# AN ANALYSIS OF THE SOURCES OF ECONOMIC GROWTH IN MALAWI

**MASTER OF ARTS (ECONOMICS) THESIS**

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**UNIVERSITY OF MALAWI**

**CHANCELLOR COLLEGE**

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# AN ANALYSIS OF THE SOURCES OF ECONOMIC GROWTH IN MALAWI

**MASTER OF ARTS (ECONOMICS) THESIS**

**By**

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Submitted to the Department of Economics, Faculty of Social Science, in partial fulfilment of the requirements for a Master of Arts Degree (Economics)

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## DECLARATION

I the undersigned hereby declare that this thesis is my own work which has not been submitted to any other institution for similar purposes. Acknowledgements have been duly made where other people's work has been used. I am solely responsible for all errors contained herein.

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**Full Legal Name**

_____

**Signature**

_____

**Date**

## CERTIFICATE OF APPROVAL

The undersigned certify that this thesis represents the student's own work and effort and has been submitted with our approval

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**Second Supervisor**

## DEDICATION

This paper is dedicated to my late dad, **PETER MBEDZA-MBEWE**

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## ABSTRACT

Using the aggregate production function, the study examines the main components of Malawi's growth rates as well as elasticity of output growth with respect to sectorial factor inputs from Agriculture, Manufacturing and Services between 1980 and 2012. The study employs a parametric approach where Ordinary Least Squares (OLS) procedure is applied and Total Factor Productivity (TFP) is obtained as a residual. The estimated growth of TFP is 7% (9%) while elasticity of output growth with respect to capital accumulation and growth in labor are 0.5 (78%) and 0.2 (13%), respectively and the figures in brackets are contributions to output growth. The sectorial analysis shows that factor inputs in the manufacturing sector have statistically significant positive effect on economic growth, with elasticities of 0.17 and 0.37 for labor and capital respectively. Labor in the agriculture sector is statistically significant and has a coefficient of -0.59 while the other variables are insignificant. The results indicate capital accumulation as main growth channel and the manufacturing sector as the most productive sector.

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| | |
|---|---|
| **COMESA** | Common Market for Eastern and Southern Africa |
| **DPP** | Democratic Progressive Party |
| **GDP** | Gross Domestic Product |
| **LCD** | Least Developed Countries |
| **OECD** | Organisation for Economic Co-operation and Development |
| **OLS** | Ordinary Least Squares |
| **RBM** | Reserve Bank of Malawi |
| **SADC** | Southern African Development Community |
| **SSA** | Sub Saharan Africa |
| **TFP** | Total Factor Productivity |

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background

Economic growth is the steady process by which the productive capacity the economy is increased over time to bring about rising levels of national output income (Todaro & Smith, 2003). The growth performance has been diverse among countries around the world. On the one hand, rapid growth rates were experienced by the Asian tigers between the 1965 and 1995, which experienced growth rates of around 6.0 per cent per year in per capita terms (De Gregorio & Lee, 1999). On the other hand, many countries in Sub-Saharan Africa (SSA) and Latin America registered less than 1.0 per cent average growth rates in per capita income during the same period (ibid).

While some countries achieve rapid growth of income and high standards of living, others remain mired at a level of development that does not assure the subsistence needs of the population. In particular, economic growth rates for Malawi are still not high enough to make a real dent in the pervasive poverty. There is thus a need to raise substantially real Gross Domestic Product (GDP) growth rates on a sustained basis. Empirical studies have shown that the most important determinants of economic growth in countries are not the same. Some researchers have found that physical capital accumulation plays the dominant role (for example, Chow (1993), Boreinsztein & Ostry (1996) and Hu & Khan (1997)), while others have shown that

Total Factor Productivity (TFP) growth is the dominant source of output growth (for example, Krugman (1994) and Young (2000)).

Malawi, which is one of the Least Developed Countries (LCDs), does not have sufficient resources, and therefore, there is need for cautious and specific policy prescription for optimal utilization of the resources.

Malawi's population, estimated at 17 million, is 85% rural and 15% urban. Poverty remains high at 50.7% and is fundamentally rural, which takes up about 95% of the poor. Regional distribution of the rural poor is highly skewed with 47% of the poor in the South, compared to 35% in the Centre, and 13% in the North. Unemployment is high at 21%, and differs by rural/urban and region (AEO, 2015).

Agriculture accounts for about 29% of GDP while industry and all services account for 16% and 55% respectively (World Bank, 2016). There is an interesting pattern in how these compositions have evolved in that in the period from the 60s to early 90s agriculture's share of the GDP ranged from 37% to 55%, and services' share from 24% to 42%. The industry's share was higher in the period between the late 70's to early 90s (ibid). This displays a transition from predominantly agriculture to a more diversified economy although agriculture still plays an important role in the economy.

Malawi's economic growth for 2016 was estimated to be about 2.8%, a revision from the earlier 5.6%. This came after the dry spells experienced in some parts of the country due to El Nino (RBM, 2016). The economy grew by 5.7% in 2014 but slowed down to 2.8% in 2015 as Malawi suffered from dual challenges of adverse weather conditions and macroeconomic instability. Flooding in southern districts followed by

countrywide drought conditions saw a contraction in agricultural production. Maize, the key crop for food security purposes, saw a 30.2% year-on-year drop in production (World Bank, 2016). The growth may reach 4.9% in 2017, with agriculture as the main driver, conditional on favorable weather conditions, macroeconomic stability, consistency in policy implementation and renewed private-sector confidence (AEO, 2016). This is the background where this study is situated as the proceeding part clearly shows the problem and hence justifies the study.

### 1.2 Research Problem and Justification of the Study

Malawi is one of the poorest countries in the world despite the fact that it has been more than 50 years after independence (World Bank, 2015). The country's economy has not been performing well in terms of growth. Firstly, the growth rates have been low in comparison to the target for the SSA region of 7% per annum, which was supposed to achieve halving down poverty levels by 2015 (Tahari et al., 2004). Only a few short periods have the growth rates averaged 7% or higher like 2004-2009 otherwise they have been below (ODI, 2011).

Secondly, the growth rates have not been stable, with high variations from negatives like in 1995 when it was -10% in 1994, to positives even to some point in 2008 when Malawi was the second fastest growing economy according to World Bank. To achieve economic development and permanently reduce poverty, there is need for a sustainable growth which is stable. Therefore, the current situation makes the attainment of macroeconomic stability a difficult thing to achieve.

Thirdly, it has been two consecutive years, 2015 and 2016, where the rate of growth of GDP has been lower than the rate of population growth of around 3.1%. In addition, the proportion of the population living below the international poverty line of US $1.9/ day in 2011 PPP prices remained flat at 69% in 2016 with a possibility of a slight decline in 2017 (Record, 2016). This is a clear indication that Malawi needs to record a higher rate of economic growth than do many comparable countries to ensure improvements in average living standards and reductions in poverty.

This, however, does not imply that nothing has been happening to try to improve the situation. Every nation attempts to raise the welfare of its citizens through sufficient economic growth. In the case of Malawi, several strategies have been put in place by Malawi Government like Vision 2020, Malawi Growth and Development Strategies I and II, Malawi Poverty Reduction Strategy, just to mention a few. There have also been several structural reforms like privatization, and the recent public sector reform. This may indicate a gap that is still there in terms of what policies may work to achieve high and sustainable economic growth and consequently economic development.

In order to achieve this kind of growth, an economic recovery strategy should be hinged on increased production and productivity. Increased productivity is dependent on the relevant and detailed information about economic growth. It is, therefore, important to decompose the structure of Malawi's economy and its growth rate, to gain a better understanding of those factors that have produced differences in growth rates of the economy. For a proper design of policies that increase growth, policy makers should know what accounts for variation in growth rates across periods and

across sectors, what the roles of the various factors in economic growth are, and what the production structures and factors underlying them are.

Several studies have tried to explain economic growth in Malawi. For example, Khungwa (2007) studied economic growth in Malawi and found investment, terms of trade, openness and human capital as the main determinants of growth. Simwaka et al (2012) also investigated economic growth in Malawi but with respect to financial development to see the causal relationship between the two. Evidently, there are many variables and factors which influence economic growth and this paper tries to find the proximate sources of economic growth by using the Cobb-Douglas production function in the theory of economic growth which employs the proximate variables.

Particularly, the study assesses the contribution of the growth of the factor inputs and TFP on economic growth, which the other studies did not do. In addition, this study also disaggregates capital and labor into three sectors (primary, secondary and tertiary) which are; agriculture, manufacturing and services respectively. As far as the literature I have gone through, this kind of study has not been done before for Malawi.

This study intends to decompose the economy and growth rates into different components and examine the role of the different factors in the economy in order to understand better Malawi's growth process. In other words, the study will find out the channel of Malawi's economic growth, whether it is factor accumulation (labor and/or capital) or technological advancement. Thus, we would gain better understanding about the sources of economic growth and thus provide useful information for more effective and appropriate public policy.

### 1.3 Objectives of the Study and Research Questions

The main objective is to decompose the sources of economic growth.

Specifically, this paper will;

1. Assess the contribution of the growth of TFP and factor inputs of the aggregate economy on output growth
2. Examine the output elasticity with respect to the growth of factor inputs in the three main sectors of the economy, namely; agriculture, manufacturing and services

Corresponding to the specific objectives, the following questions are asked:

1. What are the contributions of the growth of TFP and factors inputs of the aggregate economy on the output growth?
2. What is the output elasticity with respect to the growth of factor inputs in the three sectors and the implications

### 1.4 Significance of the Study

This study will assist in the policy framework of the country as it will provide an in-depth analysis of the sources of economic growth for Malawi with respect to the factors of production and technological progress. It will also bring a new insight as to what sectors are more important with regards faster economic growth. The sectorial analysis will go beyond knowing the sectorial shares in the output growth and explore the elasticities. This will enable us to know by how much output growth will increase if we increase capital or labor in a specific sector.

### 1.5 Conclusion and Organization of the Study

The chapter has introduced the thesis in giving the background of economic growth as a topic as well as what the paper intends to find out. The subsequent chapters will develop the paper in order. Chapter Two follows with a brief overview of the economy of Malawi. A review of literature, both theoretical and empirical comes in Chapter Three. Chapter Four presents the methodology to be used in the study. Then Chapter Five presents and discusses the results of the study and finally chapter six with conclusion and policy implications

# CHAPTER TWO

# OVERVIEW OF MALAWI ECONOMY

## 2.1 Introduction

This chapter provides an overview of the Malawi economy, specifically the economic growth and several shocks as well as policies along the period under discussion. The subsections include the general trend from 1960-2014, and the two periods, 1960s-1980s and 1990s-2000s. The discussion contains specific shocks, if any, and policies which were introduced or implemented.

## 2.2 The Economy from 1960-2014

To give a very clear picture of the evolution of the growth rates in the country, a graph in 1 shows the GDP growth rates from period 1960 to 2014. The study only considers the period from 1980-2012 but for a thorough understanding of the economic growth, the graph starts from 1960-2014.

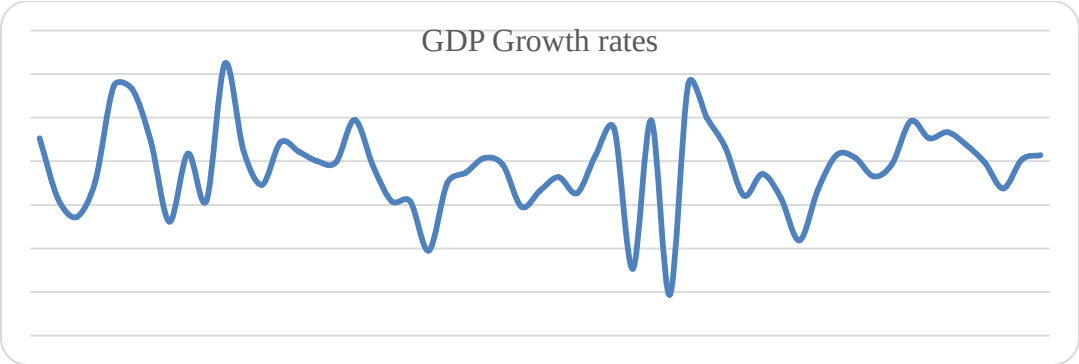


**Figure 1: GDP Growth over Period 1960-2014**

**Source:** Author's computation using data from WDI

One salient feature from the figure is the high variation, which indicates a very unstable pattern in terms of growth in this country. A detailed explanation of the graph will then follow in the subsequent sections.

### 2.3 The Economy from 1960 to Early 1980's

Going back from independence, the period 1964-1979 was characterized by macroeconomic stability and a fairly high GDP growth averaging 5.9% annually. One of the reasons for these growth rates was export-oriented policies that encouraged agricultural exports. Although this succeeded to generate growth, it did not create a general expansion in the Malawi economy as a large part of the population was left out of the development process because it favored estate over smallholder agriculture (Pryor, 1990).

In the late 1970's and early 1980's, Malawi's economy was affected by a series of external shocks including a fall in export prices and a rise in import prices (e.g. oil price), drought and a dramatic increase in transport costs for foreign trade due to war in Mozambique (Durevall, 2002). This caused foreign reserves to go down, which resulted in heavy losses incurred by many tobacco estates and consequently, investments dropping. Then at around the same time, a series of IMF and World Bank supported structural adjustment programs were initiated in the country.

### 2.4 The Economy from Late 1980's to Early 2000's

In the early 90s, specifically in the period 1992-1995, the country experienced a bad performance of the economy with the lowest growth rate of -10% registered in 1994, inflation rising to over 80% in 1995 and an annual GDP growth average of 0% over

the period (Durevall, 2002). In this period, there were two droughts, a deterioration of terms of trade suspension of balance of payments support due to donor concerns about overspending, lack of human rights and poor governance in relation to the 1994 elections. In 1995, the government embarked on a structural adjustment program with support from the World Bank, IMF and other donors, to stabilize the economy aiming to improve the fiscal position and reducing inflation as well as to initiate structural reforms. The structural reforms included private sector reform with privatization, deregulation, regulatory reform and agricultural liberalization (ibid).

After several years of varied economic growth rates, the country experienced a marked improvement in the years after 2004, when the government led by Dr. Bingu Wa Muntharika came into power. Growth averaged 7.1% between 2006 and 2010 and poverty (African Development Bank, 2012). The success was attributed to good governance, good rains, Farm Input Subsidy Program (FISP), among other things. Poverty rates stood at 39% in 2009 from 52% in 2004 and the reduction was fastest in urban areas and in the north of the country, with the largest reduction in the Northern region, representing a 25 percentage-point fall, from 56% to 31% (ODI, 2011). The economy, however, took another direction from around 2011 when the country started having problems of foreign exchange shortages, which was a result of the overvalued Malawi Kwacha. At around the same time, there were issues of poor governance, human rights issues and many factors which led to the donors suspending their aid and this just almost brought the economy to its knees. The new government, which came in 2012 after the death of Bingu wa Muntharika, came with reforms which saw the economy starting to improve again in 2014 (AEO, 2015).

## 2.5 Conclusion

Therefore, with the numerous challenges the economy has and continues to face currently, it becomes a priority to come up with measures that will achieve high economic growth, which will consequently lead to economic development. These challenges indicate that there is falling in the contributors of economic growth as such understanding the composition of output growth helps to enlighten on how to align policy in a way that will address the constraints in the economy of Malawi.

# CHAPTER THREE

# LITERATURE REVIEW

## 3.1 Introduction

Economic growth is a widely discussed topic in the literature and we will review some of the literature, which helps build this paper. This chapter will discuss a review of relevant literature, which comprises of theoretical and empirical literature in sections 3.1 and 3.2 respectively.

## 3.2 Theoretical Literature

The study is based on a neoclassical framework and section 3.1.1 discusses the production function of the neoclassical model. Section 3.1.2 gives a brief discussion of total factor productivity and section 3.1.3 examines the interaction of TFP, capital and labor in output growth.

### *3.2.1 The Production Function*

According to Barro & Sara-i-Martin (2004), a standard growth-accounting framework, based on a standard Cobb-Douglas production function, is used to investigate the sources of growth

$$Y = F(T, K, L) \qquad (3.1)$$

Where Y is GDP, T is the level of technology, K is the capital stock, and L is the quantity of labor. The production function makes clear that GDP can change only if there is a change in the productive inputs, including the level of technology.

Taking logarithms of equation (3.1) and derivatives with respect to time we get

$$\dot{Y}/Y = g + \left(F_K K/_Y\right).\left(\dot{K}/_K\right) + \left(F_L L/_Y\right).(\dot{L}/_L) \qquad (3.2)$$

Where $F_K$ and $F_L$ are the marginal products of capital and labor respectively and $g$ is the growth due to technological change given by $g \equiv (\frac{F_T T}{Y}) \cdot (\frac{\dot{T}}{T})$.

$\dot{Y}$ = derivative of output with respect to time,

$\dot{K}$ = derivative of capital with respect to time,

$\dot{L}$ = derivative of labor with respect to time.

Equation 3.2 says that the growth rate of GDP can be decomposed into the growth rates of the factor inputs, and technology. In particular, it says that the decomposition is a weighted average of the growth rates of the three inputs, where the weights are given by the relative contributions of each of the factors to GDP. These contributions, in turn, are the social marginal products times the amount of input divided by GDP.

### *3.2.2 The Total Factor Productivity*

There is a residual growth in total output of an entity or economy that cannot be explained by the accumulation of traditional inputs such as capital and labor, and this is measured by total factor productivity (Barro & Sara-i-Martin, 2004). TFP reflects the efficiency on the use of inputs, and is less tangible than capital and labor inputs, accounting for a range of factors from technology, to human capital, to organizational innovation.

Total factor productivity growth reflects phenomena such as advances in general knowledge, the advantages of particular organizational structures or management

techniques, reductions in inefficiency and reallocations of resources to more productive uses. It is often taken as a measure of long term technological change brought about by such factors as technical innovation (ibid).

From equation 3.2, g cannot be measured directly, as such it is calculated as a residual or difference between the actual growth rate of GDP and the part of the growth rate that can be accounted for by the growth rate of capital and labor:

$$g = \frac{\dot{Y}}{Y} - (\frac{F_k K}{Y}) \cdot (\frac{\dot{K}}{K}) - (\frac{F_L L}{Y}) \cdot (\frac{\dot{L}}{L}) \quad (3.3)$$

Notice that to estimate g empirically, we need to know the social marginal products, $F_k$ and $F_L$, but these values would typically not be measurable directly. In practice, we assume that the social marginal products can be measured by observed factor prices (Barro, 1999). If the factors are paid their social marginal products, so that $F_k = R$ (the rental price of capital) and $F_L = w$ (the wage rate), then $F_L L = wL$, which is the total the wage bill. Hence, $F_L L/Y = wL/Y$ is the fraction of GDP used to pay wages, a fraction known as the labor share, denoted by $s_L$. Similarly, the ratio $F_K K/Y = RK/Y$ is the fraction of GDP used to rent capital, a fraction known as the capital share, which we denote by $s_K$.

Using this notation, the estimation of the rate of technological progress can be rewritten as;

$$\hat{g} = \frac{\dot{Y}}{Y} - s_K \left(\frac{\dot{K}}{K}\right) - s_L(\frac{\dot{L}}{L}) \quad (3.4)$$

This formulation was first presented by Solow (1957), so it is also called the Solow residual. If we assume the condition $s_K + s_L = 1$ or $Y = R_K + w_L$, the computation of the residual simplifies to;

$$\hat{g} = \frac{\dot{Y}}{Y} - sK\left(\frac{\dot{K}}{K}\right) - (1 - sK)\left(\frac{\dot{L}}{L}\right) \quad (3.5)$$

### *3.2.3 Interaction of TFP, Capital and Labor in Output Growth*

Acemoglu (2007) somehow agrees with Barro & Sara-i-martin (2004) in his argument that countries that have grown faster are typically those that have invested more in both physical and human capital. One of the major points that emerged from his analysis is that focusing only on physical and human capital is not sufficient. Both to understand the process of sustained economic growth and to account for large cross-country differences in income, we also need to understand why societies differ in the efficiency with which they use their physical and human capital. The concept of technology is used to capture factors other than physical and human capital that affect economic growth and performance. He concluded that rapid capital accumulation has been and was very important in generating growth miracles in East Asia, Holland and other countries and debates the relative roles of human capital and technology.

At some level, fundamental causes are the factors that enable us to link the questions of economic growth to the concerns of the rest of social sciences, and ask questions about the role of policies, institutions, culture and exogenous environmental factors (Acemoglu, 2007). However, fundamental causes can only have a notable influence on economic growth if they affect parameters and policies that have a first order influence on physical and human capital and technology. Therefore, an understanding of the mechanics of economic growth is essential for assessing whether candidate

fundamental causes of economic growth could indeed play the role that is sometimes attributed to them.

Over the longer term, growth will be determined primarily by the factors which determine productivity, and secondly those which improve labor participation. The drivers of productivity growth are factors which improve the efficiency with which inputs such as capital, labor and materials are transformed into outputs. The contribution of some of these factors to output growth can be captured by appropriate input measures, while all else, like unmeasured inputs and technological progress are included in TFP growth (Barro & Sara-i-Martin, 2004).

In the traditional Solow Neoclassical Growth Model, a one-off increase in inputs to raise the scale of production only has an impact on per capita output growth in the short run, while technological progress makes a persistent contribution. However, in later endogenous growth models, investment, particularly in innovation greatly impacts technological progress and therefore has an impact on growth in the long as well as short term. Innovation by firms exploiting scientific advances creates the technological progress, which is the main driver of growth in the long run (Barro, 1999).

Growth accounting provides a breakdown of observed economic growth into components associated with changes in factor inputs and a residual that reflects technological progress and other elements (Barro, 1999). It is empirically motivated and can been seen as a first attempt to understand the long-term growth process. It does not rely on any ex ante implications of any theoretical framework and therefore,

does not aim to give explanations of the underlying forces of growth such as preferences, institutions and economic policies.

According to Growth Accounting there are three elements that contribute to the production of goods and services; labor, capital and technology (Jajri, 2007). Labor and capital, known collectively as the factor inputs, refer to workforce and capital goods that are used in producing goods and services. Technology refers to all methods employed by labor and capital to produce goods and services more quickly and efficiently. We can then conclude, based that argument that there are two distinct sources of growth, input driven and technology driven (ibid).

## 3.3 Empirical Literature

Several empirical studies have been undertaken to examine the sources of economic growth for different countries and regions. The results from these studies are not the same, as some support TFP growth as the main channel of economic growth while others attribute the main contribution to the factor inputs (labor, physical capital and human capital) and other factors included in the specific studies. Section 2.2.1 discusses the literature which supports TFP growth as main channel which will be followed by section 2.2.2 which then reviews the literature which supports factor inputs and other factors.

### *3.3.1 TFP Growth Channel*

Kerekes (2008) analyzed the patterns of economic growth using a production frontier approach. The paper investigated the sources of growth around growth regimes change where the derivation of structural breaks in growth rates series was combined

with nonparametric growth accounting, which allows the decomposition of productivity changes into technological progress and efficiency changes. The study used a selection of high-income, middle-income and low-income countries and found that even medium-run growth rate changes are mainly the result of productivity changes. He argued that growth spurts in developing countries are based on efficiency improvements. This implies that factor accumulation is of minor importance. In this sense, countries with higher levels of capitalization have their production frontiers shift outwards indicating technological progress. Technological progress benefits predominantly countries that produce capital intensively and have high levels of income per capita.

Duma (2007) investigated Sri Lanka's sources of growth using a growth accounting framework for the period 1980 to 2006. His study revealed two patterns in the channel of growth, the first of which was in the period of the 80's. For this time, labor growth was the main contributor of economic growth. For the larger remaining time TFP growth took the dominance as it was now the main contributor to economic growth.

### *3.3.2 Factor Growth Channel*

Baier et al (2002) examined the relative importance of the growth of physical and human capital and the growth of TFP on 145 countries. They found that TFP is an unimportant part of average output growth across all countries. The weighted-average TFP growth is only about 0.13 percent per year, which is about 8 percent of growth of output per worker. However, TFP growth accounts for about 25 percent of output growth per worker for the western countries including United States; 20 percent for Southern Europe; and 18 percent for Newly Industrialized Countries. On the other

hand, Central and Southern Africa, Central and Eastern Europe and Middle East have negative TFP growth. Across all countries, variation in aggregate input growth could account for as much as 32 percent of the variance of the growth of output per worker.

Baily (2003) in a review article on the sources of economic growth in Organization for Economic Co-operation and Development (OECD) countries summarizing the main findings of the OECD growth project initiated in 1999 noted that disparities in growth have arisen largely from differences in labor utilization, with low growth countries experiencing slow growth or declines in employment and hours. This suggests labor force growth as an important determinant in the differences of growths among countries.

Krasnopjorovs (2013) in the Doctoral Thesis, *Factors of Economic Growth in Latvia* in which he assessed the factors of economic growth in Latvia using econometric modeling techniques identified the main factor of economic growth in Latvia as fixed capital accumulation. Although every euro of public investments on average contributes to the GDP growth at least as much as the euro of private investments, fixed capital accumulation in the private sector is the primary source of economic growth owing to its larger amount and faster growth. The positive impact of fixed capital accumulation on the average labor productivity level in the country is both direct by increasing capital to labor ratio and indirect, through allowing to use more productive technologies.

Mamuneas & Ketteni (2012) conducted a growth accounting study for some European countries. They decomposed output growth to its components for Cyprus, Greece and

the Euro area using data from 1996 to 2011. The results, especially after 2008 suggest that Greece has a negative TFP growth rate, while Cyprus and the Euro area averages appear to be close to zero. With respect to output decomposition, they observed that in the period 2008-2011, there is a dramatic decline in the contribution of TFP and labor growth in both the Euro area and Greece. Both contributed negatively in output growth and thus the reduction of output growth. In Cyprus, a decline in the labor and TFP contribution is also observed. Only labor growth has a negative contribution while TFP growth still has a positive contribution (close to 7%) but it decelerates. The contribution of capital growth is positive and capital appears to have a small acceleration. Output growth would have been worse if capital did not accelerate. This indicates that although TFP has positive contribution but it is not as much as the contribution of capital accumulation, therefore, supports the factor input growth channel.

A Comparative Analysis for Taiwan and Mainland China by Chow (2002) provides a statistical summary of aggregate economic growth in Taiwan and mainland China using the standard national income accounting framework by decomposing aggregate growth into components due to growths in capital, labor and total factor productivity. The major findings in Japan included the stability of input coefficients (under the assumption of constant returns) and of the rate of increase in TFP for the entire period 1951-1999. Labor exponent was about 0.7 and a rate of annual increase in TFP of about 0.03, as well as slower exponential rate of growth of real GDP since 1987 to about 0.065 from the 1951-1999 average of 0.081 mainly as a result of the large reduction in the growth rate of labor input to half. For mainland China, the major findings included the stability of the relative input coefficients. a labor exponent of

about 0.35 and a rate of increase in TFP of about 0.027 and the absence of equally large reduction in the rate of increase in labor input as in Taiwan and the smaller exponent of labor leading to a prospect of only a moderate reduction in future growth rate. This shows a contrast in the effect of labor growth in the two countries and such differences can be extended to other countries.

Wang & Yao (2002) studied the sources of China's economic growth incorporating human capital accumulation. They constructed a measure of China's human capital stock over 1952–1999 and employed it in the growth accounting exercise. The findings of the study showed that the accumulation of human capital was quite rapid and it contributed significantly to growth and welfare. Secondly, after incorporating human capital, the growth of total factor productivity (TFP) still played a positive role in GDP growth in the reform period, while it was negative in the pre-reform period. They concluded that a high priority should be given to human capital accumulation and productivity growth, if a country is to sustain its growth. This study went beyond one by Chow (2002) by including an input of human capital, which proved to be important, thus even giving more clarity on the sources of growth.

Iwata *et al* (2003) did a nonparametric assessment of the sources of economic growth in Asia. They contested the use of conventional growth-accounting approach to estimating the sources of economic growth, which requires unrealistically strong assumptions about either competitiveness of factor markets or the form of the underlying aggregate production function. They found that output elasticity with respect to capital and labor tends to be different from the income shares of these

factors and that the growth of total factor productivity over the period 1960-95 has been an important factor in the overall growth performance of these countries.

Cheng & Huang (2004) applied a growth accounting method in an open economy based on nonparametric local polynomial regression estimation technique to analyze the sources of economic growth in twelve developing economies over the period 1960-2002. Just like Iwata et al (2003), they considered nonparametric estimation better than parametric and they further considered the welfare effect of terms-of-trade change similar to technological change. The results indicated that terms of trade shifts have distinct positive effects in four economies and small negative effects in the others. They also found that capital accumulation and employment growth account for a large part of real output growth. The growth of total factor productivity plays a slight role in economic growth. This agrees with the findings of Chow (2002), Mamuneas & Ketteni (2012), Weng & Yao (2002) and many others, especially developing economies where TFP plays a lesser role than factor input contribution. Although the study found that, for real output, capital accumulation is the most important contributor and that growth in employment and in TFP plays almost the same role on average, there was evident difference among individual economy about the contribution of various factors to real growth.

Badunenko *et al* (2012) in a study on Significant Drivers of Growth in Africa employed bootstrap techniques in a production frontier framework to provide statistical inference for each component in the decomposition of labor productivity growth. They showed that only two of the four components have significantly contributed to growth in Africa. Although physical capital accumulation was the

largest force, it was not statistically significant and thus, ignoring statistical inference would falsely identify physical capital accumulation as a major driver of growth in Africa when it is not. Just as Wang & Yao (2002), the results identify human capital accumulation as a major driving force behind labor productivity growth in Africa.

Dike (1995) did a study that decomposed the sources of Nigeria's economic growth over the period 1950-1991 using neoclassical growth accounting methodology. The results were characteristic of the general results economic growth in less developed countries, namely that labor-force expansion and capital accumulation are the engine for long-run growth in GDP, with improvement in TFP playing, at best, a marginal role. Another important element in the Nigerian experience is that deteriorating capacity utilization constitutes a key drag on capital productivity growth and, hence, economic growth and capital accumulation.

Amin (2002) examined the sources of growth in Cameroon using the aggregate production function and data for the period between 1961 and 1997 and the driving force behind the sources of growth in the economy at the whole economy and sector levels. He used both parametric and non-parametric approaches. The results showed that the contribution of the growth of factor inputs is greater than the contribution of total factor productivity, with capital input playing a larger role. At the sector level, input growth greatly influenced the sectorial output growth. Specifically, the capital input turned out to be the most important factor influencing output growth in all the sectors. The results showed high growth rate of total factor productivity, thus suggesting the potential and growing importance of TFP in the growth process, although at that moment its contribution was very small.

Kalio *et al* (2012) carried out a growth accounting analysis of total factor productivity and economic growth in Kenya. They employed the neoclassical production function to assess the contribution of the classical factors and technological advancement to output. Growth accounting analysis of the Kenyan scenario revealed that accumulation of the classical inputs, capital and labor, are more important than total factor productivity growth in explaining output growth, with contributions of 71.4%, 25% and 3.6% respectively. The paper also showed that TFP is influenced by openness of the economy as well institutions and terms of trade. The coefficients for openness, institutions and terms of trade were 0.3136, -0.3822 and -0.3352 respectively, showing openness has a positive influence while the other two variables having a negative relationship with TFP. They concluded that the Kenyan economy is propelled by factor accumulation and at the level of development at that time the economy should concentrate more on policies that raise factor supplies for enhanced output.

Khungwa, (2007) did a study on determinants of economic growth in Malawi using a growth framework that emanates from Cobb-Douglas production function. The study used time series secondary data covering from 1970 to 2003. The study found that investment, terms of trade, openness and human capital are the main determinants of growth in Malawi. These variables significantly affect growth both in the short run and long run. The findings imply that in order to boost economic growth in Malawi policies and strategies that are to be implemented should aim at increasing human capital, creating a conducive macroeconomic environment that will attract investors and improvement of terms of trade. Above all, she recommended that government should continue to pursue stable macroeconomic policy.

### 3.4 Conclusion

From the review above, most authors seem to agree that factor input contribution plays a larger role in the output growth an economy, although a few found that TFP growth played a greater role. Notice should be made that mostly in developed and advanced economies, TFP growth plays a larger role than in LCDs where the factor input accumulation, and mostly capital accumulation takes the lead. This paper adopts the two factor inputs, physical capital and labor and will do the analysis for Malawi and see whether the results will correspond with the literature on other countries or not.

# CHAPTER FOUR

# METHODOLOGY

## 4.1 Introduction

The study undertakes a time series analysis of the Malawi economy for the period beginning 1980 to 2012.

## 4.2 Analytical Framework

This paper is in the context of the neoclassical growth model, which is based on the production function. According Sara-i-Martin (2004), the production function parameters are central to the decomposition of output growth into contributions from physical capital, labor, and total factor productivity. The neoclassical model has associated assumptions which make it weak. For example, it makes the assumptions of competitive factor markets, constant returns to scale, and constant price levels.

However, as for market-clearing conditions, Krelle (1988) observes that a constant degree of monopolization of markets shifts both distribution of income and the propensity to save, thus changing numerical results, but has no effect on the main results. As for price levels, the underlying assumption may be understood as being not important enough to matter for long run growth or, alternatively, its fluctuations are being brought under control. As Amin (2002) also notes, both in less developed countries and some developed countries perfect competition conditions do not really

hold. Yet empirically estimated values for the elasticities have not been markedly different from the factor shares of the national product.

The Cobb-Douglas production function in the Solow-Swan Neoclassical Growth Model is given as:

$$Y(t) = F(K(t), L(t), t) = A(t)F(K(t), L(t)) \quad (4.1)$$

Where

$Y_t =$ GDP in real terms

$A_t =$Technological progress as measured by total factor productivity,

$K_t =$ Real capital stock,

$L_t =$ Labor force. Real capital stock is approximated by gross fixed capital formation and labor represented by labor force.

Taking log derivatives of equation 4.1 with respect to time yields

$$\dot{Y}/Y = \frac{\partial F}{K}\frac{K}{F}\dot{K}/K + \frac{\partial F}{L}\frac{L}{F}\dot{L}/L + \dot{A}/A \quad (4.2)$$

Therefore, we end up with the growth equation;

$$G_Y = G_A + å_K G_K + \varepsilon_L G_L \quad (4.3)$$

$G_Y = \dot{Y}/Y =$growth rate of output,

$G_A = \dot{A}/A =$growth rate of technological change,

$G_K = \dot{K}/K =$growth rate of capital,

$G_L = \dot{L}/L =$growth rate of labor,

$\varepsilon_K = \frac{\partial F}{K}\frac{K}{F} =$output elasticity with respect to capital

$\varepsilon_K = \frac{\partial F}{K}\frac{K}{F} =$output elasticity with respect to labor

### 4.3 Estimated Regressions

Motivated by Amin (2002), we will regress the growth rate of output on growth rates on capital and labor.

$$d\ln(GDP_t) = \alpha + \beta_1 d\ln(K_t) + \beta_2 d\ln(L_t) + \mu_t \quad (4.4)$$

Where

$d\ln(GDP)$ = Growth rate of output,

$d\ln(K)$ = Growth rate of capital,

$d\ln(L)$ = Growth rate of labor,

$\alpha$ is constant (which is the growth rate of TFP), $\beta_1$and $\beta_2$ represent output elasticity with respect to capital and labor respectively. $\mu$ is the error term.

`ate economy.

The study also investigates the impact of the factor inputs in the three sectors; agriculture, manufacturing and services, by running a second regression which has growth rate of output as the dependent variable and the growth rates of the sectorial factor inputs as regressors.

$$d\,ln(GDP_t) = \alpha + \beta_1 d\,ln(Kagri_t) + \beta_2 d\,ln(Kman_t) + \beta_3 d\,ln(Kserv_t) +$$
$$\beta_4 d\,ln(Lagri_t) + \beta_5 d\,ln(Lman_t) + \hat{a}_6 d\,ln(Lserv_t) + \mu_t \quad (4.5)$$

$d\,ln(Kagri)$ =Growth rate of capital in the agriculture sector,

$d\,ln(Kman)$ =Growth rate of capital in the manufacturing sector,

$d\,ln(Kserv)$ =Growth rate of capital in the services sector,

$d\,ln(Lagri)$ =Growth rate of labor in the agriculture sector,

$d\,ln(\,pman)$ =Growth rate of labor in the manufacturing sector and

$d\,ln(Lserv)$ =Growth rate of labor in the services sector.

## 4.4 Variable Description

**Growth rate of real GDP**: GDP is measured as it will be used as the dependent variable in the regressions; for the whole economy and the analysis of the sectorial inputs.

**Growth rate of Gross Fixed Capital Formation stock**: This is an independent variable in the first regression involving aggregate economy. Gross Fixed Capital Formation (K) refers to the capital invested on social amenities, infrastructure and fixed assets in an economy. This is directly linked to investment, that is, when investment increases, output will increase and real GDP will also increase. This, therefore, also translates to the growth rates hence it is expected to be positively related with economic growth. The coefficient is expected to be positive and between 0 and 1 (Amin, 2002).

**Growth rate of Labor:** Labor It is one of the independent variables together with the growth rate of capital in the aggregate equation. If the level of employment increases, output level will increase, hence real GDP will increase.

Thus a growth in the labor force will cause growth in output. It is also expected to be positive and between 0 and 1 (Amin, 2002).

## 4.5 Diagnostic Tests

### *4.5.1 Test for Unit Root (Non-stationarity)*

Before undertaking estimation of models (4.4) and (4.5) it is important to carry out stationarity test to see whether the series are stationary or not. A non-stationary time series will have a time-variant mean or time-varying variance or both. If a time series is non-stationary, we can study its behavior only for the time period under consideration. Each set of time series data will, therefore, be for a particular episode.

Therefore, for the purposes of forecasting, such (non-stationary) time series may be of little practical importance. The study will employ Philip-Peron test for stationarity.

### *4.5.2 Test for Heteroskedasticity*

Assuming homoscedastic disturbances when there is heteroscedasticity will still result in consistent estimates of the regression coefficients, but these estimates will not be efficient. Also, the standards errors for these estimates will be biased. Therefore, the study will use the Breusch-Pagan-Godfrey heteroscedasticity test to see whether there is heteroscedasticity or not.

### *4.5.3 Test for Serial Correlation*

There is a need to have no serial correlation before estimating our models. Ignoring serial correlation when it is present will result in consistent but inefficient estimates of the regression coefficients and biased standard errors. Consequently, the study will employ the Breusch-Pagan-Godfrey test for serial correlation.

## 4.6 Sources of Data

The study is a time series analysis, which uses data running from 1981-2012. Data on the factor inputs from the sectors was obtained from National Statistics Office (NSO), while data for output, capital and labor were obtained from the World Bank database.

## 4.7 Conclusion

The chapter has elaborately explained the methodology which the study uses to get the results. The following chapter will give the results from the implementation of the chapter

# CHAPTER FIVE

# PRESENTATION AND DISCUSSION OF RESULTS

## 5.1 Introduction

This chapter will present, discuss and interpret the findings of the study.

## 5.2 Descriptive Statistics

Table 1 below shows descriptive statistics for the variables which have been employed in this study. The variables are all in growth rates.

**Table 1: Descriptive Statistics**

| VARIABLE (Growth Rates) | Mean | Maximum | Minimum | Std. Dev. |
|---|---|---|---|---|
| GDP | 0.05 | 0.17 | -0.10 | 0.05 |
| GROSS FIXED CAPITAL | 0.07 | 0.54 | -0.40 | 0.29 |
| CAPITAL (AGRICULTURE) | 0.31 | 0.96 | -0.43 | 0.51 |
| CAPITAL (MANUFACTURING) | 0.24 | 0.67 | -0.65 | 0.38 |
| CAPITAL (SERVICES) | 0.10 | 0.45 | - 1.41 | 0.78 |
| LABOR (AGGREGATE) | 0.03 | 0.07 | 0.01 | 0.01 |
| LABOR (AGRICULTURE) | 0.00 | 0.40 | -0.48 | 0.17 |
| LABOR (MANUFACTURING) | 0.00 | 0.22 | -0.32 | 0.12 |
| LABOR (SERVICES) | 0.06 | 0.43 | -0.05 | 0.10 |

The growth rate of GDP has a mean of 5% with a maximum of 17% and a minimum of -10%. It deviates from the mean by 5 %. Growth of Gross Fixed Capital averages 7% with a maximum of 54% as well as a minimum of -40%. It deviates from the mean by 29%. Labor growth has a mean of 3%, reaching a maximum of 7% and a minimum of 1%. It has the smallest deviations of 1%. From the variables in the sectors, growth of capital in manufacturing has the highest mean of 24%, while labor in Agriculture and Manufacturing has almost zero per cent mean. Among them capital in Services has the highest standard deviation of 78% with the lowest standard deviation of 1%.

## 5.3 Diagnostic Tests

This section provides the diagnostic tests that were conducted in order to ensure that the employed model is free from econometric errors.

### *5.3.1 Unit Root Test*

The study begins its estimation by testing for the presence/absence of unit roots in all the variables used in the model. We used the Mackinnon critical values in decisions concerning the null hypotheses, whether to or fail to reject them. Whenever the absolute value of the calculated statistics is greater (lesser) than the critical value, we reject (fail to reject) the null hypothesis and conclude that the variable is stationary (non-stationary).

The Phillip Peron approach was used to test for unit roots in the variables. Table 2 shows the test results for stationarity.

**Table 2: Unit Root test in levels**

| Variable (Growth Rates) | PP Statistic | 1% Level | 5% Level | 10% Level | P VALUE |
|---|---|---|---|---|---|
| REAL GDP (Aggregate) | -6.864 | -3.702 | -2.980 | -2.622 | 0.0000 |
| LABOR (Aggregate) | -2.718 | -3.709 | -2.983 | -2.623 | 0.0710 |
| CAPITAL (Aggregate) | -4.307 | -3.709 | -2.983 | -2.623 | 0.0004 |
| Labour (Services) | -6.113 | -3.702 | -2.980 | -2.622 | 0.0000 |
| Labour (Manufacturing) | -6.329 | -3.709 | -2.983 | -2.623 | 0.0000 |
| Labour (Agriculture) | -4.497 | -3.709 | -2.983 | -2.623 | 0.0002 |
| Capital (Services) | -2.760 | -3.702 | -2.980 | -2.622 | 0.0642 |
| Capital (Manufacturing) | -7.579 | -3.709 | -2.983 | -2.623 | 0.0000 |
| Capital (Agriculture) | -5.912 | -3.709 | -2.983 | -2.623 | 0.0000 |

From Table 2 we reject the null hypothesis of non-stationarity and conclude stationarity in levels for all variables. Therefore, all the variables are used in levels.

### *5.3.2 Heteroscedasticity*

A Breusch-Pagan-Godfrey test was carried to check for heteroscedasticity in the regression involving aggregate variables

**Table 3: Breusch-Pagan-Godfrey Heteroscedasticity Test for Aggregates**

| | | | |
|---|---|---|---|
| F-Statistic | 0.2447 | Prob. F(2,30) | 0.3020 |
| Obs*R Squared | 2.5273 | Prob. Chi-square(2) | 0.2826 |
| Scaled Explained SS | 8.2893 | Prob. Chi-square(2) | 0.0158 |

From the table we failed to reject the null hypothesis that there is no heteroscedasticity and conclude homoscedasticity. The test was also carried out for the regression for the sectors and Table 4 presents the results.

**Table 4: Breusch-Pagan-Godfrey Heteroscedasticity Test for Sectors**

| | | | |
|---|---|---|---|
| F-Statistic | 0.0300823 | Prob. F(6,26) | 0.2917 |
| Obs*R Squared | 7.619093 | Prob. Chi-square(6) | 0.2674 |
| Scaled Explained SS | 4.316738 | Prob. Chi-square(6) | 0.6339 |

From Table 4, we fail to reject the null hypothesis that there is no heteroscedasticity and conclude homoscedasticity.

### *5.3.3 Serial Correlation*

A Breusch-Pagan-Godfrey test for serial correlation was also carried out for the aggregates and Table 5 presents the results

**Table 5: Breusch-Godfrey Serial Correlation LM Test for Aggregates**

| | | | |
|---|---|---|---|
| F-statistic | 0.7839 | Prob. F(2,30) | 0.4661 |
| Obs*R-squared | 1.7438 | Prob. Chi-Square(1) | 0.4182 |

From the table we fail to reject the null hypothesis that there is no serial correlation. The test was also carried out for the sectors and the results are presented in Table 6.

**Table 6: Breusch-Godfrey Serial Correlation LM Test for Sectors**

| | | | |
|---|---|---|---|
| F-statistic | 1.1763 | Prob. F(2,30) | 0.8395 |
| Obs*R-squared | 0.4777 | Prob. Chi-Square(1) | 0.7875 |

From the results, we fail to reject the null that there is no serial correlation. We then proceed to estimate our models and the subsequent sections present and discuss the results.

### 5.4 Analysis of the Sources of Growth

The analysis starts with the results obtained from regressing output growth on capital and labor in the aggregate form. The regression results are presented in Table 7 below.

**Table 7: Regression Output for the Aggregates**

| **Variable** | **Coefficient** | **t-Statistic** |
|---|---|---|
| **Constant** | 0.681** | 2.468 |
| **Growth of Capital** | 0.503** | 2.432 |
| **Growth of Labor** | 0.210 | 1.406 |
| R-Squared | 0.79 | |
| Adjusted R-Squared | 0.78 | |
| N | 32 | |
| Prob. (F-Statistic) | 0.0000 | |
| F-Statistic | 47.50 | |

*** denotes significant at 1% level, ** denotes significant at 5% level, * denotes significant at 10% level.

From output in Table 7, we see that the model is significant with an F-statistic of 47.5, which implies significance at all levels. The model is also fairly explaining the variations in the dependent variable with an adjusted R squared of about 78%.

The results indicate that not all the variables are statistically significant although all have economic significance. The growth rate of gross fixed capital is statistically significant at 5% level. According to the results, a 1% increase in the growth of capital will lead to about 0.5% increase in output, holding all things constant.

The growth rate of labor input is statistically insignificant. The constant is statistically significant at 5%. The constant is the growth rate of TFP, and this means that TFP growth is 7%. This is not a high growth rate when compared to developed countries but in comparison with other developing countries, it is a promising position.

To sum it up, Table 7 provides a basis of the sources of growth, where aggregate economic growth is explained by growth in capital and labor. It also gives the growth rate of TFP. In order to make a conclusion as to which source of growth play a major role, we need a breakdown analysis. This will ascertain the sources of growth for the Malawi economy in terms of contribution to the economic growth in relation to each other. The analysis is presented in Table 8

**Table 8: Breakdown of Contribution of sources to Economic Growth**

| **Source of Growth (A)** | **Elasticity (B)** | **Growth Rate (C)** | **Contribution to Output Growth (D)=(B)*(C)** | **Contribution to Output Growth (%)(E)** |
|---|---|---|---|---|
| **Growth of Capital** | 0.503 | 0.0716 | 0.036 | 78% |
| **Growth of Labor** | 0.210 | 0.0290 | 0.006 | 13% |
| **TFP Growth** | | | 0.004 = (0.046-0.036-0.006) | 9% |
| **Total Output** | | 0.046 | | |

Column D is found by multiplying elasticity in column B and the growth rate in column C, where the elasticities are the weights.

Column E is then found by getting proportions of the contributions to output growth from a total of the sum of column D. Column E gives the contributions in column D in percentages. The analysis reveals that the growth in factor inputs plays a greater role in explaining economic growth other than TFP represented by about 91% and 9% respectively. Capital accumulation has a larger contribution of about 78% to output growth followed by growth of labor, which contributes about 13%.

This finding answers research question number one corresponding to the first specific objective which assesses the contribution of the growth of TFP and factor inputs of the aggregate economy on output growth. It is also similar to findings for studies in other developing countries in Africa by Amin (2002), Baier *et al*. (2002), Onjala (2002), Limam and Miller (2004), Tahari *et al*. (2004), Bigsten & Durevall (2006) and Kalio *et al* (2012). Apart from total factor productivity contributing less to economic growth, its own growth is little, which would indicate why more countries in Africa are poor because total factor productivity is responsible for long term economic growth.

### 5.5 Output Elasticity with Respect to Factor Inputs from Main Sectors

Having estimated and analyzed the TFP as well as the factor inputs contribution at the aggregate economy level, we now go further to do the analysis at the sector level. The analysis also used time series data from 1980 to 2012.

### *5.5.1 Regression Output for Sectors*

This section discusses the sources of growth in output with regards to the sectorial inputs. This analysis investigates elasticity of output with respect to the sectorial inputs (capital and labor) with reference to specific objective number two. Table 9 summarizes the results followed by interpretation and discussion.

**Table 9: Regression Output for the Sectors**

| Variable | Coefficient | T-Statistic |
|---|---|---|
| **Growth Labor (services)** | -0.0555 | -0.778 |
| **Growth of Labor (man.)** | 0.168*** | 2.971 |
| **Growth of Labor (agri.)** | -0.591*** | -3.707 |
| **Growth of Capital (serv)** | 0.404 | 1.676 |
| **Growth of Capital (man.)** | 0.370*** | 3.150 |
| **Growth of Capital (agri.)** | 0.523 | 1.643 |
| **Constant** | -2.144 | -2.0152 |
| R-Squared | 0.59 | |
| Adjusted R-Squared | 0.49 | |
| N | 32 | |
| F-Statistic | 30.9 | |
| Prob. (F-Statistic) | 0.0000 | |

*** denotes significant at 1% level, ** denotes significant at 5% level, * denotes significant at 10% level.

For the services sector, the results indicate that both labor and capital in this sector are statistically insignificant.

We then discuss the findings from the manufacturing sector. The growth of labor has a positive coefficient 0.167554, which is statistically significant at 1% level of significance. This means that a one percentage increase in the growth rate of labor in the manufacturing sector will increase output growth by 0.17%, holding all things constant. Growth of capital has a coefficient of 0.370470 and is statistically significant at 1% level of significance. Therefore, a one percentage increase in the growth of capital in the manufacturing sector will increase output growth by 0.37%, holding all things constant.

Lastly, we analyze the inputs in the agriculture sector. The growth of labor has a negative coefficient -0.591133, which shows that growth of labor has a negative impact on economic growth. It is statistically significant at 1%. This means that a one percent increase in the growth of labor in the manufacturing sector will decrease output growth by 0.59%. This could be so because agriculture has a lot of labor, which is also unskilled and therefore may not be productive. The growth of capital is statistically insignificant.

From the results, we see that all inputs have a positive impact on economic growth except labor in the agriculture sector and the services sector (not significant). However, only a few inputs are statistically significant; labor in the agriculture sector, and capital and labor in the manufacturing sector, while the others are not. On a general note, we can conclude that to increase economic growth we need to increase

the growth of inputs in all the sectors, except for labor in the agriculture sector. Specific emphasis should, however, be in the manufacturing sector.

This gives implication of the output elasticity of with respect to growth of factor inputs from the main sectors which is part of objective two.

### 5.6 Conclusion

This chapter has presented and interpreted the results from the estimation of the models discussed in chapter 4. These results were found after conducting several tests as is required for time series studies.

# CHAPTER SIX

# SUMMARY, CONCLUSION AND IMPLICATIONS

## 6.1 Introduction

This chapter presents the study summary, conclusions and policy implications. The summary under section 6.1 examines the objectives outlined in the study in reference of the research findings. Section 6.2 discusses the policy implications by highlighting the possible intervention measures that can be drawn from this study as a way of providing literature and advice to policy makers on the effectiveness of efforts to improve the country's economic growth. The final part of the chapter, section 6.3 provides the limitations that were encountered during the course of this research and areas of further study.

## 6.2 Summary

The study set out to investigate the sources of economic growth in Malawi by use of two regressions, where one is aggregate analysis and the other is sectorial analysis. All data employed in the study was from 1980 to 2012. Firstly, the analysis was for the aggregate economy to find out the contribution of growth rates of capital and labor on output growth as well as the growth and role of Total Factor Productivity. Then the analysis turned to the sectorial factor inputs to ascertain output elasticity with respect to the factor inputs in the three main sectors of the economy; Agriculture, Manufacturing and Services.

For the aggregates the study found that growth of capital is statistically significant and has a positive coefficient of 0.503 which shows that a one percent increase in the growth of capital will lead to a 0.51% in output growth. Growth of labor was found not statistically significant. The TFP growth was estimated to be 7%. Capital accumulation accounts for 78% of output growth while growth of labor contributes about 13% to output growth. In conclusion, growth of factor inputs, especially capital, play a greater role in explaining output growth than TFP, which accounts for only 9% of output growth. However, there are future prospects of TFP because of the positive growth which has a potential of translating into higher contribution to output growth.

For the sectorial analysis, we found all the coefficients positive except for labor in the agriculture sector. However, only the inputs in the manufacturing sector and the labor in the agriculture sector were found statistically significant. A percentage increase in the growth rate of labor in the manufacturing sector will lead to 0.17% increase in output growth, holding all things constant. A percentage increase in the growth rate of capital in the manufacturing sector will lead to 0.37% in output growth, holding all things constant. At the same time a percentage change in the growth rate of labor in the agriculture sector will lead to a 0.59 decrease in the growth of output. For the other sectors, all the inputs are positive although not statistically significant, which means a percentage increase in the growth rate of each input will lead to a positive increase in output growth, holding all things constant.

### 6.3 Policy Implications

Total factor productivity growth has been more important in developed economies than in developing economies, as studies have shown. Our study shows more the importance of factor input (especially of capital) than of total factor productivity. Although the importance of capital is highlighted, the role of labor is equally important. Of similar importance is the knowledge that the total factor productivity is yet to play a greater role in output growth. This is very important as the growth rate of TFP is positive while it can be negative in some countries. Thus one would expect TFP to become very important in the economy. Because the technology level is low but growing, more effort must be put into developing this component of growth, especially through research and development.

The high elasticity of output growth respect to capital shows that an increase in the growth of capital will lead to more output growth than an increase in labor. Therefore the country must embark on policies that will ensure a high growth in capital. This may include promoting exports which may increase the flow of foreign exchange into the country which then might be used to grow the capital structure of the economy.

Employment policy is another matter to be considered because it concerns both the supply side and the demand side of an economy. Although there is positive contribution of labor growth to economic growth, the relationship is not statistically significant. The exponentially growing population growth is leading to a rapidly growing labor force, and thus unemployment and under-employment may occur. Consequently, income per capita will fall as labor force grows explosively. Since Malawi is labor-rich and capital scarce, its comparative advantage resides in

(unskilled) labor intensive activities. Therefore, we need to exploit comparative advantage in order for the low-skilled workers to realize rising real wage rate from a trade expansion in goods and service which intensively use unskilled labor.

### 6.4 Limitations and Suggestions for Future Research

The data on factor inputs for the sectors was very scarce and the samples were not very large but this was the closest to best data we could use. As such the results need to be interpreted with caution. Lastly, the usual cautionary note about the interpretations of regression results generally found in the literature applies equally here. These regressions indicate only correlations and not causation.

For future research, others may include human capital as one of the inputs in order to have a better understanding of these sources of economic growth. Others may even go on and do the analysis using nonparametric approach which may give better results. This study did not pursue this one because the time frame could not accommodate the complexity involved with the associated methodologies.

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# Appendix

## Data Variables used in the study

| YEAR | GDP(Billions) | Gross Fixed Capital | LABOR (000') | L.Agri (000') | L.Man (000') | L.Serv (000') | K.Agri | K.Man | K.Serv |
|---|---|---|---|---|---|---|---|---|---|
| 1980 | 375.804 | 2.49E+08 | 2886.042 | 80300 | 37200 | 3700 | 2500000 | 8200000 | 13600000 |
| 1981 | 356.093 | 1.95E+08 | 2966.122 | 97800 | 35800 | 3900 | 7900000 | 19300000 | 13400000 |
| 1982 | 365.053 | 2.67E+08 | 3031.9 | 89600 | 35600 | 4100 | 8000000 | 17100000 | 14800000 |
| 1983 | 378.537 | 3.28E+08 | 3105.163 | 86000 | 35700 | 4200 | 7400000 | 34400000 | 13000000 |
| 1984 | 398.875 | 2.2E+08 | 3125.525 | 69900 | 31000 | 4600 | 7700000 | 18000000 | 12600000 |
| 1985 | 417.107 | 3.62E+08 | 3165.583 | 74200 | 33000 | 4800 | 14200000 | 39600000 | 11400000 |
| 1986 | 416.211 | 2.75E+08 | 3231.608 | 76700 | 38200 | 5100 | 14300000 | 39700000 | 18500000 |
| 1987 | 422.976 | 4.51E+08 | 3314.148 | 78300 | 33300 | 5400 | 15600000 | 43100000 | 24100000 |
| 1988 | 436.415 | 7.57E+08 | 3540.06 | 85300 | 32000 | 5600 | 34200000 | 52900000 | 19100000 |
| 1989 | 442.283 | 1.08E+09 | 3748.768 | 90200 | 33100 | 6300 | 33700000 | 69600000 | 10100000 |
| 1990 | 467.459 | 1.18E+09 | 3945.333 | 89200 | 38700 | 6200 | 39600000 | 89300000 | 48900000 |
| 1991 | 508.269 | 1.25E+09 | 4033.88 | 90100 | 36700 | 6000 | 41300000 | 150100000 | 13300000 |
| 1992 | 470.998 | 1.29E+09 | 4085.337 | 92100 | 38600 | 6200 | 42500000 | 197100000 | 14900000 |
| 1993 | 516.647 | 1.38E+09 | 4118.929 | 94700 | 38400 | 7200 | 46800000 | 196200000 | 29400000 |
| 1994 | 463.364 | 3E+09 | 4159.544 | 95000 | 48000 | 8589 | 73000000 | 181700000 | 28000000 |
| 1995 | 527.445 | 3.71E+09 | 4223.317 | 59000 | 52000 | 8967 | 1.91E+08 | 583000000 | 1E+08 |
| 1996 | 580.078 | 4.3E+09 | 4282.136 | 68000 | 57000 | 9211 | 1.53E+08 | 741000000 | 1.3E+08 |
| 1997 | 618.289 | 5.08E+09 | 4372.556 | 74000 | 54000 | 9238 | 1.88E+08 | 1.118E+09 | 1.56E+08 |
| 1998 | 624.849 | 7.32E+09 | 4484.1 | 75000 | 57000 | 8913 | 2.27E+08 | 1.179E+09 | 2.43E+08 |
| 1999 | 646.976 | 1.15E+10 | 4649.03 | 75600 | 62000 | 9200 | 4.65E+08 | 1.775E+09 | 59300000 |
| 2000 | 651.993 | 1.41E+10 | 4816.421 | 78800 | 59000 | 9300 | 3.98E+08 | 1.995E+09 | 4.19E+08 |
| 2001 | 625.42 | 1.85E+10 | 4980.217 | 78800 | 42700 | 9300 | 2.58E+08 | 1.636E+09 | 1.11E+08 |
| 2002 | 636.43 | 3.3E+10 | 5149.749 | 63300 | 41000 | 10100 | 3.59E+08 | 1.136E+09 | 1.43E+08 |
| 2003 | 672.742 | 4.04E+10 | 5327.607 | 52400 | 42200 | 15500 | 5.32E+08 | 1.543E+09 | 1.69E+08 |
| 2004 | 709.208 | 5.21E+10 | 5516.503 | 55000 | 42750 | 14800 | 5.73E+08 | 2.912E+09 | 1.86E+08 |
| 2005 | 732.39 | 7.4E+10 | 5716.899 | 36660 | 43420 | 21690 | 5.53E+08 | 5.859E+09 | 4.58E+08 |
| 2006 | 766.813 | 1.09E+11 | 5914.974 | 42620 | 42700 | 21260 | 7.01E+08 | 8.362E+09 | 3.92E+08 |
| 2007 | 840.427 | 1.35E+11 | 6053.191 | 63500 | 52000 | 22300 | 9.74E+08 | 6.718E+09 | 1.61E+08 |
| 2008 | 904.633 | 1.54E+11 | 6311.109 | 85500 | 39000 | 23900 | 1.74E+09 | 9.877E+09 | 1.98E+08 |
| 2009 | 979.972 | 1.82E+11 | 6504.714 | 94200 | 42000 | 25320 | 1.67E+09 | 9.614E+09 | 7.94E+08 |
| 2010 | 1,047.34 | 2.11E+11 | 6709.559 | 95800 | 43100 | 26500 | 2.9E+09 | 1.017E+10 | 3.61E+08 |
| 2011 | 1,098.17 | 1.35E+11 | 6914.49 | 79600 | 40400 | 27310 | 4.7E+09 | 1.346E+10 | 3.76E+08 |
| 2012 | 1,118.88 | 1.79E+11 | 7133.748 | 81300 | 40400 | 28200 | 5E+10 | 1.765E+10 | 3.91E+08 |