 35 fold output per capita than that of Niger.

Gregorio (1992), Knight and Villanueva (1993) and Hall and Jones (1999) addressed human capital to explain the variation of output per worker. Their results show that investment in physical and human capital, public investment, outward-oriented trade policies, and macroeconomic stability have positive impact on growth, while the amount of government spending and political instabilities have negative impact on growth. Low investment ratio and high population growth explain the low growth rate in African countries.

Senhadji (2000) also studied about 88 countries from 1960-1994 and found that total factor productivity function contributes less in LDCs. The critical parameter, the share of physical capital in output, was econometrically estimated. He examined the determinants of cross-country differences in TFP and pointed out that the level of TFP as the more relevant variable to explain the growth. Public consumption, real exchange rate, external debt to GDP ratio, and war causality to population ratio, had negative effects on growth of LDCs.

Medina-Smith (2001) showed that physical investment, population growth and export growth are key players of Costa Rica's economic growth. However, research carried out within the neoclassical framework did not shed much light on driving forces behind the determinants of growth proxies: physical capital, human capital and technical change (Ruttan, 1998).

Ercolani and Wei (2010) investigated China's rapid growth over the period of 1965 to 2002, employing the framework of Lewis-Ranis-Fei theory of the dualistic economic development model. They found that China's economic growth was mainly due to the development of the non-agricultural (industrial and service) sectors, driven by rapid labour migration and capital accumulation. They concluded that the Chinese economic reform in 1978 coincided with the beginning of phase two. The phase three growth could occur when China's agricultural labor market was fully commercialized.

Foellmi and Zweimuller (2008) explained the relationship between structural change and economic growth by using Engle's consumption cycle and Kaldor's facts of economic growth. Taking the economy from the demand side, they argue that the non-linear Engle's consumption curve causes the structural change. Poor societies spend mostly on basic goods, especially on food items, and these necessity goods are income inelastic, while non-agricultural manufactured goods are almost unit elastic and luxuries are highly elastic. If households get richer, they will spend more on manufactured goods and luxuries. Production and supply will respond according to demand.

As the demand for agricultural goods decline, labor from the agricultural sector shifts out of the agricultural sector to more demanding sectors. As the share of the budget on food declines, the share of labor in agriculture declines. The coexistence of stagnating and expanding industries imply a changing sectoral

composition and a continuous reallocation of labor across sectors. Their model also addresses the two-way causality between economic growth and structural change, which captures the realistic pattern of structural change and is capable of reproducing the great structural transformation from the agricultural sector towards the industrial and service sectors.

Laitner (2000) tried to relate the neoclassical variable of savings rate to structural change. He included two sectors in his model: agriculture and manufacturing. Engle's law states that when income is low, agricultural consumption is important and production on land is a major capital accumulation factor. Technical progress creates higher income and demand shifts to manufacturing goods. The study showed that the average propensity to save rises when the economy industrializes.

Industrial development is a major driving force for structural change, which is a key development process. Virtually, all cases of high, rapid, and sustained economic growth in modern economic development have been associated with industrialization, particularly significant share and growth in the manufacturing sector (Szirmai, 2009). A highly positive correlation of 0.79 between the log value of per capita income and the share of manufacturing sector was observed in his study. The share of manufacturing goods in total commodity in Taiwan was as high as 77 percent and those of other countries have 72 percent in Switzerland, 64 percent in Japan, 63 percent in the US, 72 percent in Germany,

66 percent in South Korea, 63 percent in Thailand, 58 percent in Malaysia and 52 percent in China.

There are nine points for the importance of industrialization in economic development and the structural change process argued by Szirmai (2009). They are as follows: the degree of industrialization and per capita income are highly correlated; there is a structural change bonus when resources are transferred from the agricultural to industrial sector; industrial production and growth are more dynamic than those of the agricultural and service sector; there is no Baumol's disease effect; capital accumulation can be faster in the manufacturing sector; advantage of economies of scale; technological advances in the manufacturing sector continues to be very important in the economic catch up process; spillover effects are stronger in the manufacturing sector; and the demand for industrial goods tends to increase as income rises (Engel's Law).

Castiglione (2011) uses the quarterly time series data of the US from 1987 to 2007 to test the relationship between long-run growth rate of labor productivity and the growth rate of output for the manufacturing sector. The Cointegration and Granger Causality test were done and the results found that the variables are integrated of order (1,1) and cointegrated.

As a conclusion, a regular feature of economic growth is the simultaneous movement of a series of economic variables: improved technology, human capital

accumulation, investment, savings, and the systemic change in productive structures. The increase in savings rate and higher investment ratios are usually regarded as essential for the acceleration of economic growth. Rapid economic growth in developing countries is the result of the reallocation of labor towards high-productivity activities subject to increasing return to scale. 'Deep' transformation translates into the rapid rise in the standard of living, whereas the opposite is true for 'shallow' transformation (Ocampo, 2003).

3. New Growth Theories

Massive divergence in absolute and relative per capita income across countries draws more attention to the economists in modern economic history.[9] The apparent inconsistency between the neoclassical implications and lack of evidence of convergence toward steady state growth even in current developed economies motivated and gave birth to new growth theories (Romer, 1983: 3). Lucas (1988) stated that by assigning technology a great role as a source of growth implied every other role to be minor, and also does little to explain the wide diversity in growth rates.

The major difference between the neoclassical and the new growth theories is treatment of technological progress, which was treated as an endogenous variable in new growth theories. The models of Romer (1986) and Lucas (1988) have attracted many development economists. Romer argued that

[9] See Kuznets, 1955; 1966; Maddison, 1979: 27-41; Pritchett, 1995; Prescott, 1997]

long-run growth is driven primarily by the accumulation of knowledge by forward looking, profit maximizing agents.[10] They abandoned the conventional assumption of diminishing return to capital accumulation of the neoclassical school. Capital is defined in a broader sense as the combination of physical capital, human capital and knowledge capital. Knowledge can be accumulated without limit. They, therefore, assume that human capital does not diminish over time. They also assume the labor and capital ratio to be constant, which allows some unemployment while the neoclassical school assumes output at the full employment level.

Income rises because of technological change, which is evident from the Industrial Revolution in Europe. K. Pomeranz (2000) named it as a great divergence. The most important mechanism of economic growth is the creation of new technical knowledge in the R&D department of firms (Romer, 1986). He assumes factors other than knowledge are in fixed supply. This implies knowledge is only capital for production of a good. The model is known as the AK model where ‘A’ stands for the level of technology and ‘K’ stands for human capital or level of knowledge accumulation.

The argument of new growth theorists is the most important problem for economic development of LCDs, which is not lack of physical capital but lack of human capital and technical knowledge. To catch up with other economies, they

[10] See Romer [1986: 1003]

have to invest more in human resource development, education and the health sector. Romer (1986) argues that technological progress is the prime mover of economy and agents respond according to market signals. Lucas (1988) argued the more accumulation of human capital the more productive the society as a whole. The formation of human capital must go through an educational development process.

They assume technology continues to grow so that the growth continues in the long run. The rate of innovation in advanced countries determines the growth of their economies, but for LCDs, the imitation is cheaper and faster. The fast growth of China is the evidence of this concept. Acemoglu and Zilibotti (2001) argued that the OECD countries designed their economies to make use of their skilled labor force. However, the LDCs have a low skill labor force resulting in a lower growth rate.

Sena and Fontenele (2004) suggest that economic growth policies are very crucial for LDCs' growth. The macro variables they considered in their study are education level, skill of labor force, saving rates, services provided by government and volume of trade. Madsen *et al.* (2009) tested the new growth theories on the growth of India. R&D investment, international R&D spillover, distance to technology frontier and economic reform effectively explain India's economic growth.

Lin and Zhang (2007) focused structural change on growth, converging technological progress in both the traditional and modern sectors and found that the technological progress in the traditional sector happens horizontal innovation based on expanding variety, while the technologies in the modern sector become not only increasingly capital-intensive but also progressively productive over time. Application of the basic model to LDCs shows that the optimal industrial structure is endogenously determined by its factor endowments.

It is clear that the emergence and advancement of information and communication technology (ICT) made the world different during the 1970s. Teixeira and Silva (2011) argued that countries which are not yet at the technological frontier have high opportunities to catch up through ICT. The lagged values of the share of both technological- and knowledge-driven industry to total GDP promoted share of manufacturing goods in export and therefore have a significant impact on the level and growth of per capita GDP. He also found that the imports of technologically advanced products also contribute positively to aggregate growth.

There are some advantages for the late-comers to industrialization. The advantages of backwardness are the late-comers' benefits from technological spillover from advanced industrialization, as well as not needing to invest time and money in the industrial R&D sector (Gerschenkron, 1962). Late-comers can copy the best practices from advanced countries, avoid suffering from

environmental damage, and they can be at the forefront when technology makes its U-turn.

We can conclude that the unprecedented rate of technological advances during last two decades is remarkable in world economic history. Even poor countries were able to participate in this progress. However, global macroeconomic stability is crucially important to continue the economic development of any country. In other words, growth in poor nations requires that the world economy be able to absorb a rapid increase in the supply of tradable produced in the developing world (Rodrik, 2009). Based on the literature review of growth theories, the study utilized the Lewis's dual sector model incorporation with neoclassical foundation. Kaldor's first law is adopted and modified to hypothesize the study. Although Lewis' model consider the supply side of the economy implicitly assuming the economy as a closed one, the study take economy from both supply and demand side and assumes as an open economy.

Chapter III. Overview of Economic Structure, Agricultural Economy and Poverty in Myanmar

A. Overview of the Economic Structure

The stages of structural change in economic development generally involve the step-wise transition of GDP dependence from the agricultural sector to labor-intensive manufacturing jobs and to advanced industrial and technological employment (Lin, 2012). Economic growth of many developed and developing countries including some LDCs in Southeast Asia, such as Laos and Cambodia, have been accompanied by a decline in the share of the primary agricultural sector and a rising share of the industrial sector. In contrast, the structure of Myanmar's economy largely remained unchanged for more than four decades due to the unchanging share of agriculture in GDP and agricultural labor as a major proportion of the total labor force.

In Myanmar, the agricultural sector contributed about 39.9 percent of the GDP in 2010, while the industrial and service sectors contributed 22.6 percent and 37.5 percent, respectively (MOAI, 2011). On average, the share of agricultural GDP from 1938 to 2010 was 44.53 percent with a standard deviation (SD) of 3.5 percent. For the same period, the industrial GDP share was only 9.16 percent on average with a SD of 3.25 percent. The share of agricultural labor in total labor force was 65.30 percent on average with 1.84 percent of SD and the industrial

labor share was 9.36 percent with 0.97 percent SD.[11] The small SDs indicate very little change in the economic structure of Myanmar since the 1930s.

For decades Myanmar's economic development policies have relied heavily on agriculture. The socialist government and its successors emphasized the agriculture sector as a major engine of growth for the nation's economy. However, it is observed that the agricultural sector was heavily exploited and lost its growth potential (Kudo, 2007). During the socialist era, crops were classified into planned or controlled crops and non-planned or uncontrolled crops. The cultivated land was also classified into planned and non-planned areas. In the planned area, farmers had no right to decide what to grow, how to grow and when to grow crops. Farmers had to follow government-dictated cultivation plans. Furthermore, the government's agricultural policies provided no incentive to farmers. The agricultural product market was also seriously distorted by the government.

The successive governments also put more emphasis on the maximization of production rather than on the maximization of farm income. For example, farmers were given pressure to grow more rice regardless of the small benefit per acre, further increasing their debt. Because of scanty income, there was not enough savings for investment, which led to poor productivity.

[11] See Appendix Table 2. Source: Booth (2000) and MOAI (2010)

Apart from mismanagement and policy failure in the agriculture sector, there are other factors which contributed to the economic stagnation of the Myanmar economy. The socialist government implemented inward looking import substitution economic policies. It also nationalized private industries. Many business men and entrepreneurs were put into jail for no particular reason. As a result, the number of state owned enterprises increased significantly during the socialist era.[12] By the early 1980s, government expenditure on SOEs was about 50 percent of the total government expenditure (Thein and Than, 1995). The SOEs, however, did not perform well and caused huge budget deficits. For that reason, the share of the manufacturing sector in GDP has remained more or less unchanged for several decades.

Additionally, Myanmar has had a dual exchange rate system. General Ne Win overvalued the local currency to discourage export and the subsequent military government never tried to unify the exchange rates until 2011, when democratic government came into power. No private investment or foreign investment was welcomed during the socialist economy period. As a result, Myanmar's economy deteriorated dramatically. The official exchange rate had been unreasonably pegged at around 6.0 Ks per dollar for more than seven decades against market rates, which varied from 58 Ks in 1990 to 1293 Ks in

[12] Political era of Myanmar: Before 1885 is monarchy era, 1985-1948 is colony era, 1948-1962 is Parliament Democracy era, 1962-1988 is Myanmar way of socialism era, 1988-2010 is Military Regime.

2007, which means there was a 95.5 percent depreciation of currency within 17 years.

To make matters worse, Myanmar's economy seems to have suffered from the Dutch disease, an economic phenomenon leading to exchange rate appreciation because of a large inflow of foreign currency. Myanmar discovered new natural gas fields in 1995 which fueled military expenditures. There was no transparency during the military regime and all government expenditures and national income accountings were not officially announced. Aside from the new gas field discovery and the growing export of natural gas, the government promoted other foreign exchange earning activities such as gem shows (from yearly to biannual events). During gem shows, the market exchange rate appreciates notably. The exchange rate appreciation harms the sectors which contribute most to total exports,

As a result, Myanmar's export share in the region dramatically fell. In 1937, Myanmar took 11.5 percent of the export share of all ASEAN exports and was the wealthiest country among Southeast Asian nations. However, Myanmar's share of export in ASEAN gradually fell to 6.2 percent (1955), 4.7 percent (1965), 0.7 percent (1980) and, 0.3 percent (1995 and 1998). During the same period, Thailand increased its share of total ASEAN exports from 4.7 percent (1937), to 9.1 percent (1955), 13.1 percent (1965), 17.6 percent (1995) and 16.5 percent (1998).

Myanmar has never been incorporated into the flying geese pattern of industrialization in Asia and the Pacific. In Asia, Japan was the one who made the first take off in industrialization. Hong Kong, Taiwan, Korea and Singapore, four countries with newly industrialized economies (NIEs), followed with export-led growth by industrialization followed by the second-tier NIEs of Indonesia, Malaysia and Thailand. When a country develops, wage rise leads to a loss in the comparative advantage of industries. Then, investors move to labor abundant countries to take advantage of their lower wages. Thus, the second-tier NIEs gain opportunities for economic development. While Myanmar is in a good position given its abundant labor and low wages, the country has not taken advantage of this opportunity.

B. Performance of the Agricultural Sector

As discussed above, Myanmar has given the agricultural sector a top priority among other sectors of the economy for about half a century. However, the performance of agriculture has not been satisfactory compared to other countries' performances. Table 3.1 presents the labor productivity in terms of USD per labor for three sub-sectors of selected economies. Agricultural labor productivity of Myanmar and Vietnam is the same and China and Thailand are 2.28 and 2.59 times more productive than Myanmar. Korea is almost 21 times.

Table 3.1 Labor Productivity in the Agricultural, Industrial and Service Sectors of Selected Countries (2011)

	Unit	Myanmar	Vietnam	Philippines	Malaysia	Thailand	China	ROK	Israel	USA
Total GDP	USD Mil	50,200	121,600	216,200	247,600	339,400	6,989,000	1,164,000	245,300	15,060,000
Share of agricultural GDP	percent	43	20	12.3	10.2	12.2	9.6	3	2.5	1.2
Share of industrial GDP	percent	20.5	41.4	33.3	42.1	45.3	47.1	39.4	31.2	22.2
Share of Service GDP	percent	36.6	38.6	54.4	47.8	42.5	43.3	57.6	64.7	76.6
Total Labor Force	Million	32.53	48.23	39.81	11.6	39.81	816.2	25.09	3.227	153.4
Share of agricultural labor	percent	70	53.9	33	13	42.4	38.1	7	2	0.7
Share of industrial labor	percent	7	20.3	15	36	19.7	27.8	23.6	16	20.3
Share of service labor	percent	23	25.8	52	51	37.9	34.1	69.4	82	79
Per capita production in agriculture*	USD	**948** (1.00)	**936** (0.99)	2,024 (2.14)	16,747 (17.67)	**2,453** (2.59)	**2,158** (2.28)	**19,883** (20.97)	**95,019** (100.23)	168,299 (177.53)
Per capita production in industry*	USD	4,519 (1.00)	5,142 (1.14)	12,056 (2.67)	24,962 (5.52)	19,604 (4.34)	14,508 (3.21)	77,453 (17.14)	148,229 (32.80)	107,363 (23.76)
Per capita production in service*	USD	2,456 (1.00)	3,772 (1.54)	5,681 (2.31)	20,006 (8.15)	9,560 (3.89)	10,873 (4.43)	38,505 (15.68)	59,978 (24.42)	95,192 (38.76)
Per capita Income (PPP)	USD	1,300	3,300	4,100	15,600	9,700	8,400	31,700	31,000	48,100
Investment/GDP	percent	16	33.2	19.8	20.3	26.9	48.4	27.4	18.8	12.4

Source: UCTAD, * = Author's computation based on above data, Numbers in parentheses are times of productivity than Myanmar's respective productivity.

more productive, Israel is 100 times more productive, and the US is 177 times more productive than Myanmar

1. Agricultural Growth and its Importance in Transitional Stage

The average GDP growth and component sectors of economy such as agricultural, industrial and service sectors' growth rate by decade and by political era from 1970 to 2010 are estimated and presented in Table (3.2). During the 1980s, the performance of all sectors of the economy was very poor with many negative growth rates for several years. After implementing an open door market oriented economic system in 1988, economic performance improved. Around the year 2000, Myanmar found new natural gas and oil fields and started commercial production in 2003, which contributed to the surge in industrial growth for the period of 2001 to 2010.

Table 3.2 Growth Rate of GDP and Component Sectors of Myanmar Economy

Period	GDP Growth (%)	Agricultural Growth (%)	Industrial Growth (%)	Service Growth (%)
1970-1980	4.19	6.45	3.49	2.60
1981-1990	1.40	3.47	0.01	0.86
1991-2000	7.12	7.12	6.55	7.55
2001-2010	12.05	7.10	23.79	13.57
1970-1988	2.74	5.16	1.05	0.73
1989-2010	9.01	6.75	14.52	9.79
1970-2010	6.19	6.04	8.46	5.71

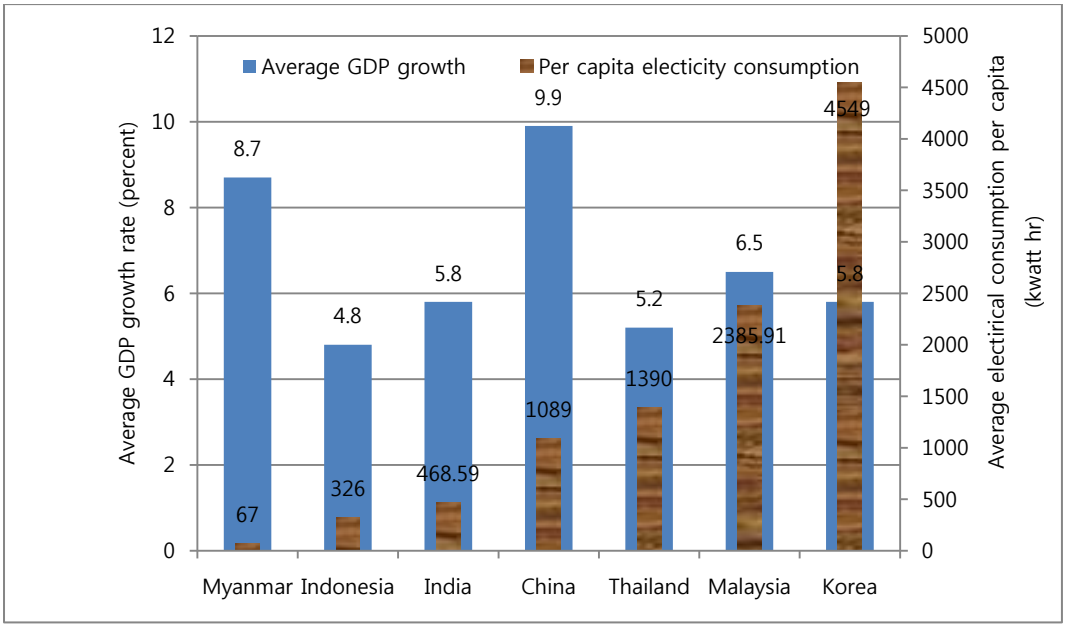
Source: UNCTAD

The per capita electricity consumption is usually used an indicator of living standard and level of industrialization of any country. Figure 3.1 shows the average GDP growth rate and average electrical consumption per capita for some selected countries during 1990-2006. The 17 year average shows Myanmar has the lowest per capita electrical consumption with 67 kilo watt hr per year while other countries such as Indonesia, India, China, Thailand, Malaysia, and South Korea consumed at 326, 469, 1089, 1390, 2386, and 4549 kilo watt hr per capita per year respectively.

Power cables do not reach most rural areas in Myanmar and only a few industries are run by electricity.[13] Even in big cities, there are severe electrical shortages for household use during summer when major hydro power stations usually have lower power production. Myanmar still has to practice an alternate power distribution system during summer. Because of limitation in electricity supply, the level of industrial expansion is very minimal and contributed only 17.3 percent to total GDP in 2009-10 (MOAI, 2011). Economic and industrial growth rates during the decade of 2001-2010 were relatively higher than other decades because of the export surge of natural gas (Table 3.2).

[13] WB said only one out of four people in Myanmar has access to electricity. One of the WB working groups, International Financial Corporation (ICF), committed to 165 million loans without interest for the electricity sector development in Myanmar (2013, February 5).

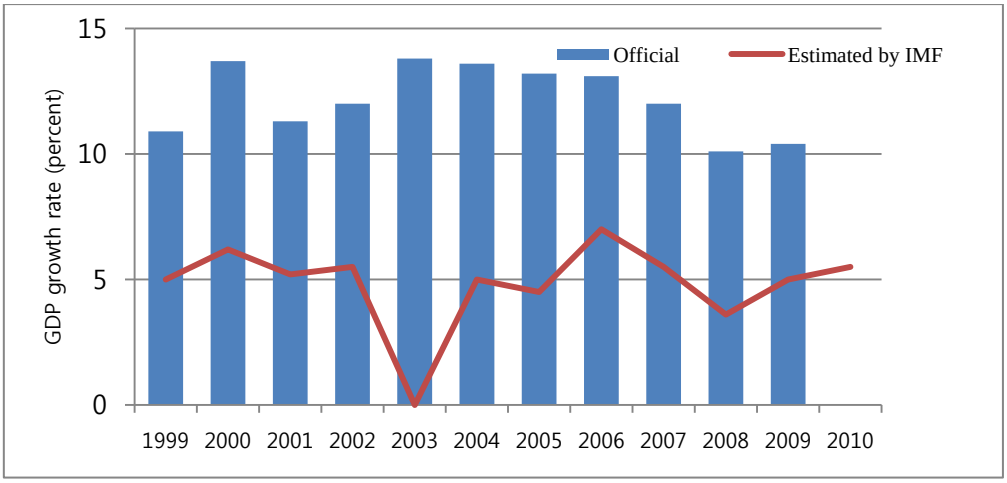
Figure 3.1 Average GDP Growth Rate and Per Capita Electrical Consumption for Selected Countries during 1990-2006.



Source: ADB Database

Many scholars and international financial institutions have doubts about the official GDP growth rates of Myanmar. Many of them believe that the official estimates are exaggerated and need to be re-adjusted to reflect the real situation for the people of Myanmar. The gap of growth estimates by the International Monetary Fund (IMF), an international institution, , and the official estimates are presented in Figure 3.2.

Figure 3.2 The Comparison between Official and IMF Estimated GDP Growth Rates of Myanmar (1999-2010)



Source: IMF

Rahman and Tun (2011) compared and contrasted the official GDP growth rate and IMF estimated growth in their study. Although official average GDP growth is 12.19 percent for the period of 1999-2010, the US dollar term and trade value adjusted economic growth was only 4.83 percent for the same period (Figure 3.2). The economic growth rate estimated by the IMF is more relevant to the amount of per capita consumption of electricity. Very low level of per capita electricity consumption seems to indicate that Myanmar is not yet ready for industrialization in the very near future.

2. Major Crops and Allocation of Land

The agricultural sector contributed about 40 percent of GDP in 2010-11 and crop production contributed 31.9 percent to the Myanmar economy or 80 percent of the agricultural sector. Thus, agriculture constitutes almost one third of national income. Although agriculture is major earner of nation's economy, the productivity has not yet reached to its frontier and there are a lot of rooms to develop. The wide range of crop diversification is required to boost agricultural income. The optimal allocation of land to maximize farm income and the encouragement of non-traditional cash crops such as fruits, vegetables, and cut-flowers are recommended to sustain agricultural growth.

There are ten principal, traditional crops which receive major attention from the government. They are two cereal crops; rice and corn, two industrial crops; cotton and sugarcane, three oil seed crops; groundnut, sesame and sunflower, and three pulses; black gram, green gram and pigeon pea.[14] Rice always has received top priority in terms of loan, irrigation, other subsidies, research and extension. Twenty million acres or 34 percent of total sown area were allocated to rice. Productivity in pulses soared from 17,000 MT in 1989/90 to 831,000 MT in 2000-01. However, the allocation of land to pulses is only 19 percent of total sown area. The third largest growing area is allocated to oil seed

[14] Pulses are annual leguminous crops and sometimes called as peas and beans. But, this study uses pulses representing all kinds of leguminous crop production.

crops which account for 14.5 percent for groundnut, sesame, sunflower and niger together. MOAI classifies the oil palm as a perennial crop so it is not included in oil seed crop. Major crops and land allocation to respective crops are presented in Table 3.3.

Table 3.3 Major Crops and Sowing Area in Myanmar (2011-12)

No.	Crop	Sown area ('000 ha)	Percent of total sown area
1	Rice	8050	34.15
2	Pulses	4501	19.10
3	Sesame	1585	6.72
4	Groundnut	877	3.72
5	Sunflower	859	3.64
6	Rubber	504	2.14
7	Cotton	351	1.49
8	Cotton	351	1.49
9	Soybean	169	0.72
10	Niger	158	0.67
11	Sugarcane	152	0.64
12	Oil palm	125	0.53
13	Mustard	101	0.43
14	Tea	95	0.40
15	Jute and Kenaf	15	0.06
16	Others	5677	24.09
	Total	23570	100.00

Source: MOAI, 2012

Despite having top priority, rice production is not satisfactory. Official data shows the increasing trend of rice production, but there is no increasing trend in rice export (Appendix Table 4). Successive governments have aimed at maximizing output, but not at maximizing the profit or income of farmers.

Generally, the high yield variety of rice is not quality rice. That is why Myanmar rice is not worth as much as Thai and Vietnamese rice in the world rice market (Myanmar Rice Exporters Association). Rice after rice or summer paddy cultivation was introduced in the early 1990s and total production of rice at that time increased and rice export exceeded one million metric tons in 1993-94. Summer paddies need irrigation and high rates of input consequently they are not as profitable as other crops such as peas and beans. There is a trade-off between water productivity and fertilizer consumption.[15] To maximize water productivity high fertilizer application is required which is costly, risky and environmentally unfriendly.

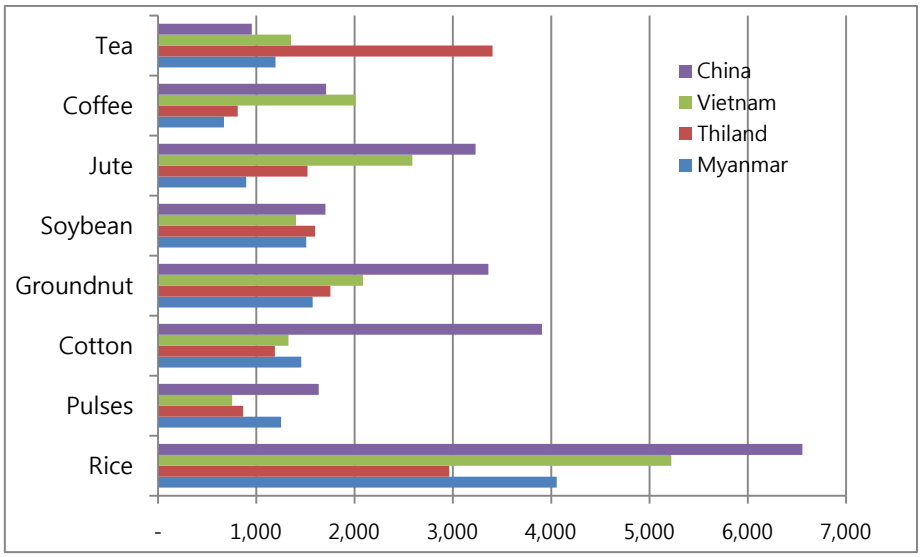
Due to the high production cost of rice it is not so profitable and price competitive anymore. Additionally, it requires more irrigated water than any other crop. For example, for the similar soil type and weather condition, rice needs irrigated water of 750-1440 mm per hectare, while other crops such as wheat need 375 mm, maize, sorghum, and groundnut need 510 mm, 150 mm, and 360 mm per hectare respectively (Chandy, 2004). One FAO study revealed that pulses and beans, and a few plantation crops, chili, shrimp and pork, are only price competitive items among twenty potential agricultural products of Myanmar (FAO, 2010). Although, farmers could not choose their preferred crops during the

[15] Water productivity plays a crucial role in modern agriculture which aims to increase yield production per hectare per unit of water used, both under rain-fed and irrigated conditions. It describes the ratio between the quality of a product (biomass or yield) and the amount of water depleted or diverted.

1990s and the 2000s, they now have freedom of choice in agricultural production, according to new policies implemented in 2012. After policy change which encourages private sectors to participate in production, marketing and export, the crop scenario is expected to change.

Figure 3.3 depicts the yield of important crops in Myanmar, compared with that of China, Vietnam and Thailand. Myanmar is more productive only in pulses and cotton than that of Thailand and Vietnam. Although labor productivity for Myanmar and Vietnam are the same as mentioned above, the land productivity of Vietnam for selected crops are much better than those of Myanmar, especially in rice, groundnut, jute and coffee.

Figure 3.3 Yield of Selected Crops for Selected Countries in 2011
(Unit: Kilogram per hectare)



Source: MOAI, 2011.

3. Expenditure Allocation on Selected Departments of MOAI

The allocation of budget to agricultural R&D and education has been minimal. While the share of budget allocated to irrigation infrastructure increased from a quarter to 60 percent of total MOAI's budget annually, the ministry allocated its education and R&D expenditure from 0.3 to 1.36 percent of MOAI's total budget. To develop new and advanced seeds and technologies, the investment in R&D is crucial. The number of agricultural researchers in Myanmar was only 619 in 2002, while neighboring Bangladesh had 1807 and China, India, and Vietnam had 50198, 16737, and 2732 researchers, respectively, for the same year Table (3.11).

While agricultural R&D expenditure for China, India, Vietnam, and Bangladesh was USD2574, USD1355, USD56, and USD109 respectively, Myanmar allocated only USD8 million to agricultural R&D (Beintema and Stads, 2008), which is less than one percent of total budget allocated for MOAI (Table 3.4). One of the major problems underlying low productivity of small and medium farmers in Myanmar is that they do not have enough credit. The only public financial institution, Myanmar Agricultural Development Bank (MADB), provides less than one tenth of farmers' actual needs. The budget allocation of MOAI to MADB is very small, ranging from 0.95 percent in 2002/03 to 5.16 percent in 2009/10, although it soared to 8.54 percent in 2010/11 (Table 3.4).

Table 3.4 Budget Allocation of MOAI for Selected Departments (2001-2010)

Fiscal Year	MOAI Total (Million Ks.)	Education and Research*	MADB Budget*	Irrigation Expenditure*	WRUD Expenditure*
2001/2	90,436.292	0.36	1.04	23.57	4.23
2002/3	106,127.946	0.30	0.95	24.53	5.42
2003/4	120,371.530	0.32	1.26	29.84	6.86
2004/5	105,866.728	0.69	2.40	35.40	8.56
2005/6	122,202.307	0.71	2.88	45.33	13.62
2006/7	163,145.610	0.91	4.04	42.37	8.92
2007/8	190,248.060	1.01	4.55	50.12	8.66
2008/9	256,577.169	1.36	3.72	59.72	5.13
2009/10	223,925.305	1.18	5.16	54.01	6.33
2010/11	241,788.904	1.24	8.54	45.83	4.76
Average	162,068.985	0.81	3.45	41.07	7.25

Source: MOAI Headquarter, Nay Pyi Taw, * Unit = Percent of total budget.

Another important department is the water resources utilization department (WRUD) and it has a fair enough budget compared to the education, research, and rural finance divisions. On average the budget allocation for the last decade was 0.81 percent to education and research, 3.45 percent to MADB, 7.25 percent to water resources utilization, and 41.07 percent to the irrigation department.

Since great emphasis has been given to investment in irrigation infrastructure, the irrigated area has been expanded from 12.5 percent in 1988 to 18.1 percent of total sown acres in 2008. However, total coverage of irrigated area is still relatively lower than other countries such as Laos (22.3 percent), Thailand (26.5 percent), Vietnam (31.9 percent), India (33.8 percent), China (47.3 percent), and Bangladesh (57.5 percent) (MOAI, 2011).

4. Allocation of Agricultural Inputs and Facilities

A major portion of the MOAI budget, 41.07 percent on average, is allocated to construction of new infrastructure for increasing irrigated areas and about two thirds of irrigated land is allocated for rice production. One can easily see the government's great endeavor to increase rice export. More than 80 percent of limited agricultural loans are also prioritized to rice farmers (Table 3.5). There is a total rice growing area of 8.07 ha (20 million acres) and the requirement of seed is 30 million baskets. But the average rice seed distributed to farmers is only 1.33 percent of the requirement. This fact is a very important indicator to improve the rice sector of Myanmar.

Although pulses is the queen crop for the time being, it is observed that it requires less support in terms of irrigation (5.4 percent) and loans (4.1 percent). Sesame is a high value export crop and irrigated sesame gives a significantly higher yield, as a result higher allocation of irrigation to sesame will increase farm

income. Sesame has only received 3.63 percent of total irrigation and 4.8 percent of loan on average for last ten years.

Table 3.5 Inputs Allocation to Important Crops in Myanmar (Unit-Percent of Total)

Crop	Irrigation	Fertilizer	Pesticide (powder)	Pesticide (liquid)	Loan	Seed (Baskets)
Rice	74.62	57.45	22.84	34.83	80.11	400,556
Maize	1.01				0.26	16,874
Sesame	3.63	1.48	1.79	2.37	4.8	1,387
Groundnut	0.79				7.94	
Sunflower					0.22	17,211
Pulses	5.4	2.26	4.03	14.61	4.15	17,042
Jute	1.28	7.65	0.06	0.67		
Cotton	0.83	8.74	42.16	27.95	1.84	
Rubber		7.93				1,154,200[a]
Sugarcane	0.36					8,033[b]

Source: CSO data, [a]Rubber Sapling, [b]Sugarcane stalk in ton, http://www.myanmararchives.com

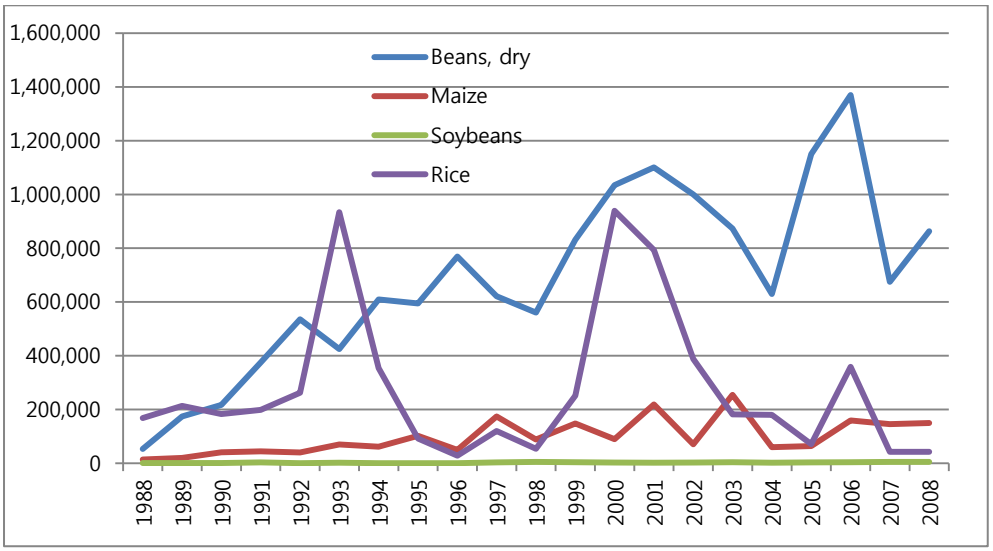
For mechanized farming, there are many kinds of farm machinery but the number of tractors as a representative for mechanization was picked as an indicator for the level of farm mechanization. The total number of tractors in Myanmar was only 11,000 in 2007 (MOAI, 2011), while there were 830000, 163000, and 63000 tractors in Thailand, Vietnam and the Philippines. This reflects that Myanmar's agriculture still relies on labor intensive traditional farming. As

economic structural change takes place, there will be a definite need for labor substitution technologies and machineries.

5. Agricultural Export

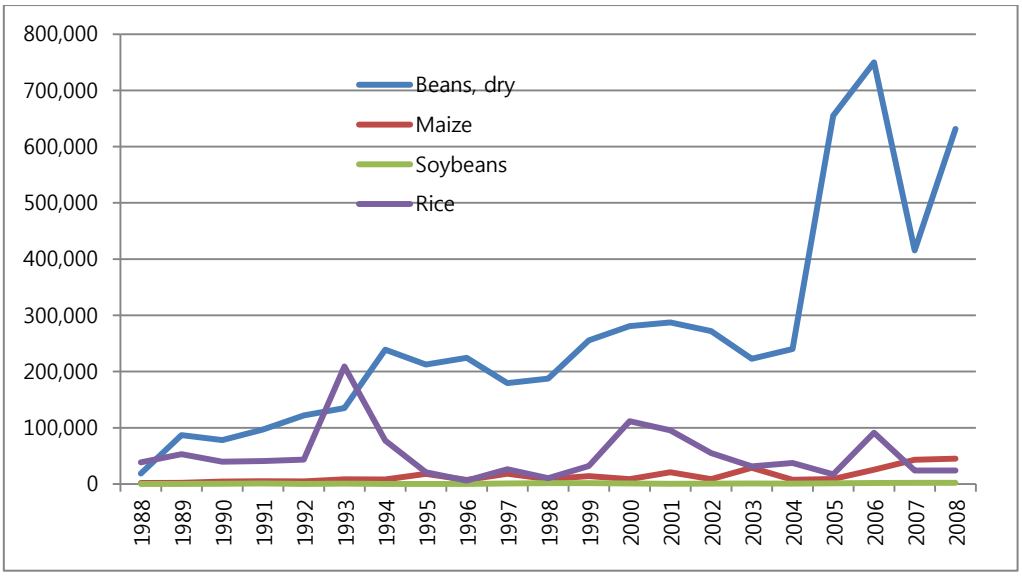
Agricultural export shared 17.5 percent of total export in 2010-11 (MOAI, 2011). In the crop export scenario, pulses shared 74 percent of total agricultural export and rice, maize, rubber and other crops shared 11.79, 3.61, 4.08, and 6.52 percent respectively in 2007-08 (CSO, 2009). It is too dangerous to rely heavily on one crop category in the crop export sub-sector. Furthermore, India is the major importer of pulses. India has a huge agricultural R&D sector with more than 16,000 researchers, so that technological achievement in India's major peas and beans can occur anytime. For rice export, Myanmar is facing aggressive competition with Thailand and Vietnam, two of the world's top rice exporters. India entered into the world rice trade in 2012 with about nine million tons of export at a lower price. In addition, considering African countries like to import low price rice, Myanmar could lose its low price market in Africa to countries like India. More discussion on rice export is done under the comparative study for a rice economy sub-title.

Figure 3.4 Export Volume of Selected Crops in Myanmar (1988-2008)



Source: UNTAC

Figure 3.5 Export Value of Selected Crops in Myanmar (1988-2008)



Source: UNTAC

The major agricultural produce export partners are India for pulses, Thailand, China and Vietnam for wood and wood products, and Japan and the US for marine produce (Aung, 2009). The other export partners are Germany, France, UK, Malaysia and Singapore. Figure 3.4 and 3.5 depict the export volume and value of the major export crops of Myanmar. Aside from the relatively better performance of rice around 1993, Myanmar earned its major crop export from pulses. By paying more attention and putting more inputs to pulses cultivation, higher productivity is expected.

6. Comparison of Agricultural Economy of Myanmar to Thailand and Vietnam

This section compares and contrasts the performance of Myanmar's agricultural sector with similar economies such as Thailand and Vietnam. It was observed that these two countries had much better performance than that of Myanmar in terms of agricultural production and agricultural exports. The Vietnamese agricultural sector produced twice as much as Myanmar and the value of Thailand's agricultural GDP was 2.4 times that of Myanmar. Although Myanmar's agricultural export shared 17.5 percent of total export, its value was only USD1.5 billion in 2010, while the agricultural export of Vietnam and Thailand shared 4.5 and 4.1 percent of their total export; the value of agricultural export was USD 4.3 and 9.9 billion respectively. While Myanmar is still relying on traditional crops they diversified their crop sector to non-traditional cash crops

emphasizing market oriented crop diversification for agricultural crops (Table 3.6).

Here in lies a signal for export diversification in the crop export sector and an impetus to explore and penetrate the world market with non-traditional and high value items such as fruits, flowers and vegetables. In order to reduce over reliance on one or few major importers of Myanmar pulses, we should explore more export markets which can offer better prices. The US, EU and many other western countries lifted economic sanctions on Myanmar recently so that the US and European markets are potential markets for Myanmar agricultural products.

Irrigation infrastructure is a long term investment for agricultural development. While Myanmar has constructed more than 200 irrigation projects during the last two decades, only 16.7 percent of cultivated land is covered by irrigation. Investment in new irrigation infrastructures which are cost effective and do not have any conflicts to the existing ecosystem and environment is recommended. Another important input for increasing crop productivity is increased utilization of fertilizer. According to United Nations Conference on Trade and Development (UNCTAD) database, Myanmar used only 3.28 kg per ha of fertilizer, while Thailand and Vietnam used 130.88 and 286.57 kg per ha respectively.

Table 3.6 Comparison of Agricultural Economy for Myanmar, Thailand and Vietnam (2010)

	Myanmar	Vietnam	Thailand
Total GDP (Billion USD, PPP)[a]	82.68	299.95	602.1
Per capita GDP (USD, PPP)[b]	1200	2900	8100
Percent of Agricultural GDP [c]	39.9	22	13.3
Value of Agricultural GDP (Billion USD)[d]	32.99	65.99	80.08
Total Export Value (Billion USD)[c]	8.586*	96.3	244.4
Percent of Agricultural products share in export [d]	17.5*	4.5	4.1
Value of Agricultural Export (Billion USD)[e]	1.503[d]	4.376	9.978
Total sown area (million ha)*	14	9	19
Total irrigated area (% of total)*	18.7	47.8	33.8
Fertilizer utilization (Kg/ha) [f]	3.28	130.88	286.57
Major agricultural export products	Peas and Beans, rice, sesame, groundnut, sugarcane, fish,	Rice, coffee, cashew nut, rubber, soybean, sugarcane, peanut, poultry, fish, seafood	Rubber, shrimp, rice, cassava, corn, sugarcane, tobacco, fruits, fresh flowers, tuna

Sources: [a]Estimated by IMF for 2011, [b]CIA estimates for 2010, [d]Computed by author, [c]UNCTAD (2010), [e] http://www.indexmundi.com/trade/exports/?section=0, *MOAI 2012[b]. [f]UNCTAD (2008)

7. Comparative Study of the Rice Economy

Myanmar is putting all efforts to regain its status of top rice exporter in the world, the gap between Myanmar rice export and that of current top rice exporters remains huge. In 2012, the emergence of India in the world rice export market changed the scenario. India entered the market with about 9 million MT while Vietnam exported 8.8 million MT, Thailand exported 7.0 million MT and Myanmar exported 1.1 million MT, which was the highest of the last 24 years (Commerce J, 2012).

People from Myanmar, Thailand and Vietnam rely on rice as a staple food and Myanmar has the lowest population among the three. Although rice productivity in Vietnam is higher than Myanmar, Myanmar's rice productivity is higher than that of Thailand (Figure 3.3). Following Engle's Law, which states the household's expenditure on food falls as income rises, Myanmar people consume more rice per capita than the average Vietnamese or Thai person. Myanmar has the lowest per capita GDP (PPP) of USD 1200 among the three countries (Table 3.6). By conducting a nationwide integrated household living survey, the UNDP estimated per capita rice consumption in Myanmar is 200 kg per year which is equivalent to two tons of white rice per day for the average person.

Table 3.7 Comparison of Rice Economy for Myanmar, Thailand and Vietnam (2009)

		Myanmar	Vietnam	Thailand
1	Population (Million) [a]	59.12	85.85	67.7
2	Rice Yield (MT/Ha) [b]	4.067	5.228	2.87
3	Total rice sown area (Million ha) [b]	8	7	11
4	Total paddy production (Million MT) [b]	33	39	31
5	Total white rice export (Million MT) [b]	0.536	3.411	8.62
6	Per capita consumption (kg/person)[c]	200	170	105
7	Total rice need for local consumption (Mill MT)[d] (1*6/1000)	11.82	14.59	7.11
8	Total white rice production [d] (5+7)	12.36	18.01	15.73
9	Percent net white rice production [d] (8/4*100)	37.45	46.17	50.74
10	Net loss after harvesting (Post harvest losses + Milling losses) [d]	**62.55**	53.83	49.26

Source: [a] = UNFPA Estimates, [b] =MOAI 2012, [c] = Kenney G, 2001, [d] = Author's computation.

Given the above assumptions and facts, Myanmar's rice statistics seem tos having some flaws. It is presented in Table 3.7. Every country has reserved rice for emergency purposes and the exportable surplus can be estimated by total production minus the sum of amount of local consumption, amount of reserve, amount of seed requirement, post harvest losses and milling losses. However, the amount of reserve and required amount of seed is usually carried from year to year so that it can be hold as a constant and negated from the equation.

Vietnam has about 25 million more people than Myanmar and its exportable surplus was 3.4 million tons in 2009. While Thailand and Vietnam

have about half the net white rice production, Myanmar has only one third of net white rice production. The gap between total paddy production and total net white rice production is so huge that the agricultural scientists and authorities must analyze this gap and the causal factors of extreme post harvest losses in Myanmar.

Possible answers may be due to unreliable statistics and exaggerated productivity figures, rice export through borders may not be accounted, losses because of the poor and traditional post harvest handling technology, and low head rice recovery because of the use of low capacity,old mills and hullers. According to Myanmar Agricultural Produce Trading (MAPT) statistics, there were 15,392 hullers and 1211 rice mills in 2011. Among 1211 rice mills, only 230 were capable to produce super quality 5-15 percent rice. The rest of rice mills and hullers produce 25-35 percent quality rice.

Milling recovery of Myanmar rice mills vary from 40-60 percent, which is a very low recovery rate compared to the national average of 62.5 percent in the Philippines, and a minimum milling recovery of 67 percent in Thailand and Vietnam. According to International Rice Research Institute (IRRI) rice statistics the milling recovery of head rice can be as high as 84 percent so that there is huge room for development in the rice milling sector of Myanmar. This indicates that Myanmar needs rush investment in the milling sub-sector. Furthermore, agricultural statistics should be stronger and more reliable. Table 3.8 presents the

possible losses of rice after harvesting in two different scenarios: traditional and mechanized.

Table 3.8 The Possible Post Harvest Losses in Traditional and Mechanized Scenarios

Traditional Postharvest Chain		Mechanical Postharvest Chain	
Process	% loss	Process	% loss
Manual Harvesting	1-5	Harvesting with Combine harvesters	1-5
Manual threshing	1-5	Machine threshing	1-5
Sun drying	3-5	Mechanical drying	1-2
Open storage	5-10	Sealed storage	1-2
Village Milling	20-30	Commercial Milling	5-30

Source: IRRI

More post harvest losses are observed in the drying, storage and milling stages. The vast majority of Myanmar farmers traditionally harvest rice by sickles, which costs about 15 percent of the total production cost (Aung, 2012). Recently small to medium power combined harvesters were introduced and there are about 200 combined harvesters in Myanmar now (MOAI, 2012). Farmers have been using locally produced threshers for about two decades, however, paddy drying machines are just at the introduction stage.

To boost the exportable rice surplus, another important factor is the importance of using quality seed. MOAI distributed 11,831 MT of quality seed in 1995-96 but distributed only 7 MT of quality seed in 2011-12. Quality seed is quite significant for grain size, germination, color, pest and disease resistance, and

a higher rate of mill outturn. China's average rice yield is about 7 MT per hectare because of its tremendous investment in the seed industry. About 52 percent of rice growing area in China is covered by hybrid rice. Furthermore, super rice from China yields 12-13 MT per hectare.

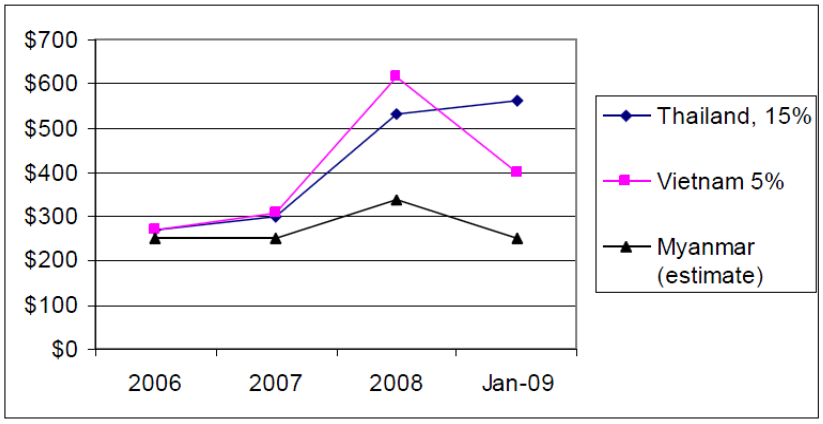
Vietnam initiated hybrid rice during the 1970s but started growing it in 1991. Locally produced quality seed covered 18.54 percent of total rice growing area in Vietnam so that about 80 percent of seeds are imported from China. Although Vietnam can produce its own hybrid rice and other quality rice seed at reasonable prices, Vietnamese people still prefer imported hybrid and other quality seed from China because they believe the imported seeds are better than the locally produced seed in terms of uniformity in grain size, freedom from off type and impurities, good germination, and lack of discoloration. The nine year average imported value of quality rice amounted to USD14.5 million from 1998-2006, which accounted for 1.55 percent of the rice export value (Nga, 2006).

Myanmar started research on hybrid rice in 1991 and is at the very beginning stages of hybrid rice cultivation. Pa-le-thwe hybrid rice, introduced from China, was the pioneer and cultivated only 1892 hectare in the 2012 summer season. There is an 18-45 percent yield advantage for growing hybrid rice, however, the market demand for Pa-le-thwe is not yet certain. In conclusion, there is wide room to develop rice production in order to get more exportable surplus,

especially increasing utilization of quality seed, utilization of the recommended amount of chemical fertilizer, and improving post harvest handling.

In spite of paying much attention to increased output of rice, the quality of rice in Myanmar is not competitive in the world market and Myanmar receives a much lower price than Thailand and Vietnam for rice (Figure 3.6).

Figure 3.6 The Export Price of Rice for Myanmar, Thailand and Vietnam (2006-2009)



Source: Food and Agricultural Policy Research Institute (2009)

C. Poverty in Myanmar

The poverty incidence for urban areas in Myanmar was 23.9 percent, 22.4 percent for rural areas, and 22.9 percent for the whole country in 1997 (CSO, 1997). However, the Myanmar democratic government admitted that 26 percent

of the total population were living under the poverty line in 2010 and has aimed to reduce poverty to 16 percent by 2015. The United Nations Development Program (UNDP) conducted the integrated household living condition and livelihood survey in 2005 and 2010 and they used calorie intake, food share in consumption expenditure, and ownership of small assets as poverty proxies. Generally, a household is put in the poor category if they spend 50 percent or more of their income on food. If a person intakes 2100 calorie per day, he or she is not poor. This nationwide survey covered 18660 households and the general results suggested that food share in consumption for the bottom three deciles had increased, landlessness had increased, credit access to agricultural activities had declined and unemployment had increased. According to the integrated household living condition survey conducted by the Harvard Kennedy School in 2009-10, revealed that 64 percent of rural households involved in agriculture and 46 percent of farmers are poor.[16]

About 70 percent of the total population dwells in rural areas and around 63 percent of the total work force relies on the agricultural sector. Conditions for being poor and escaping poverty totally depend on agricultural and rural development. There are several reasons for why rural people are in poverty. Firstly, landlessness and jobs are seasonal. The small farmers don't produce enough or a subsistence amount of food for their families. Low productivity is also a factor

[16] See on page of the Ash Center, Harvard Kennedy School report at http://www.ash.harvard.edu/extension/ash/docs/myanmar1111.pdf

because farmers do not have enough credit or access to the loan market. Climate change and its impacts are another reason for crop failure in some years. Flood and drought add more challenges to vulnerable farmers. Myanmar does not have a crop insurance system, which is practiced in advanced countries. Furthermore, there are few off-farm job opportunities for the majority farm population.

Unemployment is one of the most challenging problems in Myanmar. A recent study by Myanmar's Lower House planning and finance development committee found that the unemployment rate is as high as 41.6 percent, or roughly speaking, about 40 percent of the total population does not have a job (Table 3.9). This is a severe problem and must be solved as soon as possible.

It is clear that most impoverished people are in rural areas since 70 percent of the total population is in rural areas. By interpolation, it is estimated that about 16 million of unemployed people are from rural areas, resulting in about 24 million jobless people. According to the parliamentary report from the Lower House planning and finance development committee, Kayah State has the highest unemployment rate of 58.5 percent and the Mandalay Division has the lowest unemployment rate of 29.7 percent. The unemployment rate of each State and Division are presented in Table 3.9.

Table 3.9 Poverty Rate and Unemployment Rate of each State and Division in Myanmar, 2013

No.	Poverty Rate		Unemployment Rate	
	State/Division	%	State/Division	%
1	Chin	73	Kayah	58.5
2	Rakhine	44	Karen	49.9
3	Shan	33	Kachin	48.2
4	Tanintheryi	33	Chin	47.9
5	Ayeyarwaddy	32	Sagaing	44.9
6	Kachin	29	Rakhine	43.5
7	Magway	27	Magway	43.4
8	Mandalay	27	Shan	41.4
9	Bago	18	Mon	39.1
10	Karen	17	Tanintheryi	37.1
11	Mon	16	Yangon	33.3
12	Yangon	16	Ayeyarwaddy	33.3
13	Sagaing	15	Bago	31.5
14	Kayah	11	Mandalay	29.7
	Union Average	27.9	Union Average	41.6
	STD	16.0	STD	8.1

Source: Weekly Eleven News (Jan 23, 2013)

Table 3.10 Selected Indicators of Poverty for Myanmar (1980-2011)

Year	Life expectance at birth	Expected years of schooling	Means years of schooling	GNI per capita (2005 PPP $)	HDI value
1980	55.1	6.1	1.7	364	0.279
1985	55.5	6.5	2.2	409	0.307
1990	57.3	6.2	2.4	340	0.298
1995	60.1	7.6	2.7	420	0.340
2000	61.9	8.0	3.1	576	0.380
2005	62.9	8.8	3.5	1,018	0.436
2010	64.7	9.2	4.0	1,484	0.479
2011	65.2	9.2	4.0	1,535	0.483

Source: UNDP Human Development Report 2011

Given these high unemployment rates, the union average poverty rate is about 28 percent, ranging from 11 percent in Kayah State to 73 percent in Chin State with a SD of 16.0. It already looks like a severe, chronic disease. The right and immediate cure for this chronic disease is to create more employment by adopting labor intensive agricultural technology, agricultural diversification and creating non-farm job opportunities.

D. How can Development of Agriculture Reduce Rural Poverty?

Given the fact of the real unemployment rate recently revealed by the government, job creation is vitally important for Myanmar to pull its people out of poverty and to lead the country on the right growth path. Myanmar needs to focus all its mighty efforts on agricultural and rural development along with industrialization. Rural infrastructure development is the first priority for non-farm job opportunity creation for the rural majority. Rural infrastructure development is crucially important for increasing productivity, creating non-farm opportunities and uplifting the living standard of rural people.

Construction, and the lengthening and widening of village and farm roads are very important. When agricultural goes for mechanization the farm roads are key to farm infrastructure. Land development is an integral part of rural and agricultural development, but it needs some constitution for land development

programs. Myanmar is still lacking the necessary land development Act. Irrigation facilities must be constructed and maintained. Other community facilities such as warehouses to store farm produce and workshops to repair farm machinery should be included. As mentioned earlier, electricity production cannot meet even current demands. Power policies need to move toward further industrialization and rural and agricultural development to pull the vast majority of poor out of extreme poverty.

At the same time agricultural scientists and authorities have to try to increase agricultural productivity and farm income. Myanmar has to reconsider the rice-first policy. It is necessary to reset the goal of the agricultural development policy to be farm income maximization instead of productivity maximization. The food sufficiency for each State and Division is to be redefined as in terms of ability to purchase the food instead of pushing every State and Division to produce rice for their self sufficiency. Agricultural diversification has to enhance by conducting more research on recommendations for a farm income maximization cropping system based on regional specific availability of resources and based on the comparative advantage and market demand.

Phase I or the pre-conditions for agricultural development mentioned in Fei-Ranis-Lewis model have to be met in order to prepare for the next phase, such as regulations on land tenure systems, land reform, farmers' awareness to technological improvements, adult literacy, market information and access to

market. In Myanmar, farmers had no rights to choose the crops of their choice for decades. If their land was registered as low-land, no up-land crops or other fruits or vegetables were allowed to be cultivated. If the farmers violated the regulations, the state could withdraw farmers' cultivable land rights.

By law land is state owned property in Myanmar and farmers only own the right to cultivate. The relaxation of those undesirable regulations on land is very crucial for agricultural development. In Vietnam, the collective farming system was strictly practiced during the 1980s and 1990s, but it was relaxed into 20 year cultivation rights to farmers and there are more proposals to loosen land ownership by amending the land reform law continuously in 1993, 2001 and 2003 in order to match with development policies (Tuyen, 2010). Many analysts pointed out this factor, had a significant impact on the development of Vietnamese agriculture. Some congressmen in Myanmar have proposed the amendment for land regulations in Congress, which is still under debate.

When pre-conditions are met, phase II follows. In phase II, the role of agricultural research and extension is very important. Agricultural R&D can be seen as an engine for agricultural growth. The government should adequately invest in R&D for every sector of the economy according to the priority of the importance to development of the country. Industrialized countries have benefited from R&D investment in agriculture which comes from both the public and private sectors. In developing countries, R&D investment in agriculture usually

comes from the public sector and contribution from the private sector is very minimal.

The share of R&D spending on agricultural research by the public sector was 90.7 percent and 9.3 percent by the private sector in Asia and the Pacific countries in 2003. Among countries in the Asia-Pacific region, the share of R&D expenditure for agriculture for four OECD countries, China and India were 41 percent, 26.8 percent and 14.1 percent of total regional spending respectively. The combination of ten ASEAN countries shared 14.5 percent of regional spending in 2003 (IFPRI, 2008).

The agricultural research intensity ratio is the ratio of expenditure on agricultural research to the value of agricultural GDP as an indicator of devotion to agricultural R&D for respective countries. In terms of research capacity, China has the highest capacity in agricultural R&D in the world (Beintema and Stads, 2008). China employed more than 50,000 full time equivalent (fte) researchers in the agricultural R&D sector, while India employed about 17,000 fte researchers, and Indonesia, Pakistan and the Philippines employed more than 3,000 fte researchers each in 2002 (Table 3.11). Fan and Parday (1997) concluded that the 20 percent agricultural output increase from 1963 to 1992 was due to agricultural research in China.

Increase in per capita grain production from 319 kg in 1978 to 381 kg in

2007, and per capita meat production from 9 kg and per capita milk production from 1 kg to 26 kg in 1978 and 2007 were observed in China (Chen, 2011). China doubled its expenditure on agricultural R&D from $1.2 billion in 1991 to $2.6 billion in 2002. Chinese researchers improved the dwarf rice varieties, which increased 50 percent of total rice production, and super-rice added another 20 percent of rice production. China was able to feed its bursting population by heavily investing in agricultural R&D and by contributing aggressively to their agricultural scientists. Aside from rice, hybrid maize, dwarf-wheat, transgenic Bt cotton, and other seed-based technologies have been achieved.

Table 3.11 shows the number of public agricultural researchers and public spending on agricultural R&D for selected countries. The data shows Myanmar has a very weak sector in agricultural R&D. The number of researchers in the agricultural sector is only 619 which was a combination of three sub-sectors of agriculture: crop, livestock and fishery, and the forestry sector. The crop sector shared about 40 percent of the total number of researchers and it is only 258 fte in 2004 and 30 percent of R&D expenditure which was $2.4 million in 2004 (Stads and Kam, 2007). Myanmar also has the lowest share of post-graduate researchers in Asia. While Myanmar has 20 percent of post-graduate agricultural R&D researchers, including 18 percent master degree and 2 percent doctoral degree, Bangladesh shared 87 percent, Malaysia shared 72 percent, and Laos shared 45 percent in 2002-03.

The preference of consumers is changing from generation to generation so that it is very challenging for researchers to go with innovation driven agricultural research which could quench the thirst of customers' and stakeholders' needs and benefits. The role of researchers is important to transform farmers' poor living conditions into prosperous ones. Myanmar's century long journey of rice production is still in a stage of stagnation although rice is the priority crop in terms of research expenditure and irrigation facility allocation.

Table 3.11 No. of Public Agricultural Researchers and R&D Spending on Agriculture in Selected Countries from 1991 to 2002

Country	No. of Researchers			Spending on Agricultural R&D (USD in millions)		
	1991	1996	2002	1991	1996	2002
China	60,114	53,083	50,198	1,174	1,531	2,574
India	14,968	16,675	16,737	746	861	1,355
Indonesia	4,548	4,760	4,751	220	255	177
Philippines	2,424	3,053	3,213	80	121	141
Vietnam	1,862	1,991	2,732	8	22	56
Pakistan	3,223	3,428	3,508	223	188	171
Bangladesh	1,635	1,772	1,807	81	82	109
Myanmar[a]	na	na	619	na	na	8

Source: Beintema and Stads (2008) and [a] Stads and Kam (2007)

Phase II of agricultural development relies heavily on labor-intensive, capital-saving technologies since the nation does not save enough capital for investment in other sectors at this very early stage of economic development.

Labor is still abundant in the agriculture sector so that labor-intensive technologies in agriculture are very suitable in phase II of agricultural development. When agriculture gets its momentum of development with labor-intensive technologies, some amount of labor can be withdrawn from the agricultural sector and brought to the non-agricultural sector because there is no other source of labor aside from pulling from the agricultural sector in agricultural based under-developed countries. With the historic experience of Japan, Korea and Taiwan, it is possible to follow up Lewis's two sector model of economic development.

To speed up agricultural development in Phase II, education opportunities for farmers must be created and introduction of new inputs and effective utilization of them have to go along with improved technologies. The most important thing is to orient the agriculture from subsistent traditional farming to business oriented agriculture. Profit maximization is very important to persuade farmers to adopt new technologies, new crops, and new cropping patterns. No technology will be sustainable if it is not economically feasible. Most of the government led top-down agricultural projects were not sustainable in the past because they did not take into account long run economic feasibility, access to market and market demand. There were many cases of failure in government driven projects such as growing *jatropha* during 2005-07. There was nation-wide pressure to grow *jatropha* for bio-fuel production but it ended in failure because

of economic infeasibility.

Phase III of agricultural development should be the expansion of agricultural development based on capital-intensive, labor saving technologies. In this stage of agricultural development, the growth of the non-agricultural sector is in momentum to develop. The capital saved from the agriculture sector and obtained from other sources such as foreign direct investment and reallocation of earnings from abundant natural resources is strong enough to develop the non-agriculture sector of the economy. In Phase III, it is possible to observe substantial structural reform. In this stage, agriculture is no longer a major contributor to the nation's GDP and labor becomes a scarce resource in the agricultural sector. For this reason, capital-intensive, labor saving, mechanized farming technologies are tremendously needed in Phase III.

In summary, this chapter presents the structural stickiness toward agriculture in Myanmar. And it points out some determinants for economic stagnation in Myanmar such as weak and failure manufacturing sector, dual exchange rate system, and suffering from the Dutch disease. Furthermore, total bias on rice economy in terms of resource allocation and dramatic fall in share of export value in ASEAN region because of heavy reliance on primary good export are pointed out. The rest of the chapter discussed the relatively poor performance of agriculture sector compared to that of Thailand and Vietnam, poverty situation in Myanmar and how development of agriculture can contribute poverty reduction.

Chapter IV. Empirical Analysis for the Relationship between Agricultural Productivity Growth and Poverty Reduction in Myanmar

A. Conceptual Framework

The international community has set a goal to strive for halving world poverty by 2015 through MDGs. Empirical studies have shown that improvements in agricultural productivity are important for poverty reduction (Mellor 1999). Furthermore, agriculturally driven growth tends to generate a larger welfare effect than non-agriculturally driven growth, especially for the poorest 20 percent of the population (Bravo-Ortega and Lederman, 2005 and WB, 2007). Gallup *et al*. (1997) found that a one percent increase in agricultural GDP leads to a 1.61 percent increase in the incomes of the poorest quintile. The studies of Irz *et al.* (2001) and Thirtle *et al.* (2001) also show that the increase in agricultural GDP growth contributes positively to poverty reduction. Thus, agricultural development can be a key engine of pro-poor growth or shared growth.

Vietnam has made a significant achievement in poverty reduction and has become a benchmark for other LDCs. The country reduced its chronic poverty

consistently from 58.1 percent in 1993 to 19.5 percent in 2004 to 16 percent in 2006 and to 14.5 percent in 2008 (Lam, 2011). Thus, Vietnam reduced the poverty rate by 43.6 percentage points during a very short period of 15 years, pulling about 28 million people out of chronic poverty. The Vietnamese poverty reduction strategy has been based on job creation not only in the non-agricultural sector but also in the agricultural sector which has led to an agricultural productivity boom.

There exists a large pool of labor force in the agricultural sector of low income countries. We assume that the marginal productivity of labor in agriculture is zero and there is surplus labor in the agricultural sector.[17] Agriculture can absorb the labor like a sponge so that we can find the phenomenon of underemployment in agriculture[18]. Increase in agricultural productivity supports poverty reduction via three channels: increase in both on-farm and off-farm employments, decrease in real food prices, and increase in real wage and real income (Schnieider and Gugerty, 2011).

The standard form of agricultural production function is agricultural productivity as a function of land, labor, capital and total factor productivity (TFP). TFP of agriculture depends on physical capital, human capital, level of

[17] This assumption follows Lewis' Dual Economy model (1954).

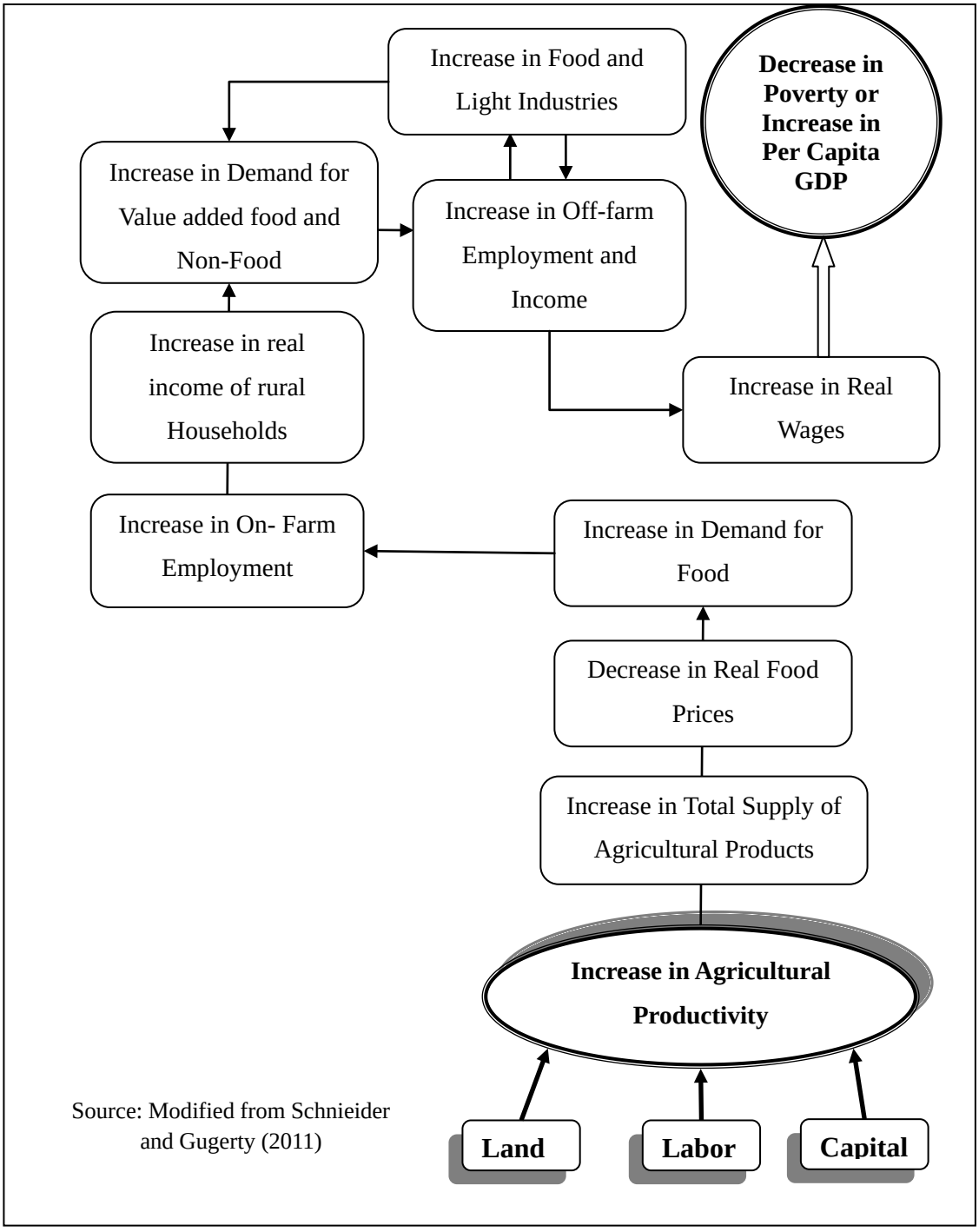
[18] The definition of underemployment is high-skilled workers are working at low pay jobs and some are working as part-time workers who would prefer to be full-time. Which means the economy cannot fully utilize its human resources efficiently. Here in this case of agriculture, that means part-time or seasonal workers, although they prefer full time jobs.

investment in education and research, rural infrastructure, and well developed extension services. Physical capital includes the use of material inputs for agricultural production such as fertilizer, chemicals, farm machineries, *etc*. Human capital may be proxied by the adult literacy rate and life expectancy. Rural infrastructures may be proxied by the measures of road density, electricity consumption per capita and irrigation facilities. Aside from those explanatory variables the total factor productivity accounts for the residual or the effect of technological change. The technological change involves development of new seed[19] and production technologies, which are the result of investment in education and agricultural research.

Based on the literatures reviewed for this study, the following relationship between agricultural productivity growth and poverty reduction or increase in per capita income of rural people is postulated (Figure 4.1).

[19] Development of new seed implies development of modern varieties (MVs), which have high yielding, pest and disease resistance and other improved characteristics.

Figure 4.1 Relationship between Agricultural Productivity Growth and Poverty Reduction



Source: Modified from Schnieider and Gugerty (2011)

The total value of agricultural production is taken to reflect the contribution of agriculture to the economy and per capita GDP is considered as a proxy for poverty as about 70 percent of people reside in rural areas of Myanmar.

B. Analytical Framework

1. Research Questions and Hypotheses

In this section, we examine the question of whether agricultural productivity growth has effect on per capita GDP growth and explore the determinants for agricultural productivity development in Myanmar. The hypotheses are formulated based on the research questions:

a) The agricultural productivity growth per hectare of land has an impact on GDP per capita growth rate, which is a proxy for measurement of poverty.
b) Agricultural labor to land ratio, physical capital and human capital are determining factors for agricultural productivity growth in Myanmar.

2. Data and Econometric Models

The empirical analysis is separated into two parts for this section. The first part is to examine the relationship between agricultural GDP growth and per capita GDP growth. To reflect the agricultural productivity, the agricultural GDP is transformed into agricultural GDP per hectare, which measures how much a hectare of land can produce the output in terms of the local currency unit during a year. Then, the relationship between agricultural GDP growth and factors of

agricultural production is studied. The factors under consideration are arable land area, number of agricultural labor, amount of fertilizer utilization, number of working animals and numbers of tractors as a proxy for farm machineries and use of capital, amount of the utilization of modern variety, where rice seed is taken as a proxy for all crops, irrigated area, and number of primary school enrollment.

Furthermore, total rice production has been taken as a representative for all crops grown in Myanmar because it takes tiger share in terms of allocation of land, irrigation water, loan, fertilizer subsidies and any other inputs.[20] It is also treated as top priority in agricultural R&D and draws major attention to policy makers. Therefore, total rice production has been taken as one of the explanatory variables. Classical measures for poverty are head count ratio and Gini coefficient. But UNDP introduced the human poverty index (HPI) in 2010 as a poverty indicator for developing countries (HPI-1) and for developed countries (HPI-2) with different indicators to estimate the indices. The UN defines poverty as the percent of population living with $1.25 a day of income, which is called absolute poverty. However, those indices are not available for Myanmar as a time series so per capita GDP in local currency unit is used. The data are collected from the IRRI world rice statistics online database from 1965 to 2010.[21] Although, only per capita income cannot serve as a measure of poverty, it can be used as a proxy to

[20] See Table 3.5 in this dissertation.
[21] International Rice Research Institute (IRRI), World Rice Statistics database: http://irri.org/index.php?option=com_k2&view=itemlist&layout=category&task=category&id=744&Itemid=100346&lang=en

reflect the living standard of the vast majority in a country. Many poverty related studies have used per capita GDP as a dependent variable.[22] The agricultural GDP and per capita income are in local currency units and transformed into real terms by using GDP deflator and CPI treating 2005 as a basic year.

3. Empirical Model Estimation

The relationship between agricultural productivity growth and poverty reduction can be described in functional form as follows:

Per capita income of rural population = f (Agricultural productivity growth)…. (A)

Agricultural Productivity Growth = g (land, labor, capital) ……..……(B)

Capital = physical capital + human capital ……..…….…...… (C)

Substitute (C) into (B) gives –

Agricultural Productivity Growth = g (land, labor, physical/human capital) …..(D)

Substitute (D) into (A) yields:

Per capita income of rural population = h (land, labor, physical capital, human capital) …….……..… (E)

Model (A) and (D) are estimated and drawn conclusion to model (E). Per capita GDP is used instead of per capita income for the rural population in model (A) because about 70 percent of the total population lived in rural areas so that per capita GDP can serve as a proxy for per capita income of rural people in Myanmar.

[22] See Bruckner (2012), Awokuse (2009), and Ravallian and Chen (2007).

a. Unit Root Test

It is very important to check the stationary for the time series data in order to avoid the spurious regression problem. The stationary variables are already qualified to enter the regression analysis, but the non-stationary variables are differenced to become stationary. Mean, variance and covariance of the series are constant over time in a stationary series.

We used the unit root testing techniques to identify whether variables were stationary or not. Both the Augmented Dickey-Fuller (ADF) tests and the Phillips-Perron (PP) tests were carried out to test the null hypothesis that the series has a unit root. PP test statistics were larger than that of ADF to reject the null hypothesis. If non-stationary series are tested and become stationary, they are named as I(1) or differenced stationary. However, we did not take I(1) series for regression analyses of this study to avoid problems of spurious regression.

A great advantage of the Philips-Perron test is that it is non-parametric, i.e. it does not require selecting the level of serial correlation as in the case of the Augmented Dickey Fuller's (ADF) test. Rather it takes the same estimation scheme as in the ADF test, but corrects the statistic to conduct for autocorrelations and heteroscedasticity. It also involves fitting procedure to allow more data series to be stationary. The main disadvantage of the PP test is that it is based on asymptotic theory. Therefore it works well only in large samples. Both PP and ADF tests have similar disadvantages of sensitivity to structural breaks and poor

small sample power resulting into unit root conclusions (Maddala and Wu, 1999). The Augmented Dickey-Fuller test for the intercept and trend is used to check the unit roots of the data series.

b. Correlation Test

Correlation coefficients measure the degree of the linear relationship between two random variables. Its value lies between minus one and plus one. The signs indicate the direction of relationships and the bigger the coefficient, the stronger the relationship. However, correlation does not necessarily imply the causality. The correlation tests are preliminarily done to see the degree of linear relationship among variables.

c. Regression Analysis for the Relationship between Agricultural Productivity and Poverty Reduction

After conducting the unit root tests, the stationary variables are considered to enter in the regression analysis. OLS estimation is used to test the relationship between the agricultural GDP growth rate and per capita GDP growth rate in the following functional form:

$Y_t = \beta_0 + \beta_1 X_t + \epsilon_t$ …… (4.1)

Where Y_t is the per capita GDP growth (GPCG) in real term and X_t is the agricultural GDP per hectare or agricultural productivity growth rate (AGGR) at 2005 constant price of local currency, Kyats. ε_t Is the white noise of the model.

After observing the relationship between two variables of major interest, we put the time factor to see the time effect to the model. Then, we fit the model 4.12 as:

$Y_t = \beta_0 + \beta_1 X_t + \beta_2 t + \epsilon_t$ …… (4.2)

Where *t* is the time effect of a unique stationary series.

d. ARDL Model

Autoregressive distributed lag models, ARDL are constructed to test the short and long run relationship among the variables. It also has a "distributed lag" component, in the form of successive lags of the explanatory variable, X_t. Sometimes, the current value of X_t itself is excluded from the distributed lag part of the model's structure. In this section, we estimate ARDL (1,1) for short run relationship between empirical variables, GDP per capita growth and growth rate of agricultural GDP. Based on the empirical model 4.2, the extended ARDL (1,1) models 4.3 and 4.4 are constructed as follows.

$Y_t = \beta_0 + \beta_1 t + \beta_2 Y_{t-1} + \beta_3 X_{t-1} + \epsilon_t$ ……..…… (4.3)

$Y_t = \beta_0 + \beta_1 t + \beta_2 Y_{t-1} + \beta_3 X_{t-1} + \beta_4 X_t + \epsilon_t$ ……..…… (4.4)

e. Checking for Long-Term Causality (VAR Model)

The major interest of economists is looking for the long-term relationship between variables. Let’s assume both variable Y and X are stationary because we can make them differenced stationary if we find the unit root problem. There is a common problem in economics of distinguishing the dependent and explanatory

variables (Asterious and Hall, 2007). Sometimes, both variables may be explanatory or dependent. In this case, vector autoregressive (VAR) models are of great help. They are very simple and do not need to worry about distinguishing between the dependent and independent. The estimation procedure is also very simple because we can use the OLS method. In most cases, it is better than complex simultaneous equation models (Mahmoud, 1984 and Mc.Nees, 1986).

The severe critiques for VAR models are they are not based on any economic theories and take the sense of "everything can cause everything". There is a problem with the loss of degree of freedom since lag variables come into the picture, especially when we do not have a large enough sample size. That is why, some variables, which seem less significant to the model can be dropped out. It is also difficult to interpret the coefficients because of lacking economic theoretical background.

The empirical VAR model is defined as:

$$Y_t = \alpha_1 + \beta_1 t + \emptyset_{11} Y_{t-1} + \cdots + \emptyset_{1p} Y_{t-p} + \gamma_{11} X_{t-1} + \cdots + \gamma_{1q} X_{t-q} + \epsilon_t \quad (4.5)$$

$$X_t = \alpha_2 + \beta_2 t + \emptyset_{21} Y_{t-1} + \cdots + \emptyset_{2p} Y_{t-p} + \gamma_{21} X_{t-1} + \cdots + \gamma_{2q} X_{t-q} + \epsilon_t \quad (4.6)$$

Subscripts of coefficients indicate which equation they are from. VAR is the extension of the AR model to the case in which there is more than one variable in the study. If we have *k* variables, there are *k* simultaneous equations, generally. We can select the optimal lag length by using some information criteria such as

Akaike's information criteria (AIC).[23] Notice that different information criteria suggest different levels of optimal lag so that it is flexible to choose which criteria to use.[24] If error terms from a series are stationary and have a zero mean there is a long run relationship between two variables. We need to test to distinguish between the long run relationship and spurious relationship. Durbin-Watson test statistics can be used. If the DW statistics is bigger than 0.38, there is co-integration, if otherwise, there is no cointegration.

f. Aggregate Agricultural Production Function

The econometric model to examine the relationship between the growth of the agricultural sector and factors of agricultural production (the Model B), which is the aggregate agricultural production function, is generally defined as:

$Y = f\,(ALK)$ …… (4.7)

Where Y is total output, A is area of arable land, L is number of agricultural labor and K represents the other capital inputs. To define the land productivity, the equation 4.16 is divided by A on both sides giving the agricultural productivity function in general.

$Y_t/A_t = f\,(X_t/A_t)$ or $y_t = f(x_t)$ ……..…….…. (4.8)

Where y_t is land productivity at time t and x_t are vector of inputs per hectare of land at time t such as labor to land, utilization of fertilizer per hectare, number of

[23] Calculate the AIC for VAR(p) for p=1,2,…,p_{max}. And choose the optimal lag length which yields the smallest value of information criteria.

[24] Other criteria are Schwarz-Bayes Information Criterion (SBIC) and Hannan-Quinn IC (HQIC).

tractors or draft animals per hectare, amount of improved variety seed per hectare, irrigated portion of land per hectare, and total rice production per hectare of arable land. Be noticed that rice production per hectare is different from actual rice yield here. This variable is considered to reflect the impact of a rice economy to agricultural sector growth. The regression model is re-written as:

$y_t = \alpha_1 + \gamma_1 t + \sum_{i=1}^{n} \beta_i x_t + e_t$ ……..……..….. (4.9)

Where y_t is the growth rate of agricultural GDP per hectare at year t and γ_1 is the time effect coefficient. The preliminarily considered factors of production, x_t, are already mentioned above. Then, the equation 4.9 is incorporated with the human capital variable and the rate of change in number of primary school enrollment to estimate model D.

Finally, the empirical model yields as:

$y_t = \alpha_1 + \gamma_1 t + \sum_{i=1}^{n} \beta_i x_{it} + \theta h_t + e_t$……..……. (4.10)

The various combinations of explanatory variables are considered according to their degree of correlation to estimate multiple regression at a time. Then the results are interpreted as elasticities according to economic theories. Ultimately, the final conclusions are drawn upon findings of the empirical model results.

C. Results and Discussion

1. Descriptive Analysis

The empirical study answers the question of how the agricultural sector growth plays in economic growth promotion and poverty reduction in one of the least developing countries, Myanmar. Sustained growth in an economy requires the continuous growth in sub-sectors of the economy. As of 2010, agriculture is the major sector of Myanmar's economy since it shares 40 percent of GDP, 67 percent of workforce and 20 percent of total export (FAOStat). Some comparative descriptive studies were done for the relationship between the agricultural sector and poverty reduction in South Korea, China and Vietnam and are presented before the empirical findings for Myanmar.

a. South Korea's Experience

South Korea has experienced colonial bitterness and legacy, internal conflicts, civil war and extreme poverty in the past. The per capita GDP was as low as $73 in 1953. However, the South Korean economic miracle enabled the country to reach a per capita GDP of $21,695 in 2007. During colonial times, rice was the major crop among agricultural produce in South Korea. The agricultural sector contributed almost one third of total GDP until 1975. With the Saemaul Undong movement in 1970, General Park's government helped to improve the living standard of rural poor. Agriculture was diversified into more profitable

production such as raising cows, chicken, pigs and fish. Greenhouses were introduced to enable crop production in winter.

Industrialization was encouraged to promote rural income from the non-agriculture sector. As a result, the average farm household income was KRW 674,500, which was higher than that of the average urban household of KRW 644,500 in 1974 (ADB, 2012). As income of the rural area increased there was more demand for local industrial products.

Agriculture is an ever important sector for any country for food sufficiency and as a traditional or cultural business except in city countries like Hong Kong and Singapore. South Korea's agriculture sector does not have a comparative advantage to drive export led growth in economic development of the country. The government, therefore, encouraged other industries which have comparative advantages. However, it simultaneously protects the agricultural sector and the welfare of the agricultural rural community at a high cost. Most of the protection cost comes from strict rules from labor movement restrictions (Diao *et al.,* 2002). Heavy subsidies in the price of rice and major inputs such as agricultural chemicals and off-farm employment creation were the key factors for reducing poverty in South Korea. Extreme poverty of 40.9 percent in 1965 was reduced to 14.8 percent in 1976 and to 7.6 percent in 1991.[25] Industrialization

[25] See the Table 2 in Kwon and Yi, 2008. The absolute poverty line was 121,000 *won* per month (at 1981 prices) for a five-person household (Kwon, 1998: 34).

plus balanced growth, not only for urban areas but also for the rural community, contributed to South Korea's poverty reduction. We can conclude that poverty reduction in South Korea was not due to agricultural development, but development in the manufacturing sector or overall structural change.

b. China's Experience

China does not have comparative advantage in the agriculture sector and in agricultural export. However, food security matters most for peace and tranquility of a nation. Therefore, the central government of China always cares about food security for its huge population and makes wise plans to boost productivity of agricultural land and to improve farmers' lives. In China, more than 200 million farmers are producing food for more than 1300 million people with 10 percent of the world's arable land and 6.5 percent of the world's water resource (IPRCC, 2010).

The government of China realized that technology mattered most for food security. Public expenditures on irrigation infrastructure, rural roads, and fertilizer production were increased by law. More than 100 major agricultural research institutes were established for farm level oriented science and technology. According to FAO data, the central government's support to the agricultural sector was less than 50 billion Yuan in 1984 and increased to 450 billion Yuan in 2008. Investment in R&D for agriculture has continuously increased from just 4 billion

Yuan in 1990 to 11 billion Yuan in 2005. China poured a huge amount of money into biotechnological research in the crop sector from less than 100 million Yuan in 1986 to 1650 million Yuan in 2003.

With continuous efforts to push China's economy forward, economic growth during 1978-2008 was 9.0 percent on average and the agricultural sector growth rate was 4.6 percent, while the strictly controlled population growth rate was only 1.07 percent (IPRCC, 2010). Agriculture is a key player for food security, poverty reduction, and diversification. In the animal husbandry sector, pork, poultry, beef and mutton production were encouraged and observed a steep upward trend. Grain, oilseed crops, vegetables and fruit production were increased by 74, 505, 453, and 3005 percent respectively.

Extreme poverty reduction during just three decades was a stunning example to the developing world. The poverty rate of 31 percent in 1978 was dramatically reduced to 9.5 percent in 1990 and 2.5 percent in 2008. More than half of a billion people were pulled out of extreme poverty. The contribution of the agricultural sector to poverty reduction is three times higher than that of other sectors in China (IPRCC, 2010). In spite of success in massive poverty reduction, China still has more than 254 million people living under the absolute poverty line as of 2005.

Market liberalization in the mid 1990s followed by the gradual removal of

grain market barriers had a great impact on agricultural growth. Labor intensive manufacturing also absorbed the surplus labor, simultaneously. Internal migrations to coastal cities were as huge as about 137 million in 2007, which increased from 84 million in 2001. Increased employment in the manufacturing sector and remittance to rural families were also factors of poverty reduction in China. Motalvo and Ravallion (2010) found that increase in GDP of the primary sector has had a significant effect on poverty reduction in China with elasticity of -2.23. This finding re-affirms the argument that growth in agriculture is key to fighting poverty and hunger (Grewal and Ahmad, 2011).

c. Vietnam's Experience

Agriculture plays a key role for the economic development of any country that depends heavily on the agricultural sector for its economy. The share of agriculture in GDP for Vietnam was as big as 90 percent during the Vietnam War. Vietnam managed to reduce its dependency on agriculture to almost 49 percent in 2002 and continuously reduced it to 20 percent in 2010. Some of the most radical changes were made in the agriculture sector. Although the portion of agriculture in GDP is decreasing, the value of total agriculture production keeps growing every year.

About 70 percent of the rural population earns their primary income from the agriculture sector, which includes crop, animal and fish production. Among which, rice occupies 85 percent of the food crop sector (Young, 2002). Income

from rice was about one sixth of GDP in 1990 and contributed one fourth of export earnings. Rice production was stagnant starting from the time of Vietnam War until the 1980s. During the reform period, rice yield was increased by 3.23 percent annually during 1981-87 and 2.8 percent annually during 1988-95.

The increase in yield and production of rice in Vietnam were highly contributed to by the modern rice varieties which were adopted from the International Rice Research Institute (IRRI). The area covered by modern varieties (MV) in 1963 was only 1 percent and expanded to a 33 percent adoption rate in 1975. Those MVs are IR8, IR42, OM1490, and OMCS96. They are fertilizer responsive, high yielding, non-photoperiod sensitive, highly resistant to rice blast disease and short maturing varieties. Fortunately, Vietnam is endowed with two fertile river deltas: Mekong River Delta (MRD) in the South and Red River Delta (RRD) in the North. MRD covers 45 percent of the total rice area and RRD covers 16 percent. MRD produces about half of the total rice production in Vietnam.

The rice area covered by MVs in 1998 was 7.3 million ha or 87.2 percent and 90 percent in the year 2000. Rice yield in MRD was 4.3 ton per ha (83.4 baskets per acre) and in RRD was 5.3 ton per ha (102.8 baskets per acre). Rice production was increased not only by horizontal expansion but also by vertical expansion.[26] The rice area grew at an average of 1.5 percent and yield increased

[26] Horizontal expansion in agriculture implies increase in cultivated land and increase in cropping

by 3.5 percent annually from 1980 to 2000. The achievement in the rice economy enabled Vietnam to become a rice exporter in 1989. Rice productivity had increased, but was still not sufficient for export until 1988 (Figure 4.2). Vietnam exported 1.7 million tons of rice in 1989. It was doubled in 1998 with more than 3.5 million tons. During another decade the rice export doubled to 6.8 million tons in 2010. Vietnam exported 7.1 million tons of rice in 2011. Vietnam would be the top rice exporter in the world, if India had not entered into the world rice market with 9.75 million tons of rice export in 2012 (USDA, 2012).

Growing hybrid rice is one of the contributing factors to the success of the rice economy in Vietnam. The hybrid rice area was increased from 435,508 ha in year 2000 to 612,984 ha in 2010. Hybrid rice yield also increased from 6.44 ton per ha (125 baskets per acre) in year 2000 to 6.9 ton per ha (133.9 baskets per acre) in 2010. It can, therefore, be said that during one decade 1.4 million tons more of rice were produced because of hybrid rice.

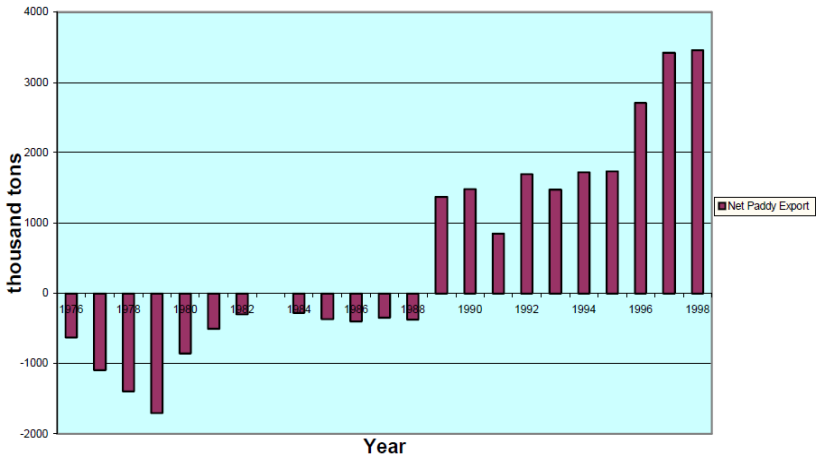
During *Doi Moi*, the reform in agriculture was mainly carried out by shifting the commune or collective system to an individual oriented system. However, there was a maximum area ownership of land. There were very significant effects of land policy change to the Vietnamese agricultural sector. Farmers could respond to market signals because of flexibilities in land policies. Agricultural land use taxes were reduced to a certain rate that the share of total

---

intensity, and vertical expansion implies the increase in yield because of new technologies.

land use tax in GDP of 0.7 percent in 1996 was reduced to 0.3 percent in 2001. Tax exemption was given to farmers who owned an amount of land under the given limit, and a 50 percent tax cut was given to those who owned more than the given limit of land. Micro-credits to farmers were provided at about 8.97 million VND on average per farm household in 2000 at the interest rate of 0.9 percent per month (Marsh, 2007).

Figure 4.2 Vietnam Net Rice Export (1976-1998)



Source: Ngoc Quang Pham, 2006:20

Irrigation infrastructures were invested in agricultural development so that the total irrigated area of 0.353 million ha in 1986-90 was increased five folds to 1.5 million ha in 1995. Fertilizer use also boosted from 41 kg per ha in 1976 to 182 kg per ha in 1994. The rice sector is the pride of Vietnamese agriculture so that 68 percent of total fertilizer utilization was devoted to rice production. The

total fertilizer used in 1994 was 5.5 times of that in 1976. Ownership of tractors in 1977 was 10,160 in RRD in the North and 27,420 in MRD in the South so that only 30-40 percent of land was prepared by tractors. After allowing private ownership of machineries in 1988, more than 50 percent of land was prepared by tractors and about 90 percent of farmers use axial flow threshers.

Given policy flexibilities and support by the government, the Vietnamese rice sector is expected to continue booming in the future too. No one can deny that the development in agriculture has helped Vietnam to solve economic difficulties, to reduce poverty and to maintain stability in the political arena. It has been a good foundation to build a modern and industrialized nation.

2. Unit Root Test

Before conducting empirical analysis for the relationship between the performance of the agricultural sector and poverty reduction for Myanmar, all preliminarily considered variables were checked for their stationarity. Augmented Dickey-Fuller's (ADF) tests were conducted to check if the null hypothesis of respective variables had a unit root. ADF tests suggested most of the variables were stationary except the utilization of seed per hectare. Then the Phillips-Perron (PP) test was done for the seed utilization variable and the test statistics rejected the null hypothesis. Therefore, the time series data for amount of seed distribution is acceptable as a stationary series by PP test results. The results of the ADF and

PP tests are presented in Table 4.1.

The data are collected from the IRRI world rice statistics database and the sample size is from 1966-2010. Real GDP per capita and agricultural GDP are in the constant local currency unit at the 2005 price. The number of primary school enrollment is obtained from the UN-UNESCO website from 1976 to 2010. Therefore, the models without education variable have number of observations from 1966 to 2010 and the models with education variable have number of observations from 1976 to 2010.

The explanatory variables are growth of agricultural GDP per hectare (AGGR), number of agricultural labor per hectare (Lab), amount of fertilizer utilization per hectare (Fert), number of tractor per hectare (Tractor), amount of seed distribution per hectare (Seed), portion of irrigated land per hectare (Irri), total amount of rice production per hectare of arable land (RTPro), number of working animals per hectare (Ani), and number of primary school enrollment (PEdu).

Table 4.1 Results of Unit Root Tests for 1965-2010

Variables	Test	t Statistics	Probabilities
Real GDP per capita growth rate (GPCG)	ADF	-3.9967	0.0002
	PP	-3.9967	0.0002
Agricultural GDP per hectare growth (AGGR)	ADF	-7.0627	0.0000
	PP	-12.6068	0.0000
Number of agricultural labor per hectare (Lab)	ADF	-8.4714	0.0000
	PP	-8.4341	0.0000
Fertilizer utilization per hectare (Fert)	ADF	7.7940	0.0000
	PP	-7.9481	0.0000
Number of tractor per hectare (Tractor)	ADF	-5.9095	0.0000
	PP	-5.9097	0.0000
Seed distribution per hectare (Seed)	ADF	-1.3897	0.5785
	PP	-5.0453	0.0001
Portion of irrigated land per hectare (Irri)	ADF	-6.2345	0.0000
	PP	-6.2244	0.0000
Total rice production per arable land (RTPro)	ADF	-8.2531	0.0000
	PP	-8.8476	0.0000
Number of draft animals per hectare (Ani)	ADF	-8.3555	0.0000
	PP	-8.3051	0.0000
Number of primary school enrollment (PEdu)[a]	ADF	-5.1654	0.0002
	PP	-5.1586	0.0002

Note: ADF = Augmented Dickey-Fuller Test, PP = Phillips-Perron Test, [a] Sample size 1976-2010.

3. Relationship between Agricultural Productivity and Poverty Reduction

a. Regression Analysis

Both dependent and independent variables are tested for their stationarity and the sample size is from 1965 to 2010. The estimated models for equation 4.1 and 4.2 are as follows.

$\hat{Y}_t = 17.467 + 0.5\, X_t$ ……..……..(4.1)'

(6.763) (2.692) $R^2 = 0.1443$, DW statistics = 0.7654
*** ***

$\hat{Y}_t = -1484.9 + 0.5345 X_t + 0.7556\, t$ …… (4.2) '

(-5.1873) (3.6575) (5.2485) $R^2 = 0.4832$, DW statistics = 1.2693
*** *** ***

Where $\hat{Y}_t$ is the estimated real GDP per capita growth (GPCG) at time *t*, X_t is the agricultural productivity growth at time *t* (AGGR), which is the agricultural GDP per hectare of land or land productivity growth over time, and *t* is the time trend. Time trend is considered as an explanatory variable to support the model stronger because of its perfect autocorrelation (AR) criteria. The numbers in parenthesis are *t statistics* values and they all are significant at 1 percent level. Model 4.2' is better fit to the variables since it has higher R^2 values and DW statistics. Model 4.2 ' can explain 48.32 percent of the total variation in GPCG.

b. ARDL Model Estimation

$\hat{Y}_t$ = -939.4 + 0.48t + 0.2838 Y_{t-1} - 0.5345 X_{t-1} ……..….. (4.3) '
(-2.1218) (2.1469) (1.575) (-0.3910)
** ** ns ns
R^2 = 0.3363, DW statistics = 1.9287

$\hat{Y}_t$ = -1003.243 + 0.50t + 0.37 Y_{t-1} + 0.6733 X_t + 0.016X_{t-1} …… (4.4) '
(-2.7419) (2.7546) (2.4723) (4.4339) (0.1005)
*** *** ** *** ns
R^2 = 0.5587, DW statistics = 1.9368

ARDL models are constructed to examine the effects of past values of the variables on dependent variables (4.3 and 4.4). Estimated models are presented in 4.3' and 4.4' above. Time trend is also considered to give better results, which is significant in both model 4.3' and 4.4' at 5 percent and 1 percent levels. The coefficient of time trend can be interpreted as the time effect to the model. One year lag values of both dependent (GPCG) and explanatory (AGGR) variables are not significant in model 4.3'. However, a one year lag value of dependent variable and the current value of explanatory variables are significant at 5 percent and 1 percent levels in Model 4.4'. Furthermore, model 4.4' is better fit to the parameters since it has higher goodness of fit indicator R^2 than that of the model 4.3'. DW statistics show no serial correlation in the models.

c. Long Run Causality Test: VAR Models

Vector Autoregressive models are run to test the long run causality between stationary variables. VAR is a kind of causality test and while Granger causality test is good for bivariates, VAR is good for multivariates.

Table 4.2 The results of VAR models

Dependent variable: $GPCG_t$				Dependent variable: $AGGR_t$			
C	-1011.05	-1023.12	3.4599	C	775.198	1035.225	3.4847
	[-2.4236]	[-2.560]	[0.9338]		[2.3413]	[3.7501]	[1.190]
	**	**	ns		**	***	ns
Year	0.5133	0.5193	-	Year	-0.3886	-0.5204	-
	[2.4340]	[2.5688]			[-2.324]	[-3.7376]	
	**	**			**	***	
$GPCG_{t-1}$	0.3940	0.3827	0.5187	$AGGR_{t-1}$	-0.2124	-0.3223	-0.2341
	[2.3647]	[2.820]	[3.8835]		[-1.477]	[2.6640]	[-1.706]
	**	***	***		ns	**	*
$GPCG_{t-2}$	-0.0435	-0.0362	0.1354	$AGGR_{t-2}$	-0.3532	-0.398	-0.334
	[-0.2862]	[-0.263]	[1.0518]		[-2.980]	[-3.456]	[-2.545]
	ns	ns	ns		***	***	**
$AGGR_t$	0.6408	0.6733	0.7014	$GPCG_t$	0.4945	0.4614	0.2584
	[4.2593]	[4.3715]	[4.2689]		[4.7985]	[4.5481]	[2.6123]
	***	***	***		***	***	**
$AGGR_{t-1}$	-0.0230	-	-	$GPCG_{t-1}$	-0.1756	-	-
	[-0.1204]				[-1.385]		
	ns				ns		
df	37	38	39	df	37	38	39
R^2	0.5531	0.5530	0.4759	R^2	0.4988	0.4721	0.2790
Adj R^2	0.4928	0.5059	0.4350	Adj R^2	0.4310	0.4173	0.2235
AIC	7.941	7.897	8.0085	AIC	7.4192	7.4223	7.6899
SC	8.186	8.0996	8.1723	SC	7.6650	7.6281	78537

Source: Author's own estimation, AIK = Akaike Info Criteria, SC = Schwarz Criteria. The data in [ ] are *t statics* value. ***, **, *, and ns are significant at 1 percent, 5 percent, 10 percent levels and not significant.

Two lags of dependent variables are considered as suggested by the model and the results are presented in Table 4.2. In VAR models there are no exogenous and endogenous variables in particular and they are treated inversely. The coefficients in the VAR model do not have an immediate meaning because they do not follow the dichotomy of endogenous and exogenous variables. That is why the standard concept of elasticity interpretation does not apply here. The dichotomy in VAR is the current and past values of variables. Instead of taking the other exogenous variables to explain the relationship, VAR treats its own current and past values to explain the short and long run relationships. VAR provides forecasts for the models and takes the behavior of dynamic feature of economic variables. What we can interpret here is if the VAR coefficients are different from zero, the simultaneous changes of the current values will lead to long run changes. According to the VAR model, the results presented in Table 5.11 suggest that there is a long run relationship between GDP per capita growth rate and agricultural GDP growth.

4. Aggregate Agricultural Productivity Function Estimation

a. Correlation Analysis

To estimate the empirical model 4.9 and 4.10 there are eight explanatory variables. Therefore, the correlation analysis is preliminarily conducted in order to guess the more relevant variables to the function. The relatively stronger linear relationship between agricultural productivity and land to labor ratio, the portion

of irrigated land per hectare of land, and total rice production per hectare of arable land are observed with the correlation coefficients of 0.33, 0.42 and 0.44 respectively. The correlation coefficients matrices are presented in Appendix Tables 13 and 14.

b. Multiple Regression Analysis

Multiple regression analyses to see the impact of factors of agricultural production on the agricultural productivity growth were conducted and the results are presented in Table 4.3. Agricultural productivity is generally defined as the amount of output per unit of input. In this study, we take into account the total value of agricultural production per hectare of arable land during a year as land productivity or agricultural productivity. There are eight explanatory variables to estimate in the empirical models 4.9 and 4.10. We have conducted many combinations of explanatory variables for each analysis according to their strength of relationship in correlation analysis. Most of the analyses were not significant at all with low explanatory power, *i.e.*, small R^2 values, and have not been presented here. The relatively strong multiple regression analyses with some significant variables were picked and presented as the results (Table 4.3). Several combinations of variables were taken into account in multiple regression analysis. The ten relatively strong models and their estimated values are presented. Model I is the best fit with the highest R^2 value of 0.7042.

Table 4.3 The Results of Multiple Regression Analyses for Estimating Agricultural Productivity Growth Rate

Variables	I	II	III	IV	V
Constant	2.1619	2.5998	2.5687	2.5086	3.4921
	(1.7719) *	(1.3104) ns	(0.1673) ns	(1.3583) ns	(1.8511) *
Labor ha^{-1}	1.5686	0.6189		0.2751	0.4410
	(3.0725)***	(0.7803) ns		(0.5378)ns	(0.8293) ns
Ferti ha^{-1}	-0.0079	-0.0053			
	(-0.7509) ns	(-0.2855) ns			
Tractor ha^{-1}	-0.0282	0.1397			
	(-0.2310) ns	(0.7877) ns			
Seed ha^{-1}	0.0098	0.0161			
	(0.1643) ns	(0.1451) ns			
Irri ha^{-1}	0.2138	0.5651	0.5765	0.4888	0.6381
	(1.0434) ns	(1.6819) ns	(2.1929)**	(1.5704) ns	(1.9963) *
TRPro ha^{-1}	0.7662	0.6359	0.5011	0.4851	
	(4.0983) ***	(2.2988) **	(2.4222)**	(2.3019)**	
WAni ha^{-1}	-1.1597	-0.6881			
	(2.643) **	(-1.0257) ns			
PEdu	0.3010				
	(1.1624) ns				
N	35	45	45	45	45
R^2	0.7042	0.3138	0.2761	0.2812	0.1883
Adj R^2	0.6096	0.1840	0.2416	0.2286	0.1496
DW Stat	1.6054	2.4575	2.4733	2.5068	2.2215

Source: Author's own estimation, numbers in parentheses are t statistics and ***, **, and * are significant at 1 percent, 5 percent and 10 percent level and ns is not significant.

Table 4.3 (Continued)

Variables	VI	VII	VIII	IX	X
Constant	2.5086	3.6034	1.8601	2.0394	2.0119
	(1.3583) ns	(1.8401)ns	(1.3505) ns	(1.5579) ns	(1.5522) ns
Labor ha^{-1}	0.2751	0.4148	-	0.6665	0.6916
	(0.5378) ns	(0.7601) ns		(2.1129) **	(2.229) **
Ferti ha^{-1}		0.0005	-	-0.0076	-
		(0.0296) ns		(-0.6676)ns	
Seed ha^{-1}	-	0.0734			
		(0.6503) ns			
Irri ha^{-1}	0.4888	0.5970	0.4607	0.2318	0.2194
	(1.5704) ns	(1.7921) *	(2.5259) **	(1.1280) ns	(1.0825)ns
TRPro ha^{-1}	0.4851		0.6118	0.6032	0.5853
	(2.3019) **		(3.5841)***	(3.6649)***	(3.6392)***
PEdu			0.4493	0.3779	0.3934
			(1.5732) ns	(1.3833) ns	(1.380) ns
N	45	45	35	35	35
R^2	0.2812	0.1969	0.5320	0.6068	0.6006
Adj R^2	0.2286	0.1166	0.4853	0.5366	0.5455
DW Stat	2.5068	2.2095	1.8120	1.8289	1.8819

Source: Author's own estimation, numbers in parentheses are t statistics and ***, **, and * are significant at 1 percent, 5 percent and 10 percent level and ns is not significant.

Labor to land ratio and total rice production per arable land are significant at the 1 percent level and the number of working animal per hectare has negative elasticity and significant at 5 percent level in model I. Although the growth rate of primary school enrollment is not significant in any model, it makes the models stronger because it is observed that the R^2 values are higher if PEdu is considered in the model (Model I, VIII, IX and X).

The conventional explanatory variables in agricultural production function are land, labor, capital, and technology. However, the variables considered as a proxy of capital, such as number of tractors, number of working animals, utilization of fertilizer and modern variety of seed, are not significant in any empirical model of the study except the number of working animals per hectare in Model I. However, it has negative impact on agricultural productivity growth. These findings indicate that Myanmar's agriculture is still very labor intensive because capital inputs have no significance in the function. The significance of labor to land ratio in Models I, IX and X highlights and supports this argument.

Total rice production per hectare of arable land is significant most of the time since successive governments put all efforts into the rice economy. The portion of irrigated land per hectare is also significant in 4 out of 10 of the models. We can interpret that irrigation infrastructure development is the right policy implication to boost agricultural productivity.

D. Conclusion

In conclusion, irrigated land area, total rice production and education are very important factors for growth in agricultural productivity. Furthermore, we have proved that agricultural productivity growth is a causal factor for per capital GDP growth in the short and long run. As a result agricultural productivity growth is very important to reduce poverty and to improve agricultural productivity the government should invest more in rural infrastructure development and education.

It can be concluded that Myanmar's agriculture still has wide room to develop by using more capital and improve technologies. Land productivity can be increased by utilizing more fertilizer, improved seed varieties, and further developing irrigation infrastructures. The other capital input factors, such as tractors and number of working animals, do not have an impact on land productivity. However, level of education does have an impact on productivity since empirical models are much stronger when the education variable is considered. Herein lies the final conclusion, which is that developing agricultural productivity has a strong impact on per capita GDP growth in particular, or poverty reduction in general.

Chapter V. Empirical Analysis for the Importance of Structural Change in Long-Term Economic Growth

A. Conceptual Framework

Development economics have proposed several “engine of growth” hypotheses, including agriculture, trade, industrialization, and structural change. Each hypothesis has been proposed and tested for different countries. There is no one-size-fits-all theory to apply to all countries so we must apply the suitable model and theory for different growth stages of economic development for individual countries.

The Lewis dual economy model proposes structural change in the form of the utilization and reallocation of surplus labor from the traditional sector to the modern sector as an engine of long-term economic growth. In this study we propose to drive the economy with a faster pace of agricultural growth while preparing to meet pre-conditions for take-off. After gaining some speed, there should be a gradual shift to labor intensive industrialization based on value added agricultural, food industry or other labor-intensive industries. Some intervention policies such as rural infrastructure development, the agricultural prioritization policy, welcoming foreign direct investment to the agricultural sector, asking for loans and grants from donor countries to invest in agriculture, and micro-credit

plans to provide for capital lacking small farmers, will be crucial for the development of the agricultural sector. Simultaneously, developing infrastructures such as roads, bridges and buildings, establishing an investor friendly environment, construction of special economic zones, developing utilities such as electricity, systematic water distribution, and communication and information technology, are complementary for preparing ground for new investments in the manufacturing sector.

During the structural change process in Japan, the share of agriculture in total GDP was 63 percent from 1878-82, which was reduced to 26 percent from 1923-27 (Kuznets, 1966: 9). Japan took about five decades to transform its economy from an agrarian to an industrialized one with technologies during the late nineteenth and early twentieth century. However, for other newly emerging countries, structural change did not take as much time as in Japan. For example, South Korea reduced its agricultural contribution to total GDP from 28.6 percent in 1975 to about 2.6 percent in 2010. It took only 30 years for Vietnam to reduce its agricultural contribution to total GDP from 40.2 percent in 1980 to 20.6 percent in 2010 (UNCTAD).

China reallocated its surplus labor force from the agricultural sector to the non-agricultural sector during the process of its economic reform. Through reallocation of labor, the share of agricultural labor in the total labor force was reduced from 70.5 percent in 1980 to 40.5 percent in 2010. While the Chinese

economy has been growing by two digit numbers in most of the years of the last three decades, the share of agricultural GDP was reduced from 30.2 percent in 1980 to 10.1 percent in 2010. Between 1978 and 2010, on average the real GDP growth rate of China was 10 percent.

It is observed that the time in structural change shortens as technologies are improved. Late-comers can benefit from technological improvements and have more opportunities linking up with emergent global institutions and networks. The firms in developing countries can easily acquire technology and get market access from global outsourcing firms without much effort and heavy investment in R&D (Mathews, 2006).

In Myanmar, the vast land with more than 70 percent of the labor force would produce not only for domestic consumption but also for primary goods exports and provision of raw materials for the food industry. The agricultural sector itself has the phenomenon of disguised unemployment or underemployment.[27] With technological change and capital-intensive agriculture, the substitution of capital for labor would make it possible to pull some amount of unskilled labor from the agricultural sector and reallocate it to the basic manufacturing sector.

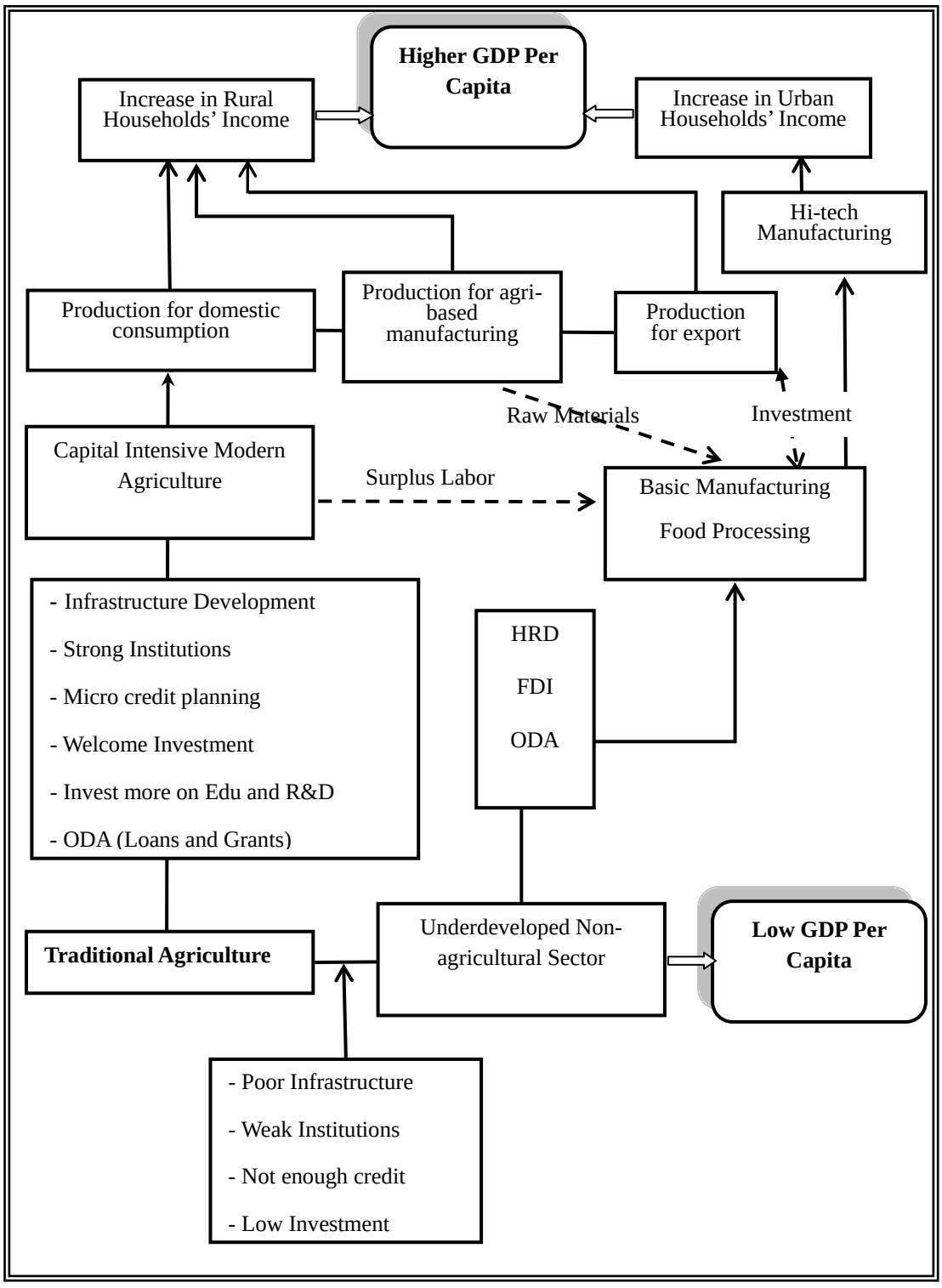
[27] Disguised unemployment exists frequently in developing countries whose large populations create a surplus in the labor force. Where more people are working than is necessary, the overall productivity of each individual drops. Disguised unemployment is characterized by low productivity and frequently accompanies informal labor markets and agricultural labor markets.

The conceptual framework for this study (Figure 5.1) was constructed based on the Lewis dual sector economy and assumptions, Rostow's liner-stages-of-growth theory together with neoclassical and new growth theories. If the agricultural sector is bigger than other sectors of economy in terms of share of labor and/or share of GDP in total GDP, it can take five major roles in a country: provide food supply, expand agricultural goods exportation, supply its surplus labor to the non-agricultural sector, savings from agricultural sector can be reinvested in the non-agricultural sector, and it can help the expansion of industrialization (Timmer, 1995; Yao, 2000; and Johnston and Mellor, 2011).

The non-agricultural sector is defined as all economic activities other than agricultural activities, which includes manufacturing, service, mining, and construction. However, the conceptual framework of this study includes only the manufacturing sector.[28] The manufacturing sector would produce the goods not only for domestic consumption but also for export. The export earnings would be reinvested not only in the development of the basic industrial sector but also for the high-tech industrial sector in the long run.

[28] The study follows the ISIC standards mentioned in Chapter II.

Figure 5.1 Relationship between Structural Change and Economic Growth



New growth theories posit accumulation of human capital and technological progress as the major driver of economic development [Lucas (1988) and Romer (1983)].[29] In the current conceptual framework, education is considered as an embedded factor to develop all sectors of the economy. While the economy is taking momentum at the stage of labor-intensive industrialization, human resource development will lay the ground for knowledge- or technological-based industrialization in the long run.

The increase in agricultural productivity and hence, rural household income, will reduce rural poverty. Job opportunities in the urban area created by new industrialization would increase the income of the rural population and ultimately lead to the increase in per capita GDP in the long run. To drive Myanmar's economy to be pro-poor, with balanced and sustainable economic growth, all components of agriculture, industrialization, and trade and export promotion would play their respective roles (Figure 5.1).

[29] Y=AK; where Y= Total output, A= Level of Technology, and K= Both of knowledge accumulation human capital and physical capital accumulation. Labor is assumed to be increasing with constant rate and there is no depreciation in capital. Knowledge grows with increasing returns.

B. Analytical Framework

1. Research Questions and Hypotheses

In this section, this dissertation asks the following research questions regarding structural change and economic development in Myanmar and selected economies. The questions are whether economic structural change matters in the economic growth of Myanmar and the selected economies in Asia and what the causal factors of economic development are. The study takes the evidence of the successful experiences in economic development via structural transformation of other countries to apply for Myanmar. The results of comparative study answer this question. Furthermore, the structural transformation in other successful economies sheds light on Myanmar's structural stickiness towards agriculture. The hypotheses are formulated according to the research interest as follows:

1. The declining rate of change in agricultural GDP contributes to real GDP growth rate.
2. The increasing rate of change in industrial GDP contributes to real GDP growth rate.
3. The rates of change in agricultural GDP, industrial GDP and the agricultural labor share Granger cause to real GDP growth of an economy and *vise versa*.

2. Data and Econometric Model

This study utilizes time series data for eight countries including Myanmar, China, Indonesia, South Korea, Malaysia, the Philippines, Thailand and Vietnam. The macroeconomic data is taken mainly from World Development Indicators and the United Nations Conference on Trade and Development (UNCTAD). The study period differs according to data availability and stationarity of the time series. Therefore, the study period for Myanmar is from 1991-2010, for Vietnam is from 1985-2010 and from 1980-2010 for the other six countries.

Not all ASEAN member countries are included in the study. The sample countries are carefully chosen from ASEAN plus three nations. Japan is intentionally excluded because the structural transformation process for Japanese economic development is much earlier than other countries. Significant structural transformation processes have been observed in South Korea and China since late 1970s. The other reason for taking South Korea in the study is because of the initial economic situations in the early 1960s is similar to the current situation of Myanmar. China is included in the study as it also represents a case of successful structural transformation during economic development process and is a strategically important neighbor of Myanmar. Historically, Myanmar used to adopt the ideology and economic policies of China in one way or another. Among ASEAN member countries the original ASEAN five member countries are taken into account. ASEAN five nations are Malaysia, Indonesia, the Philippines,

Thailand and Singapore. Singapore is not included in the study because it does not have considerable agricultural sector. Vietnam is taken into the study because the economic reform in Vietnam has been started since late 1980s, which is almost the same period with regime change in Myanmar during late 1980s. And Vietnam's poverty reduction strategies are very convincing to the other LDCs.

The empirical models are constructed based on the Lewis dual economy model incorporated with neoclassical growth theories. Neoclassical growth theory states that the economic growth is a function of capital accumulation and labor growth. Gross fixed capital formation is used as a proxy for physical capital accumulation (Ercolani and Wei, 2010; Awokuse, 2009; Brown, 2009; Wang and Piesse, 2009; Fields, 2006 and Azariadis, 1996) and takes trade to GDP ratio to allow the model to represent an open economy (Otkulu and Ozdemir, 2004; Radelet *et al.*, 1997; Bosworth *et al.*, 1995; Sachs and Warner, 1995; Tyler, 1980; and Michaely, 1977).

$$Y = AK^{\alpha} L^{\beta} \qquad \text{(5.1)}$$

Where Y = total output, K = capital accumulation and L = labor force.

$\alpha+\beta=1$, assuming the model is constant return to scale or homogenous of degree one.

Many studies exclude labor variables because they assume the economy at the full employment state, which does not reflect the real situation of LDCs. In this study the annual changes of number of agricultural workers to total labor is

included to reflect the structural change. Gross capital formation is defined as the summation of the flow of consumer’s durable commodity to household and enterprise, flow of producer’s durable commodities to enterprises, volume of total construction, net change in business inventories, and net change of claims against foreign countries. The relationship between resource reallocation to productivity growth by the conventional shift-share method considers only the supply side, while the demand side is taken exogenously or simply ignored.

Let’s say an economy is composed of three sectors: agriculture, manufacturing and service. If so, growth of output in each sector *i* can be expressed by Solow’s model with its assumption of homogenous of degree one (Timmer and Szimai, 2000).

$$\dot{Y}_i = v_i \dot{L}_i + (1 - v_i)\dot{K}_i + \dot{A}_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (5.2)$$

Where *Y* is the growth of production for sector *i*, *L* is labor input, *K* is capital input, and *A* is TFP in sector *i*, where *i* goes from 1 to 3. v_i stands for the labor share in value added production of sector *i*. Then, $1\text{-}v_i$ is capital share of value added production for sector *i*. Aggregate output growth of an economy can be re-written by summing all sectors’ output growth (5.2) together yields the following equation (5.3). Define the share of contribution of sector *i* output in aggregate output as q_i. Then total output growth equation yields as follow.

$$\dot{Y} = \sum q_i \dot{Y}_i = \sum q_i v_i \dot{L}_i + \sum q_i (1 - v_i)\dot{K}_i + \sum q_i \dot{A}_i \quad \ldots\ldots\ldots\ldots\ldots (5.3)$$

Where $q_i = Y_i / \Sigma Y_i$.

Aggregate growth can be directly estimated by respective aggregate variables such as the share of labor input to agriculture, manufacturing and service and share of capital input to agriculture, manufacturing and service.

Based on the theoretical model (5.3), empirical models are specified as follows.

$$\dot{Y}_t = a_0 + a_1\dot{A}_t + a_2\dot{K}_t + a_3\dot{T}_t + a_4\dot{L}_t + e_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5.4)$$

$$\dot{Y}_t = a_0 + a_1\dot{I}_t + a_2\dot{K}_t + a_3\dot{T}_t + a_4\dot{L}_t + e_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5.5)$$

Where: $\dot{Y}_t$ = the rate of real GDP growth

$\dot{A}_t =$ the rate of change in share of agricultural GDP (SAR)

$\dot{I}_t =$ the rate of change in share of industrial GDP (SIR)

$\dot{K}_t =$ the growth rate of gross fixed capital formation to GDP (GCFR)

$\dot{T}_t =$ the growth rate of total trade to GDP (STDR)

$\dot{L}_t =$ the growth rate of agricultural labor to total labor (CALAR)

$e_t =$ white noise or error term

Many empirical studies utilize the amount of foreign direct investment (FDI) to GDP as an explanatory variable; this study does not include FDI because the number of observations for FDI inflow to Myanmar is not large enough. The model 4.4 and 4.5 are modified into the model 4.6 and 4.7 by adding one lag value of dependent variable, the growth rate of real GDP, as an explanatory variable.

$$\dot{Y}_t = a_0 + a_1\,\dot{Y}_{t-1} + a_2\,\dot{A}_t + a_3\dot{K}_t + a_4\dot{T}_t + a_5\dot{L}_t + e_t \dots\dots\dots\dots\dots (5.6)$$

$$\dot{Y}_t = a_0 + a_1\,\dot{Y}_{t-1} + a_2\,\dot{I}_t + a_3\dot{K}_t + a_4\dot{T}_t + a_5\dot{L}_t + e_t \dots\dots\dots\dots\dots (5.7)$$

Where $\dot{Y}_{t-1}$ = the lag value of real GDP growth rate.

In the models 5.6 and 5.7, the consideration of the lag dependent variable as an explanatory variable is important. Some empirical studies have used the autoregressive distributed lag (ARDL) model to detect the short run and long run relationships among the variables. As we have a limited time series period, only one lag term for the dependent variable is treated as an explanatory variable. It is very effective in terms of the interpretation of the model as we only lose one degree of freedom. If we can prove that the lag value of the dependent variable is significant from zero, the other one lag value of explanatory variables is also significant. We can prove it by a simple mathematical equation. Suppose the model is: Y(t) = a X(t) and then take one lag value of the dependent variable as an explanatory variable, then,

$Y(t) = a_1 Y(t-1) + a_2 X(t)$ …….. (5.8)

Rearrange the equation as: $Y(t) - a_1 Y(t-1) = a_2 X(t)$ ……. (5.9)

Then $(1-a_1 L)\, Y(t) = a_2 X(t)$ where L = lag operator

$$Y(t) = \frac{a_2}{1-a_1 L} X(t)$$

$$Y(t) = \frac{1}{1-a_1 L}\, a_2 X(t) \quad \text{and let } x = a_1 L$$

Then, $$Y(t) = \frac{1}{1-x}\, a_2 X(t)$$

But $\frac{1}{1-x} = 1 + x + x^2 + x^3 + \ ...$

Then, $Y(t) = (1 + x + x^2 + x^3 + \ ...)\ a_2\ X(t)$

$$Y(t) = (1 + (a_1 L) + (a_1 L)^2 + (a_1 L)^3 + \cdots)\ a_2\ X(t)$$

$$Y(t) = \left(a_2\ X(t) + a_1 a_2\ X(t-1) + {a_1}^2 a_2\ X(t-2) + {a_1}^3 a_2\ X(t-3)\right) \ldots(5.10)$$

The above proof shows the lag operator of the dependent variable responds to the lag operators of other explanatory variables as well.

3. Empirical Model Estimation

Much macroeconomic time series data are non-stationary in nature. If the series shows trends or having unit roots, the ordinary least square (OLS) estimation leads to spurious regression with high R^2 values. Therefore, they are checked for their stationary status before moving to the next step of regression analysis. If it is a non-stationary data set, the data are transformed into the first differencing form to make them stationary. All variables are transformed into error correction form equivalently. Some more details about the unit root test have already been explained in Chapter IV.

After conducting unit root tests for all data series and if they are stationary, the regression using OLS is run for stationary series. The real GDP value series are usually non-stationary in nature so that the rate of real GDP growth is used as

a dependent variable. Then, all explanatory variables are also transformed into the rate of change in percentage terms such as the rate of change in share of agricultural GDP, the rate of change in industrial GDP share, the rate of change in gross fixed capital formation to GDP, the rate of change in trade to GDP ratio, and the rate of change in agricultural labor to total labor ratio.

As the major data source used for this study is UNCTAD stat online data, the variables are defined according to UNCTAD. The economy is composed of three major sectors: agriculture, industry and service. Gross fixed capital formation is a statistically measured indicator for the value of acquired new or existing fixed assets by both the private (business and households) and the government sector during a given period of time, usually during a fiscal year. It is not a measure of total investment but the value of net additional fixed assets in the economy. The term gross means the measure is not adjusted to deduct the consumption and depreciation of the fixed assets from the figure.

Share of total trade to GDP ratio measures the openness of the economy, which is the ratio of the value of total trade, value of exports plus value of import, to total GDP. In the empirical model share of labor in the agricultural sector is estimated and then takes the form of percentage change of the rate of agricultural labor. There is only 30-year panel data in the study so that the regression model includes only the lag value of the dependent variable not to lose many degrees of freedom.

4. Granger Causality Test

In time series data, events happen dynamically as time goes by. If event A happened before B, we may say A is a causal factor for event B. In econometric analysis, we usually define variables as dependent (Y) and explanatory variables (Xi). If OLS suggests the significance for probability, we could say that X has explanatory power to Y. In time series analysis, we can test the long-term relationship between variables of interest. The Granger causality test can be conducted not only for level stationary but also for differenced stationary series. If the Granger causality test holds, it suggests X Granger causes Y. We can then interpret that the past values of X have explanatory power for Y, or X might be causing Y.

Checking causality for the differenced stationary series, we may conduct more complicated two step procedures (Engle and Granger, 1987). However, if both Y and X are stationary, we can explain it by using the autoregressive distributed lag, ARDL (1,1) model.

$$Y_t = \alpha + \varphi_1 Y_{t-1} + \beta_1 X_{t-1} + \epsilon_t \quad \text{..... (5.11)}$$

β_1 measures the influence of X_{t-1} on Y_t. If β_1 is zero, X does not Granger cause Y or the past value of X does not explain the cause of Y. OLS estimation can be used to test whether the probability of β_1 is significantly different from zero. In this study the variables of interest are real GDP growth rate, the rate of change

in the share of agricultural GDP, the rate of change in the share of industrial GDP, and the rate of change in agricultural labor in total labor force. Six tests of Granger causality for each economy were conducted for three pair-wise combinations and *vise versa*.

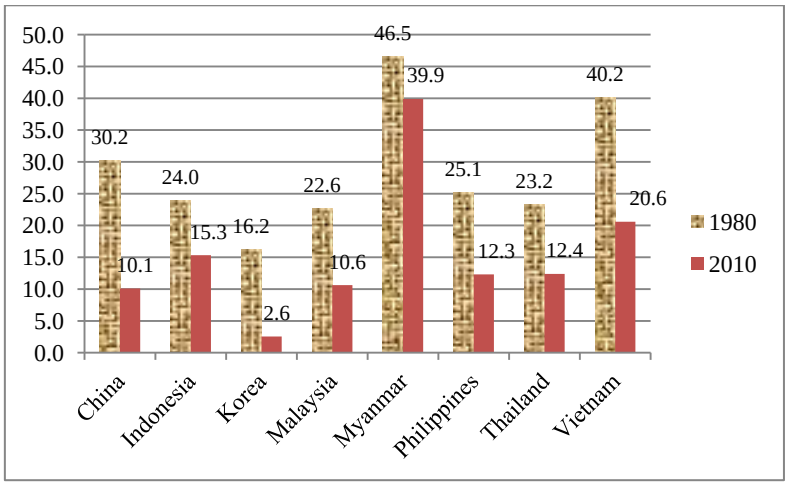
C. Results and Discussions

1. Descriptive Analysis

The experiences of other countries have shown that to reduce reliance on the agricultural sector is a must during the economic development process. Figure 5.2 shows the reduction in reliance on agriculture for selected economies during three decades from 1980 to 2010. While the other economies trimmed down their reliance on agriculture from a half to one third, Myanmar still relies on the agricultural sector for about 40 percent of its economy. The data are share of agricultural GDP in percent.

In the figure six economies which are members of ASEAN, along with China, being a neighbor and a world’s economically powerful country, and South Korea, representing a miracle of economic development, are brought under study.

Figure 5.2 Reliance on Agriculture in Selected Economies (1980-2010)



Source: UNCTAD

Table 5.1 shows the change in the share of the agricultural labor force during the last three decades for selected economies. South Korea shows a clear structural shift from the agriculture sector, which a reduction from 36.4 percent in 1980 to 5.25 percent in 2010. Other economies are also trimming down their reliance on the agriculture sector, while Myanmar does not have significant reduction of employment in the agricultural sector because it has only reduced its reliance by 9 percent within last three decades.

Table 5.1. Share of Agricultural Labor in Total Labor Force in Selected Countries (1980-2010)

Country	1980	1990	2000	2010	Total Change
China	74.12	74.34	69.34	62.50	11.62
Indonesia	57.89	56.03	48.70	41.95	15.94
South Korea	36.40	18.07	9.95	5.25	31.15
Malaysia	40.96	27.13	18.70	13.46	27.50
Myanmar	76.26	76.21	70.91	67.17	9.09
Philippines	51.60	45.71	40.05	34.62	16.98
Thailand	72.33	65.48	57.69	48.98	23.35
Viet Nam	74.12	68.22	61.93	57.33	16.79
Average	60.46	53.89	47.15	41.04	19.42

Source: UNCTAD

It is observed that the share of agricultural labor change is not as large as share of GDP change in China and Vietnam. For example, while share of agricultural GDP change in China decreased from 30.2 percent in 1980 to 10.1 percent in 2010, the reduction in the share of agricultural labor is just 11.62 percent during the same period. However, change in the share of agricultural labor is relatively larger than the agricultural GDP change in other six economies. For example, while the total reduction in agricultural labor share is 31.15 percent in South Korea, the reduction in agricultural GDP share is only 13.6 percent (16.2 percent in 1980 to 2.6 percent in 2010).

a. South Korea

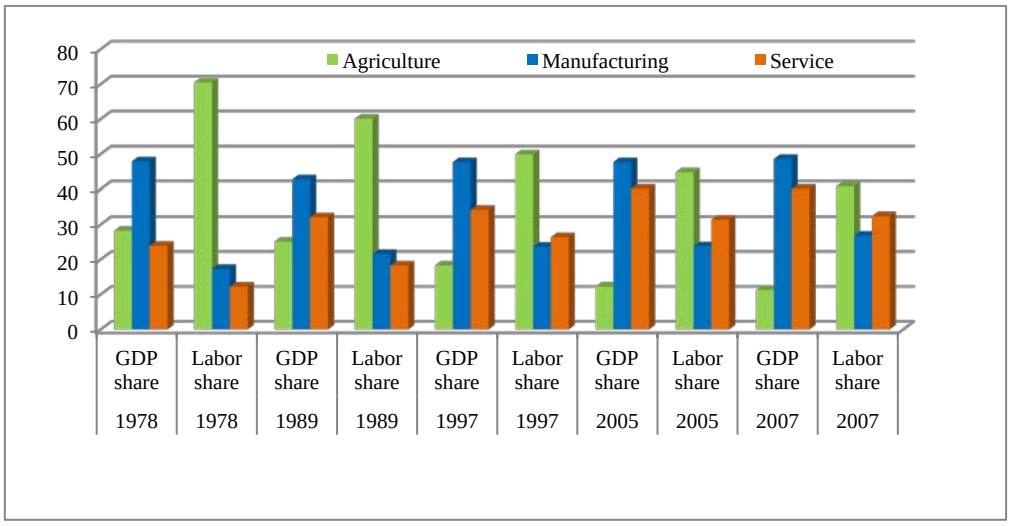
The economic structure of South Korea in 1975 was composed of agriculture (28.6 percent), manufacturing (20.9 percent) and service (50.5 percent). At the latter part of traditional industrialization or at the beginning of the knowledge-based era in 1990, agriculture contributed only one tenth of GDP (11percent), manufacturing (27.8 percent) and service (61.2 percent). When South Korea became one of the top economies in the world, the agriculture sector shared about only 3 percent, and manufacturing and service shared 39.4 and 57.6 percent in 2010.

South Korea's structural change pattern is consistent with convergence theories which state the faster rate of economic growth in developing countries can catch up to the growth rate of developed countries where they have a diminishing rate of per capita income growth. The fast and sustained rate of economic growth in South Korea makes it possible to catch up with developed economies. Being the fourteenth largest economy in the world and changing status from an aid recipient country to a donor country within four decades are milestones of economic achievement for South Korea. As stated in endogenous growth theories, wealth is a factor of technology and knowledge in which human capital is embedded. Endogenous growth theories explain the current stage of growth of knowledge economy in South Korea.

b. China

The structural change pattern of the Chinese economy can be clearly seen in figure 5.3. The shift or movement of labor from the less productive agriculture sector to the more productive sectors of industry and service were made within three decades. As the economy grew, the transfer of labor from the agricultural sector to the non agricultural sector was done within three decades. Share of labor in the agricultural sector dropped from 70.5 percent in 1978 to just 40.8 percent in 2007. Consequently, the share of agriculture to GDP declined from 28.2 percent in 1978 to only 11.3 percent in 2007 (Valli and Saccone, 2009). However, this does not imply that productivity in the agricultural sector is decreasing.

Figure 5.3 Structural Change Pattern of Chinese Economy (1978-2007)



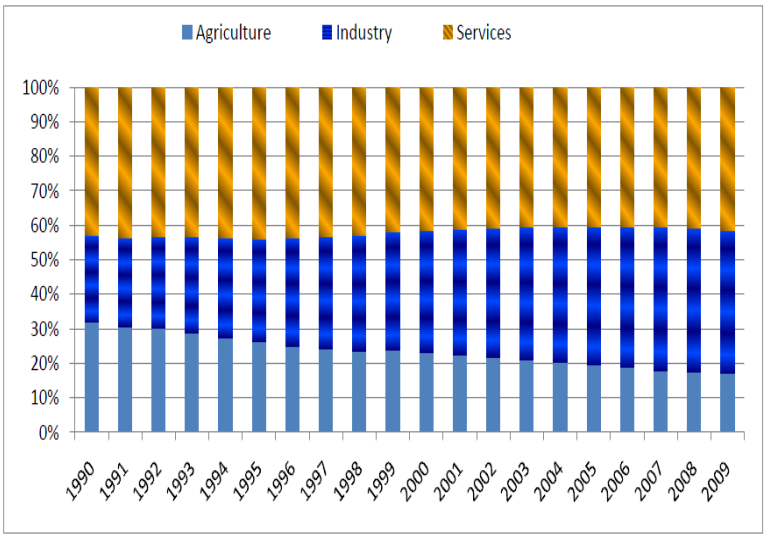
Source: NBS (2007, 2007)

c. Vietnam

During the Vietnam War, from 1960-63, Vietnam's economy relied almost entirely on the agriculture sector with 89.9 percent of total GDP, and relied very little on the manufacturing and service sectors with only 2.0 and 8.1 percent of total GDP during 1960-63. After the War, the Vietnam planned to build the nation with a socialism oriented market economy and intended for the state to stay as the dominant role of economy. The government aim to shift the economy from traditional and small scale agriculture to modernized agriculture and from small scale industries to large scale industries. The economic structural change pattern is observed and presented in Figure 5.4.

The share of agriculture in total GDP decreased from one third of GDP (32 percent) in 1990 to about 17 percent in 2009. As Vietnam is trying to industrialize, the portion of the industrial sector in total GDP increased from 25 percent in 1990 to 42 percent in 2009, while the service sector did not change much. During the same period the contribution of the service sector also decreased from 43 to 41 percent. Significant economic structural change was observed between the agricultural and manufacturing sectors during two decades. Among the sub-sectors in manufacturing, food product manufacturing took more than 18 percent of total GDP, which is an indicator of the importance of agriculture as the basis of economic development in Vietnam.

Figure 5.4 Share of GDP by Sector in Vietnam (1990-2009)



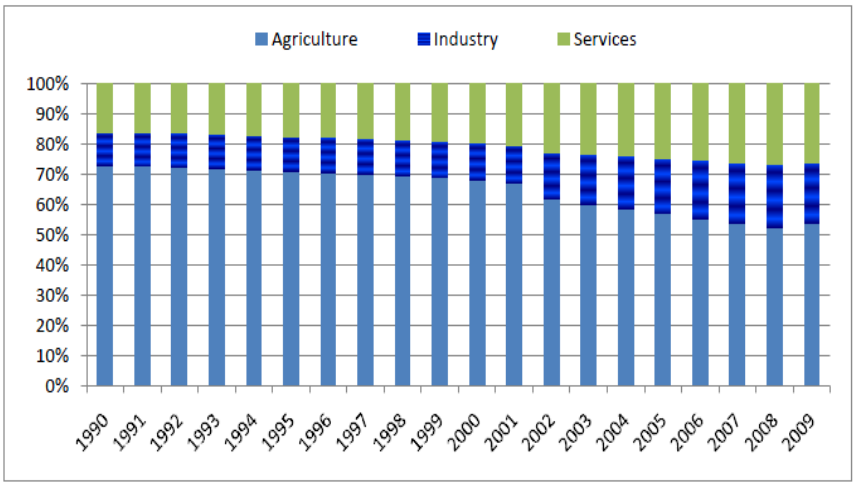
Source: http://www.gso.gov.vn/default_en.aspx?tabid=468&idmid=3&ItemID=12107

For labor structural change, it was observed that the agricultural sector still employed more than half (54 percent) of total labor in 2009, although it decreased from 73 percent of total agricultural labor in 1990. By observing Figure 5.5 of employment patterns, we can see the shift in labor from the agricultural to non-agricultural sector. The employment pattern indicates that the unskilled labor from the agricultural sector can be transferred to other labor-intensive manufacturing sectors as Lewis (1954) suggested in his dual-economy structural change economic development model.

In Vietnam the population rate is growing at 1.14 percent per year and the labor force is growing by more than one million every year (WB, 2012). The

government has to create new job opportunities to meet the job demand and it created more than 3.5 million new employments from 1992 to 1997. The distribution of new job opportunities was 16.7 percent in the agricultural sector, 27.0 percent in the manufacturing sector and 56.3 percent in the service sector (Belser, 2000). Employment growth in all sectors was observed so we cannot separate the employment shift from sector to sector. The estimated unemployment rate in Vietnam was 4.4 percent in 2010, while Myanmar had about 40 percent unemployment in 2012.[30]

Figure 5.5 Share of Employment by Sector in Vietnam (1990-2009)



Source: http://www.gso.gov.vn/default_en.aspx?tabid=467&idmid=3&ItemID=11671

[30] See in Poverty and Unemployment report for Myanmar in Table 3.9

d. Study on Empirical Variables

The thirty year average values of variables for each country are presented in Table 5.2. However, data for Vietnam is only included from 1985 to 2010. For estimating the real GDP growth rate (GDPR), the sample size for Myanmar was reduced from 1992 to 2010 to avoid suspected extreme data observations. The average real GDP growth rate of Myanmar is observed as the highest among the sample countries with 10.182 percent, followed by China with three decades of economic growth at an average rate of 10.10 percent. The real GDP growth rate of Myanmar is arguable among analysts and economists. I have discussed this in Chapter 3. From the last three decades the Philippines has the lowest average real GDP growth rate with 3.22 percent. As expected, the share of agricultural value added in total GDP (SAR) is the highest in Myanmar with 36.36 percent for a 30 year average, and South Korea has the lowest share of agriculture in GDP with 2.55 percent on average. The negative rates of change in agricultural GDP are observed in all of the sample countries with the smallest rate of change in Myanmar (-0.745 percent) and the highest rate of change in South Korea (-5.867 percent).

Share of industrial value added in total GDP (SIR) ranges from 13.24 percent in Myanmar to 45.43 percent in China. Although positive rates of change in share of industrial GDP are expected, China and the Philippine have negative growth rates. The total gross domestic product is the summation of the

contribution from the agricultural, industrial and service sectors, but this study does not take the service sector into account. Although the service sector is invisible in this study, it is imaginable that most of the economies in the study are trying to develop their service sectors because the rate of change in industrial growth is less than the negative rate of change in the share of agricultural GDP. The average growth rate of the share of industrial GDP for Myanmar is the largest with 2.765 percent because Myanmar found new oil and gas fields, which have become productive since 2001.

The gross capital formation to GDP ratios (GCFR) ranged between 14.47 percent in Myanmar and 39.06 percent in China. The average gross capital formation for sample countries is 27.57 percent in the last three decades and Myanmar's GCFR is observed to be far below the average GCFR. The highest rate of change in gross capital formation to GDP is observed in Vietnam with 4.93 percent and the Philippines with -0.2 percent growth of GCFR.

The total trade to GDP ratio is a good indicator for the relationship between economic growth and the openness of an economy. Asian tigers stand at the top in the world for trade to GDP ratio. Singapore is the world's number one trader with a trade to GDP ratio of 456.09 percent in 2005, followed by Hong Kong with 383.35 percent. (WDI database).[31] In this study, the share of trade to

[31] See: http://www.nationmaster.com/graph/eco_tra_of_gdp-economy-trade-of-gdp

GDP ratios (STDR) are expected to have positive growth in all economies and it was observed that the highest rate of change in trade to GDP ratio was in China with 5.708 percent and the lowest rate of change in STDR was in South Korea with 1.374 percent. The thirty year average trade to GDP ratios ranged from 30.82 percent in Myanmar to 141.51 percent in Malaysia. The average trade to GDP ratio for sample countries is 67.867 percent, but Myanmar has less than half of the average value, which means Myanmar still has a lot of room to open its economy in many dimensions.

All economies under the study show negative growth in the share of agricultural labor to total labor (CALAR) as expected, and range from -0.42 percent in Myanmar to -6.245 percent in South Korea. For last three decades, Myanmar has had the highest labor ratio in the agricultural sector with 72.31 percent and South Korea has had the lowest agricultural labor to total labor ratio with 15.57 percent on average. Myanmar, again, has the highest average agricultural labor to total labor ratio from that of all sample countries, which is 43.814 percent.

Table 5.2 Average Values of Variables for Selected Economies (1980-2010)

Country	GDPR	SAR	SIR	GCFR	STDR*	CALAR*
Myanmar	10.182 [a]	36.36	13.24	14.44	30.82	72.31
	(2.918) [a]	(-0.745)	(2.765)	(1.198)	(5.648)	(-0.420)
China	10.02	10.10	45.43	39.06	36.12	69.81
	(6.446)	(-3.457)	(-0.076)	(1.162)	(5.708)	(-0.565)
Indonesia	5.459	15.33	42.16	27.22	60.26	50.66
	(21.10)	(-1.287)	(0.474)	(2.989)	(1.374)	(-1.064)
South Korea	6.109	2.55	39.22	31.67	44.14	15.57
	(25.420)	(-5.857)	(0.272)	(0.103)	(1.374)	(-6.245)
Malaysia	6.019	10.62	43.00	28.37	141.51	23.69
	(-1.647)	(-2.082)	(0.323)	(0.472)	(1.931)	(-3.640)
Philippines	3.220	12.31	34.44	21.67	58.91	42.28
	(-16.345)	(-2.184)	(-0.548)	(-0.200)	(1.659)	(-1.319)
Thailand	5.616	12.38	38.57	30.39	81.57	60.61
	-(4.003)	(-1.634)	(1.513)	(0.569)	(3.382)	(-1.289)
Vietnam	6.780 [b]	28.85 [b]	33.03 [b]	27.71 [b]	89.60	65.65
	(4.816) [b]	(- 2.434) [b]	(1.769) [b]	(4.930) [b]	(3.699)	(-0.847)
Average	6.67	21.67	36.14	27.57	67.867	43.814
Minimum	3.22	2.55	13.24	14.49	30.82	15.57
Maximum	10.182	36.36	45.43	39.06	141.51	72.31
Std Dev	2.35	13.85	10.15	7.20	36.187	21.332

Source: Author's Estimation based on WB-WDI database. * = Based on UNCTAD stat, [a] Sample size (1992-2010), [b] Sample size (1985-2010), Sample size (1980-2010) if otherwise. Numbers in parenthesis are the averages rate of changes.

2. Unit Root Test

Checking for the stationary of time series is the first step to especially deal with macroeconomic variables. This study conducted the unit root tests hypothesizing that the series has unit roots. First of all, the Augmented Dickey Fuller's Test (ADF) was conducted for checking stationary. ADF statistics suggest one series, which is the rate of change in trade to GDP ratio (STDR) of the Philippines out of 48 series is non-stationary at a 10 percent level of significance. Then, Phillips-Perron's (PP) unit root test was conducted again and the PP statistics rejected the null hypothesis in all unit root tests at a 1 percent level of significance, which means all variables are qualified to enter the regression analysis. The results for both the Augmented Dickey-Fuller and Phillips-Perron tests are presented in Table 5.3 and 5.4.

The non-stationary series are to be dropped in regression analysis in order to avoid spurious regression problems. Meanwhile, according to Tables 5.3 and 5.4, all variables can be assumed to be stationary.

3. Correlation Analysis

Correlation analyses were conducted to see the strength and direction of relationships among the variables and were presented in Appendix Table 5-14. It is observed that the key structural change variables, SAR and SIR are strongly negatively correlated.

Table 5.3 Results of Unit Root Tests (Augmented Dickey-Fuller's Test)

Country	GDPR	SAR	SIR	GCFR	STDR	CALAR
Myanmar [a]	-4.0081	-3.932	-2.9349	-3.4323	-3.843	-4.0477
	(0.0074)	(0.0086)	(0.0609)	(0.0234)	(0.0103)	(0.0068)
China	-5.0959	-4.8666	-3.8925	-4.8882	-5.1996	-3.1000
	(0.0003)	(0.0005)	(0.0060)	(0.0005)	(0.0002)	(0.0369)
Indonesia	-5.1184	-4.7819	-4.9517	-5.7708	-6.0367	-4.2346
	(0.0003)	(0.0006)	(0.0004)	(0.0001)	(0.0000)	(0.0024)
Korea	-5.6574	-8.0200	-3.3710	-6.0022	-6.3232	-2.8848
	(0.0001)	(0.0000)	(0.0203)	(0.0000)	(0.0000)	(0.0592)
Malaysia	-5.2907	-5.3694	-4.6388	-4.5076	-4.2764	-3.1284
	(0.0002)	(0.0001)	(0.0012)	(0.0013)	(0.0022)	(0.0347)
Philippines	-5.2658	-5.2438	-5.7129	-4.3218	-2.5924	-6.665
	(0.0002)	(0.0002)	(0.0001)	(0.0020)	(0.1060)	(0.0000)
Thailand	-5.8802	-5.7049	-6.2657	-4.7680	-5.1792	-4.9631
	(0.0000)	(0.0001)	(0.0000)	(0.0006)	(0.0002)	(0.0003)
Vietnam [b]	-4.3240	-4.5785	-3.3513	-4.8699	-5.0493	-5.7463
	(0.0026)	(0.0013)	(0.0226)	(0.0008)	(0.0003)	(0.0000)

Note: [a] The sample size is from 1992 to 2010, [b] is from 1985 to 2010 and the rest are from 1980 to 2010. Numbers in parenthesis are the value of probability.

Table 5.4 Results of Unit Root Tests (Phillips-Perron's Test)

Country	GDPR	SAR	SIR	GCFR	STDR	CALAR
Myanmar [a]	-4.0834	-3.9392	-2.9537	-3.4323	-3.842	-4.0684
	(0.0063)	(0.0085)	(0.0584)	(0.0239)	(0.0103)	(0.0065)
China	-5.1824	-7.8850	-3.7986	-4.8759	-5.222	-3.0588
	(0.0002)	(0.0000)	(0.0075)	(0.0005)	(0.0002)	(0.0404)
Indonesia	-6.2831	-4.7646	-4.9468	-7.6091	-6.3647	-4.2549
	(0.0000)	(0.0006)	(0.0004)	(0.0000)	(0.0000)	(0.0022)
Korea	-5.6574	-11.557	-3.4248	-6.3066	-6.2937	-2.8447
	(0.0001)	(0.0000)	(0.0182)	(0.0000)	(0.0000)	(0.0631)
Malaysia	-5.2877	-5.3471	-4.5036	-4.4929	-4.2193	-3.1008
	(0.0002)	(0.0001)	(0.0013)	(0.0013)	(0.0025)	(0.0309)
Philippines	-5.2659	-5.2483	-5.7129	-4.1627	-4.0554	-6.6658
	(0.0002)	(0.0002)	(0.0001)	(0.0031)	(0.0039)	(0.0000)
Thailand	-5.8796	-5.7029	-6.1734	-4.7334	-5.1761	-4.9745
	(0.0000)	(0.0001)	(0.0000)	(0.0007)	(0.0002)	(0.0003)
Vietnam [b]	-4.7898	-4.5704	-3.0119	-4.8714	-5.0698	-5.7663
	(0.0008)	(0.0014)	(0.0480)	(0.0008)	(0.0003)	(0.0000)

Note: [a] The sample size is from 1992 to 2010, [b] is from 1985 to 2010 and the rest are from 1980 to 2010. Numbers in parenthesis are the value of probability.

4. Regression Analysis

Four empirical regression analyses were done for each country and the results are summarized and presented in Table 5.5 to 5.8. EViews statistical software version 7.0 is used to estimate the equations.

a. Empirical Model I

The first empirical model is based on equation 5.4. The main explanatory variable in model I is the rate of change in share of agricultural GDP (SAR) and the results of the model are presented in Table 5.5. The other explanatory variables are the growth rate of gross capital formation to GDP (GCFR), growth rate of share of trade to GDP (STDR) and rate of change in agricultural labor to total labor (CALAR). The variable CALAR is to reflect the labor structural change in the economy.

Although, as we observed and stated above, there is a negative growth of share of agricultural GDP in all economies under the study, Model I does not suggest any significant relationship with real GDP growth rate in any economy. The rate of change in gross capital formation to GDP ratio is significant in the models for Indonesia, the Philippines and Thailand at a 1 percent level. The model suggests that a 1 percent growth rate of gross capital formation to GDP will give a rise of 2.94 percent in the change in real GDP growth in Indonesia and 3.1 percent increase in the Philippines.

Table 5.5 Results of Regression Analysis Model I

	MMR	CHI	INDO	ROK	MYS	PHIL	THAI	VN
Constant	-3.148	-2.428	22.27	-180.6	89.67	21.93	30.43	9.013
	(-0.138)	**(-0.229)**	**(0.580)**	**(-0.403)**	**(0.232)**	**(0.291)**	**(0.479)**	**(1.230)**
	ns	ns	ns	ns	ns	ns	ns	ns
SAR	1.837	-1.521	-5.912	-15.35	1.740	-6.509	1.995	-0.235
	(0.756)	**(-0.900)**	**(-1.092)**	**(-1.027)**	**(0.312)**	**(-0.923)**	**(0.668)**	**(-0.332)**
	ns	ns	ns	ns	ns	ns	ns	ns
GCFR	0.606	-0.287	4.472	12.07	-0.908	9.032	-6.899	0.357
	(0.840)	**(-0.207)**	**(2.940)**	**(1.462)**	**(-0.315)**	**(3.101)**	**(-3.077)**	**(0.901)**
	ns	ns	***	ns	ns	***	***	ns
STDR	-0.191	0.254	-0.863	3.181	1.213	-1.017	7.402	0.512
	(-0.729)	**(0.475)**	**(-0.710)**	**(0.449)**	**(0.169)**	**(-0.240)**	**(2.112)**	**(1.186)**
	ns	ns	ns	ns	ns	ns	**	ns
CALAR	-16.30	-4.414	19.13	-17.59	24.61	37.16	40.57	7.621
	(-0.502)	**(0.307)**	**(0.690)**	**(-0.242)**	**(0.226)**	**(0.747)**	**(0.897)**	**(1.702)**
	ns	ns	ns	ns	ns	ns	ns	ns
N	18	30	30	30	30	30	30	25
R^2	0.106	0.064	0.543	0.155	0.016	0.349	0.362	0.226
Adj R^2	-0.148	-0.079	0.470	0.020	-0.140	0.245	0.260	0.063
DW Stat	1.223	1.680	2.192	0.873	1.814	1.744	2.008	1.488

Note: Numbers in the parentheses are t-Statistics, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level, and ns= not significant.

However, it has a negative impact in Thailand at one percent significant level with a 1 percent change of growth in gross capital formation and a decrease of 3.077 percent in real GDP growth rate.

The growth rate of share of trade to GDP is significant only in Thailand at a 5 percent level. It suggests a 1 percent change in share of trade to GDP growth will increase 2.112 percent in real GDP growth. According to Model I the rate of change in agricultural labor to total labor is not significant in any economy. In conclusion, Model I is not applicable to Myanmar, China, South Korea, Malaysia and Vietnam. R^2 values are very small in the models of those countries, as well. However, Model I can explain the 54.3 percent, 34.49 percent and 36.2 percent of total variation in real GDP growth rate in Indonesia, the Philippines and Thailand respectively. There is no serial correlation in the models for Indonesia and Thailand as the Durbin-Watson statistics suggested.

b. Empirical Model II

The regression analysis results of empirical Model II are presented in Table 5.6. The major explanatory variable in this model is the growth rate of share of industrial GDP (SIR) and the other explanatory variables are the same as in Model I. The growth rate of share of industrial GDP is significant at a 10 percent level and a 1 percent level in the models for Indonesia and South Korea. One

percent growth in SIR suggests a 1.87 percent increase in real GDP of Indonesia and a 2.83 percent increase in real GDP growth of South Korea.

The growth rate of gross capital formation to GDP ratio (GCFR) is significant at a 1 percent level in Indonesia, the Philippines and Thailand. One percent growth in GCFR suggests 4.48 percent and 2.78 percent growth in real GDP of Indonesia and the Philippines. However, in Thailand it suggests a negative causal relationship. The growth rate of share of trade to GDP (STDR) is significant at a 5 percent level in Thailand only, and suggests a 1 percent growth in STDR will increase to 2.28 percent in change in real the GDP growth rate.

The growth rate of share of agricultural labor in total labor force (CALAR) shows no significance in any model. In conclusion, Model II does not fit for Myanmar, China, Malaysia and Vietnam since their R^2 values are very small. It is no wonder that small R^2 values result in negative adjusted R^2 values.

Table 5.6 Results of Regression Analysis Model II

	MMR	CHI	INDO	ROK	MYS	PHIL	THAI	VN
Constant	7.947	0.420	34.759	-133.8	104.5	33.129	4.4903	9.472
	(0.346)	**(0.036)**	**(0.9699)**	**(-0.335)**	**(0.285)**	**(0.4259)**	**(0.0654)**	**(1.281)**
	ns	Ns	ns	ns	ns	ns	ns	ns
SIR	-1.323	1.585	13.352	65.613	-5.033	9.1512	5.3222	-0.049
	(-1.570)	**(0.435)**	**(1.8737)**	**(2.838)**	**(-0.334)**	**(0.5249)**	**(0.4172)**	**(-0.056)**
	ns	ns	*	***	ns	ns	ns	ns
GCFR	0.305	-0.188	4.9432	9.6651	-0.898	8.5646	-7.720	0.354
	(0.497)	**(-0.127)**	**(4.4819)**	**(1.3075)**	**(-0.312)**	**(2.7878)**	**(-3.104)**	**(0.891)**
	ns	ns	***	ns	ns	***	***	ns
STDR	-0.301	0.308	-1.991	3.241	2.464	-0.411	7.852	0.498
	(-1.161)	**(0.572)**	**(-1.472)**	**(0.519)**	**(0.344)**	**(-0.093)**	**(2.283)**	**(1.115)**
	ns	ns	ns	ns	ns	ns	**	ns
CALAR	-5.816	-8.147	29.532	-21.66	29.919	31.899	30.042	7.370
	(-0.186)	**(-0.586)**	**(1.1228)**	**(-0.343)**	**(0.2941)**	**(0.640)**	**(0.656)**	**(1.652)**
	ns	ns	ns	ns	ns	ns	ns	ns
N	18	30	30	30	30	30	30	25
R^2	0.209	0.0421	0.5807	0.3345	0.0174	0.3345	0.3555	0.2219
Adj R^2	-0.016	-0.105	0.5136	0.2280	-0.139	0.2280	0.2523	0.0580
DW Stat	1.143	1.692	1.913	1.1793	1.814	1.8935	2.1493	1.5573

Note: Numbers in parentheses are t-Statistics, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level, and ns= not significant.

Meanwhile, Model II appears to explain economic growth of Indonesia, South Korea, and Philippines to a certain extent. It can explain 58.07 percent and 35.55 percent in total variation of the rate of change in real GDP growth (GDPR) of Indonesia and Thailand and explains 33.45 percent in South Korea and the Philippines. Durbin Watson statistics indicate no serial correlation problem in Indonesia, the Philippines and Thailand, but there is one in South Korea.

c. Empirical Model III

Model III includes the one lag value of a dependent variable, the rate of change in real GDP growth as one of the explanatory variables and the other explanatory variables are the same with Model I and the results are presented in Table 5.7 We have explained that if the coefficient of lag value of a dependent variable as an explanatory is significantly different from zero the lag values of other explanatory variables are also significant so that the inclusion of $GDPR_{t-1}$ variable is very meaningful. Unfortunately, the $GDPR_{t-1}$ shows no significance in any economy, which means the lag value of other explanatory variables also do not have a relationship with GDPR. Although $GDPR_{t-1}$ itself is not significant it makes model stronger and makes other variables become more significant, which means the lagged GDPR has effect on current GDPR.

The rate of change in share of agricultural GDP (SAR) is significant at a 5 percent level in Myanmar. The result reflects the agrarian picture of the economy

Table 5.7 Results of Regression Analysis Model III

	MMR	CHI	INDO	ROK	MYS	PHIL	THAI	VN
Constant	1.4722	0.1003	33.866	-201.7	88.255	16.564	28.361	9.026
	(0.0751)	**(0.0089)**	**(0.8368)**	**(-0.403)**	**(0.214)**	**(0.210)**	**(0.4212)**	**(1.190)**
	ns	ns	ns	ns	ns	ns	ns	ns
GDPR $_{t-1}$	0.1918	0.0809	-0.111	-0.311	-0.020	-0.117	-0.053	0.003
	(0.8537)	**(0.3422)**	**(-0.792)**	**(-0.490)**	**(-0.087)**	**(-0.580)**	**(-0.264)**	**(0.0138)**
	ns	ns	ns	ns	ns	ns	ns	ns
SAR	5.9577	0.7819	-6.640	-9.597	1.8259	-5.931	1.891	-0.231
	(2.3824)	**(-0.400)**	**(-1.187)**	**(-0.566)**	**(0.3108)**	**(-0.806)**	**(0.591)**	**(-0.300)**
	**	ns	ns	ns	ns	ns	ns	ns
GCFR	0.7244	-0.561	4.3253	10.995	-0.939	9.486	-6.891	0.356
	(1.1707)	**(-0.373)**	**(2.7522)**	**(1.290)**	**(-0.305)**	**(3.047)**	**(-2.943)**	**(0.8522)**
	ns	ns	**	ns	ns	***	***	ns
STDR	-0.292	0.354	-1.057	4.779	1.194	-1.090	7.410	0.5115
	(-1.291)	**(0.6289)**	**(-0.846)**	**(0.640)**	**(0.159)**	**(-0.244)**	**(2.034)**	**(1.1351)**
	ns	ns	ns	ns	ns	ns	*	ns
CALAR	-33.84	-5.433	24.618	-26.08	24.168	36.043	39.829	7.626
	(-1.183)	**(-0.368)**	**(0.8588)**	**(-0.335)**	**(0.2100)**	**(0.6999)**	**(0.8392)**	**(1.652)**
	ns	ns	ns	ns	ns	ns	ns	ns
N	18	30	30	30	30	30	30	25
R^2	0.404	0.0582	0.5670	0.1220	0.0172	0.359	0.3667	0.2262
Adj R^2	0.134	-0.137	0.4729	-0.068	-0.196	0.220	0.2290	0.0113
DW Stat	1.361	1.4339	2.0685	0.8649	1.7788	1.576	1.9269	1.429

Note: Numbers in parentheses are t-Statistics, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level, and ns= not significant.

suggesting a 1 percent growth in SAR increases 2.38 percent in GDPR during the study period. The rate of change in gross capital formation to GDP (GCFR) is significant at a 5 percent level in Indonesia and at a 1 percent level in the Philippines and Thailand. The results suggest that a 1 percent change in GCFR increases the GDPR of 2.75 percent in Indonesia and 3.04 percent in the Philippines. However, it shows a negative relation in Thailand as Model I and II suggested. The rate of change in share of trade to GDP (STDR) is significant only in Thailand at a10 percent level, suggesting a 1 percent increase in STDR increases 2.03 percent in GDPR in Thailand, which means trade is an engine of growth in Thailand's economy.

The rate of change in agricultural labor share in total labor force (CALAR) does not explain anything in any economy in Model III. In conclusion, Model III does not fit to China, South Korea, Malaysia and Vietnam because their R^2 values are very small. However, Model III explains 40.4 percent, 56.70 percent, 35.9 percent and 36.67 percent of the total variation in GDPR of Myanmar, Indonesia, the Philippines and Thailand, respectively.

d. Empirical Model IV

Model IV is a modification of Model II by adding the lag value of the dependent variable as an explanatory variable and the other independent variables are the same as in Model II and the results are presented in Table 5.8.

Table 5.8 Results of Regression Analysis Model IV

	MMR	CHI	INDO	ROK	MYS	PHIL	THAI	VN
Constant	15.10	0.826	47.12	-154.6	105.0	27.98	6.4719	9.4968
	(0.788)	**(0.070)**	**(1.238)**	**(-0.358)**	**(0.268)**	**(0.342)**	**(0.090)**	**(1.2503)**
	ns	ns	ns	ns	ns	ns	ns	ns
GDPR t-1	0.200	0.119	-0.103	-0.374	-0.000	-0.142	-0.093	0.0243
	(0.986)	**(0.5086)**	**(-0.781)**	**(-0.691)**	**(-0.001)**	**(-0.700)**	**(-0.472)**	**(0.1136)**
	ns	ns	ns	ns	ns	ns	ns	ns
SIR	-2.311	-0.250	13.74	65.86	-5.035	9.438	5.834	-0.028
	(-3.043)	**(-0.060)**	**(1.892)**	**(2.850)**	**(-0.316)**	**(0.501)**	**(0.417)**	**(-0.031)**
	**	ns	*	***	ns	ns	ns	ns
GCFR	-0.096	-0.472	4.922	8.020	-0.893	9.102	-7.645	0.3445
	(-0.185)	**(-0.304)**	**(4.369)**	**(1.077)**	**(-0.289)**	**(2.787)**	**(-2.955)**	**(0.823)**
	ns	ns	***	ns	ns	**	***	ns
STDR	-0.398	0.394	-2.195	4.761	2.458	-0.818	7.738	0.493
	(-1.853)	**(0.707)**	**(-1.585)**	**(0.744)**	**(0.327)**	**(-0.170)**	**(2.157)**	**(1.070)**
	*	ns	ns	ns	ns	ns	**	ns
CALAR	-12.54	-8.275	35.60	-24.75	30.02	31.47	31.569	7.450
	(-0.478)	**(-0.584)**	**(1.305)**	**(0.370)**	**(0.278)**	**(0.611)**	**(0.6608)**	**(1.607)**
	ns	ns	ns	ns	ns	ns	ns	ns
N	18	30	30	30	30	30	30	25
R^2	0.5101	0.052	0.602	0.343	0.017	0.348	0.361	0.222
Adj R^2	0.2875	-0.145	0.515	0.200	-0.196	0.206	0.223	0.006
DW Stat	1.541	1.487	1.737	1.192	1.813	1.674	1.995	1.580

Note: Numbers in parentheses are t-Statistics, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level, and ns= not significant.

The lag value of real GDP growth (GDPRt-1) and the rate of change in agricultural labor share in total labor force (CALAR) are not significant in any economy as they were in Model III.

The rate of change in industrial GDP share (SIR) is significant at a 5 percent level in Myanmar, 10 percent in Indonesia and 1 percent in South Korea. The rate of change in agricultural GDP (SAR) and SIR are highly negatively correlated in correlation analysis (Appendix Table 5). The correlation coefficient value is -0.667 for Myanmar, -0.531 for Indonesia and -0.449 for Malaysia so that the signs of relationship between SAR and GDPR and SIR and GDPR are opposite. Therefore, Model IV suggests the negative relationship between SIR and GDPR for Myanmar because Model III has suggested the positive relationship between SAR and GDPR for Myanmar. For the case of Indonesia and South Korea, Model IV suggests that a 1 percent increase in the rate of change of industrial GDP (SIR) increases 1.89 percent and 2.85 percent at 10 percent and 1 percent significant levels. The results show that Myanmar does not have structural transformation during the study period and the increasing share of industrial GDP (SIR) is a causal factor for economic growth in South Korea and Indonesia.

The rate of change in gross capital formation to GDP (GCFR) is significant in Indonesia, the Philippines and Thailand at 1 percent, 5 percent and 1 percent significant level, respectively. A 1 percent increase in GCFR increases 4.36 percent and 2.78 percent GDPR in Indonesia and the Philippines. However, a

negative relationship between GCFR and GDPR is observed for Thailand in all of the models. The rate of change in share of trade in GDP (STDR) is significant in Myanmar and Thailand at a 10 percent and 5 percent significant level, but there is a negative relationship between STDR and GDPR for Myanmar. The Model suggests that a 1 percent increase in STDR increases 2.15 percent of real GDP growth (GDPR) in Thailand.

As a conclusion, Model IV does not suggest anything for China, Malaysia and Vietnam as models for those economies have very small R^2 values. However, the goodness of fit parameter, R^2, is high enough in the other economies of Myanmar (0.5101), Indonesia (0.602), the Philippines (0.348) and Thailand (0.361).

5. Granger Causality Test

If the series are stationary, it is useful to run the Granger Causality test for their short run relationship. Six pair-wise Granger Causality tests for each economy were conducted. They were the Granger causality between the share of agricultural GDP (SAR) and the growth rate of real GDP (GDPR), the share of industrial GDP (SIR) and the real GDP growth (GDPR), and the rate of change in the share of agricultural labor in total labor force (CALAR) and GDPR.

The hypotheses are such as the rate of change in agricultural GDP share in total GDP (SAR) does not Granger cause the real GDP growth rate (GDPR),

GDPR does not Granger cause SAR, the rate of change in industrial GDP share in total GDP (SIR) does not Granger cause the real GDP growth rate (GDPR), GDPR does not Granger cause SIR, the rate of change in agricultural labor share in total labor force (CALAR) does not Granger cause GDPR, and GDPR does not Granger cause CALAR. The results are presented in Table 5.9. There are 8 out of 48 tests, which suggest the Granger causality.

The null hypothesis that SAR does not Granger cause GDPR is rejected in South Korea and the Philippines at a 5 percent significant level, which means the rate of change in agricultural GDP might be a causal factor for real GDP growth changes in South Korea and the Philippines. The F test statistics reject the null hypothesis of the rate of change in the industrial GDP (SIR) does not Granger cause to GDPR in Indonesia and in the Philippines at a 5 percent significant level. It means that SIR might be a causality factor for GDPR in Indonesia and the Philippines. The reverse hypothesis of GDPR might be a causal factor for the rate of change in SIR is suggested by the Granger causality test for Indonesia.

The null hypothesis that the rate of change in agricultural labor in total labor force (CALAR) does not Granger cause the GDPR is rejected in China and Thailand at 5 percent and 10 percent significant levels. This means that CALAR might be a causal factor for GDPR in China and Thailand.

Table 5.9 Results of Granger Causality Tests

Hypothesis	MMR	CHI	INDO	ROK	MYS	PHIL	THAI	VN
1. Change in share of agricultural GDP does not Granger cause real GDP growth rate.	0.4649 ns	1.2727 ns	0.4727 ns	4.0192 (.031)**	1.2371 ns	5.4787 (.011)**	0.3911 ns	1.4884 ns
2. Real GDP growth rate does not Granger cause change in agricultural GDP share.	1.4539 ns	2.1727 ns	0.4858 ns	0.0442 ns	0.3477 ns	0.165 ns	0.7024 ns	0.4952 ns
3. Change in share of industrial GDP does not Granger cause real GDP growth rate.	0.6614 ns	0.6945 ns	3.7364 (.039)**	0.4649 ns	0.0555 ns	4.4658 (.023)**	0.1002 ns	1.1085 ns
4. Real GDP growth rate does not Granger cause change in industrial GDP share.	0.620 ns	4.4306 (.023)**	5.2343 (.013)**	0.4348 ns	0.6554 ns	0.0851 ns	1.0043 ns	0.9613 ns
5. Change in agricultural labor ratio to total labor force does not Grange cause real GDP growth.	2.659 ns	4.2745 (.025)**	0.04416 ns	0.1688 ns	1.3986 ns	1.0619 ns	2.8344 (.079)*	0.5893 ns
6. Real GDP growth rate does not Granger cause Change in agricultural labor ratio to total labor force.	02.0679 ns	5.0470 (.014)**	0.2564 ns	0.089 ns	0.1532 ns	1.2017 ns	0.2240 ns	0.6113 ns

Note: Numbers are F-Statistics, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level and ns= not significant.

The reverse hypothesis of GDPR does not Granger cause CALAR is rejected in China, meaning the CALAR might be a causal factor of GDPR of China.

D. Conclusion

The comparative study is conducted to show how important structural transformation has been in the economic development process of other successful economies. It is observed that increasing share of industrial GDP is a causal factor for economic growth in South Korea and Indonesia. Myanmar is the only country with opposite relationships between SAR and GDPR and SIR and GDPR, indicating the structural rigidity as a fact of being a poor economy. It should also be noted that the results may be due to the short study period, i.e. 1992-2010, used for the analysis.

Granger causality results give the broader scenarios of results because it has relatively weaker relationship than regression analysis does. Therefore, the Granger causality tests yield the significant results to China and the Philippines while regression analyses do not give significant results for them. In conclusion, the study finds the evidence of the importance of the structural transformation in economic development in China, Indonesia, South Korea, and the Philippines. It is the good example for Myanmar to do structural transformation in the long-term economic development

Chapter VI. Conclusion and Policy Recommendations

A. Summary and Conclusion

Myanmar is now at the crossroads of development policy choice. Its economy has been characterized by long-term stagnation, prevalent poverty and the structural stickiness towards agriculture for more than half a century. The government thus faces the daunting challenges of promoting industrialization and economic growth, while at the same time achieving poverty reduction in the context of MDGs.

The objective of this dissertation is to investigate the role of agriculture in pro-poor growth and structural change in the long-term economic development of Myanmar. In particular, this study constructs the conceptual framework, which delineates the processes of structural change and pro-poor growth, and conducts econometric analyses to test the empirical models drawn from the conceptual framework. The comparative study is conducted to examine the impact of structural change on economic development of the selected economies.

The examination of historical data shows that Myanmar has experienced very little structural change in terms of the shift from the agricultural sector to the industrial sector, while many other Asian economies have undergone significant structural changes. Myanmar has remained the poorest country among ASEAN members and still faces the problem of widespread poverty.

While the theories of economic development would call for structural change and industrialization in order to achieve long-term economic growth, the government also faces the challenge of reducing poverty and ensuring pro-poor growth in the short and medium terms. In this respect, this study constructs a conceptual framework which not only accounts for longer term structural change but also the transition process in which agricultural plays a key role in achieving poverty reduction and pro-poor growth of Myanmar.

The econometric analyses of this study consist of two parts. The first part of the analysis focused on the role of agricultural productivity growth in poverty reduction and examined the determinants of agricultural productivity growth. Agricultural productivity growth is very important for the vast majority of workers who are involved in agriculture. Boosting land and labor productivity in the agricultural sector is crucial for poverty reduction and capital accumulation before shifting to the industrialized stage.

This study takes GDP per capita growth as a proxy of poverty measure. This part of analysis focused only on Myanmar, using data from IRRI world rice statistics' online source for the period of 1965 to 2010. Conventionally, the factors of agricultural production are land, labor, capital and total factor productivity. For estimation of the aggregate agricultural production function, the number of agricultural labor, amount of improved rice seed distribution and amount of fertilizer utilization, the irrigated area, number of tractors and working animals

and the number of primary school enrollment are considered in the multiple regression analysis. All variables are taken as per hectare base and transformed into the rate of change. Furthermore, the total rice production per hectare of arable land is also taken into account because the rice economy takes the lion share of agricultural sector in Myanmar all the time.

Regression analysis is conducted to examine the relationship between agricultural productivity growth and per capita income growth. ARDL (1, 1) models are estimated for short run causality and VAR models are constructed and estimated for long run causality tests. The results of the models suggest that the agricultural productivity per hectare growth is a contributing factor for GDP per capita growth and they have both short run and long run relationships. Empirical evidence of this study supports the argument that enhancing agricultural productivity should be the focal point of designing development policies for poverty reduction.

The results of estimating aggregate agricultural production function imply that the agricultural sector in Myanmar is still at the labor intensive stage as only labor to land ratio is significant while other capital proxy variables such as seed, fertilizer, tractors and working animals are not significant in any model. However, the portion of irrigated land per hectare is significant in 4 out of 10 models. It implies that investment in irrigation infrastructural has a positive impact on agricultural productivity growth. The total amount of rice production per hectare

of arable land, which is different from rice yield, is significant in most of the models indicating that the effect of the rice economy on the overall agricultural sector and the low degree of agricultural diversification in Myanmar. The models become stronger when the education variable is included, which highlights the importance of education on agricultural productivity growth.

Allocation of land and other resources should be readjusted along with reform strategies and changing situations. Currently almost 50 percent of MOAI's budget is allocated to irrigation and other water resource infrastructure investment, less than 1 percent is allocated to education and research, and 3.45 percent on average of last ten years to MADB for agricultural loan. However, Myanmar irrigated land covers only 18.1 percent of the total cultivated area, while Laos covers 22.3 percent, and Thailand, Vietnam, India, China and Bangladesh cover 26.5, 31.9, 33.0, 47.3, and 57.5 percent respectively.

Rice gets top priority in all supports and facilities from the government, such as 75 percent of total irrigation, 80 percent of total loan, and 57.45 percent of fertilizer subsidies. Even with such supports in the rice sector, the export share of rice in total agricultural export is only 11.79 percent, while pulses receive a share of 74 percent in agricultural export earnings. However, pulses are given relatively minimal support from the government, such as 5.4 percent of irrigation and 4.1 percent of loan.

As compared to the similar economies of Vietnam and Thailand, the share

of agriculture in GDP of Myanmar is 40 percent but the value of agricultural export is only $1.5 billion. Vietnam's share of agricultural GDP was 22 percent and the value of agricultural goods export was $ 4.3 billion and Thailand's share of agricultural GDP was 13.3 percent but the value of agricultural export was $9.94 billion in 2010. The value of agricultural productivity per acre in Israel is $5000 per annum, but Myanmar's productivity is only $800 per acre per year meaning Myanmar's agriculture has huge room and potential to develop.

The most important thing with high return is investment in research and development. However, R&D expenditure for agricultural sector is the lowest among neighboring countries. While R&D expenditure on agriculture was only USD8 million in Myanmar, it was USD 2574 million in China, USD 1355 million in India, USD 177 million in Indonesia, USD 109 million in Bangladesh and USD 56 million in Vietnam in 2002 (Stats and Kam, 2007).

Another bottleneck in agricultural development is education and trained manpower, which is supported by the empirical models. And the third most important input for agricultural productivity development is use of chemical fertilizer. However, the amount of fertilizer utilization per hectare is very minimal compared to other countries such as Vietnam and Thailand. Fertilizer utilization in Myanmar was only 3.28 kg per hectare while Vietnam use 130.88 kg and Thailand used 286.57 kg per hectare in 2010 (UNCTAD). That is why, one explanatory variable of amount of fertilizer utilization per hectare is not

significant in empirical models.

In the second part, a conceptual framework was constructed based on Lewis' dual sector economy, incorporating Rostow's linear-stages-of-growth theory and neoclassical growth theories. Myanmar is considered as being in the stage of pre-conditions for take-off. The agricultural sector, with surplus labour and disguised unemployment, can contribute to the expansion of the industrial sector with low labour costs. Historical evidence shows the development processes of Japan, South Korea, China, Vietnam, and many other advanced economies have been accompanied by the structural shift.

Four empirical models are constructed to examine the impact of structural composition on economic growth in Myanmar and other selected economies for three different periods based on data staionarity and availability. The study periods are from 1991-2010 for Myanmar, 1985-2010 for Vietnam and 1980-2010 for other six countries. The models support the hypothesis concerning the impact of structural change on economic growth in the cases of Indonesia and South Korea. The increasing rate of change in the industrial sector caused the economic growth in Indonesia and South Korea. The key structural change variables, the rate of change in agricultural GDP and industrial GDP, are significant for Myanmar but with opposite signs, which reflect Myanmar's structural stickiness towards the agricultural sector. According to the model results, the increasing rate of change in the agricultural sector causes the economic growth of Myanmar and

the opposite has been true for the industrial GDP change during the study period. This is likely to reflect the exclusive reliance of the successive governments' policies on the agrarian economy in Myanmar. In other words, the cause of economic stagnation in Myanmar is its structural stickiness towards agriculture.

Granger causality tests are done to test the short run relationship between the key variables. The results shed light on the case of China where the rate of change in agricultural labor might cause economic growth and *vice versa*. The rate of change in share of industrial GDP Granger caused the economic growth of Indonesia and the Philippines, while the decreasing growth of agricultural GDP Granger caused the economic growth in South Korea and the Philippines. However, it should be noted that empirical models are not fit for the economic growth of Malaysia, Thailand and Vietnam.

B. Policy Recommendations

As Myanmar is at a very critical stage of development, comprehensive rural and agricultural development policies must be implemented as poverty reduction strategies. Poverty reduction can be achieved by developing agricultural productivity through an increase in the income of the rural population.

If compared with the agricultural productivity of other countries shown in descriptive analysis of this study, Myanmar has a lot of room to increase agricultural productivity to reach its frontier in many ways. No one would deny

that investment in infrastructure and new technologies yield high returns on investment. Firm level oriented new technologies are in demand and more funds should be allocated to the agricultural R&D sector. The extension system should diffuse the new knowledge and technologies to farmers.

Enhancing agricultural productivity may be politically costly because the results of R&D are not immediately visible. Most policy makers do not like to allocate much of the budget to the R&D sector. As a consequence, technology is stagnant in the low income or economic stagnation stage.

This study suggests gaining momentum in agricultural development; there must be a shift from traditional agriculture to modern agriculture with labor intensive technology and crop diversification to boost the income of farmers. Instead of total production maximizing policies, farm income or profit maximization strategies will lead to sustainable growth in the long run.

This study suggests that structural change towards the industrial sector is a key to achieving economic development and initiating the catching up process. The study yields the empirical evidence supporting the fact of increasing in the share of industrial GDP is the key for the economic growth in South Korea and Indonesia. It implies that Myanmar should not be reluctant to initiate structural change in order to lead the country to long-term economic growth path.

At the same time, however, it is crucial to implement pro-poor or balanced growth policies to attain sustainable growth. Agricultural productivity

development is the immediate solution to achieving this policy goal. Industrialization and agricultural developments are not policy alternatives and the effective development plans should embrace both goals to the important linkage between agricultural and non agricultural sectors of the economy.

Structural transformation is not an overnight process and it will take time and unexpected obstacles may occur to delay or block the way in the development process. But, there is no other way to put the country on the right path of development. This study, therefore, would like to take an opportunity to give policy recommendations based on the findings of the research at the right time of economic and political reform period for Myanmar.

Based on the research and findings of this study, the following agricultural and economic policies are recommended for economic reform and the rapid and sustainable economic development of Myanmar.

1. Industrialization is the next step for economic development while giving no less attention to development of the agricultural sector.
2. Investment in agricultural infrastructure such as irrigation facilities should be continued.
3. Crop diversification is needed to divert away from rice-biased policies and other traditional crops to more profitable and export oriented cash crops such as fruits, flowers and vegetables. On the other hand, farm income maximization policies are recommended.

4. Investment in education and agricultural R&D expenditure should be increased.
5. Land and other resources such as irrigation, fertilizer subsidies and loans should be reallocated to crops other than rice according to their profitability.
6. Investing in basic infrastructure of the economy such as roads, power generators, communication facilities, and labor-intensive-agricultural-based industries is encouraged.
7. Non-farm employment opportunities have to be created to earn regular income for the rural people in order to reduce poverty.

C. Limitations of the Study

Very few or no attempt has been made to study the economic development of Myanmar from the structural change point of view. Many weaknesses remain in this study such as unavailability of time series data for poverty indicators of head count ratios and Gini coefficient for Myanmar. The important variables like foreign direct investment and R&D expenditures on the agricultural sector are not available for sufficient observation.

Despite the limitations, this study provides the striking findings of the relationship between the rate of change in structural composition and economic growth. Furthermore, the study bridges the relationship between structural change

and poverty reduction with agricultural productivity growth.

D. Suggestion for Future Study

Future study may focus on the relationship between the small and medium farm sector as a traditional sector and the large and commercial farm sector as a capitalist sector of the agricultural economy. Commercial farms utilize the surplus labor from the traditional sector so that structural change pattern between intra-agricultural sectors is worth studying. This study can provide the spillover effect of prevention from the massive internal migration problem. Encouraging commercial farming and rural development would lead to the ultimate shared and balanced growth of a country.

REFERENCES

Acemoglu, D., and F. Zilibotti, 2001. “Productivity Differences.” *Quarterly Journal of Economics,* Vol. 116: 563-606.

Adams, Richard H. Jr. 2002. “Poverty Reduction in Vietnam 1988 to 1997/98.” A Country Case Study Technical Report, USAID, Washington. Nov 29, 2002.

ADB. 2003. “Technical Assistance for Promoting Partnerships to Accelerate Agriculture Development and Poverty Reduction in the Greater Mekong Subregion.” Asian Development Bank, TAR: OTH 37096, June 2003

ADB. 2004. “Technical Assistance to the Kyrgyz Republic for a Study of the Impact of Land Reform on Agriculture, Poverty Reduction and Environment.” Asian Development Bank, TAR: KGZ 38079, October 2004.

Adelman, I. 1984. “Beyond Export-Led Growth.” *World Development.* Vol. 12 (9): 937-49.

Adelman, Irma and Sherman Robinson. 1986. “U.S. Agriculture in a General Equilibrium Framework: Analysis with a Social Accounting Matrix”. *American Journal of Agricultural Economics*, Vol. 68 (5): 1196-1207.

Adelman, Irma and Cynthia Taft Morris. 1997. “Editorial: Development History and its Implications for Development Theory.” *World Development.* Vol. 25 (6): 831-840. June 1997.

Ahn, Hyeon Ju and Jai S. Mah. 2007. “Development of Technology-Intensive Industries in Korea”. *Journal of Contemporary Asia*. Vol. 37 (3): 364-379. August 2007.

Al-Hassan, Ramatu M. and Hohn Baptist D. Jatoe. 2007. “Beyond Food Production: The Role of Agriculture in Poverty Reduction,” FAO and Edward Elgar, 2007. 160-187.

Alvarenz-Cuadrado, Francisco. and Markus Poschke. 2010. “Structural Change out of Agriculture: Labor Push versus Labor Pull.” Unpublished.

Anderson, T. and C. Hsiao. 1981. “Estimation of Dynamic Models with Error components.” *Journal of the American Statistical Association* 76375): 598–606.

Arcand, Jean-Louis. 2001. “Undernourishment and Economic Growth: The Efficiency Cost of Hunger.”*FAO Economic and Social Development Paper*. 147.

Arellano, M. and O. Bover. 1995. “Another look at instrumental variables estimation of error-component models.” *Journal of Econometrics* 68: 29–51.

Ash Center, Harvard Kennedy School. 2011. “Myanmar Agriculture in 2011: Old Problems and New Challenges.” http://www.ash.harvard.edu/extension/ash/docs/myanmar1111.pdf

Asteriou, Dimitrios and Stephen G. Hall. 2007. “Applied Econometrics: A Modern Approach using EViews and Microfit.” Published by Palgrave Macmillan.

Aung, Nay Myo. 2012. “Production and Economic Efficiency of Farmers and Millers in Myanmar Rice Industry.” Institute of Developing Economies, Japan External Trade Organization. VRF Series No. 471. February 2012.

AusAid. 2000. “Income Generation for the Rural Poor.” The Australian Aid Program’s rural development strategies paper. 2000, June.

Awokuse, Titus O. 2008. “Does Agriculture Really Matter for Economic Growth in Developing Countries?” Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Melwaukee, WI, July 28, 2009.

Azariadis, Costas. 1996. “The Economics of Poverty Traps Part One: Complete Markets.” *Journal of Economic Growth*, Vol. 1: 449-486. December 1996.

Bahmani-Oskooee, M. and S. Chomsisengphet. 2002. “Stability of M2 money demand function in industrial countries.” *Applied Economics*, 2002, Vol. 34: 2075-2083

Balassa, Bela. 1978. "Exports and Economic Growth: Further Evidence’, *Journal of Development Economics*, Vol. 5, pp. 181-189.

Baumol, William J. 1967. “Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis.” *The American Economic Review*. Vol. 57(3) 415-426. June 1967.

Beckford, G. 1972. “Persistent Poverty.” New York and London: Oxford University Press.

Beintema, Nienke M. and Gert-Jan Stads. 2008. “Agricultural R&D Capacity and Investment in Asia-Pacific Region.” International Food Policy Research Institute IFPRI. Asia-Pacific Association of Agricultural Research Institute APAARI. Research Brief No. 11.

Belser, Patrick. 2000. “Vietnam on the Road to Labor-Intensive Growth?” *Policy Research Working Paper 2389*, The World Bank, East Asia and Pacific Region, Vietnam Country Office, July 2000.

Benhabib, J. and M. M. Spiegel. 1994. “The Role of Human Capital in Economic Development Evidence from Aggregate Cross-Country Data.” *Journal of Monetary Economics*, Vol. 34: 143-173.

Binswanger, H. and Braun J. Von 1993. “Technological Change and Commercialization in Agriculture.” in M. Lipton, and J. van der Gaag Editors. Including the Poor, Washington DC, The World Bank.

Binswanger, H., M-C. Young, A. Bowers, and Y. Mundlak. 1987. “On the Determinants of cross-country Aggregate Agricultural Supply.” *Journal of Econometrics*, Vol. 36: 111-131.

Binswanger, H.P., K. Deininger, and G. Feder. 1995. “Power, Distortions, Revolt, and Reform in Agricultural Land Relations.” J. Behrman, and T.N. Srinivasan Editors. Handbook of Development Economics, Vol. IIIB, Amstardam, Elsevier.

Blundell, R. and S. Bond. 1998. “Initial Conditions and Moment Restrictions in Dynamic Panel-Data Models.” *Journal of Econometrics.* Vol. 87: 115–143.

Booth, Ann. 2003. “The Burma Development Disaster in Comparative Hisorical Perspective.” *SOAS Bulletin of Burma Research*, Vol. 1: 1479-1487. Spring 2003, ISSN.

Bosworth, B.P., S.M. Collins, and Y.C. Chen. 1995. “Accounting for Differences in Economic Growth.” Brookings Institution, Washington.

Bresciani, F. and A. Valdes. 2007, “Beyond Food Production: The Role of Agriculture in Poverty Reduction.” FAO and Edward Elgar, 2007, pp. 240. ISBN 1-84720-075-3.

Brückner, Markus. 2012. “Economic Growth, Size of Agricultural Sector, and Urbanization in Africa.” *Journal of Urban Economics*, Vol. 71: 26-36.

Bruno, Michael, Martin Ravallion, Lyn Squire. 1996. "Equity and Growth in Developing Countries: Old and New Perspectives on the Policy Issues," Policy Research Working Paper Series 1563. The World Bank.

Burkhart, R. E. and M. S. Lewis-Beck. 1994. “Comparative Democracy: The Economic Development Thesis.” *American Political Science Review*, Vol. 88 (4): 903-910. December 1994.

Canning, D. 1988. “Increasing Returns in Industry and the Role of Agriculture in Growth.” *Oxford Economic Papers*, Vol. 40: 463-476.

Castiglione, Concetta. 2011. “Verdoorn-Kaldor’s Law: An Empirical Analysis with Time Series Data in the United States.” *Advances in Management & Applied Economics*. Vol. 1(3): 135-151.

Cervantes-Godoy, D. and J. Dewbre. 2010. “Economic Importance of Agriculture for Poverty Reduction”. OECD Food, Agriculture and Fisheries. Working Papers No. 23. OECD Publishing. http://dx.doi.org/10.1787/5kmmv9s20944-en

Chai, Andreas and Alessio Moneta. 2010. “Retrospectives Engel Curves.” *Journal of Economic Perspective.* Vol. 24 (1): 225-240

Chen, Baizhu and Yi Feng. 2000, “Determinants of Economic Growth in China: Private Enterprise, Education, and Openness.” *China Economic Review,* Vol. 11: 1-15.

Chen, Kevin Z. and Yumei Zhang. 2011. “Regional Case Study R2: Agricultural R&D as an Engine of Productivity Growth in China.” The Government Office for Science. London. UK. January 2011.

Chenery, H. and A. Strout. 1966. “Foreign Assistance and Economic Development,” *American Economic Review,* Vol. 56 (4).

Christiaensen, L., L. Demery, and J. Kuhl. 2011. “The Evolving Role of Agriculture in Poverty Reduction – An Empirical Perspective.” *Journal of Development Economics,* Vol. 96: 239-254.

Ciccone, A. and M. Jarocinski. 2008. “Determinants of Economic Growth: Will data tell?.” Working Paper Series No. 852, European Central Bank, January 2008.

Crampton, Caroline. 2010, “Burma: A brief history”. Published 24 June 2010. http://www.newstatesman.com/asia/2010/06/aung-san-burma-british

Cuddington, J. T., R. Ludema, and S. A. Jayasuriya. 2002. “Reassessing the Prebish-Singer Hypothesis: Long-Run Trends with Possible Structural Breaks at Unknown Dates.” Georgetown University. October, 2002.

Das, S.P. 1982. “Sector Specific Minimum Wages, Economic Growth and Some Policy Implications.” *Journal of Development Economics,* Vol.10 (1): 127-131.

Datt, G. and M. Ravallion. 1996. “How important to India’s poor is the sectoral composition of economic growth?” *The World Bank Economic Review,* 101: 1–25.

Datt, G. and M. Ravallion. 1998. “Farm productivity and rural poverty in India.” *Journal of Development Studies,* Vol. 34(4): 62–85.

Deng, Kent G. 2009. “Economic Growth of the People’s Republic of China, 1949–2009” Macquarie University Press, 2009.

Dercon, Stefan. 2009. “Rural Poverty: Old Challenges in New Contexts.” Oxford: Oxford University Press.

Diao, Xinshen, John Dyck, David Skully, Agapi Somwaru, and Chinkook Lee, 2002. “Structural Change and Agricultural Protection: Costs of Korean Agricultural Policy, 1975 and 1990 ” United States Department of Agriculture, Agricultural Economic Report No. 809, March 2002.

Dolado, Juan J., T. Jerkinson, and S. Sosvilla-Rivero. 1990. “Cointegration and Unit Roots.” *Journal of Economic Survey.* Vol. 4(3).

Dowrick, S., and N. Gemmell, 1991. “Industrial Catching up and Economic Growth: A Comparative Study Across the World’s Capitalist Economics.” *Economic Jounal,* Vol. 101: 263-276.

Duttaray, Mousumi, Amitava K. Dutt, and Kajal Mukhopadhyay. 2008. “Foreign Direct Investment and Economic Growth in Less Developed Countries: An Empirical Study of Causality and Mechanisms.” *Applied Economics,* Vol. 40: 1927-1939.

Echevarria, C. 1997. “Changes in Sectoral Composition Associated with Economic Growth.” *International Economic Review.* Vol. 38 (2): 431-452.

Engle, R.F. and C.W.J Franger. 1987. “Co-integration and Error Correction: Representation, Estimation and Testing.” *Econometrica.* Vol. 55: 251-276.

FAO. 1998. “Poverty Alleviation and Food Security in Asia: Lessons and Challenges.” Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific, December 1998. 175p

Fei, JCH. and Gustav Ranis. 1964. “Development of the Labour Surplus Economy.” Irwin, Homewood. Ill.

Foellmi, Reto and Josef Zweimüller. 2008, “Structural Change, Engel’s Consumption Cycles and Kaldor’s Facts of Economic Growth.” *Journal of Monetary Economics*, Vol. 55: 1317-1328.

Food and Agricultural Policy Research Institute, FAPRI. 2009. “US and World Agricultural Outlook.” January, 2009.

Fugile, Keith Owen. 1991. “Vent-for-surplus as a source of Agricultural Growth in Northern Thailand, 1958-1980.” *The Journal of Developing Areas.* Vol. 25:331-346. April 1991.

Fung K. C., Hitomi Iizaka, and Sarah Tong. 2002. “Foreign Direct Investment in China: Policy, Trend and Impact.” Paper for an *International Conference on China’s Economy in the 21st Century*, June 24-25, 2002, Hong Kong.

Gallup, J. K., J. D. Sachs, and A. Mellinger. 1999. “Geography and Economic Development.” Center for International Development CID) at Harvard University, *CID Working Paper* No. 1, March 1999.

Gammell, N., T. Loyd, and M. Mathew, 2000. “Agricultural Growth and Intersectoral Linkages in Developing Economy.” *Journal of Agricultural Economics*, Vol. 51(3): 353-370.

Gardner, B. 2005. “Causes of Rural Economic Development.” *Proceedings of the 25th International Conference of Agricultural Economists*. 21-41.

Gollin, D., S.L. Parente, R. Rogerson. 2002. “The Role of Agriculture in Development.” *American Economic Review,* Vol. 92 (2): 160-164.

Grewal, B. and A. Ahmed. 2011. “Is China’s Western Region Development Strategy on Track?” *Journal of Contemporary China*, Vol. 20(69):161-181. http://dx.doi.org/10.1080/10670564.2011.541626.

Hall, R. and C. Jones. 1999. “Why do Some Countries Produce So Much More Output Per Worker Than Others?.” *Q. J. Econ*, 114: 83-116.

Hassler, Uwe and Jürgen Wolters. 2005, “Autoregressive Distributed Lag Models and Cointegration.” Diskussionsbeiträge des Fachbereichs Wirtschaftswiss-enschaft der Freien Universität Berlin, No. 2005/22,

Hausmann, R. and D. Rodrik. 2002. “Economic Development as Self_Discovery.” A research paper funded by the Ford and Rockefeller Foundations.

Herrick, Bruce and Charles P. Kindleberger. 1984. “Economic Development.” Fourth Edition, McGraw-Hill Book Company.

Hill, Hal. 1984. “Industrialization in Burma in Historical Perspective.” *Journal of Southeast Asian Studies,* Vol. 15 (1): 134-149. March 1984.

Hill, Hal and Sisera Jayasuriya. 1986. “An Inward-Looking Economy in Transition: Economic Development in Burma since the 1960s.” Singapore: Institution of Southeast Asian Studies.

Hill, Hal. 2000. “Export Success against the Odds: A Vietnamese Case Study”. *World Development*, Vol. 28 (2): 283-300, 2000

Holtz-Eakin, D., W. Newey, and H. S. Rosen. 1988. “Estimating Vector Autoregressions with Panel data.” Econometrica (566): 1371–1395.

http://dx.doi.org/10.1080/713688306

http://en.wikipedia.org/wiki/Meiji_period

http://hdl.handle.net/10419/28020

http://markus-poschke.research.mcgill.ca/papers/ACP_pushpull.pdf

http://unctad.org/en/Pages/Statistics.aspx

http://unctadstat.unctad.org/

http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx

http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1229

http://www.adb.org/publications/key-indicators-asia-and-pacific-2009

http://www.gfmag.com/gdp-data-country-reports/214-myanmar-gdp-country-report.html#axzz1qibCoj3k

http://www.indexmundi.com/trade/exports/?section=0

http://www.irri.org/index.php?option=com_k2&view=itemlist&layout=category&task=category&id=744&Itemid=100346&lang=en

http://www.myanmararchives.com/myanmardata2006/14.htm

http://www.nationmaster.com/red/country/vm-vietnam/edu-education&all=1

Humphries, H. and S. Knowles. 1998. “Does Agriculture Contribute to Economic Growth? Some Empitical Evidence.” *Applied Economics.* Vol. 30 (6): 775-781.

Huppi, Monika and M. Ravallion. 1991. “The Sectoral Structural of Poverty During and Adjustment Period: Evidence from Indonesia in the Mid-1980s.” *World Development*, 1653-1978.

Hussain, Anwar and Abdul Q. Khan. 2011. “Relationship between agriculture and GDP growth rates in Pakistan: An Econometric Analysis 1961-2007.” *Academic Research International*, Vol. 12: 322-326.

Hylleberg, S. and G.E. Mizon. 1989, “Cointegration and Error Correction Mechanisms.” *The Economic Journal.* Vol. 99: 113-125.

International Poverty Reduction Center in China, IPRCC. 2010. “Agricultural Transformation, Growth and Poverty Reduction.” China-DAC study group, OECD. *International Conference on Agriculture, Food Security and Rural Development.* Bamako, Mali, 27-28 April 2010.

International Rice Research Institute, IRRI. 2011. “World Rice Statistics, WRS” http://beta.irri.org/solutions/index.php?option=com_content&task=view&id=250

Irvin, George. 1995. “Vietnam: Assessing the Achievements of Doi Moi.” *Journal of Development Studies,* 31: 725–745.

Irvin, George. 1997. “Vietnam: Adjustment, Growth and Poverty.” *Journal of International Development,* 9: 783–801.

Irz, Xavier, Lin Lin, Colin Thirtle, and Steve Wiggins. 2001. “Agricultural Productivity Growth and Poverty Alleviation.” *Development Police Review,* 2001, Vol. 19 (4): 449-466.

James, Clive. 1996. “Agricultural Research and Development: the Need for Public-Private Sector Partnerships.” Consultative Group on International Agricultural Research, CGIAR. December 1996.

Jatuporn, Chalermpon, Li-Hsien Chien, Patana Sukprasert, and Supaporn Thaipakdee. 2011. “Does a Long-run Relationship Exit between Agriculture and Economic Growth in Thailand?” *International Journal of Economics and Finance*, Vol. 3 (3): 227-233, August 2011.

Johnston, Bruce and John W. Mellor. 1961. “The Role of Agriculture in Economic Development” *American Economic Review,* Vol. 51 (4) 566-593.

Kakwani, N. and E. Pernia. 2000. “What is Pro-Poor Growth?” *Asian Development Review* 18(1): 1–16.

Kaldor, Nicholas. 1966. “Causes of the Slow Rate of Growth of the United Kingdom: An Inaugural Lecture.” Cambridge University Press.

Kaldor, Nicolas. 1978. “Further Essay on Economic Theory.” London, Duckworth.

Kaplinsky, Raphael. 2006. “Revisiting the Revisited Terms of Trade: Will China Make a Difference?” *World Development* Vol. 34 (6): 981–995, 2006.

Kenny, Charles and David Williams. 2001. “What Do We Know About Economic Growth? Or, Why Don't We Know Very Much?” *World Development.* Vol. 29 (1): 1-22.

Khin Win, U. 1991. “A Century of Rice Improvement in Burma” International Rice Research Institute, IRRI.

Kimenyi, Mwangi S. 2002. “Agriculture, Economic Growth and Poverty Reduction.” KIPPRA Occasional Paper No. 3. June 2002.

Kirsten, Johann, Julian May, Sheryl Itendriles, Mike Lyne, Charles L. Machethe, and Lecilia Punt. 2007. “Beyond Food Production: The Role of Agriculture in Poverty Reduction.” FAO and Edward Elgar, 2007. 188-222.

Kogel, T. and A. Prskawetz. 2001. “Agricultural Productivity Growth and Escape from the Malthusian Trap.” *Journal of Economic Growth.* Vol. 6: 337-357.

Krugman, Paul. 1995. “Development, Geography and Economic Trade.” Cambridge, MA, MIT Press.

Kudo, Toshihiro and F. Mieno. 2007. “Trade, Foreign Investment and Myanmar’s Economic Development during the Transition to an Open Economy.” Institute of Developing Economies, IDE. Discussion paper. No. 116, August 2007.

Kuznets, S. 1961. “Long Term Trends in Capital Formation Proportions.” *Economic Development and Cultural Change.* July 1961.

Kyaw, D. and J. K. Routray. 2006. “Gender and Rural Poverty in Myanmar: A Micro Level Study in the Dry Zone.” *Journal of Agricultural and Rural Development in the Tropics and Subtropics*, Vol. 107(2): 103-114.

Laitner, John. 2000. “Structural Change and Economic Growth.” *Review of Economic Studies,* Vol. 67 (3). July 2000.

Lam, Tran Doan. 2011. “Poverty Reduction in Vietnam: Achievements and Challenges.” Unpublished. http://www.vass.gov.vn/anpham/mlnewsfolder.2008-01-03.1039068502/mlnews.2011-07-21.2270203498/Poverty_Assessment-Giam%20ngheo.pdf/download

Lawrence, Peter. 2004. “The Lewis Model After 50 Years: Assessing Sir Authur Lweis’s Contribution to Development Economics and Policy Conference.” University of Manchester, 6-7 July 2004. Unpublished. http://www.sed.manchester.ac.uk/research/events/conferences/documents/Arthur%20Lewis%20Papers/Lawrence.pdf

Leeson, P. F. 1979. “The Lewis Model and Development Theory’” The Manchester School, Vol. 47 (3):196-210.

Lewis, W. Arthur. 1954. “Economic Development with Unlimited Supplies of Labor.” The Manchester School. May 1954.

Lin, J.Y. and P. Zhang. 2007. “Development strategy, optimal industrial structure and economic growth in less developed countries.” The World Bank, Policy Research Working Paper Series 4905.

Lin, Justin Yifu. 2012. “From Flying Geese to Leading Dragons New Opportunities and Strategies for Structural Transformation in Developing Countries”. *Global Policy,* Vol. 3 (4):397–409, November 2012.

Linda, L. and K. Meyer. 2001. “The Freat Agricultural Transition: Crisis, Change, and Social Consequences of Twentieth Century US Farming.” *Annual Review of Sociology*, Vol. 27: 103-124.

Liu, Xiaohui, Chang Shu, and Peter Sinclair. 2009. “Trade, Foreign Direct Investment and Economic Growth in Asian Economies.” *Applied Economics*, Vol. 41: 1603-1612.

Lopez, Ramon and Gustavo Anriquez. 2007. “Beyond Food Production: The Role of Agriculture in Poverty Reduction,” FAO and Edward Elgar, 2007. 57-82.

Maddala, G. S. and Shaowen Wu. 1999. “A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test.” *Oxford Bulletin of Economics and Statistics*, Special Issue (1999) 0305-9049

Maddison, Angus. 2011. “The World Economy – A Millennial Perspective View.” Oxford. Oxford University Press.

Maddison, Augus., 2007, “Chinese Economic Reform in the Long Run, Revised and Updated 960-2030 AD” Second Edition, Development Center of the OECD.

Madsen, J.B, S. Saxenam and J.B. Ang. 2009. “The Indian growth miracle and endogenous growth.” Monash Economics Working Papers 03/09, Monash University.

Mah, Jai S. 2007. “Industrial Policy and Economic Development: Korea’s Experience”. *Journal of Economic Issues*. Vol. 61 (1): 77-92. March 2007.

Mah, Jai S. 2010. “Foreign Direct Investment Inflows and Economic Development of China.” *Journal of Policy Modeling.* Vol. 32: 155-168.

Mahmoud, E. 1984. “Accuracy in Forecasting: A Survey.” *Journal of Forecasting.* Vol. 3: 139-59.

Mamgain, Vaishali. 1999. “Are the Kaldor-Verdoorn Laws Applicable in the Newly Industrialized Countries?” *Review of Development Economics,* 33: 295-309.

Mark, Knell. 2004. “Structure Change and the Kaldor-Verdoorn law in the 1990s.” *Revue d'économie industrielle*. Vol. 105: 71-83. doi : 10.3406/rei.2004.3036

Marsh S.P., MacAulay T.G., and Hung P.V. Eds. 2007, “Agricultural development and land policy in Vietnam: policy briefs.” The Australian Centre for International Agricultural Research, ACIAR Monograph No. 126, 72p.

Masters, W. and M. McMillan. 2001. “Climate and Scale in Economic Growth.” *Journal of Economic Growth*, Vol. 6: 167-186.

Matsuyama, K. 1992. “Agricultural Productivity, Comparative Advantage, and Economic Growth.” *Journal of Economic Theory,* Vol. 58 (2): 317-334.

McKinsy *et al.* 2003. “ASEAN Competitiveness Study.” ASEAN Secretariat, Jakarta, August 2003.

McNees, S. 1986. “Forecasting Accuracy of Alternative Techniques: A Comparison of US Macroeconomic Forecasts.” *Journal of Business and Economic Statistics.* Vol. 4: 5-15.

Medina-Smith, E.J. 2001. “Is the Export-led Growth Hypothesis Valid for Developing Countries: A Case Study of Costa Rica.” Policy Issues in International Trade and Commodities Study Series No. 7

Meijerink, Gerdien and Pim Roza. 2007. “The Role of Agriculture in Economic Development.” Markets, Chains and Sustainable Development Strategy and Policy Paper Series of Wageningen UR. No. 4. April 2007.

Mellor, J.W. and B.F. Johnston. 1984. “The World Food Equation: Interrelations Among Development, Employment, and Food Consumption.” *Journal of Economic Literature,* Vol. XXII: 531-574.

Mellor, John W. 1999. “Faster, More Equitable Growth – The Relation Between Growth in Agriculture and Poverty Reduction.” Paper prepared for United States Agency for International Development Bureau for Global Programs Center for Economic Growth and Agricultural Development Division of Agriculture and Food Security. *Agricultural Policy Development Project Research Report* No. 4 October 1999.

Michaely, Michael. 1977. "Exports and Growth: An Empirical Investigation," *Journal of Development Economics*, Vol. 4(1).

MOAI. 2010. “Myanmar Agriculture in Brief.” Ministry of Agriculture and Irrigation, Myanmar.

____ . 2011. “Myanmar Agriculture in Brief.” Ministry of Agriculture and Irrigation, Myanmar.

____ . 2012. “Myanmar Agriculture in Brief.” Ministry of Agriculture and Irrigation, Myanmar.

Montalvo, Jose G. and Martin Ravallion. 2010. "The Pattern of Growth and Poverty Reduction in China," *Journal of Comparative Economics*. Vol. 38(1): 2-16. March 2010.

Morrissey, Oliver. 2006. “Policy Forum: Economic Development: Trade or Aid? Aid or Trade? or Aid and Trade?” *The Australian Economic Review,* Vol. 39 (1):78–88

Mundlak, Yair. 2005. “Economic Growth: Lessons from Two Centuries of American Agriculture.” *Journal of Economic Literature.* Vol. XLIII: 989-1024. December, 2005.

Mya Than and N. Nishizawa, 1990. “Agricultural Policy Reforms and Agricultural Development in Myanmar.” in Mya Than and Joshphs L. H. Tan Eds. Myanmar: Dilemmas and Options. Singapore: Institute of Southeast Asian Studies.

Myat Thein and Mya Than, 1995. “Transitional Economy of Myanmar: Performance, Issues, and Problems.” in Seiju Finch Naya and Joseph Tan Eds. Asian Transitional Economies: Challenges and Prospects for Reform and Transformation. Singapore: Institute of Southeast Asia Studies.

Myint, Hla. 1971. “Economic Theory and the Underdeveloped Countries.” New York, Oxford University Press.

Ngoc Pham Quang , Trinh Bui and Thanh Nguyen Duc. 2006. "Structural change and economic performance of 1986-2000: Evidence from Vietnam Input-output tables.” *Paper for the Intermediate Input-Output Meetings 2006 on Sustainability, Trade & Productivity, Sendai, Japan*, July 26-28, 2006.

Ocampo, José Antonio. 2003. “Structural Dynamics and Economic Growth in Developing Countries”. Published in 2003.

Okonkwo, I. C. 1989. “The Erosion of Agricultural Exports in an Oil Economy: The Case of Nigeria.” *Journal of Agricultural Economics*, Vol.40(3): 375-384.

Olsson, O. and D. A. Hibbs. 2005. “Biogeography and Long-Run Economic Development.” *European Economic Review.* Vol. 4(4) : 909-938.

Oo, U Myo. 1994. “Post-harvest Practices for Food Grains: Situation and Improvements Needed.” FAO/AFMA/Myanmar Training Workshop, Yangon, Myanmar.

Organization for Economic Cooperation and Development. 2001. “Rising to the Global Challenge: Partnership for Reducing World Poverty.” Statement by the DAC High Level Meeting, April 25–26, in Paris.

Petrakos, G., P. Arvantitidis, and S. Pavleas. 2007. “Determinants of Economic Growth: The Experts’ View.” Working Paper, Dynamic Regions in a Knowledge Driven Global Economy Lessons and Policy Implications for the EU.

Phillips, A.W. 1954. “Stabilization Policy in Closed Economy.” *The Economic Journal.* Vol. 64: 290-323.

Pio, Alessandro. 1994. “New Growth Theory and Old Development Problems: How Recent Developments in Endogenous Growth Theory Apply to Developing Countries”. *Development Policy Review*. Vol. 12(3): 277-300, September 1994.

Pomeranz, K. 2000, “The Great Divergence: China, Europe, and the Making of the Modern World Economy” USA: Princeton University Press, 2000.

Qin, Duo, Marie Anne Cagas, Pilipinas Quising, and Xin-Hua He. 2006. “How Much Does Investment Drive Economic Growth in China?.” *Journal of Policy Modeling*, 28: 751–774.

Radelet, Steven, Jeffrey Sachs, and Jong-Wha Lee. 2001. “The Determinants and Prospects of Economic Growth in Asia.” *International Economic Journal,* Vol. 15 (3) 1-29.

Rahman, Shafique and Khine Tun. 2011, “A Note on Estimates for Myanmar with Conversion in US Dollar terms using Trade-Value Weighted Exchange Rate.” *Technical Report submitted to UNDP, Yangon, Myanmar*. June 2011.

Ranis, Gustav. 2004. “Arthur Lewis’ Contribution to Development Thinking and Policy.” Center Discussion Paper No. 891. Economic Growth Center, Yale University.

Romer, P.M. 1986. “Increasing returns and long-run growth”. *Journal of Political Economics,* Vol. 94: 1002-1037.

Romer, P.M. 1987. “Growth Based on Increasing Returns due to Specialization.” *Am. Econ. Rev*, Vol. 77: 56-62.

Romer, P.M. 1990. “Endogenous Technological Change.” *Journal of Political Economics,* Vol. 98: 71-102.

Ros, Jaime. 2000. “Development Theory and Economics of Growth.” The University of Michigan Press.

Rostow, Walt Whitman. 1962. *"The Stages of Economic Growth."* London: Cambridge University Press, pp. 2, 38, 59

Ruttan, Vernon W. 1998. “The New Growth Theory and Development Economics: A Survey.” *The Journal of Development Studies*, Vol. 35(2): 1-26.

Sachs, Jeffrey D., Andrew Warner, Anders Åslund, and Stanley Fischer. 1995. "Economic Reform and the Process of Global Integration." *Brookings Papers on Economic Activity*, Vol. 1: 1-118. 25th Anniversary Issue.

Saha, N. and J. Gilbert. 2004. "Immiserizing Growth in a Developing Economy Export Enclave." *International Journal of Business and Economics*, Vol. 3 (3): 217-224.

Sarris, Alexander. 2001. "The Role of Agriculture in Economic Development and Poverty Reduction: An Empirical and Conceptual Foundation." Rural Development Strategy Background Paper #2, Rural Development Family. The World Bank. August 2001.

Schneider, K. and M. K. Gugerty. 2011. Agricultural productivity and poverty reduction: linkages and pathways." *The Evans School Review*, Vol.1(1), 56-74.

Schultz, T. W. 1964. "Transforming Traditional Agriculture." New Haven, Yale University Press.

Sena, A. and R. Fontenele. 2004, "The new endogenous growth theory: An investigation on growth policy for developing countries." XLII Congress of the Brazilian Society of Economics and Rural Sociology, Cuiaba-MT. Dynamic Sectoral and Regional Development. http://www.sober.org.br/palestra/12/07O079.pdf

Senhadji, Abdelhak. 2000. "Sources of Economic Growth: An Extensive Growth Accounting Exercise." *IMF Staff Papers*, Vol. 47 (1).

Silva, Ester G. and Aurora A.C. Teixeira. 2008. "Surveying Structural Change: Seminal Contributions and a Bibliometric Account." *Structural Change and Economic Dynamics*. Vol. 19: 273-300.

Soe, Tin. 2012. “Myanmar in Economic Transition: Constraints and Related Issues Affecting the Agricultural Sector.” *Asian Journal of Agriculture and Development.* Vol. 1(2): 57-68.

Soloaga, Isidro and Mario Torres. 2007. “Beyond Food Production: The Role of Agriculture in Poverty Reduction,” FAO and Edward Elgar, 2007. 83-108.

Solow, R. 1956. “A contribution to the theory of economic growth.” *Quarterly Journal of Economics,* Vol. 70: 65-94.

Solow, R.M. 1957. “Technical change and the aggregate production function.” *Review of Economic Statistics,* Vol. 39: 312-320.

Stads. Gert-Jan, and Pau Sian Kam. 2007. “Agricultural Science and Technology Indicator: Myanmar.” ASTI Country Brief No. 38. June 2007.

Stern, N. 1994. “Growth Theories, Old and New, and the Role of Agriculture in Economic Development.” Mimeographed, A report prepared for the Policy Analysis Division of FAO.

Szirmai, Adam. 2011. “Industrialization as an Engine of Growth in Developing Countries, 1950-2005.” *Structural Change and Economic Dynamics.* 23(2012): 406-420.

Taylor, L. 1991. “Income Distribution, Inflation and Growth.” Lectures on Structuralist Macroeconomic Theory. Camberidge, Massachusetts. The MIT Press.

Thein, Myat. 2004, “Economic Development of Myanmar.” Institute of Southeast Asia Studies, Singapore.

Thirlwall, A.P. 1986. “A General Model of Growth and Development along Kaldorian Lines.” Oxford Economic Papers, Vol. 38: 199-219.

Thirtle, Colin., Lin Lin, and Jenifer Piesse. 2003. “The Impact of Research-Led Agricultural Productivity Growth on Poverty Reduction in Africa, Asia and Latin America.” *World Development,* Vol. 31(12): 1959–1975.

Tiffin, R., and X. Irz, 2006. “Is Agriculture an Engine of Growth?.” *Agricultural Economics*, 35: 79-89.

Timmer, C.P. 1995. “Getting Agriculture Moving: Do Markets Provide the Right Signals?.” *Food Policy*, 2(5): 455-472.

Timmer, C.P. 2002. “Agriculture and Economic Development.” in Gardner B. L. and G.C. Rausser Eds. Handbook of Agricultural Economics. Agriculture and its External Linkages, Vol.2A. Amsterdam: Elsevier Science Publishers.

Timmer, Marcel P. and Adam Szirmai. 2000. “Productivity Growth in Asian Manufacturing: The Structural Bonus Hypothesis Examined.” *Structural Change and Economic Dynamics.* Vol. 11: 371-392.

Titus O. Awokuse. 2009. “Does Agriculture Really Matter for Economic Growth in Developing Countries?” Paper presentated at the American Agricultural Economics Association Annual Meeting, Milwaukee, WI, July 28, 2009

Tsakok, I. and B. Garner, 2007. “Agriculture in Economic Development: Primary Engine of Growth or Chicken and Egg?.” *American Journal of Agricultural Economics*, 85: 1145-1151.

Tun Wai, U. 1996. “Myanmar.” in P. B. Rana and Naved Hamid Eds. “From Centrally Planned to Market Economies: The Asian Approach”. Vol. 3, Lao PDR, Myanmar and Vietnam. Hong Kong: Oxford University Press.

Tyler, W. 1980. “Growth and Export Expansion in Developing Countries: Some Empirical Evidence.” *Journal of Development Economics.*, Vol. 9:121-130.

UNESCO. 2006. “Education for All Global Monitoring Report 2005/06”

United Nations Development Program, UNDP. 2011. “UNDP Human Development Report” 2011.

United Nations. 2000. “A Better World for All”. New York: United Nations.

United Nations. 2007. “Globalization, Agriculture, and the Least Developed Countries” United Nations Ministerial Conference of the Least Developed Countries. Making Globalization Work for the LDCs, Istanbul. 9-11 July 2007.

United States Department of Agriculture, USDA. 2012. “India Topples Thailand as World’s Largest Rice Exporter.” *The Economic Times.* October 29, 2012.

Utkulu, Utku and Durmus Özdemir. 2004. “Does Trade Liberalization Cause a Long Run Economic Growth in Turkey” *Economics of Planning,* Vol. 37: 245-266. September 2004,

Valli, Vittorio and Donatella Saccone. 2009. “Structural Change and Economic Development in China and India.” *The European Journal of Comparative Economics,* Vol. 6 (1) 101-129

Vogel, S. J. 1994. “Structural Changes in Agriculture: Production Linkages and Agricultural Demand-Led Industrialization.” Oxford Economic Papers, Vol. 46: 136-156.

Wang, Xiaobing and Jenifer Piesse. 2009. “Economic Development and Surplus Labor: A Critical Review on the Lewis Model.” BWPI Working Paper 89. Brooks World Poverty Institute. The University of Manchester.

Weekly Eleven News. 2013. “Myanmar Unemployment Rate near to 40 Percent: Study Finds.” *Weekly Eleven News Journal.* Vol. 8(23). January 23, 2013.

White, H. and A. Anderson. 2001. “Growth vs. Redistribution: Does the Pattern of Growth Matter?” *Development Policy Review* 19(3): 167–289.

Wu, Jason J. and Aaron L. Game. 2011. “Cointegration Test with Stationary Covariates and the CDS-Bond Basis during the Financial Crisis.” *Staff Working Paper in the Finance and Economics Discussion Series* FEDS. 2011-18, March 28, 2011.

Yaghmaian, Behzad. 1994. “An Empirical Investigation of Exports, Development, and growth in Developing Countries: Challenging the Neoclassical Theory of Export-Led Growth.” *World Development,* Vol. 22 (12): 1977-1995.

Yao, Shujie. 2000. “How Important is Agriculture in China’s Economic Growth?” *Oxford Development Studies.* Vol. 28 (1): 33-49.

Yong, Kenneth B., Gail L. Cramer, and Eric J. Wailes. 1998. “An Economic Assessment of the Myanmar Rice Sector: Current Developments and Prospects.” *Research Bulletin 958*, Arkansas Agricultural Experiment Station, University of Arkansas, February 1998.

Young, Kenneth B., Eric J.Wailes, Gail L. Cramer, and Nguyen Tri Khiem. 2002. “Vietnam’s Rice Economy: Developments and Prospects.” Arkansas Agricultural Experiment Station, University of Arkansas, Research Report 968, April 2002.

Zarra-Nezhad, Mansour and Fatimah Hosainpour. 2011. “Review of Growth Models in Less Developed Countries.” *The International Journal of Applied Economics and Finance, 5: 1-17.*

Zhang, Kevin Honglin. 2001. “Does Foreign Direct Investment Promote Economic Growth? Evidence from East Asia and Latin America.” *Contemporary Economic Policy* Vol. 19(2): 175-186. April 2001.

APPENDIX 1 (TABLES)

Table 1. Sectoral Contribution of GDP for Selected Countries (1980, 2007)

Country	Agriculture		Industry		Service	
	1980	2007	1980	2007	1980	2007
NIEs						
Hong Kong	0.8	0.0	31.7	8.8	67.5	91.2
Singapore	1.3	0.1	38.1	29.4	60.6	70.5
Taiwan	7.7	1.5	45.7	28.3	46.6	70.2
Korea	14.7	3.0	41.3	39.4	43.7	57.6
2nd tier NIEs						
Malaysia	22.9	10.0	35.8	46.8	41.3	43.2
Thailand	23.2	11.4	28.7	43.9	48.1	44.7
Indonesia	24.8	13.8	43.4	46.7	31.8	39.4
Other Developing Countries						
Philippines	25.1	14.1	38.8	31.7	36.1	54.2
China	30.1	11.3	48.5	48.6	21.4	40.1
Vietnam	50.0	20.3	23.1	41.6	26.9	38.1
India	38.1	17.6	25.9	29.4	36.0	52.9
Bangladesh	41.2	18.9	16.3	28.5	42.5	52.6
Cambodia	55.6[a]	31.9	11.2[a]	26.8	33.2[a]	41.3
Nepal	61.8	32.5	11.9	16.6	26.3	50.9
Laos	61.2[a]	42.6	14.5[a]	31.8	24.3[a]	25.6
Myanmar	46.5	43.4	12.7	19.9	40.8	36.7

Source: Myint 2009. Table 7, P. 60-61. [a] Data for 1990 because 1980 data is not available for Cambodia and Laos.

Table 2. Percentage Share of GDP and the Labor Force by Agriculture and Manufacturing Sectors in Myanmar (1938-2010)

	Percentage of GDP		Percentage in Labor force	
	Agriculture	Manufacturing	Agriculture	Manufacturing
1938/39	45.8	5.7	69.6	10.7
1947/48	48.5	5.4	n.a	n.a
1953/54	44.7	6.3	62.9	9.3
1960/61	40.1	10.5	n.a	n.a
1973/74	40.0	10.4	63.8	10.4
1983/84	49.0	9.6	64.6	9.2
1990/91	47.8	9.1	65.6	7.2
1999/00	43.2	9.4	n.a	n.a
2009/10	41.7	16.0	61.2[a]	n.a
Average	44.53	9.16	65.30	9.36
SD	3.50	3.25	2.60	1.38

Source: Booth (2000) Table 8, p.21 and [a] from MOAI (2010) p.56

Table 3. Rice Seed Distributed by the Government (1983-2010)

Year	000 basket	MT	Year	000 basket	MT
1983	636	13,267	1997	579	12,078
1984	913	19,045	1998	579	12,078
1985	750	15,645	1999	571	11,911
1986	1201	25,053	2000	573	11,953
1987	881	18,378	2001	391	8,156
1988	488	10,180	2002	59	1,231
1989	409	8,532	2003	46	960
1990	601	12,537	2004	47	980
1991	689	14,373	2005	na	na
1992	568	11,848	2006	79	1,648
1993	623	12,996	2007	102	2,128
1994	566	11,807	2008	102	2,128
1995	567	11,828	2009	120	2,503
1996	579	12,078	2010	0.431	9

Source: Various Issues of Myanmar Agriculture at a Glance, MOAI. na=not available

Table 4. Rice Production and Export of Myanmar, Thailand and Vietnam (1962-2010)

	Area (Ha)	Yield (ton/ha)	Prod'n (MT)	Export (MT, '000)	Export Value (USD, '000)		
year	Myanmar	Myanmar	Myanmar	Myanmar	Myanmar	Thailand	Vietnam
1962	4,654.0	1.7	7,664.7	1,717.6	167,127.0	155,763.0	9,551.0
1963	4,877.5	1.6	7,782.9	1,712.0	170,180.0	165,009.0	36,634.0
1964	4,976.1	1.7	8,507.7	1,413.0	149,230.0	210,989.0	6,553.0
1965	4,848.3	1.7	8,055.1	1,335.0	138,323.0	208,384.0	330.0
1966	4,516.5	1.5	6,636.4	1,127.6	120,097.0	192,360.0	1,580.0
1967	4,706.0	1.7	7,769.4	540.0	66,484.0	230,062.0	520.0
1968	4,763.4	1.7	8,022.9	351.7	50,727.0	181,483.0	400.0
1969	4,671.6	1.7	7,984.7	549.4	66,901.0	141,571.0	3,300.0
1970	4,808.7	1.7	8,161.9	641.0	53,409.0	120,990.0	2,900.0
1971	4,763.8	1.7	8,175.0	810.5	60,617.0	139,909.0	900.0
1972	4,528.1	1.6	7,356.8	524.3	40,783.0	213,307.0	480.0
1973	4,879.5	1.8	8,601.9	145.8	17,832.0	174,332.0	400.0
1974	4,884.1	1.8	8,583.4	214.3	81,263.0	484,259.0	700.0
1975	5,029.6	1.8	9,207.7	291.6	73,825.0	287,176.0	6,500.0
1976	4,911.5	1.9	9,319.3	623.0	107,870.0	421,723.0	1,400.0
1977	4,864.0	2.0	9,462.0	661.4	115,928.0	656,027.0	1,200.0
1978	5,010.5	2.1	10,528.3	348.3	73,394.0	512,654.0	5,300.0
1979	4,441.9	2.4	10,447.9	590.2	135,135.0	763,622.0	1,800.0
1980	4,800.9	2.8	13,317.4	653.1	182,317.0	952,712.0	10,143.0

Table 4. Continued …

	Area (Ha)	Yield (ton/ha)	Prod'n (MT)	Export (MT, '000)	Export Value (USD, '000)		
year	Myanmar	Myanmar	Myanmar	Myanmar	Myanmar	Thailand	Vietnam
1981	4,808.7	2.9	14,146.6	673.9	216,474.0	1,211,221.0	2,750.0
1982	4,562.3	3.2	14,373.4	701.3	156,173.0	978,673.0	6,000.0
1983	4,659.2	3.1	14,288.1	858.4	165,438.0	876,394.0	28,000.0
1984	4,601.3	3.1	14,255.5	621.8	118,334.0	1,100,573.0	22,000.0
1985	4,660.8	3.1	14,317.0	581.5	93,025.0	829,656.0	15,000.0
1986	4,665.7	3.0	14,127.1	597.2	72,814.0	772,713.0	21,623.0
1987	4,482.8	3.0	13,638.4	303.0	38,254.0	882,208.0	17,107.0
1988	4,527.3	2.9	13,167.1	47.8	8,324.0	1,370,965.0	27,192.0
1989	4,732.4	2.9	13,806.5	168.2	38,619.0	1,768,937.0	290,018.0
1990	4,760.0	2.9	13,971.8	213.6	53,000.0	1,086,344.0	304,637.0
1991	4,575.0	2.9	13,204.2	183.1	39,654.0	1,195,994.0	234,482.0
1992	5,056.2	2.9	14,840.4	198.8	40,868.0	1,425,771.0	417,742.0
1993	5,486.8	3.1	16,763.2	262.5	43,286.0	1,301,733.0	363,000.0
1994	5,742.9	3.2	18,198.9	933.8	209,000.0	1,558,241.0	425,000.0
1995	6,032.7	3.0	17,956.9	353.8	77,370.0	1,951,828.0	530,000.0
1996	5,768.5	3.1	17,679.8	92.3	20,879.0	1,999,922.0	855,000.0
1997	5,408.3	3.1	16,651.4	28.3	6,032.0	2,157,457.0	870,892.0
1998	5,458.5	3.1	17,077.7	120.4	26,354.0	2,097,924.0	1,019,739.0
1999	6,210.8	3.2	20,126.0	54.3	10,319.0	1,950,411.0	1,025,095.0
2000	6,302.5	3.4	21,323.9	251.4	31,970.0	1,638,431.0	666,667.0
2001	6,412.5	3.4	21,916.0	939.1	111,607.0	1,578,213.0	624,710.0
2002	6,381.0	3.4	21,805.0	793.5	95,523.0	1,631,963.0	725,535.0

Table 4. Continued …

	Area (Ha)	Yield (ton/ha)	Prod'n (MT)	Export (MT, '000)	Export Value (USD, '000)		
year	Myanmar	Myanmar	Myanmar	Myanmar	Myanmar	Thailand	Vietnam
2003	6,528.0	3.6	23,146.3	388.0	55,000.0	1,828,480.0	719,916.0
2004	6,532.8	3.8	24,939.0	182.2	31,378.0	2,696,248.0	950,315.0
2005	7,384.0	3.8	27,683.0	180.2	37,329.0	2,327,666.0	1,407,229.0
2006	8,074.0	3.8	30,924.0	71.3	17,306.0	2,577,154.0	1,275,895.0
2007	8,011.0	3.9	31,451.0	1.8	442.0	3,470,015.0	1,489,970.0
2008	8,078.0	4.0	32,573.0	500.0	null	null	null
2009	8,000.0	4.1	32,682.0	null	null	null	null
2010	8,051.7	4.1	33,204.5	null	null	null	null

Source: IRRI World Rice Statistics

Table 5. Correlation Coefficient Matrix (Myanmar)

	GDPR	LAGDPR	SAR01	SIR	CGFR	STDR	CALAR
GDPR	1.000	0.089	0.331	-0.504	0.041	-0.204	-0.273
LAGDPR		1.000	-0.184	0.188	-0.103	0.026	-0.149
SAR			1.000	-0.677	-0.381	0.392	0.177
SIR				1.000	-0.069	-0.388	-0.016
CGFR					1.000	-0.144	0.121
STDR						1.000	0.296
CALAR							1.000

Table 6. Correlation Coefficient Matrix (China)

	GDPR	LAGDPR	SAR01	SIR	GCFR	STDR	CALAR
GDPR	1.000	0.125	-0.171	0.073	-0.021	0.141	-0.125
LAGDPR		1.000	-0.488	0.513	0.407	0.036	-0.261
SAR			1.000	-0.524	-0.283	-0.090	0.480
SIR				1.000	0.414	0.008	-0.414
GCFR					1.000	-0.120	-0.171
STDR						1.000	0.122
CALAR							1.000

Table 7. Correlation Coefficient Matrix (Indonesia)

	GDPR	LAGDPR	SAR01	SIR	GCFR	STDR	CALAR
GDPR	1.000	-0.113	-0.600	0.334	0.713	-0.136	0.101
LAGDPR		1.000	-0.096	0.045	-0.066	- 0.010	0.091
SAR			1.000	-0.531	-0.685	- 0.059	- 0.109
SIR				1.000	0.259	0.470	- 0.041
GCFR					1.000	- 0.082	-0.042
STDR						1.000	0.105
CALAR							1.000

Table 8. Correlation Coefficient Matrix (Korea)

	GDPR	LAGDPR	SAR01	SIR	GCFR	STDR	CALAR
GDPR	1.000	- 0.052	- 0.150	0.526	0.291	0.082	-0.135
LAGDPR		1.000	- 0.160	0.078	-0.052	0.211	-0.266
SAR			1.000	-0.072	-0.081	-0.134	0.171
SIR				1.000	0.167	0.022	- 0.107
GCFR					1.000	-0.126	-0.318
STDR						1.000	0.130
CALAR							1.000

Table 9. Correlation Coefficient Matrix (Malaysia)

	GDPR	LAGDPR	SAR01	SIR	GCFR	STDR	CALAR
GDPR	1.000	0.000	0.101	-0.088	-0.079	-0.003	0.083
LAGDPR		1.000	0.148	0.061	-0.057	-0.101	0.137
SAR			1.000	-0.449	-0.116	0.012	0.401
SIR				1.000	0.238	0.433	-0.444
GCFR					1.000	0.276	-0.284
STDR						1.000	-0.483
CALAR							1.000

Table 10. Correlation Coefficient Matrix (Philippines)

	GDPR	LAGDPR	SAR01	SIR	GCFR	STDR	CALAR
GDPR	1.000	0.006	-0.263	0.349	0.561	0.275	-0.009
LAGDPR		1.000	0.113	0.072	0.225	-0.049	- 0.095
SAR			1.000	-0.717	-0.214	-0.466	0.064
SIR				1.000	0.474	0.616	-0.027
GCFR					1.000	0.387	-0.212
STDR						1.000	0.149
CALAR							1.000

Table 11. Correlation Coefficient Matrix (Thailand)

	GDPR	LAGDPR	SAR01	SIR	GCFR	STDR	CALAR
GDPR	1.000	- 0.121	0.208	-0.145	-0.461	0.120	0.183
LAGDPR		1.000	-0.266	0.191	0.069	-0.065	0.114
SAR			1.000	-0.352	-0.067	0.209	-0.203
SIR				1.000	0.481	0.227	-0.003
GCFR					1.000	0.433	-0.331
STDR						1.000	-0.340
CALAR							1.000

Table 12. Correlation Coefficient Matrix (Vietnam)

	GDPR	LAGDPR	SAR01	SIR	GCFR	STDR	CALAR
GDPR	1.000	0.048	0.012	-0.073	0.266	0.117	0.384
LAGDPR		1.000	-0.326	-0.201	0.132	0.121	- 0.089
SAR			1.000	-0.659	0.075	0.017	0.162
SIR				1.000	0.066	- 0.245	- 0.040
GCFR					1.000	- 0.261	0.364
STDR						1.000	- 0.214
CALAR							1.000

Table 13. Correlation Coefficient Matrix for Agricultural Productivity Function (1966-2010)

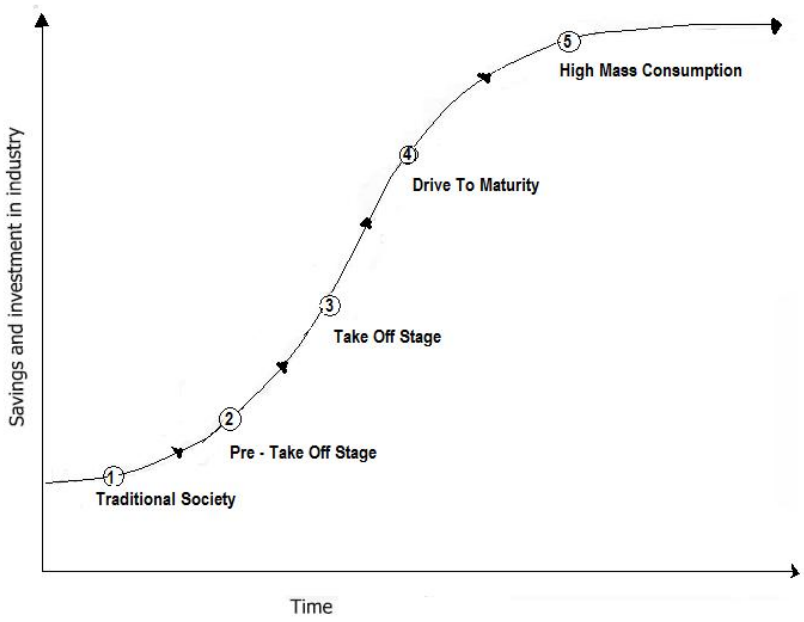
	RGPCG	AGGR	LAND	LAB	FERT	TRACTOR	IRRI	RYLD	RTPRO	ANI	SEED
RGPCG	1.0000	0.4378	0.0897	-0.0345	-0.0185	-0.1963	0.2430	-0.0620	0.1443	-0.4221	0.1587
AGGR		1.0000	-0.1049	-0.0677	0.0431	0.0534	0.2765	0.2699	0.3398	-0.1235	0.1422
LAND			1.0000	-0.0710	0.0117	-0.0415	-0.0021	-0.0019	0.0221	0.0472	0.0033
LAB				1.0000	-0.0635	0.0256	0.1118	-0.4735	-0.5166	-0.1582	-0.0016
FERT					1.0000	0.0453	0.1059	0.1007	0.1777	0.0575	0.1071
TRACTOR						1.0000	-0.2345	0.0901	-0.0123	0.0003	-0.0193
IRRI							1.0000	-0.0311	0.1216	0.0454	0.1813
RYLD								1.0000	0.7453	0.1594	0.0909
RTPRO									1.0000	0.0794	0.1815
ANI										1.0000	-0.1217
											1.0000

Table 14. Correlation Coefficient Matrix for Agricultural Productivity Function (1976-2010)

	RGPCG	AGGR	LAND	LAB	FERT	TRACTOR	SEED	IRRI	RYLD	RTPRO	ANI	PEDU
RGPCG	1.0000	0.2135	0.0594	0.0195	0.0486	-0.0016	0.1981	0.2071	-0.2090	0.1028	-0.4236	-0.2684
AGGR		1.0000	-0.2521	-0.1149	0.0275	0.1431	0.2470	0.2476	0.2844	0.4777	-0.3898	0.1507
LAND			1.0000	-0.0508	0.0109	-0.0225	0.0058	-0.0153	0.0327	0.0740	0.0814	0.0340
LAB				1.0000	-0.0805	-0.0472	-0.0016	0.1190	-0.5977	-0.6505	-0.2467	-0.0643
FERT					1.0000	-0.0113	0.1133	0.1273	0.0676	0.2159	0.0469	0.0011
TRACTOR						1.0000	-0.0382	-0.2438	0.2819	0.1593	-0.1969	-0.0648
SEED							1.0000	0.1936	0.1102	0.2293	-0.1418	0.0455
IRRI								1.0000	-0.0028	0.1964	0.0372	-0.3081
RYLD									1.0000	0.6028	0.2287	0.2040
RTPRO										1.0000	0.1070	0.0240
ANI											1.0000	-0.1309
PEDU												1.0000

APPENDIX 2 (FIGURES)

Figure 1. Demonstrations for Rostow's Linear-Stages-of-Growth Model



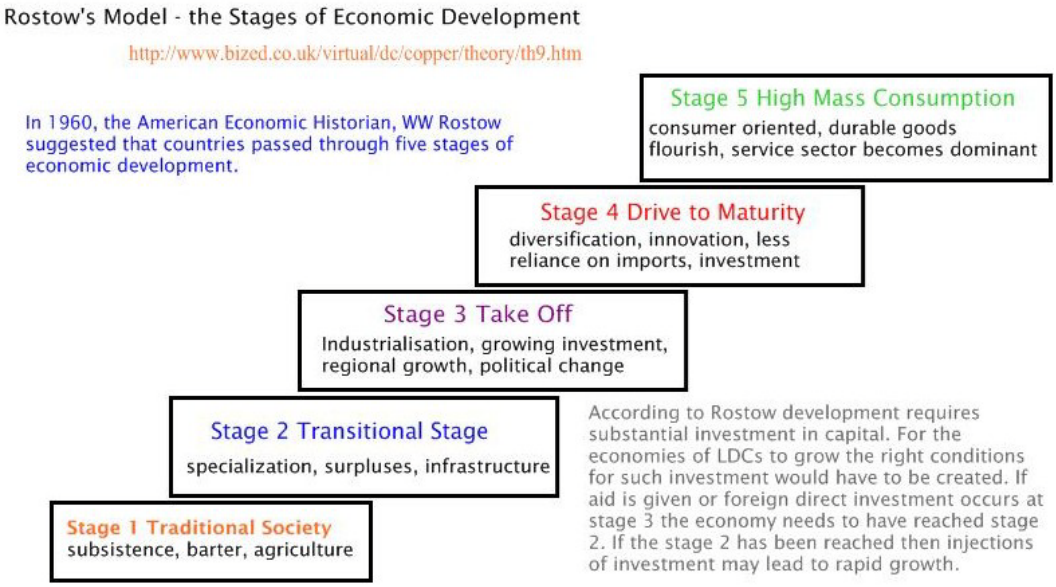


Figure 2. Demonstration of Lewis-Ranis-Fei Model (1961)

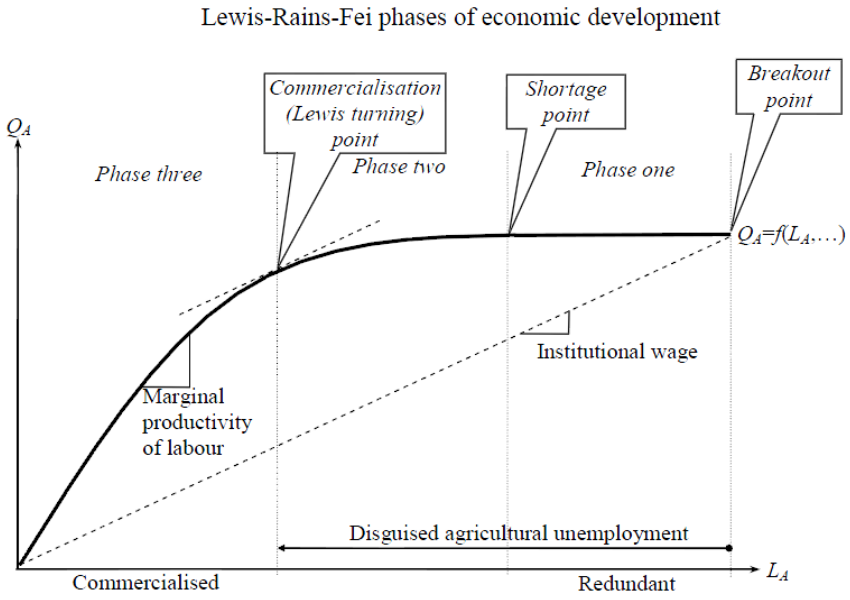
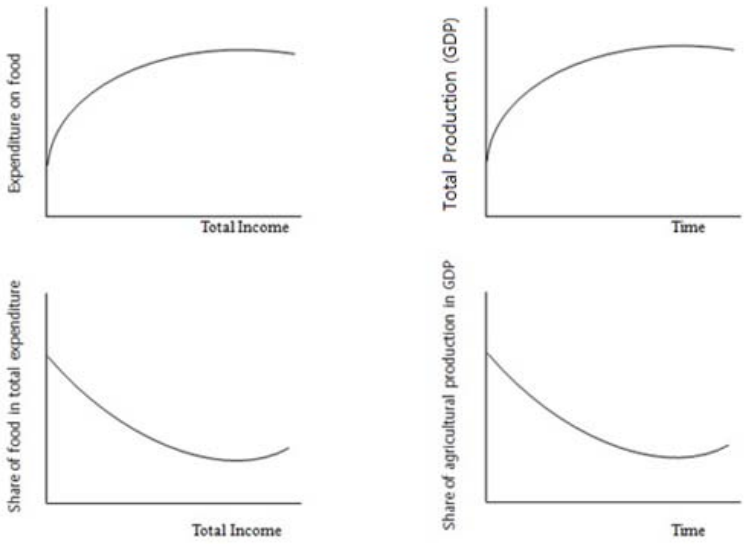


Figure 3. Demonstration of Engle's Law and the Concept of the Role of Agriculture in Economic Development.



초록

개발도상국 경제개발에 있어 농업의 역할은 개발경제학자들과 정책입안자들의 주요관심사가 되어왔다. 지난 반세기 동안 미얀마의 경제는 장기침체, 만성적 빈곤, 그리고 구조적 경직성으로 특징지어왔다. 오랫동안 국제적인 고립과 경제침체를 경험한 미얀마는 최근 민주주의를 복원하면서 지속가능한 경제개발을 목적으로 하는 개혁을 시작하고 있다. 그러나, 미얀마 정부는 장기적인 경제성장을 위한 산업화와 동시에 MDG 달성을 위한 빈곤퇴치를 동시에 추구하는데 있어 심각한 도전에 직면하고 있다.

이 논문은 미얀마의 경제발전에 있어서 친빈곤적 성장을 위한 농업의 역할과 구조적 전환을 연구하는데 목적이 있다. 특히 이 논문은 미얀마의 장기적 경제발전을 위한 구조 전환과 농업생산성 향상을 통한 단기적 빈곤퇴치를 연계함으로서 이 분야의 연구에 기여하고자 한다. 이를 위하여 구조적 변화의 과정과 친빈곤적 성장을 연계하는 개념틀을 제시하고 이를 바탕으로 계량경제적 실증분석을 하였다.

이 논문에는 두 가지의 실증적 분석이 시도되었다. 첫 번째는 빈곤퇴치와 친빈곤적 성장이라는 단기적인 정책 목표를 달성하는 데 있어서의 농업의 중요성을 밝히기 위한 실증적 분석이다. 구체적으로 농업의 생산성 향상이 미얀마의 빈곤퇴치에 기여한다는 가설을 검증하였으며, 농업의 생산성 향상에 기여하는 요소들도 분석하였다. 이를 위한 1965 년부터 2010 년 사이의 시계열 데이터는 International Rice Research Institute (IRRI)가 온라인상으로 제공하는 정보를 통해 얻었다.

실증분석을 위한 모델들은 회귀분석, ARDL, VAR 기법을 활용하여 테스트했으며, 분석을 통해 유도기간과 시간효과 사이의 장기간, 단

기간의 상관관계를 조사하였다. 결과는 헥타르 당 농업의 생산성 향상이 일인당 국민소득에 기여하는 것으로 나타났으며, 장기간, 단기간 모두 상관관계가 있는 것으로 나타났다. 이러한 실증분석 결과는 빈곤퇴치를 위한 개발정책에 있어 농업생산성 향상이 중심적으로 고려되어야 한다는 것을 보여준다.

두 번째의 실증분석은 미얀마와 아시아 다른 국가들에서 경제의 구조적인 변화가 경제성장에 기여하는지를 검증하기 위한 분석이다. 이를 위한 분석 대상 국가는 ASEAN+3 국가 중에서 선택되었는데 미얀마, 중국, 인도네시아, 한국, 말레이시아, 필리핀, 태국, 베트남이 포함되었다. 분석을 위한 데이터는 온라인상으로 제공되는 UNCATAD 시계열 자료를 활용했다. 분석대상 기간은 시계열의 자료의 입수가능성과 정상성을 고려해 국가별로 다르게 선정되었는데, 미얀마는 1991-2010 년, 베트남은 1985-2010 년, 다른 6 개 국가의 경우 1980-2010 년의 기간을 대상으로 분석했다.

본 연구를 위한 개념틀은 Lewis 의 Dual Economy Model 에 Rostow 의 Linear-Stages-of-Growth 이론과 신고전주의 성장모델들을 접목하여 만들어졌다. 미얀마는 “성장을 위한 전제조건” 단계로 분류하였다. 미얀마를 포함해 표본국가로 선정된 다른 아시아 국가들의 산업구조 변화가 경제성장에 미치는 영향을 조사하기 위하여 4 개의 실증모델을 만들었다. 구조적 변화에 있어 주요 변수는 농업 GDP 성장 (SAR), 공업 GDP 성장 (SIR), 총 노동력 중 농업노동력의 구성(CALAR) 이다. 분석결과는 인도네시아와 한국의 경우 GDP 중 공업의 비중을 늘리는 것이 경제성장에 상관이 있다는 가설을 지지한다. 구조적 변화의 주요 변수 중에서 SAR, SIR 은 미얀마에도 중요한 변수로 나왔지만 그 영향은 정반대의 방향으로 나타났다. 이는 농업에 치중한 미얀마의 구조적 경직성을 반

영하고 있다고 해석되었다. 다시 말해서, 본 연구결과는 분석대상 기간 동안 미얀마의 장기 저성장의 원인이 구조적인 변화를 거치지 않았기 때문이라는 것을 의미한다. 한국과 인도네시아의 경제성장에 관한 중요한 실증분석의 결과들은 미얀마의 경제발전을 위한 개발정책에 중요한 시사점을 제공해준다.

본 논문은 산업의 구조적 변화가 장기적인 경제성장과 성장을 따라잡는 과정을 시작하는데 있어서 핵심적 요소라는 것을 제시한다. 그러나 동시에 친빈곤적 또는 균형 잡힌 성장정책이 지속적인 경제성장에 중요하다는 것도 제시한다. 농업생산성의 향상은 이러한 정책목표를 달성하기 위해 즉각적으로 해결해야 할 과제이다.