EFFECT OF TOTAL FACTOR PRODUCTIVITY ON ECONOMIC GROWTH IN KENYA: AN EMPIRICAL ANALYSIS 1970-2015

BY

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MASTER OF SCIENCE (FINANCE AND ECONOMICS)

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DECLARATION

I declare that this Dissertation is my original work and has not been previously published or submitted for the award of degree. I also declare that this paper contains no material written or published by other people except where due reference is made and author duly acknowledged.

Student name: ____ Reg No. ________

Sign: ______________________________ Date: __________

I do hereby confirm that I have examined the Master's Dissertation of

Beatrice Wekhe Misorimaligayo

And I have certified that all revisions that the dissertation panel and examiners recommended have been adequately addressed.

Sign: ____ Date: _________________

Dr. Christine Nanjala Simiyu

Dissertation Supervisor

ABSTRACT

In view of the challenges stated in the Economic Recovery Strategy Paper for Wealth and Employment Creation (ERSPWEC) 2003-2007, the empirical findings of Kalio, Mutenyo and Owuor (2012) and on the basis of the point of motivation by Parente and Prescott (1996), the purpose of this study was to build a model to explain the effect of Total Factor Productivity (TFP) on economic growth in Kenya using time series data for the period 1970-2015. The TFP components of Foreign Direct Investment (FDI), Foreign Aid (FA) and Financial Development (FD) are used to explain the effect on economic growth after accounting for labour and capital productivity. To achieve the objectives an ARDL bounds test of co-integration is employed and a preliminary unit root test, co-integration test, Error Correction Model (ECM) and diagnostic tests are carried out. The ECM findings reveal that the TFP Components of Foreign Aid and Financial Development have insignificant effect on economic growth in the long run and therefore the null hypotheses are accepted. However, Foreign Direct Investment has a significant effect on Economic Growth and the null hypothesis is rejected.Multidirectional causality is determined due to the Error Correction Terms (ECTs) having statistically significant coefficients for Economic Growth, Foreign Direct Investment and Foreign Aid, while Financial Development is insignificant and there is unidirectional causality. The model passed the diagnostic tests except for presence of omitted variable bias in Foreign Aid and Financial Development. A robustness check is then carried out to determine the consistency of the ARDL findings using the Johansen test of co-integration, vector error correction model (VECM) and post estimation tests. The findings reveal consistency in the ECTs with (-.91) for ARDL and (-.87) for VECM with economic growth as the dependent variable for co- integrating equation one. The post estimation tests show non-normality of data for Economic Growth and the Orthogonalized impulse response functions show that Economic Growth and Foreign Direct Investment have significant effect of transitory shocks on each other from period 0 to 3 beyond which at period 4 the shocks become permanent and insignificant. The other variables show effect of permanent shocks from period 0 to 13 on themselves and on each other. In conclusion, the permanent shocks for Foreign Aid are due to regulatory and structural impediments that hinder the growth of TFP in the economy. Financial Development is affected by fragmented goods and capital markets and weak financial systems which prevent the leveraging of cross border investment opportunities. Foreign Direct Investment is affected by high transaction costs and weak absorptive capacity in the business environment. To realise significant effect of the TFP components on Economic Growth, recommendations for policy action are to improve policies for the adoption of technology, implement structural and economic reforms, lower the transaction costs to businesses, improve governance and strengthen financial systems to world class levels in order to raise the levels of savings and investments in the economy.

Keywords: Total Factor Productivity (TFP), Foreign Direct Investment (FDI), Foreign Aid (FA), Financial Development (FD), Economic Growth (EG), Autoregressive Distributed Lag (ARDL) Model, Kenya.

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I acknowledge the relentless support and encouragement of my loving husband Jerome, and our sons Ray and Dylan.

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DEDICATION

I would like to dedicate this dissertation to my loving husband and best friend Jerome and our sons Ray and Dylan.

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ACRONYMS AND ABBREVIATIONS

AIC	Akaike Information Criteria
ASEAN	Association of South East Asian Nations
ARDL	Auto Regressive Distributed Lag
BG LM	Breusch-Godfrey Langrange Multiplier
BP	Breusch Pagan
EC	Error Correction
ECM	Error Correction Model
FA	Foreign Aid
FD	Financial Development
FDI	Foreign Direct Investment
HIBC	Hannan Quinn Information Criteria
KNBS	Kenya National Bureau of Statistics
LM	Langrange Multiplier
LR	Long Run
MFP	Multi Factor Productivity
MVIF	Mean Variance Inflation Factor
ODA	Overseas Development Assistance
OECD	Organization for Economic Cooperation and Development
SBIC	Schwarz Bayesian Information Criteria
SR	Short Run
SWILK	Shapiro wilk
TFP	Total Factor productivity
TG	Technical Grants
VECM	Vector Error Correction Model

CHAPTER ONE: INTRODUCTION

1.0 Background of study

The classic works in the academic literature pioneered by Solow (1957) defines Total Factor Productivity (TFP) or Multi factor productivity (MFP) or Solow residual as the rate of growth of real output not accounted for by the growth of factor inputs. Similarly, Comin (2006) describes TFP as the portion of output not explained by the amount of inputs used in production. These definitions describe the importance of TFP for growth, economic fluctuations and development as well as likely future research (Comin, 2006).

The Solow Residual model is a measure of TFP which is exogenously determined and the various factors comprising TFP are measured together as a left-over hence the name residual. This is the source of the famous epithet “A measure of our ignorance” (Abramovitz, 1956). Assuming a neoclassical production function Solow finds that capital accumulation explains only between one-eighth and one-fourth of income growth while the rest is explained by TFP growth. At some marginal point it no longer pays off to increase the classical inputs of labour and capital, and in the long run output growth depends entirely on knowledge creation or technological progress (Issaksson, 2007). Higher TFP indicates better level of technology, higher per worker capital and larger returns. It enhances an economy’s ability to produce more output from a given stock of inputs. Solow associated TFP with a shift in technological progress and it is a crucial measure of efficiency.

Romer (1990) and Lucas (1988) depart from neoclassical growth theory and provide economic meaning to the residual by focusing on externalities, including spill-overs, economies of scale, and various complementarities by considering effects of variables such as trade, human capital and endogenous technology on output growth and the different mechanisms of technology diffusion. The endogenous or exogenous technical change refers to its source. The exogenous technological change is generated outside the economic process while the source of endogenous technological change is the economic process itself, in response to profit or loss.

Adapting the definition of Solow (1957) the study uses the Solow residual model and growth accounting approach to give a theoretical framework to the residual. Growth accounting approach gives more room for decomposition of factor inputs and technological change to economic growth (Abramovitz, 1956). Issakson (2007) in his strand of literature states that TFP has been constructed to capture all effects that raise the productivity of physical factors including human capital, vintage capital, development expenditures and economies of scale, government policies, international trade policies and remittances.TFP has a broad range of influences—a variety of technological, economic and cultural factors such as technological innovations, trade unions restrictions, environmental regulations and safety measures that limit the use of production factors, frictions in financial markets, physical and human capital externalities, public expenditures or any other element that affect the aggregate productivity of the economy.

Jorgensen and Griliches (1967) analysed the determinants of TFP with emphasis on embodied and disembodied technological progress. Several determinants appear to be most important and have impacted on TFP growth such as foreign direct investment, trade, Financial Development, stability of institutions, foreign aid, human capital (health, training & education), infrastructure, and geographical predicaments. Long term determinants involve integration from trade, institutions and geographical predicaments, while medium term determinants increase capital formation and resource allocation-both factors that positively influence TFP (Issakson, 2007)

Foreign aid (FA) consists of grants or loans that one government or multilateral organization gives to a developing country to promote economic development and welfare (IMF, 2005). Chenery and Carter (1973) and others looked at the positive effect of FA on economic growth using the two-gap model developed by Chenery and Strout (1966) while examining and observing the role of FA on different sectors of the economy and its influence on economic growth, FA represented by overseas development assistance (ODA) and technical grants (TG) induces TFP growth, if it finances investment (Nachega & Fontaine, 2006). Furthermore, aid induced investment limits the strains on domestic tax base, preventing costly distortions in financing infrastructure projects (roads and irrigation) and investments in human capital in terms of education and health and training (Issaksson, 2007).

Investment in human capital enhances the absorptive capacity of technology which means a wide range of capacities from the basic skills in reading, writing and mathematics to scientific and other advanced capabilities through domestic and foreign research and development in turn, facilitates technology transfer (Oduor & Khainga, 2010) or trade reforms to increase access to foreign capital and intermediate goods..

Financial Development (FD) occurs when financial instruments, markets and intermediaries ameliorate-though not necessarily eliminate the effects of information, enforcement and transaction costs and therefore do a correspondingly better job at providing financial functions.McKinnon and Shaw (1973) explain the relationship between FD and economic growth through a model based on “outside” money and analyse the impact of real interest rate on savings deposits, investment and growth. Goldsmith (1969) and others explored the relationship between long run growth and FD.

FD represented by broad money (M3) acts as a channel for efficient allocation of resources to the most productive sectors. Allen and Ndikumana (2000) used the ratio M3 to GDP as an index of FD. A good financial system is able to allocate savings to investments with the highest returns, and high quality investments imply a higher probability for TFP growth (Nachega & Fontaine, 2006). FD affects convergence mainly through TFP growth rather than capital accumulation (Issaksson, 2007).

Trade is a carrier of technological knowledge and represents openness of the economy but that the degree of its significance depends on the absorptive capacity of the recipient country in terms of necessary level of human capital (Issaksson, 2007). Posner (1961) analysed the effect of technology on trade and he regards the technological changes as a continuous process which influences the pattern of international trade and consequently economic growth. Hsiao (1987) and others examined the relationship between exports-imports and economic growth. International trade liberalization through imports introduces foreign (relatively advanced) technology into domestic production, in particular, certain kinds of imports, namely machinery and equipment relating to foreign research and development are expected to generate more technology transfer than others (Issaksson, 2007), which in turn has a positive effect on TFP (Oduor & Khainga, 2010). Trade brings additional competition and variety to domestic markets, and exports enlarge markets for domestic production thus benefitting businesses and allowing for technology transfer which are all powerful forces for increased TFP (Issaksson, 2007).

Stability of institutions determines the level and growth of TFP (Kalio, Mutenyo & Owuor, 2012). Legislation that is “too’’ effective, corruptive or has vested interests in delaying and even stopping the adoption of new technology and using its influence, may convince legislators to enact a law against such adoption and, the more effective the legislation is, the slower the adoption of new technology (Issaksson, 2007)

Foreign Direct Investment (FDI) is cross border investment in terms of net inflows to acquire a lasting interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor (World Bank, 2013). Balasubramanyan et al (1996) and others examined the effect of FDI on economic growth. Dunning (1980) uses the O-L-I (ownership, localisation and Internationalization) advantages to explain the positive effect of FDI on economic growth. FDI results in technology spill-over to the domestic economy for instance, linkages with local suppliers and clients (so called backward and forward linkages) learning from nearby foreign firms and employee training programmes enables human capital formation and help transfer of managerial skills and technology.

However, negative externalities are also possible as barriers to accessing technology and competition may be raised. FDI could be a cost rather than a benefit (Kalio, Mutenyo & Owuor, 2012). It may replace domestic production instead of increasing competition and this can be associated with weak absorptive capacity. In many cases, FDI is also encouraged by governments and often also by international organizations by offering grace periods for taxation purposes and different business support schemes.

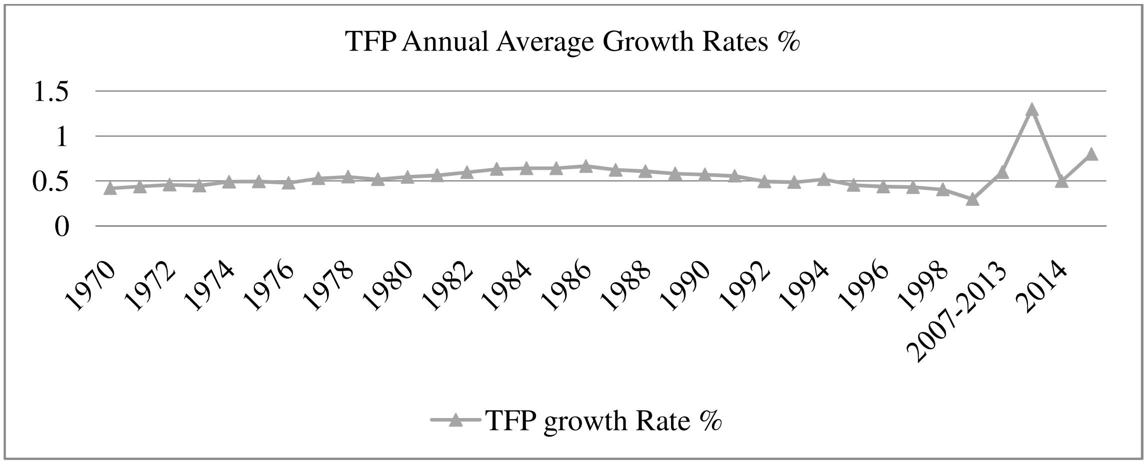
Policies to encourage these determinants will only work in an environment with good institutional quality, degree of openness of the economy to integration and flexibility of the economy (Issaksson, 2007). It is against this background of literature from Issaksson (2007) that the current study endeavours to use the components of TFP (FDI, FA and FD), which are the avenues through which TFP policy can betransferred, absorbed and also improved to affect economic growth after accounting for labour and capital productivity. It is also in this context that the study gives a brief overview of the trend of TFP, its components and Economic Growth.

1.1 Total Factor Productivity and Economic Growth in Kenya

1.1.1 Total Factor Productivity in Kenya

Figure 1.1, shows the trend of TFP annual average growth rates, which shows a rise in 2013 to decline in 2014 but starts rising again in 2015.TFP was highest in 2013 while lowest in 1999. One of the challenges in economic growth in Kenya is promoting efficiency by reversing the declining trend and raising TFP to a minimum growth level of 2.5% needed to achieve the vision 2030 targets (See Republic of Kenya, 2003).

Figure 1.1: Trend of TFP Annual Average Growth Rates: 1970-2015



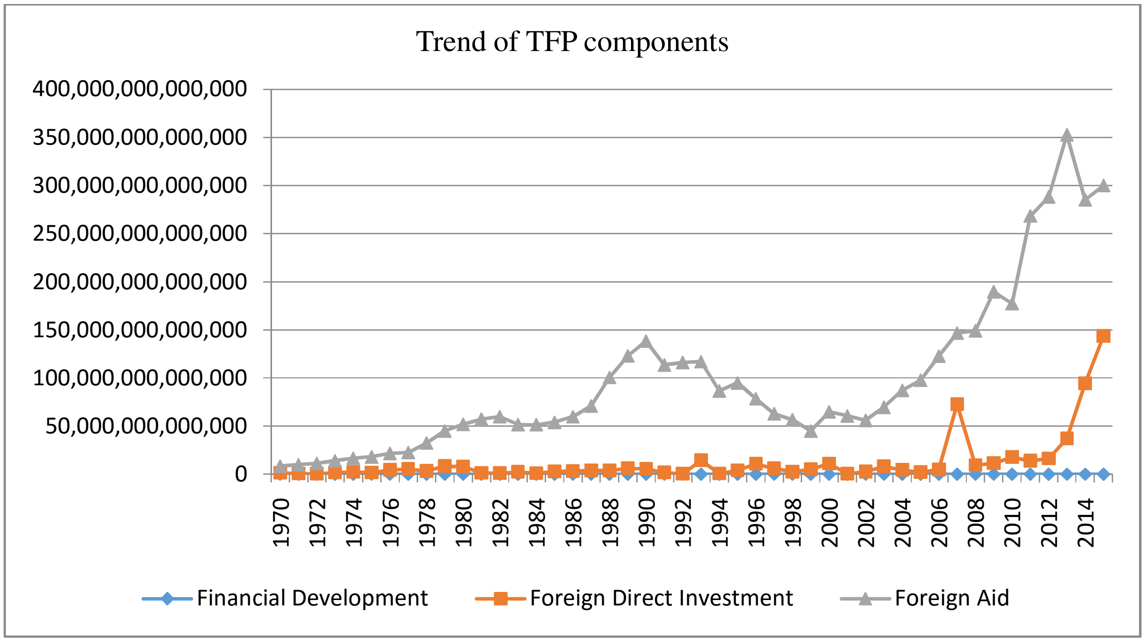
Source of data: Penn world tables 9 data. TFP growth rates at current nominal purchasing power parity for Kenya.

The declining trends in TFP are evident in the study of Kalio, Mutenyo and Owuor (2012) using growth accounting analysis finds accumulation of classical inputs, capital and labour to be more important than TFP growth with contributions of 71.4%, 25% and 3.6% respectively.In view of this, TFP growth has not been a significant factor in the observed aggregate performance in Kenya. It is therefore important to understand the dynamics of the relationship between the TFP components and economic Growth in Kenya and the factors contributing to the declining levels of TFP growth.

1.1.2 Total Factor Productivity components and Economic growth in Kenya

Figure 1.2 shows the trend of TFP components in the Kenyan economy for the period 1970-2015. Oduor and Khainga (2010) using growth accounting analysis and VAR model showed the relationship between TFP determinants and economic policy and reveal that trade policy and FDI policy significantly contributes to TFP growth in Kenya.FDI inflows have significantly increased since 2010 due to the demand stimulating effects of lower oil prices and accommodating monetary policy, and continued investmentliberalization and promotion measures(See World Bank, 2016).

Figure 1.2 Trend of TFP components in the Kenyan Economy: 1970-2015



Source of data: Foreign Direct Investment, Foreign Aid: World Bank Database. Financial Development: KNBS Economic Surveys website.

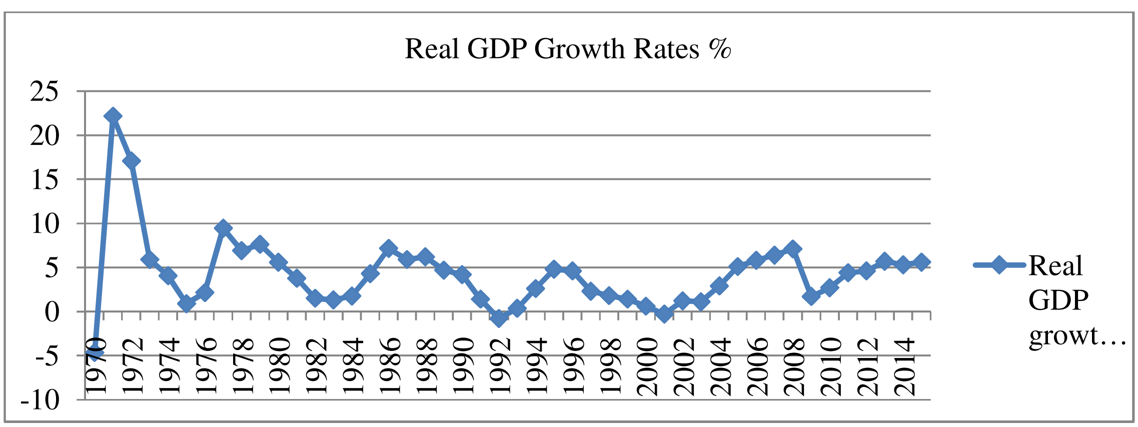
FD shows low levels due to goods and financial markets which are fragmented and this prevents the leveraging of cross-border investment opportunities (African Economic Outlook, 2016). FA shows very high levels but despite the high levels there are still regulatory and structural impediments that hinder the growth of TFP in the economy (African Economic Outlook, 2016).Nachega and Fontaine (2006) using growth accounting analysis and VAR model found that physical capital formation, foreign aid, openness to trade and Financial Development have positive and significant effects on economic growth.

1.1.3 Overview of Economic growth in Kenya

A statistical rebasing shifted the base year to 2009 and has reclassified Kenya as a low middle income country, East Africa's largest economy and Africa's ninth biggest economy (World Bank, 2015). The vision 2030 economic pillar aims at achieving a growth rate of 10 percent level and sustaining it for a long time. The vision 2030 blue print builds upon the successes of the Economic Recovery Strategy Paper for Wealth and Employment Creation (ERSPWEC) 2003-2007.The ERS was anchored on three pillars, namely: restoration of economic growth withinthe context of a stable macroeconomic environment; enhanced equity and poverty reduction; and improvement of governance to enhance efficiency and effectiveness in the economy. (See Republic of Kenya, 2008)

Figure 1.3 shows the trend of Real GDP growth rates from the period 1970-2015. The rise in GDP can be attributed to high commodity prices, high external financial flowsthrough stimulated foreign direct investment inflows and improved policies and institutions. The fall in GDP can be attributed to effects of poor infrastructure, low domestic credit, low output and low prices of major agricultural exports.(See Republic of Kenya, 2003)

Figure 1.3: Trend of Real GDP Growth Rates: 1970-2015



Source: Real GDP growth rates data from World Bank Database

1.2 Problem Statement

The empirical importance of TFP has motivated economists to develop models of TFP. Easterly and Levine (2001) posit on the importance of TFP as a long run determinant of economic growth, suggesting that growth economists should focus on TFP and its determinants rather than factor accumulation.Parente andPrescott (1996) urge that it would be very useful in designing models and policies to determine empirically the relative importance of TFP in economic growth.

The Economic Recovery and Strategy Paper for Wealth and Employment Creation (ERSPWEC) 2003-2007 states one of the challenges of economic growth in Kenya is promoting efficiency by reversing the declining trend of TFP and raising it to a minimum growth level of 2.5% needed to achieve the vision 2030 targets through adoption of new technology, improvement in governance and reducing transaction costs to businesses (Republic of Kenya, 2003).There are major challenges in the generation, acquisition and absorption of technological capacity and TFP has suffered on this account. This is accounted for by the limited use of foreign technology licences (Parente & Prescott, 1996).

Also to achieve the growth target of 10 percent according to vision 2030 will require continued implementation of prudent fiscal, monetary and exchange rate policies, enhanced effort to raise the level of investments and savings, and accelerating economic and structural reforms under the economic recovery strategy 2003-2007 in order to increase the efficiency of both physical and human capital and raise TFP.(See Republic of Kenya, 2003)

On the basis of the point of motivation by Parente and Prescott (1996), empirical findings of Kalio, Mutenyo and Owuor (2012) and in view of the challenges stated in the ERSPWEC 2003-2007, the purpose of this study was to build a model to explain the effect of TFP on economic growth in Kenyathereby assessing the empirical importance of TFP as a source of economic growth in Kenya.

The contribution of the study is in two significant ways (i) by modelling the effect of TFP on economic growth, it forms part of the growing literature on TFP in Kenya, and (ii) argues for a refocus of policy to reverse the declining trend of TFP in order to drive competitiveness of the economy and boost economic growth.

1.3 Objectives of the study

1.3.1 General Objective

The main objective of the study was to build a model to explain the effect of Total Factor Productivity on economic growth in Kenya.

1.3.2 Specific objectives

Specific objectives include;

i) To determine the effect of Foreign Direct Investment on economic growth in Kenya.

ii) To assess the effect of Foreign Aid on economic growth in Kenya.

iii) To evaluate the effect of Financial Development on economic growth in Kenya.

1.4 Research hypotheses

In view of the above stated objectives the study sought to answer the following hypotheses;

1.4.1 Hypothesis 1

Ho_1: *Foreign Direct Investment has no effect on economic growth in Kenya.*

1.4.2 Hypothesis 2

Ho_2: *Foreign Aid has no effect on economic growth in Kenya.*

1.4.3 Hypothesis 3

Ho_3:Financial Developmenthas no effect on economic growth in Kenya.

1.5 Scope and limitations of the study

The study sought to build a model to explain the effect of TFP on economic growth in Kenya for the period 1970-2015. The scope of the study is the TFP components of Foreign Direct Investment, Foreign Aid, and Financial Development in Kenya. The major limitation is the availability of data on TFP especially in the national data sources.

1.6 Significance of the study

1.6.1 To other scholars

The scholars are those who are interested in the same area of research. Thus the findings provide a background of literature to base their research on.

1.6.2 To Policymakers

Policymakers include the government and economists involved in policy making. The findings provide a base on which various policies are to be taken into consideration to increase TFP growth.

1.7 Assumptions used in the study

The study is based on the assumptions of the Solow Residual Model (1957).

1.7.1 Assumption 1

There is a stable functional relation between inputs and output at the economy-wide level of aggregation;

1.7.2 Assumption 2

That inputs are paid the value of their marginal product;

1.7.3 Assumption 3

That the function exhibits constant returns to scale, that is output increases by that same proportional change as all inputs change; and

1.7.4 Assumption 4

That technical change has the Hicks neutral form, that is the ratio of marginal products remain the same for a given capital labour ration (Constant (K/L)). Y = AF (K, L).

CHAPTER TWO: LITERATURE REVIEW

2.1 Theoretical Literature

2.1.1 Eclectic Paradigm Theory

The eclectic paradigm theory developed by Professor Dunning (1980, 1988, 1993a, 1993b) is a mix of three different theories of direct foreign investment (O-L-I) advantages. OLI model has been the most influential framework for empirical investigation of determinants of FDI for decades (Narula 2006;Cleeve 2007;Stoian & Filippaios 2008; Buckley & Harshai 2008;Stefanovic 2008;Piteil & Teece 2010).

The importance of the theory to the study is to explain the positive effect ofthe O-L-I advantages of FDI on economic growth in Kenya. "O" from ownership advantages (according to industrial organization theories of Hymer 1960; Kindleberge 1969; Caves 1974) refer to unique competitive advantages and intangible assets in the form of intellectual properties, technology, copyrights, brand name, and patents. They are usually transferrable exclusive intangible assets that a firm owns that can be used to gain competitive advantage in a foreign market (Dunning 1980, 1988, 1993a, 1993b).

There are three types of specific advantages; first, monopoly advantages in the form of privileged access to markets through ownership of natural resources, patents, and trade marks. Two, technology knowledge broadly defined so as to contain all forms of innovation activities. Three, economies of large scale such as economies of learning, economies of scope, and greater access to financial capital.

"L" from location advantages according to conventional trade theory (Dunning 1988) refers to the "push" or "pull" factors influencing where to produce and are the key factors determining who will become the host countries for the activities of the transnational corporations (Dunning, 1993a, 1993b, 2000).

First, the economic benefits consist of quantitative and qualitative factors of production; costs of transport, telecommunications, and market size. Second, political advantages in the form of common and specific government policies that affect FDI inflows. Third, social advantages that include distance between the home and host countries cultural diversity, and attitude toward strangers.

“I” internationalization advantages (in accordance with the internationalization theories of Buckley & Carson 1976;Hennart 1991; Dunning & Rugman 1985;Teece 1981; Buckley 1989) refers to the perceived advantage of hierarchical control of value-added activities to overcome market imperfections. The market imperfections could be structured or transactional, addressing the questions of why firms engage in FDI rather than license foreign firms to use their assets (Dunning , 1993a, 1993b). In contrast to internationalization theory, the eclectic paradigm theory uses transaction costs as its main explanatory variables and assumes that FDI decisions are made rationally within international firms (Melin 1992).

Rugman (2010) criticizes the eclectic paradigm and states that one of the problems of Dunning’s eclectic paradigm is that it has overdetermined the three motives for FDI. In addition, Rugman (2010) criticizes the broad definition of “L”advantages including market size, natural resources, education system and other types of political and government activity.

2.1.2 Two- Gap Theory

Chenery and Strout (1962) in their report to the government of Israel titled “Development Alternative in an open economy the case of Israel” led to the birth of the two gap model. The model came as an open debate to economists to examine and observe the role of FA on different sectors of the economy and influence on economic growth, to examine the demand for and its importance in shaping the economic characters of both micro and macroeconomic variables which were the subject of controversy.

The major assumption of this model is that most developing countries either face a shortage of domestic savings to augment for investment opportunities (savings gap) and foreign exchange constraints to finance the needed capital and intermediate goods (foreign exchange gap) this happens when external finance either grants or loans supplement domestic resources. Aid, unlike domestic savings, can fill the foreign exchange gap as well as the savings gap. The importance of the theory in the study is that the study uses the theoretical assumption of the two-gap model to explain either the positive or negative effect of FAas a component of TFP on economic growth in Kenya.

The model was first applied for Israel by Chenery and Bruno (1962), Pakistan by Chenery and Time (1965), Greece by Chenery & Alderman (1966), India by Manne (1966) and Nepal by Poudyal (1984). Chenery and Strout's (1966) work has given rise to many subsequent studies either theoretical or empirical into specific cases of the "two-gap-approach". Diwan studied the two gap model based on a production function in which imports and capital are the major inputs. Cochrane (1972) argued that there are really two models in the Chenery-Strout model namely a short and a long run one. Blomqvist (1976) made an empirical study of the two gap using cross section data of thirty three developing countries. Gersovitz (1982) again based on five Latin American countries attempted to estimate a version of the two-gap model.

The Chenery-Strout model has come under criticism. Fukuchi (1971) argued that there should be only one gap model and pointed out that the two gap model is simple and convenient in specification and estimation, and the problem has been oversimplified. Gunning (1983) compared the two- gap with a rationing model with micro- foundations, and discovered that the two gap model in general violates fix-price equilibrium properties.

2.1.3 McKinnon and Shaw Complementarity Theory

McKinnon and Shaw (1973) developed a theoretical framework that helped explain growth inducing effects of financial liberalization in contrast to financial repression. They explain the relationship between FD and economic growth through a model based on "outside" money and analyse the impact of real interest rate on savings deposits, investment and growth. They argued that the financial sector could raise the volume of savings as well as the quantity and quality of investment. Mckinnon (1973) emphasizes that the removal or relaxation of the administered interest rates would boost capital formation, since the high deposit rates attract the accumulation of money, and stimulate investment.

The importance of the McKinnon and Shaw (1973) complementarity theory to the study is to explain the either the positive or negative effect of FDas a component of TFP on economic growth in Kenya. De Gregorio and Guidotti (1995) find that FD is associated with improved growth performance and that the impact of FD increases from high to low income countries. McKinnon and Shaw's (1973) complementarity theory predicts that money and investment are complementary due to a self- financed investment and that a real deposit rate is the key determinant of capital formation. McKinnon and Shaw (1973) asset self-finance and lump sum expenditure or indivisibilities of investment for financially constrained developing countries, hence investors are obliged to accumulate money balances prior to their investment project.

Meanwhile, in many developing countries, the decades of high budget deficits had resulted in high domestic borrowings by government. Government securities at low interest rates were one of the major causes of financial repression, where interest rates were set by administrative decisions which were likely to be below the market determined levels (Fry, 1980). Their approach found only mixed empirical support and could not explain the sustained increases in the growth rate of an economy either. In the early 1980s the neostructuralists criticized the McKinnon-Shaw school and predicted that financial liberalization would slow down growth. Their arguments are in the vein of those put forward by Keynes and Tobin (1965). Stiglitz (1989) criticizes financial liberalization on the theoretical ground of market failures in financial markets. Loayza et al (2000) suggests that the direct effects of financial liberalization are detrimental to private saving.

The indicator of financial depth (M2/GNP) has a small and statistically insignificant impact on the private saving rate. However, Reinhart and Tokatlidis (2001) report that financial liberalization appears to deliver higher real interest rates (reflecting the allocation of capital toward more productive, higher return projects); lower investment, but not lower growth (possibly owing to a shift to more productive uses of financial resources; a higher level of foreign direct investment; and high gross capital flows. Liberalisation appears to deliver financial deepening as measured by the credit and monetary aggregates-but again, low income countries do not appear to show clear signs of such a benefit. In some regions, saving increased following financial sector reforms; but in the majority of cases saving declined following the reforms.

2.2 Empirical Literature Review

2.2.1 Foreign Direct Investment and Economic Growth

The following empirical studies explain the effect of FDI on economic growth that has yielded positive results. Borensztein et al (1998) examined the effect of FDI on economic growth in cross country regression framework, using data on FDI outflows from OECD countries to sixty-nine developing countries over the period 1970-1989. They find that FDI is an important vehicle for adoption of new technologies, contributing relatively more to growth than domestic investment. In addition they find a relationship between FDI and the level of human capital. FDI has a significant positive effect on economic growth. However, they qualify their results in as much as the higher productivity of FDI only holds if the host country has minimum threshold of human capital.

In another study, Balasubramanyan et al (1996) examined the relationship between FDI and economic growth in the context of differing trade policy regimes of export promotion and import substituting countries. Using cross section data to analyse forty-six developing countries over the period 1970-1985, they find support for Bhagawati's hypothesis that FDI will increase economic growth in countries which adopt export promotion policy.

Similarly, Li and Liu (2005) apply both single equation and simultaneous equation system to investigate endogenous relationship between FDI and economic growth. Based on a panel data for 84 countries over the period 1970-1999, they find positive effect of FDI on economic growth through its interaction with human capital in developing countries, but a negative effect of FDI on economic growth via its interaction with the technology gap.

In another study, Bengoa et al (2003) estimated the relationship between FDI and economic growth using panel data for eighteen Latin American countries over the period 1970-1999. They show that FDI has positive and significant impact on economic growth in the host countries. Bende et al (2001) study the impact of FDI through spill over effects on economic growth of the ASEAN-5 for the period 1970-1996. They find that FDI accelerates economic growth either directly or through spill over effects. They show that the impact of FDI on economic growth is positively signed and significant for Indonesia, Malaysia and Phillipines, while they identify a negative relationship for Singapore and Thailand.

Similarly Marwah and Tavakoli (2004) test the effect of FDI on economic growth in Indonesia, Malaysia, Phillipines and Thailand. Using time series data over the period 1970-1998, they find that FDI has a positive correlation with economic growth for all four countries.

2.2.2 Foreign Aid and Economic Growth

The following studies explain the effect of FA on economic growth in developing countries. Chenery and Carter (1973) looked at the effect of FA on development performance over the period 1960-1970 for a group of developing countries Kenya included. They utilized two sets of estimates of feasible growth and aid requirements compiled by Chenery and Strout (1966) for a sample of fifty countries for the period 1962-1975. Determining aid requirements as a function of growth objectives and domestic performance, Findings indicated that unsuccessful development led to a reduction in the aid supplied. Therefore, although the total supply of public funds for external assistance can be given, its distribution depends both on donor policy and on performance of recipients.

Similarly, the following study's findings were similar to Chenery and Carter's (1973). Griffin and Enos (1969) used the experience of twelve Latin American countries to investigate the impact of FA on development. Weisskopf (1972a) investigated the impact of foreign loans on domestic savings, and (1972b) provided econometric tests of alternative constraints in developing countries. Aho (1973) employed the two-gap model and used data from twelve developing countries to study their utilization of FA. Bacha (1973) based on one sector models researched on foreign capital inflow and the growth rate of recipient countries.

2.2.3 Financial Development and Economic Growth

The following studies have shown evidence for an association between FD and economic growth. Goldsmith (1969) reports a correlation between FD and economic activity for a sample of 35 countries covering the period 1860-1963.

For roughly 80 countries over the 1960-1989 period King and Levine (1993a) find strong evidence that a large set of financial indicators (contemporaneous and initial values) is strongly linked with growth, capital accumulation, productivity growth and investment ratios.

Regressions based on pooled cross section time series data with and without the use of instruments confirm the findings. King and Levine (1993b) more specifically state that roughly one third of the gap between very fast and slow growing countries can be eliminated by increasing the size of financial intermediation sector.

In another cross section study De Gregorio and Guidotti (1995) explore the relationship between log run growth and FD. They examine a sample of about 100 countries during 1960-1985 in order to conduct growth regressions of the Barro (1991) type. The general finding is that FD is associated with improved growth performance. As far as the analysis of subsamples in a cross section context is concerned, the authors find that the impact of Financial Development increases from high to low income countries. They subsequently analyse panel data of 12 Latin American countries, using six-year averages for 1950-85, particularly for the 1970s and 1980s unregulated financial liberalization and expectations of government bailouts explain a reversed relationship between FD and growth. This result leads to the policy recommendation that financial liberalization requires an appropriate regulatory framework in order to avoid financial crisis. The authors also find empirical support for the hypothesis that the main transmission channel from finance to growth is through increasing the efficiency of investment, rather than its volume.

Ram (1999) finds a positive association between financial factors and economic development only for high growth countries. Benhabib and Spiegel (2000) report that the specific FD variables are associated with specific components of growth such as capital accumulation and productivity growth, their results are, however, sensitive to the inclusion of country fixed effects. They interpret this finding as an inclusion that financial factors may proxy for broader country characteristics.

2.3 Summary of Literature review and Research Gap

This study reviews the theoretical and empirical literature on theeffect of TFP on economic growth. The TFP components of FDI, FA and FD have been reviewed independently to show their effect on economic growth.

The theoretical works of Dunning (1980, 1988, 1993a, 1993b) Eclectic Paradigm theory of FDI,Chenery and Strout (1962) Two-Gap theory of FA and Mckinnon and Shaw (1973) complementarity theory of FD have all helped to explain growth inducing effect of TFP components on economic growth.

Much empirical support has been found for all the TFP components and a majority of the studies come to the conclusion that the TFP components induce economic growth. Empirical studies on effect of FDI on economic growth have yielded positive results. Borensztein et al (1998); Balasubramanyan et al (1996); & Bengoa et al (2003); find that FDI has a significant positive effect on economic growth. Similarly, Li and Liu (2005) find positive effect of FDI on economic growth through its interaction with human capital in developing countries, but a negative effect of FDI on economic growth via its interaction with the technology gap. Bende et al (2001) show that the impact of FDI on economic growth is positively signed and significant for Indonesia, Malaysia and Phillipines, while they identify a negative relationship for Singapore and Thailand. Similarly, Marwah and Tavakoli (2004) find that FDI has a positive correlation with economic growth for all four countries.

Studies in relation to FA and economic growth have been carried out in developing countries. Chenery and Carter (1973) looked at the effect of FA on development performance over the period 1960-1970 for a group of developing countries Kenya included. Findings indicated that unsuccessful development led to a reduction in the aid supplied. Similarly, Griffin and Enos (1969); Weisskopf (1972a, b); Aho (1973) & Bacha (1973) study's findings were similar to Chenery and Carter's (1973).

Studies have shown evidence for an association between FD and economic growth. Goldsmith (1969) reports a correlation between FD and economic activity. King and Levine (1993a) find strong evidence that a large set of financial indicators is strongly linked with growth, capital accumulation, productivity growth and investment ratios. King and Levine (1993b) state that roughly one third of the gap between very fast and slow growing countries can be eliminated by increasing the size of financial intermediation sector. De Gregorio and Guidotti (1995) general finding is that FD is associated with improved growth performance and that the impact of FD increases from high to low income countries. Ram (1999) finds a positive association between financial factors and economic development only for high growth countries. Benhabib and Spiegel (2000) find that specific FD variables are associated with specific components of growth, and they interpret these findings as an inclusion that financial factors may proxy for broader country characteristics.

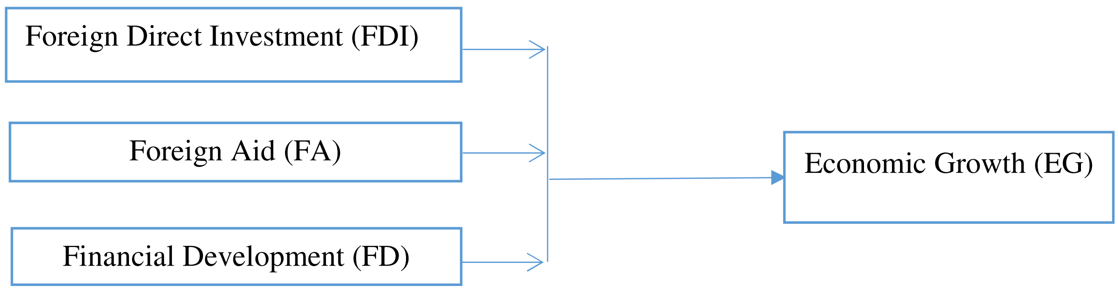
Therefore the study fills the gap in literature by building a model to explain the effect of TFP on economic growth in Kenya using the TFP components of FDI, FA and FD to assess the empirical importance of TFP as a source of economic growth in Kenya and to thus argue for a refocus of policy and reverse the declining trend of TFP in order to drive competitiveness of the economy and boost economic growth.

2.4 Conceptual Framework

Figure 2.1: Conceptual Framework

Independent variables   Dependent variable

Total Factor Productivity



Source: (Author) 2017

2.5 Operationalization of the variables

Table 2.1 Operationalization of the variables in the conceptual framework

Variable	Abbreviation	Definition	Measurement
Foreign Direct Investment	FDI	Expenditure of FDI from abroad including technology, patents, and copyrights in $ US (millions) converted to KSHS (thousands).	Ratio of FDI to GDP
Foreign Aid	FA	Inflows of FA from abroad that includes technical grants and overseas development assistance in $ US (millions) converted to KSHS (thousands).	Ratio of FA to GDP
Financial Development	FD	Broad money (M3) that includes currency (notes and coins) + demand deposits + time deposits + foreign currency denominated accounts in KSHS (thousands).	Ratio of M3 to GDP
Economic Growth	EG	Gross Domestic Product (GDP) that includes monetary value of total goods and services in the economy in KSHS.	Real GDP growth rates

Source: Author (2017)

Foreign Direct Investment (FDI)

FDI represents openness of the economy and is viewed as a channel for the transfer of advanced technology and superior organizational forms from industrialized to developing countries (Issaksson, 2007). FDI is measured as a ratio of GDP (FDI/GDP) (Kalio, Mutenyo & Owuor, 2012). Data is obtained from World Bank database.

Foreign Aid (FA)

FA is official development assistance (ODA) (IMF, 2005). FA is measured as a ratio of GDP (FA/GDP) (Nachega & Fontaine, 2006) Data is obtained from World Bank database.

Financial Development (FD)

FDrepresented by Broad money (M3) that includes currency (notes and coins) + demand deposits + time deposits + foreign currency denominated accounts. FD is measured as a ratio of GDP (M3/GDP) (Allen & Ndikumana, 2000) Data is obtained from KNBS Economic Surveys various issues

Economic Growth (EG)

EG is measured by Real Gross Domestic Product (RGDP) (Kalio, Mutenyo & Owuor, 2012) Data is obtained from World Bank database.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The main purpose of this study was to build a model to explain the effect of TFP on economic growth in Kenya using time series data for the period 1970-2015. This chapter covers the research design, model specification and data analysis procedure to achieve the objectives.

3.2 Research Design

This study uses explanatory research design to explain the relationship between the dependent and independent variables.The usefulness of explanatory research design is explaining what is observed by descriptive studies (Cooper and Schindler, 2008). This implies that the usefulness of explanatory research design in the study is to explain rather than simply describe the relationship between the variables.It also enables to explain the hypotheses in the study.

3.3 Target population

The unit of analysis is Kenya. The target population is the TFP components of FDI, FA and FD. FDI includes expenditure on technology, patents and copyrights. FA includes technical grants and overseas development assistance. FD includes M3 represented by currency, demand deposits, time deposits and foreign currency denominated accounts.

3.4 Data and its sources

The period of analysis is 1970-2015. The data is time series and the frequency of the data is yearly. The base year 1970 was chosen for comparison purposes with other studies carried out during the same period. The study uses secondary data obtained from World Bank

Database and Kenya National Bureau of Statistics website and Economic surveys various issues. The sources of data are chosen because of credibility of the data for research purposes and availability of data on online databases and therefore there is ease of access and retrieval. See appendix 1 for data collection workout.

3.5 Model Specification

The study is based on the Solow Residual model. Solow (1957) considered a simple model with two factors of production labour and capital. Assuming an aggregate production function to be;

Q = F(K, L, t) ………………………………………………………………………. (3.1)

Where Q is output, K is capital, L is labour and t is time. The variable t appears in F to allow for technical change represented by A.

In that case the production function takes the special form

Q = A(t) f (K,L)……………………………………………………………………... (3.2)

Differentiating equation (2) with respect to time and dividing by Q one obtains

$\frac{\dot{Q}}{Q} = \frac{\dot{A}}{A} + A\frac{\partial f}{\partial K}\frac{\dot{K}}{Q} + A\frac{\partial f}{\partial L}\frac{\dot{L}}{Q}$ ………………………………………………………………… (3.3)

Where dots indicate time derivatives.

Now defining w_k as $\frac{\partial Q}{\partial K}\frac{\dot{K}}{Q}$ and w_L as $\frac{\partial Q}{\partial L}\frac{\dot{L}}{Q}$ the relative shares of capital and labour and substituting in the above equation.

Note $\frac{\partial Q}{\partial K} = A\frac{\partial f}{\partial K}$ and $\frac{\partial Q}{\partial L} = A\frac{\partial f}{\partial L}$ the results are therefore,

$\frac{\dot{Q}}{Q} = \frac{\dot{A}}{A} + w_k\frac{\dot{K}}{K} + w_L\frac{\dot{L}}{L}$ ………………………………………………………………… (3.4)

Q/Q is the rate of change in output, K/K is the rate of change of real gross fixed capital and L/L is the rate of change of labour.

TFP is given as

$$\frac{\dot{A}}{A} = \frac{\dot{Q}}{Q} - (w_k \frac{\dot{K}}{K} + w_L \frac{\dot{L}}{L}) \ldots\ldots (3.5)$$

Using logarithmic rate of changeequation (4) is written as

$$\frac{dlnQ}{dt} = \frac{dlnA}{dt} + w_k \frac{dlnK}{dt} + w_L \frac{dlnL}{dt} \ldots\ldots (3.6)$$

For econometric approach equation (6) is linearized into the following form

Ln (Y) = Ln (TFP) + Ln (K) + Ln (L)……………………………………………………..(3.7)

Where:

Y is output (GDP), TFP is Total factor productivity, K is capital and L is labour.

TFP is further decomposed into the components FDI, FA and FD to explain the effect of TFP on economic growth.

$$\text{Ln TFP}_t = \text{Ln FDI}_t + \text{Ln FA}_t + \text{Ln FD}_t + \varepsilon_t \ldots\ldots (3.8)$$

Where:

FDI is Foreign Direct Investment, FA is Foreign Aid and FD is Financial Development and ε_t is for variables outside the model.

The following model was then adopted to explain the effect of TFP on economic growth. The model investigates the short run and long run relationships between the TFP components and economic growth.

$$\text{RGDP}_t = \text{f}\,(\text{FDI}_t, \text{FA}_t, \text{FD}_t) + \varepsilon_t \quad \ldots\ldots (3.9)$$

Where:

RGDP_t = Gross Domestic Product at time t

FDI_t = Foreign Direct Investment at time t

FA_t = Foreign Aid at time t

FD_t = Financial Development at time t

ε_t = Represent variables outside the model

3.6 Data Analysis Procedure

The first step in the data analysis procedure is the descriptive statistics which is estimated to provide explanations on the characteristics of the variables in the study. The next step is the use ofthe Autoregressive Distributed lag (ARDL) bounds testing approach to estimate the short and long run relationships among the variables. This method was developed by Pesaran and Pesaran (1997), Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001).

The method has several advantages; (1) this method is applicable where the regressors' are I (0), I (1) or mutually co- integrated. Therefore it does not require pretesting of the variables included in the model for unit roots unlike other techniques such as Johansen and Juselius (1990) approach.(2)It is relatively more efficient in small or finite sample data sizes (3) It allows the co- integration relationship to be estimated by OLS once the lag order of the model is identified, and (4) a dynamic unrestricted error correction model (UECM) can be derived from the ARDL bounds testing model through a simple linear reparametrization. The reparametrization is possible because the ARDL is a dynamic single dynamic model equation and of the same form with the ECM. Distributed lag model simply implies the inclusion of unrestricted lag of the regressors in a regression function. Therefore, the UECM combines the short run dynamics with the long run equilibrium without losing any long run information.

After the ARDL bounds test of co-integration approach the model is tested for serial autocorrelation, heteroscedasticity, multicollinearity, normality, omitted variable bias and model stability.After the diagnostic tests the model is then tested for robustness and consistency using the Johansen co-integration procedure and vector error correction model (VECM) and post estimation tests. Stata software is used for this data analysis procedure.

The ARDL bounds testing approach is explained in the following steps;

3.6.1 Preliminary test

As mentioned above the method does not need pretesting for stationary of the variables. However, it is still necessary to conduct unit root tests. This is because ARDL bounds test approach fails for variables which are I (2) which leads to crashing of the ARDL technique. Phillips and Perron test (P-P) (Phillips and Perron, 1988) is used. The P-P test is similar to ADF (1979) test but it incorporates an automatic correction to the DF procedure to allow for auto-correlated residuals.

3.6.2 Optimal Information Criterionusing AIC

The IC (Information Criteria) is used to select the optimal lag length. Akaike Information Criteria (AIC) is chosen since it is a more superior method and it gives relatively efficient estimates.

3.6.3 ARDL bounds test of Co- integration

Co-integration makes it possible to retrieve the relevant long run information of the relationship between the considered variables that had been lost on differencing. To check for long run relationship among the variables the following model is adopted;

$$\Delta \text{LnRGDP}_t = \lambda_0 + \sum_{i=1}^{k} \theta_i \, \Delta \text{LnRGDP}_{t-1} + \sum_{i=0}^{k} \delta_i \, \Delta \, \text{LnFDI}_{t-1} + \sum_{i=0}^{k} \pi_i \, \Delta \text{LnFA}_{t-1} + \sum_{i=0}^{k} \pi_i \, \Delta \text{Ln FD}_{t-1} + \beta_4 \, \text{LnRGDP}_{t-1} + \beta_5 \text{LnFDI}_{t-1} + \beta_6 \, \text{LnFA}_{t-1} + \beta_7 \, \text{LnFD}_{t-1} + u_t \ldots\ldots\ldots\ldots \quad (3.10)$$

Where Δ is the difference operator; RGDP is the proxy variable for economic growth; FDI represents foreign direct investment; FA represents foreign aid, FD represents Financial Development,t represents time; Ln stands for natural logarithms; k is the lag length and u is the error term assumed to be serially uncorrelated. The parametersθ_i , δ_i , π_i are the short run dynamic coefficients of the ARDL model while β_4, β_5,β_6, $\beta_7$are the long run parameters (elasticity's).

Co-integration among the variables is investigated by testing;

Ho_5: no level relationship.

The existence of co-integration is tested by the F-test of the joint significance of the long run coefficients.Likewise, a t- statistic is also provided which confirms the existence of co-integration and upper and lower critical values are provided and the same criterion of analysis is used as in the F-statistic. Pesaran, Shin and Smith (2001) provides critical values, upper and lower critical values which have to be compared with the F-statistic (Wald test) in order to accept or reject the null hypothesis. The lower critical values assume all the variables are I (0) while the upper critical values' assumes all the variables are I(1). If the variables are I (2) or above the ARDL bounds test is inapplicable.

If the F-statistic exceeds the upper critical bound, the null hypothesis is rejected meaning that there is co-integration among the variables, and if the F-statistic is below the lower critical bound; the null hypothesis is accepted indicating that there is no long run relationship among the variables. However, if the F-statistic falls within the band, the result is inconclusive, otherwise, if all the variables are known to be I (1) a decision is made using the upper critical values, and if all are known to be I (0), a decision is made using the lower critical values.

To generate critical values Pesaran, Shin and Smith (2001) used huge sample sizes of 500 and 1000 and 20000 and 40000 replications respectively, Narayan (2005) argues that such critical values are not applicable for small samples. This study usescritical values by Narayan (2005) which are applicable for smaller sample sizes of 30 to 80. Sample size for the study is 46.

ARDL approach to co-integration helps in identifying the co-integrating vector(s) in the model and this implies that each of the underlying variables stands as a single long run relationship equation. Otherwise, when there are multiple co-integrating vectors ARDL approach to co-integration cannot be applied. Hence, the Johansen and Juselius (1990) approach becomes the alternative. If there is one co-integrating vector among the underlying variables an ARDL model of the following form is constructed;

$$\text{LnRGDP}_t = \delta_0 + \sum_{i=1}^{k} \lambda_i \,\text{LnRGDP}_{t-1} + \sum_{i=0}^{k} \delta_{1i} \,\text{LnFDI}_{t-1} + \sum_{i=0}^{k} \delta_{2i} \,\text{LnFA}_{t-1} + \sum_{i=0}^{k} \delta_{3i} \,\text{LnFD}_{t-1} + u_t \qquad \text{.....(3.11)}$$

The ARDL model is re-parameterized into an error correction model (ECM). The re-parameterized result gives the short run dynamics and long run relationship of the underlying variables.

3.6.4 ARDL Error Correction Model (ECM)

The ARDL model in equation (3.11) is re-parameterized into an error correction model (ECM). The re-parameterized result from the ARDL model gives the short run dynamics and long run relationship of the underlying variables. The ECM is represented by the following equations;

$$\Delta\text{LnRGDP}_t = \varphi_0 + \sum_{i=1}^{k} \varphi_i \,\Delta\text{LnRGDP}_{t-1} + \sum_{i=0}^{k} \beta_i \,\Delta\text{LnFDI}_{t-1} + \sum_{i=0}^{k} o_i \,\Delta\text{LnFA}_{t-1} + \sum_{i=1}^{k} \phi_i \,\Delta\text{LnFD}_{t-1} + \delta ECT_{it-1} + u_{1t} \qquad \text{..... (3.12)}$$

ΔLnFDI$_t$=ϕ_0+$\sum_{i=1}^{k}\phi_i$ ΔLnFDI$_{t-1}$+$\sum_{i=0}^{k}\tau_i$ ΔLnRGDP$_{t-1}$+$\sum_{i=0}^{k}\pi_i$ ΔLnFA$_{t-1}$+$\sum_{i=1}^{k}\phi_i$ ΔLn FD$_{t-1}$ +$\alpha_i ECT_{it-1} + u_{2t}$ …………………………………………………………… (3.13)

ΔLnFA$_t$=ϕ_0+$\sum_{i=1}^{k}\phi_i$ ΔLnFA$_{t-1}$+$\sum_{i=0}^{k}\tau_i$ ΔLnRGDP$_{t-1}$+$\sum_{i=1}^{k}\pi_i$ ΔLnFDI$_{t-1}$+$\sum_{i=1}^{k}\phi_i$ ΔLn FD$_{t-1}$+ $\alpha_i ECT_{it-1} + u_{3t}$ ……………………………………………………………(3.14)

ΔLnFD$_t$=ϕ_0+$\sum_{i=1}^{k}\phi_i$ ΔLnFD$_{t-1}$+$\sum_{i=0}^{k}\tau_i$ ΔLnRGDP$_{t-1}$+$\sum_{i=1}^{k}\pi_i$ ΔLnFDI$_{t-1}$+$\sum_{i=1}^{k}\phi_i$ ΔLn FA$_{t-1}$ + $\alpha_i ECT_{it-1} + u_{4t}$ …………………………………………………………… (3.15)

Where Δ is the first difference operator while ΔLnRGDP$_{t-1}$, ΔLnFDI$_{t-1}$,ΔLnFA$_{t-1}$and ΔLnFD$_{t-1}$captures the short run dynamics of the model; u_t 's are the error terms assumed to be uncorrelated; ECT_{it-1} 's are the error correction terms obtained from equation (3.11).

The coefficients of the ECT ($\delta \& \alpha$) captures the adjustment towards long run equilibrium. The negative sign means that the dependent variable RGDP adjusts back to the equilibrium value following a shock in the short run. The larger the ECT coefficient the higher is the speed of adjustment of the model from short run to the long run. The magnitude of the coefficient measures the speed of adjustment and disequilibrium caused by short run shocks of the previous period towards long run value.

Existence of long run relationship between the variables implies that there could be evidence of causality in at least one direction, but does not indicate the direction of causality. The ECT represents long run relationship with statistically significant coefficient giving evidence of long run causal relationship. If the error correction term coefficients in equations (3.12), (3.13), (3.14) and (3.15) are statistically significant that implies causality between the variables. However, if none of the coefficients of the error correction terms in the equations is statistically significant, then there is no causality between FDI, FA, FD and RGDP.

In this procedure an error correction test is carried out for each equation in the error correction model and the following diagnostic tests are also carried out.

3.6.5 Diagnostic tests

3.6.5.1Cusum test

The Cusum test by Brown, Durbin, and Evans, 1975 is based on the cumulative sum of the recursive residuals. There are two tests; Cusum (cumulative sum) test and CUSUMSQ (cumulative sum of squares) test. This option plots the cumulative sum together with the 5% critical lines. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines.

3.6.5.2 Serial Autocorrelation test

The Breusch-Godfrey Langrange Multiplier (BG LM) test is used to test for serial auto correlation in the errors in a regression. It makes use of the residuals from the model being considered in regression analysis, and a test statistic is derived from these. The null hypothesis is that there is no serial auto correlation of any order up to p when $p > 0.05$.

Ho_6: *no serial auto correlation*

3.6.5.3 Multicollinearity test

Multicollinearity is the existence of a perfect or exact linear relationship among some or all of explanatory variables of a regression model. The Variance Inflation Factor (VIF) is used to test for multicollinearity. A $VIF < 5$ shows that there is no multicollinearity.

3.6.5.4 Heteroscedasticity test

Heteroscedasticity refers to the error variance being non constant. The Breusch pagan test is used to test for heteroscedasticity. If $p > 0.05$ it means that there is constant variance and null hypothesis is accepted.

Ho_7: *constant variance*

3.6.5.5 Normality test

The Shapiro-Wilk test is used to test for normality of the residuals. If $p > 0.05$ it shows that the residuals are normally distributed and null hypothesis is accepted.

Ho_8:*normality of residuals*

3.6.5.6 Omitted Variable Bias test

The Ramsey Reset test is used to test for omitted variables. If $p > 0.05$ it shows that there are no omitted variables and null hypothesis is accepted.

Ho_9:*no omitted variables*

3.6.6 Robustness check

The findings of the ARDL bounds test approach are tested for robustness and consistency using the Johansen co integration test and VECM approach. The importance of the robustness check is to determine if there is any consistency in the findings of the ARDL bounds test approach and the findings of the Johansen co-integration and VECM approach. This includes the following steps.

3.6.6.1 Unit root test

The variables are differenced to be I (1) using the Phillips Perron (1988) test which allows for automatic correction to the Dickey fuller procedure for auto correlated residuals.

3.6.6.2 Optimal lag length selection using IC

The IC (Information Criteria) is used to select the optimal lag length. The information Criteria includes Akaike Information Criteria (AIC), Bayesian Schwarz Information Criteria (SBIC) and Hannan Quinn Information Criteria (HQIC). The most efficient and significant lag length is chosen.

3.6.6.3 Johansen test of co-integration

Co-integration and long run relationship is determined using the Johansen co-integration technique which gives the number of co-integrating equations and their significant lag length.

3.6.6.4 Vector Error Correction Model

After determining the co-integrating equations a VECM is carried out to determine the short run relationship between the variables and the error correction term. Then, post estimations tests are carried out and they include normality test, serial correlation test, impulse response functions, orthogonalized impulse response functions and predicted co-integrating equation.

3.6.6.5 Post estimation tests

3.6.6.5.1 Normality test

The Jarque-bera test, skewness test and kurtosis test is used to test for normality of the residuals and if $P > 0.05$the null hypothesis is accepted.

Ho_9:*normality of residuals*

3.6.6.5.2 Serial correlation test

The Langrange multiplier test is used to test for serial auto correlation. If $p > 0.05$, the null hypothesis of no autocorrelation at lag order is accepted.

Ho_{10}:*no autocorrelation at lag order*

3.6.6.5.3 Impulse response function

Impulse response is the reaction of a variable to shocks in the system. This is determined to show the effect of the shocks, the significance and up to what period do the shocks last on the variable itself and on other variables. The output is displayed in table format.

3.6.6.5.4 Orthogonalized impulse response function

The orthogonalized impulse response functions are displayed in graphs to show the effect of the shocks, the significance and up to what period do the shocks last on the variable itself and on other variables.

3.6.6.5.5 Predicted co-integrating equation

The predicted co-integrating equation is displayed in a graph to show the trend of the co-integrating equation. A stable model has the trend of a stationary series.

CHAPTER FOUR: DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents findings of data analysis. This includes descriptive statistics, ARDL bounds test approach and diagnostic tests, and Robustness check and post estimation tests.

4.2 Descriptive statistics

Table 4.1: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
RGDP	46	-.0637272	6.190081	-14.11769	24.423
FDI	46	30188.59	38645.99	516.87	159593.3
FA	46	340609.9	291470.3	20413.3	987139.1
FD	46	.3358696	.1055478	.05	.51

Note: RGDP = Real Gross Domestic Product, FDI = Foreign Direct Investment, FA = Foreign Aid, FD = Financial Development

The descriptive statistics findings in Table 4.1 above show that the average rate of growth of RGDP was -.063 units per annum, average annual flow of FDI was 30188.59 units, average annual flow of FA was 340609.9 units and average annual FD was .3358 units. The highest maximum value was FA at 987139.1 units while FD was lowest at .51 units and RGDP and FDI was 24.42 units and 159593.3 units respectively. The minimum values ranged between -14.11 units for RGDP, FDI was 516.87 units, FA was 20413.3 units and FD was .05 units. The highest and lowest volatility were experienced by FA at 291470.3 and FD at .1055 while FDI was 38645.99 and RGDP was 6.19.

The findings show that the standard deviation is higher than the mean in RGDP and FDI, and RGDP has a negative minimum valuewhich is an indication of high variability for the variables except for FA and FD. To eliminate the negative values in RGDP a constant

(20) is added and RGDP becomes RGDP1, while the variability in FDI and RGDP is corrected by transforming using natural logarithm. FA and FD are also transformed to reduce non-normality of data in the variables. Table 4.2 below shows the new findings after transformation. Output in Appendix 2, Table 2.The findings after transformation showthat

Table 4.2: Descriptive statistics for transformed variables (1)

Variable	Obs.	Mean	Std. Dev.	Min	Max
lnRGDP1	46	2.946034	.3172916	1.771557	3.79369
lnFDI	46	9.543804	1.375616	6.247791	11.98038
lnFA	46	12.23658	1.107968	9.923942	13.80257
lnFD	46	-1.162565	.4348038	-2.995732	-.6733446

Note: lnRGDP1, lnFDI, lnFA and lnFD are the variables after transformation

the variability in the variables has been minimised except for lnFD which shows a negative minimum value and the standard deviation is higher than the mean. To correct the variability and eliminate the negative value in lnFD, a constant (10) is added to the values of FD,it is then transformed and lnFD now becomes lnFD1.The results are shown in Table 4.3 Output in Appendix 2 Table 3.

Table 4.3: Descriptive statistics for transformed variables (2)

Variable	Obs.	Mean	Std. Dev.	Min	Max
lnRGDP1	46	2.946034	.3172916	1.771557	3.79369
lnFDI	46	9.543804	1.375616	6.247791	11.98038
lnFA	46	12.23658	1.107968	9.923942	13.80257
lnFD1	46	2.335569	.0102469	2.307573	2.352327

Note: lnRGDP1, lnFDI, lnFA and lnFD1 are the variables after transformation

After the descriptive statistics next is the correlation matrix as presented in Table 4.4 below to determine the relationship between the variables.

Table 4.4: Correlation matrix

Variables	RGDP1	lnFDI	FA	FD
lnRGDP1	1.0000	-	-	-
lnFDI	0.3016* (0.0417)	1.0000	-	-
lnFA	0.1839	0.7071*	1.0000	-

	(0.2212)	(0.0000)		
lnFD1	-0.2680 (0.0717)	-0.2968* (0.0452)	-0.3428* (0.0197)	1.0000

*Note: *indicates significant.lnRGDP1 = Real Gross Domestic Product, lnFDI = Foreign Direct Investment, lnFA = Foreign Aid, lnFD1 = Financial Development.*

The correlation matrix findings in Table 4.4 above show that there is a positive and significant relationship between lnFDI and lnRGDP1. There is a positive and insignificant relationship between lnFA and lnRGDP1. There is a positive and significant relationship between lnFA and lnFDI, while there is a negative and insignificant relationship between lnFD1 and lnRGDP1, and a negative and significant relationship betweenlnFD1 and lnFDI,lnFA. This implies a negative impact of lnFD1 on all the variables. Notably, there are no two independent variables which are highly correlated which preclude the problem of multicollinearity. Output in Appendix 2, Table 4.

Since there is no problem of multicollinearity, the next step was to administer an ARDL bounds test approach to determine the short run and long run relationships between the variables as described in the next section 4.3. The ARDL bounds test approach has four steps that include a preliminary unit root test, co-integration test, error correction model and diagnostic tests for each equation as was presented in the ECM in section 3.6.4 and 3.6.5 in the data analysis procedure.

4.3 ARDL Bounds test approach

4.3.1 Preliminary unit root test

The unit root analysis in Table 4.5 below using Phillips-Perron test (1988) allows for automatic correction to the Dickey Fuller procedure for auto correlated residuals and shows lnRGDP1 and lnFD1 are I (0) and lnFA and lnFDI are I (1), this implies that the variables lnRGDP1, lnFD1,lnFDI and lnFA are applicable for ARDL bounds test approach whichfails for variables that are I (2). Output in Appendix 2, Table 5.

Table 4.5: Unit root results

Variables	Phillips-Perron test					
	Test statistic		Test critical values z (t)			
	Level	First difference	1 %	5 %	10 %	Mackinnon p value for z (t)
lnRGDP1	- 5.092	-11.598	-3.621	-2.947	-2.607	0.0000
lnFDI	-3.380	-11.365	-3.621	-2.947	-2.607	0.0000
lnFA	- 0.909	- 9.938	-3.621	-2.947	-2.607	0.0000
lnFD1	- 3.956	-16.045	-3.621	-2.947	-2.607	0.0000

Note: lnRGDP1 = Real Gross Domestic Product, lnFDI = Foreign Direct Investment, lnFA = Foreign Aid, lnFD1 = Financial Development.

After the unit root analysis the next step is to select AIC as the optimal information criterionas shown in Table 4.6 below.

4.3.2 Optimal Information Criterion using AIC

An ARDL regression is run using AIC as the optimal lag length. AIC is chosen as the optimal lag length sinceit gives efficient estimates and is a more superior method. The findings on Table 4.6 belowshowsthe estimates of the ARDL regression using AIC as the optimal

Table 4.6: ARDL Regression using AIC as Optimal Information Criterion

ARDL Regression Sample: 1974 - 2015			
Variable	Coefficient	Std. Error	P > | t |
lnRGDP1 *L1*	-.0843394	.1709556	0.625
lnFDI	.0748407	.0469309	0.119
lnFA	-.0336836	.0554739	0.547
lnFD1	-1.660458	5.212704	0.752
Cons	6.251297	12.35011	0.616

information Criterion.Output in Appendix 2, Table 6. After selection of AIC as the optimal information criteria the next step was to determine whether there is co-integration among the variables and therefore long run relationship among the variables as shown in Table 4.7 below.

4.3.3 ARDL Co-integration test results

The findings in Table 4.7 below show that the F statistic is greater than both the Narayan (2005) and Pesaran, Shin and Smith (2001)upper critical values I (1) and lower critical I (0) values at 10 percent, 5 percent and 1 percent significantlevels and thus the null hypothesis of no co-integration is rejected, andthis implies that there is co-integration among the

Table 4.7: ARDL Co-integration results

Narayan (2005) critical values	10 %		5 %		1 %	
	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
	2.93	4.02	3.55	4.80	5.02	6.61
Pesaran, Shin & Smith (2001) critical values	2.72	3.77	3.23	4.35	4.29	5.61
F statistic	7.368					
K (3): no of independent variables – lnFDI, lnFA &lnFD1						

variables and therefore long run relationship among the variables. Output in Appendix 2, Table 7.

After the establishment of one co-integrating vector among the variables anARDL model was constructed as shown by equation (3.11) which is re-parameterized into an error correction model. The re-parameterized result gives the short run dynamics and long run relationship of the underlying variables.Therefore, the error correction model appreciates thefact that while in the long run variables can have a long run equilibrium relationship in the short run there could be some disequilibrium which the error correction model takes care of.

The next step was to determine the error correction model as represented by equations (3.12), (3.13), (3.14) and (3.15) in section 3.6.4 and for each equation diagnostic tests were carried out. The error correction results for the first equation (3.12) are shown in

Table 4.8 below. The short run and long run relationships are determined for economic growth as the dependent variable.

4.3.4 ARDL Error correction Model

4.3.4.1 Error correction results for equation 3.12

Table 4.8 below shows the findings for the error correction test for equation 3.12. The findings show long run (LR) relationship between lnFDI, lnFA and lnFD1 but the coefficients are insignificant except for lnFDI which is significant. This implies that there is insignificant effect of the TFP components –lnFA and lnFD1 on lnRGDP1 in the long run while lnFDI has a significant effect on lnRGDP1in the long run. lnFD1 has a negative effect on lnRGDP1 implying a 1% increase in lnFD1 results in a 181% decrease in lnRGDP1. lnFDI has a positive effect on lnRGDP1 which implies an increase in lnFDI by 1 percent results in an

Table 4.8: Error correction results for equation 3.12

D. lnRGDP1		**LR**	**SR**	**Diagnostic TestsResults**
ADJlnRGDP1				BG LM = 0.6190> 0.05
L1	-.91*** (0.00)			BP = 0.1045> 0.05
				MVIF = 1.66< 5
lnFDI		.081* (0.09)		SWILK = lnFA, lnFD1, lnRGDP1 < 0.05, lnFDI > 0.05
lnFA		-.036 (0.54)		
lnFD		-1.81 (0.75)		Ramsey Reset= 0.18> 0.05
Constant	6.25 (0.61)			Cusum squared test = parameter stability

No. of observations = 42
R-squared = .44
Adj R-squared = .38
Sample = 1974 -2015

*Note:***indicates significant at 1%.Numbers in parenthesis indicate p>t. BG LM =Breusch Godfrey langrange Multiplier test, BP = Breusch Pagan test, MVIF =Mean Variance Inflation Factor test, SWILK =Shapiro wilk test.**LR** = long run coefficients, **SR**= short run* *coefficients.**lnRGDP1** = Real Gross Domestic Product, **lnFDI** = Foreign Direct Investment, **lnFA** = Foreign Aid, **lnFD1** = Financial Development.*

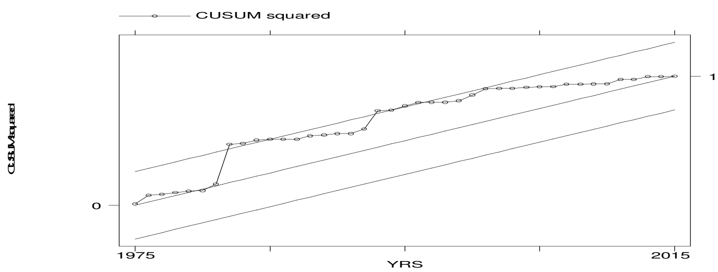
increase in lnRGDP1 by 8%, while lnFA has a negative effect onlnRGDP1 which implies an increase in lnFA by 1% results to a decrease inlnRGDP1 by 3%. Holding other factors constant the effect of TFP components on lnRGDP1 is 625 %. The variables do not present any disequilibrium caused by short run shocks of the previous period towards long run value. The adjusted lnRGDP1 represents the error correction term which isnegative and significant. This means that the dependent variable lnRGDP1 adjusts back to long run equilibrium following shocks in the short run. The coefficient (-.91) shows that a 1 percent increase in random shocks to equilibrium will lead to 0.91percent correction in the equilibrium. This shows the speed at 91percent at which there is adjustment of the model from short run to the long run.Output in Appendix 2, Table 8.

After the error correction test, an ARDL regression is run, Output in Appendix 2 Table 9and diagnostic tests are administered and the findings are as shown in Table 4.8 above. The model has passed the tests for autocorrelation, heteroscedasticity, and omitted variable bias where $p > 0.05$,and the null hypothesis is accepted, and no multicollinearity where MVIF < 5 and null hypothesis is accepted. There is normality using SWILK test in lnFDI where $p > 0.05$, while there is non-normality in lnRGDP1, lnFA and lnFD1 where $p < 0.05$. Output in Appendix 2, Table 10. Next, Figure 4.1 below shows the findings for the model stability diagnostic tests as shown by the Cusum squared test.

4.3.4.2Model Stability diagnostic test for equation 3.12

Figure 4.1 below shows the findings for the Cusum squared test. The model has passed the stability diagnostic test and this implies that there is parameter stability because the line generated is within the upper bound and lowerbound lines of 5 % significance level in the Cusum squared test.

Figure 4.1 Cusum squared test



After the diagnostic tests for equation 3.12, the next step was to administer the error correction test for equation 3.13 and the results are shown in Table 4.9 below.

4.3.4.3 Error correction results for equation 3.13

Table 4.9 below shows the error correction test for equation 3.13. Output in Appendix 2, Table 11.The findings show long run relationship between lnRGDP1, lnFA and lnFD1 but the coefficients are not significant implying that there is insignificant effect oflnRGDP1, lnFA and lnFD1 on lnFDI in the long run.lnFA has a positive effect on lnFDI implying an increase in lnFA by 1% results in an increase in lnFDI by 26percent. lnRGDP1 has a positive effect implying a 1% increase in lnRGDP1 results in 387percent increase in lnFDI. lnFD1 has a negative effect on lnFDI which implies an increase in lnFD1 by 1% results to a decrease in lnFDI by 456 percent. Holding all factors constant the effect of lnRGDP1, lnFA and lnFD1 on lnFDI is 481 per cent. The short run relationship represents the disequilibrium caused by short run shocks of the previous period towards long run value.1 % increase in lnFDI results in a decrease in lnFDI by 40% and significant at L2D,a decrease in lnFDI by 28% and insignificant at LD.1 % increase in lnRGDP1 results in a decrease in lnFDI by 109% and significant at D1 and 1% increase in lnFA results in an increase in lnFDI by 56% and significant at D1. The adjusted lnFDI represents the error correction term which is negative and significant. This means that the dependent variablelnFDI adjusts back to long run equilibrium following shocks in the short run. The coefficient (-.47) represents the speed

Table 4.9: Error correction results for equation 3.13

D. lnFDI		**LR**	**SR**	**Diagnostic Tests Results**
ADJ lnFDI				BG LM = 0.4045> 0.05
L1	-.47*			
	(0.10)			BP = 0.9535> 0.05
LD			-.28	
			(0.20)	MVIF = 3.54 < 5
L2D			-.40**	
			(0.02)	SWILK = lnFA, lnFD1, lnRGDP1 < 0.05, lnFDI > 0.05
				Ramsey Reset= 0.3413> 0.05
lnRGDP1		3.87		
		(0.15)		Cusum squared test = parameter stability
D1			-1.09**	
			(0.05)	
lnFA		.26		
		(0.59)		
D1			.56	
			(0.13)	
lnFD1		-45.67		
		(0.36)		
Constant	48.12			
	(0.35)			
No. of observations = 42				
R-squared = .61				
Adj R-squared = .52				
Sample = 1974 -2015				

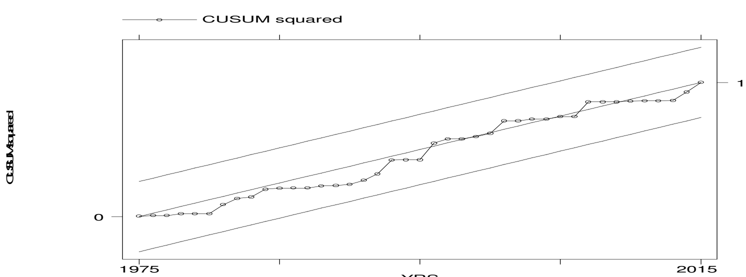
**** indicates significant at 1%, **indicates significant at 5%, *indicates significant at10%.Numbers in parenthesis indicate p>t. BG LM =Breusch Godfrey langrange Multiplier test, BP = Breusch Pagan test, MVIF =Mean Variance Inflation Factor test, SWILK =Shapiro wilk test.*****LR*** *=long run coefficients,* ***SR****= short run coefficients.****lnRGDP1*** *= Real Gross Domestic Product,* ***lnFDI*** *= Foreign Direct Investment,* ***lnFA*** *= Foreign Aid,* ***lnFD1*** *= Financial Development.*

at which there isadjustment of the model from short run to the long run at 47percent, and shows that a 1 percent increase in random shocks to equilibrium will lead to 0.47percent correction in the equilibrium.The co-integration results for the equation shows co-integration for only I (o) variables at 10 percent significance level. Output in Appendix 2, Table 12. After the error correction test, an ARDL regression is run, output in Appendix 2, Table 13, and diagnostic tests are administered and the findings are shown in Table 4.8 below.The findings show that the model has passed the tests for autocorrelation, heteroscedasticity, normality of residuals and omitted variable bias where $p > 0.05$ and null hypothesis is accepted and multicollinearity where MVIF < 5.Output in Appendix 2, Table 14. Next the findings for the model stability diagnostic tests are shown in Figure 4.2 below.

4.3.4.4: Model Stability diagnostic test for equation 3.13

Figure 4.2 below showsthe findings for the Cusum squared test. The model has passed the model stability diagnostic test and this implies that there is parameter stability because the line generated is within the upper bound and lower bound lines of 5 %significance level.

Figure 4.2 Cusum squared test



After the diagnostic tests for equation 3.13, next, an error correction test is administered for equation 3.14 to determine the short run and long run relationships as shown by Table 4.10 below.

4.3.4.5 Error correction results for equation 3.14

Table 4.10 below shows the findings forthe error correction test for equation 3.14. Output in Appendix 2, Table 15.The findings show long run relationship between lnRGDP1, lnFDI and lnFD1 and the coefficient for lnFDI is positive and significant implying a 1 percent increase

Table 4.10: Error correction results for equation 3.14

D. lnFA		**LR**	**SR**	**Diagnostic Tests Results**
ADJ lnFA				BG LM = 0.0352 < 0.05
L1	-.29*** (0.00)			DW (transformed) = 0.79 BP = 0.5892> 0.05
LD			.20* (0.06)	MVIF = 5.43 = 5 SWILK = lnFA, lnFD1,
L2D	.		.16* (0.06)	lnRGDP1 < 0.05, lnFDI > 0.05 Ramsey Reset= 0.0065 <0.05
lnRGDP1		-.206 (0.80)		Cusum squared test = parameter stability
D1		.	.68 (0.73)	
LD			0.28* (0.06)	
L2D			0.35*** (0.00)	
lnFDI		.814*** (0.00)		
D1			-.19** (0.02)	
LD			-.22*** (0.00)	
L2D			-.16** (0.02)	
L3D			-.077* (0.08)	
lnFD1		-42.96** (0.04)		
D1			42.69*** (0.00)	
Constant	31.44** (0.03)			
No. of observations = 42 R-squared = .90 Adj R-squared = .85 Sample = 1974 -2015				

**** indicates significant at 1%, **indicates significant at 5%, *indicates significant at 10%.Numbers in parenthesis indicate p>t. BG LM =Breusch Godfrey langrange Multiplier test, DW = Durbin Watson test, BP = Breusch Pagan test, MVIF =Mean Variance Inflation*

*Factor test, SWILK =Shapiro wilk test.**LR** =long run coefficients, **SR** =short run coefficients.**RGDP1** = Real Gross Domestic Product, **lnFDI** = Foreign Direct Investment, **lnFA** = Foreign Aid, **lnFD1** = Financial Development.*

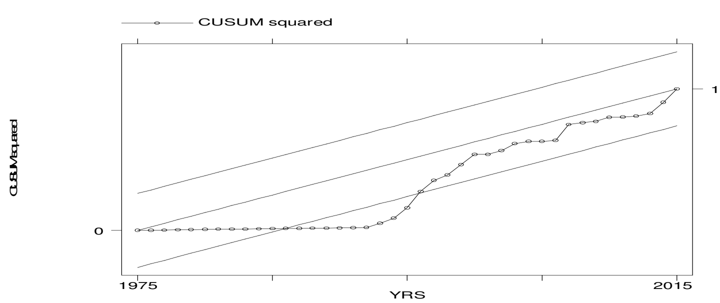
in lnFDI results in an increase in lnFA by 81 % in the long run. lnFD1 is negative and significant implying a 1% increase in lnFD1 results in a decrease in lnFA by 429%,also the coefficient for lnRGDP1 is insignificant but there is a positive effect implying a 1% increase in lnRGDP1 results in 20% decrease in lnFA. Holding all factors constant the effect of lnRGDP1, lnFDI, lnFD1 on lnFA is 314%. The short run relationship represents the disequilibrium caused by short run shocks of the previous period towards long run value. 1% increase in lnFA results in an increase in lnFA at 20% and significant at LD, an increase in lnFA by 16% at L2D and significant. 1% increase in lnRGDP1 results in an increase in lnFA by 6% at D1 and insignificant, increase in lnFA by 28% and significant at LD and increase in lnFA by35% at L2Dand significant. A 1% increase in lnFDI results in a decrease in lnFA by 19% at D1 and is significant, decrease in lnFA by 22% at LD and significant, decrease in lnFA by 16% and significant at L2D and decrease in lnFA by 7% and significant at L3D. 1 unit increase in lnFD1 results in an increase in lnFA by 426% at D1 and is significant. The adjusted lnFA represents the error correction term which is negative and significant. This means that the dependent variable lnFA adjusts back to long run equilibrium following shocks in the short run, and shows that a 1 percent increase in random shocks to equilibrium will lead to 0.29percent correction in the equilibrium. The coefficient (-.29) represents a low speed of 29percent at which there isadjustment of the model from short run to the long run.

After the error correction test an ARDL regression is run, Output in appendix 2, Table 17, and diagnostic tests are determined. The findings for the diagnostic tests are shown above in Table 4.10**.**The model has passed the tests for heteroscedasticity where $p > 0.05$ and null hypothesis is accepted,and no multicollinearity where MVIF = 5. There is normality in residuals in lnFDI where $p > 0.05$ and non-normality of residuals in lnRGDP1, lnFA and lnFD1 where $p < 0.05$ and there is presence of omitted variables bias in the model where $p < 0.05$ and null hypothesis is rejected. There is also presence of autocorrelation in the BG LM test where $p < 0.05$ and it is transformed using the DW statistic showing 0.79 which indicates positive autocorrelation since the value is closer to 0.Output is displayed in Appendix 2, Table 18. Next, the findings for the model stability diagnostic tests are shown in Figure 4.3 below.

4.3.4.6Model Stability diagnostic test for equation 3.14

Figure 4.3 below shows the findings of the Cusum squared test. The model has passed the model stability diagnostic test in the cusum squared test albeit some small deviation in the lower bound line.

Figure 4.3 Cusum squared test



After the diagnostic tests for equation 3.14, next, error correction results for equation 3.15 are shown in Table 4.11 below**.**

4.3.4.7 Error correctionresults for equation 3.15

Table 4.11 below shows the findings forthe error correction test for equation 3.15. Output is displayed in Appendix 2, Table 19.The findings show long run relationship between lnRGDP1, lnFDI and lnFA and none of the coefficients is significant implying there is insignificant effect of lnRGDP1, lnFDI and lnFA on lnFD1 in the long run. lnFA has a positive effect implying a 1% increase in lnFA results in an increase in lnFD1 by 1%. lnFDI has negative effect implying a 1 percent increase inlnFDI results in a decrease in lnFD1 by 1%, lnRGDP1 has a negative effect implying a 1% increase in lnRGDP1 results in 0.5% decrease in lnFD1. Holding all factors constant the effect of lnRGDP1, lnFDI, lnFA on lnFD1 is 33%. The short run relationship represents the disequilibrium caused by short run shocks of the previous period towards long run value. 1% increase in lnFDI results in an increase in lnFD1 by0.1% at D1 and insignificant, an increase in lnFD1 by 0.2% and significant at LD. 1% increase in lnFA results in an increase in lnFD1 by 1% and significant at D1, a decrease in lnFD1 by 0.3% and significant at LD. The adjustedlnFD1 represents

Table 4.11: Error correction results for equation 3.15

D. lnFD1		**LR**	**SR**	**Diagnostic Tests Results**
ADJ lnFD1	-.14 (0.27)			BG LM = 0.8126 > 0.05
				BP = 0.8133> 0.05
lnRGDP1				
D1		-.005 (0.78)		MVIF = 3.08< 5
				SWILK =
lnFDI		-.018 (0.33)		Ramsey Reset= 0.0021< 0.05
D1			.001 (0.20)	Cusum squared test = parameter stability
LD			**.**002*** (0.00)	
lnFA		.015 (0.45)		
D1			.014*** (0.00)	
LD			-.003* (0.10)	
constant	**.**33 (0.28)			
No. of observations = 42 R-squared = .84 Adj R-squared = .80 Sample = 1974 -2015				

*Note: *** indicates significant at 1%, ** indicates significant at 5% and * indicates significant at 10%.Numbers in parenthesis indicate p>t.BG LM =Breusch Godfrey langrange Multiplier test, BP = Breusch Pagan test, MVIF =Mean Variance Inflation Factor test,* *SWILK=Shapiro wilk test.**LR**=long run coefficients, **SR**=short run coefficients.**lnRGDP1** = Real Gross Domestic Product, **lnFDI** = Foreign Direct Investment, **lnFA** = Foreign Aid, **lnFD1** = Financial Development.*

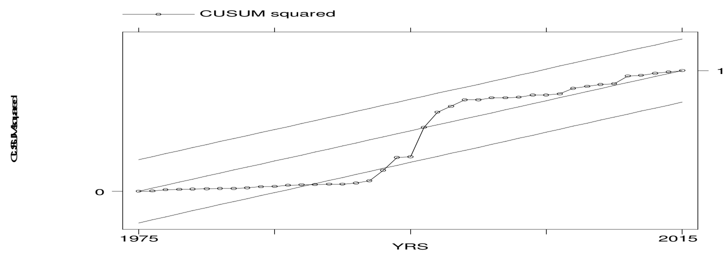
the error correction term which is negative and insignificant. This means that the dependent variable lnFD1 adjusts back to long run equilibrium following shocks in the short run, and shows that a 1 percent increase in random shocks to equilibrium will lead to 14 percent correction in the equilibrium. The coefficient (-.14) represents a speed of 14 percent at which there is adjustment of the model from short run to the long run.

After the error correction test, an ARDL regression is run, output is displayed in appendix 2 Table 21, and diagnostic tests are determined. Table 4.11 above shows the findings for the diagnostic tests.The model has passed the tests for autocorrelation, heteroscedasticity, andno multicollinearity MVIF < 5. There is normality of residuals in lnFDI where $p > 0.05$ and null hypothesis is accepted while there is non-normality in residuals in lnFD1, lnRGDP1 and lnFa where $p < 0.05$. There is also presence of omitted variable bias where $p < 0.05$ and null hypothesis is rejected. Output is displayed in Appendix 2, Table 22. The presence of the omitted variable bias is due to the limitation that while M3 the proxy for FD measures financial breadth, there are other proxies of Financial Development such as credit and monetary aggregates which account for broader country characteristics and were not taken into account. Next, the findings for the model stability diagnostic test are shown in Figure 4.4 below.

4.3.4.8 Model Stability diagnostic tests for equation 3.15

Figure 4.4 shows the findings for the Cusum squared test. The model has passed the model stability diagnostic test albeit some deviation in the lowerbound line.

Figure 4.4 Cusum squared test



After the ARDL bounds test approach, the next step was to determine a robustness check using the Johansen co-integration test (1990) and vector error correction model to check for consistency in the findings of ARDL bounds test approach with the findings of the Johansen co- integration test and VECM as shown in the next section 4.4.

4.4 Robustness check

The findings of the ARDL bounds test approach in section 4.3 were tested for robustness and consistency using the Johansen co integration test and VECM approach. The importance of the robustness check is to determine if there is any consistency in the findings of the ARDL bounds test approach and the findings of the Johansen co-integration and VECM approach. The first step is to determine the unit root results and ensure the variables are I (1) at first difference as shown in Table 4.12 below.

4.4.1 Unit root test

The findings in Table 4.12 below show that the variables are at first difference I (1) using the Phillips Perron (1988) test which allows for automatic correction to the Dickey fuller procedure for auto correlated residuals. RGDP1, lnFDI, FA and FD are I (1) first difference andthe results are similar to ARDL since the same test is used forboth models. Output is displayed in Appendix 2 Table 5.

Table 4.12: Unit root results

Vari	Phillips-Perron test

	Test statistic		Test critical values z (t)			
	Level	First difference	1 %	5 %	10 %	Mackinnon p value for z (t)
lnRGDP1	- 5.092	- 11.598	-3.621	-2.947	-2.607	0.0000
lnFDI	-3.380	- 11.365	-3.621	-2.947	-2.607	0.0000
lnFA	- 0.909	- 9.938	-3.621	-2.947	-2.607	0.0000
lnFD1	-3.958	-16.045	-3.621	-2.947	-2.607	0.0000

After the unit root test the next step is to determine the optimal lag length as shown in Table 4.13 below.

4.4.2 Optimal lag length Selection

Table 4.13: Optimal lag length selection

Sample 1974 - 2015		No. of observations 42		
lag	p	AIC	HQIC	SBIC
1	0.000	-3.53819*	-3.23489*	-2.71073*

*Note: *indicates significant*

The findings in Table 4.13 above show that AIC is the optimal lag length at lag 1. Output in Appendix 2, Table 23.It has the smallest value and gives efficient estimates and is a superior method. Hence, lag 1 is chosen as an optimal lag. However HQIC and SBIC are also significant. After the optimal lag length selection the next step is to determine co-integration and long run relationship using the Johansen co-integration technique which gives the number of co-integrating equations and their significant lag length as shown in Table 4.14 below.

4.4.3 Johansen Co-integration test

Table 4.14 below presents the findings of the Johansen co- integration test which shows 3 co-integrating equations at lag 1.Output in appendix 2 Table 24. The trace statistic is lower than the critical values at 5 percent significance level. The Schwarz Bayesian information criteria (SBIC) and Hannan Quinn information criteria (HQIC) give the significant coefficients.Thefindings show some consistency with the ARDL bounds test approach because the ARDLmodel would only be inappropriate if there were multiple co-integrating vectors.

Table 4.14: Johansen test for co-integration results

Johansen tests for co- integration						
Trend: constant		Number of obs = 45				
Sample: 1971 – 2015						Lags = 1
Maximum Rank	Parms	LL	Eigenvalue	Trace Statistic	5% Critical Value	
0	4	52.848008		88.5908	47.21	
1	11	73.241505	0.59602	47.8038	29.68	
2	16	86.646694	0.44887	20.9934	15.41	
3	19	97.073165	0.37086	0.1405*	3.76	
4	20	97.143412	0.00312			
Maximum Rank	Parms	LL	Eigenvalue	SBIC	HQIC	AIC
0	4	52.848008		-2.01043	-2.111155	-2.171023
1	11	73.241505	0.59602	-2.32466	-2.601654	-2.766289
2	16	86.646694	0.44887	-2.497484	-2.900384	-3.139853
3	19	97.073165	0.37086	-2.707105*	-3.185549*	-3.469918
4	20	97.143412	0.00312	-2.625635	-3.12926	-3.428596

*Note: *indicates significant*

After the Johansen co-integration test, the next step is to determine the short run coefficients and the error correction term using the Vector error Correction Model shown in Table 4.15 below.

4.4.4 Vector error correction model

The findings of the VECM in Table 4.15 below shows there is consistency in the results for both the ARDL model and VECM for RGDP1 where the co-integrating equation one has an error correction term with the value (-.91) for the ARDL model and (-.87) for the VECM. Output in Appendix 2, Table 25.

Table 4.15: Vector error correction model results

Vector Error-Correction Model					
Sample:1971 – 2015		No. of obs = 45	AIC = -3.469918		
HQIC = -3.185549					
SBIC = -2.707105					
Equation	Parms	RMSE	R-sq	Chi2	p > chi2
D_lnRGDP1	4	.299525	0.4519	33.80322	0.0000
D_ lnFDI	4	1.00257	0.4166	29.27304	0.0000
D_lnFA	4	.378495	0.4799	37.82477	0.0000
D_ lnFD1	4	.008119	0.4214	29.85771	0.0000
D_ lnRGDP1 Ce1 *L1* -.87***			D_ lnFDI Ce1 *L1* .0410		
Ce2 *L1*.060			Ce2 *L1* .144		
D_ lnFA Ce1 *L1* .093			D_ lnFD1 Ce1 *L1* -.004		
Ce2*L1*.079			Ce2 *L1* .030*		

***, ** and * indicates significant at 1%, 5% and 10% respectively

After determining the short run coefficients and error correction term, the next step was to carry out the post estimation tests as shown in section 4.4.5 below. This includes the normality test, serial correlation test, impulse response functions and predicted co-integrating equation.

4.4.5 Post estimation tests

4.4.5.1 Normality of residuals

The normality of residuals is tested using the Jarque-bera test, skewness test and kurtosis test. The findings on Table 4.16 show normality of the residuals for the other variables except for lnRGDP1 which shows non-normality in the Jarque-bera test, skewness test and kurtosis test where $p < 0.05$. Output is displayed in Appendix 1 Table 26.The Langrange multiplier test is used to test for serial auto correlation. The findings in Table 4.17 show that the $p > 0.05$ therefore the null hypothesis of no autocorrelation at lag order is accepted. Output is displayed in Appendix 1 Table 27.

Table 4.16: Normality test results and serial correlation results

Variable	**Jarque-Bera test Prob > chi2**	**Skewness test Prob > chi2**	**Kurtosis test Prob > chi2**	**Langrange-Multiplier test**	
				Lag	**Prob > chi2**
D_lnRGDP1	0.00000	0.00004	0.000000	1	0.75352
D_ lnFDI	0.52610	0.55806	0.33191	2	0.52467
D_lnFA	0.38901	0.21064	0.57084		
D_lnFD1	0.36352	0.44876	0.22852		
ALL	0.00000	0.00071	0.00000		

The next step in the post estimations test is to estimate the impulse response functions as shown in Table 4.17 below.

4.5.5.3 Estimating Impulse response functions

Table 4.17 shows the findings of the impulse response functions which were estimated by setting 13 as the forecast horizon.The values represent the effect of the variables on themselves and on other variables from period zero to 13 as shown below.

Table 4.17: Impulse Response functions results

step	(1) oirf	(2) oirf	(3) oirf	(4) oirf	(5) oirf	(6) oirf	(7) oirf	(8) oirf	(9) oirf	(10) oirf
0	.299522	.102803	-.06406	-.001566	0	.997289	.159391	.001812	0	0
1	.061407	.334746	.038979	-.000943	.037232	.236995	.139332	.001384	-.070579	-.136256
2	.035073	.189621	.091189	-.000192	.000494	.08287	.08103	.00006	-.024286	-.102431
3	.013781	.114966	.091692	-.000329	.001039	.043716	.064446	-.000253	-.008776	-.04347
4	.007758	.082008	.088468	-.000433	.0023	.041148	.059118	-.000344	-.002288	-.014783
5	.006078	.07113	.086218	-.000488	.003364	.043522	.057999	-.000358	-.000413	-.003859
6	.005796	.068227	.085263	-.000508	.003816	.045277	.057896	-.000357	.000021	-.000556
7	.005807	.067708	.084938	-.000514	.003973	.046056	.057961	-.000354	.000068	.00021
8	.005846	.067719	.084851	-.000515	.004016	.046328	.058012	-.000353	.000048	.0003
9	.005868	.067783	.084835	-.000515	.004025	.046403	.058034	-.000353	.000031	.000269
10	.005877	.06782	.084835	-.000515	.004025	.046418	.058042	-.000352	.000023	.00024
11	.005879	.067835	.084836	-.000515	.004024	.046419	.058045	-.000352	.00002	.000227
12	.00588	.06784	.084838	-.000515	.004023	.046418	.058045	-.000352	.000019	.000222
13	.00588	.067842	.084838	-.000515	.004023	.046417	.058045	-.000352	.000019	.00022

step	(11) oirf	(12) oirf	(13) oirf	(14) oirf	(15) oirf	(16) oirf
0	.337268	.006141	0	0	0	.004741
1	.053173	.000517	-.043179	-.182366	-.150761	.001685
2	.005226	-.000085	-.025384	-.195397	-.183248	.001188
3	-.00391	-.000143	-.017977	-.173458	-.190747	.001101
4	-.002625	-.000073	-.01458	-.160021	-.191052	.001119
5	-.001011	-.000029	-.013484	-.154296	-.190468	.001138
6	-.000169	-.00001	-.013193	-.152382	-.190078	.001147
7	.000152	-3.6e-06	-.013143	-.151873	-.18991	.001151
8	.000251	-1.9e-06	-.013145	-.151781	-.189854	.001152
9	.000274	-1.6e-06	-.013152	-.151783	-.189838	.001152
10	.000277	-1.6e-06	-.013155	-.151794	-.189835	.001152
11	.000276	-1.6e-06	-.013157	-.1518	-.189835	.001152
12	.000276	-1.7e-06	-.013157	-.151803	-.189836	.001152
13	.000275	-1.7e-06	-.013158	-.151804	-.189836	.001152

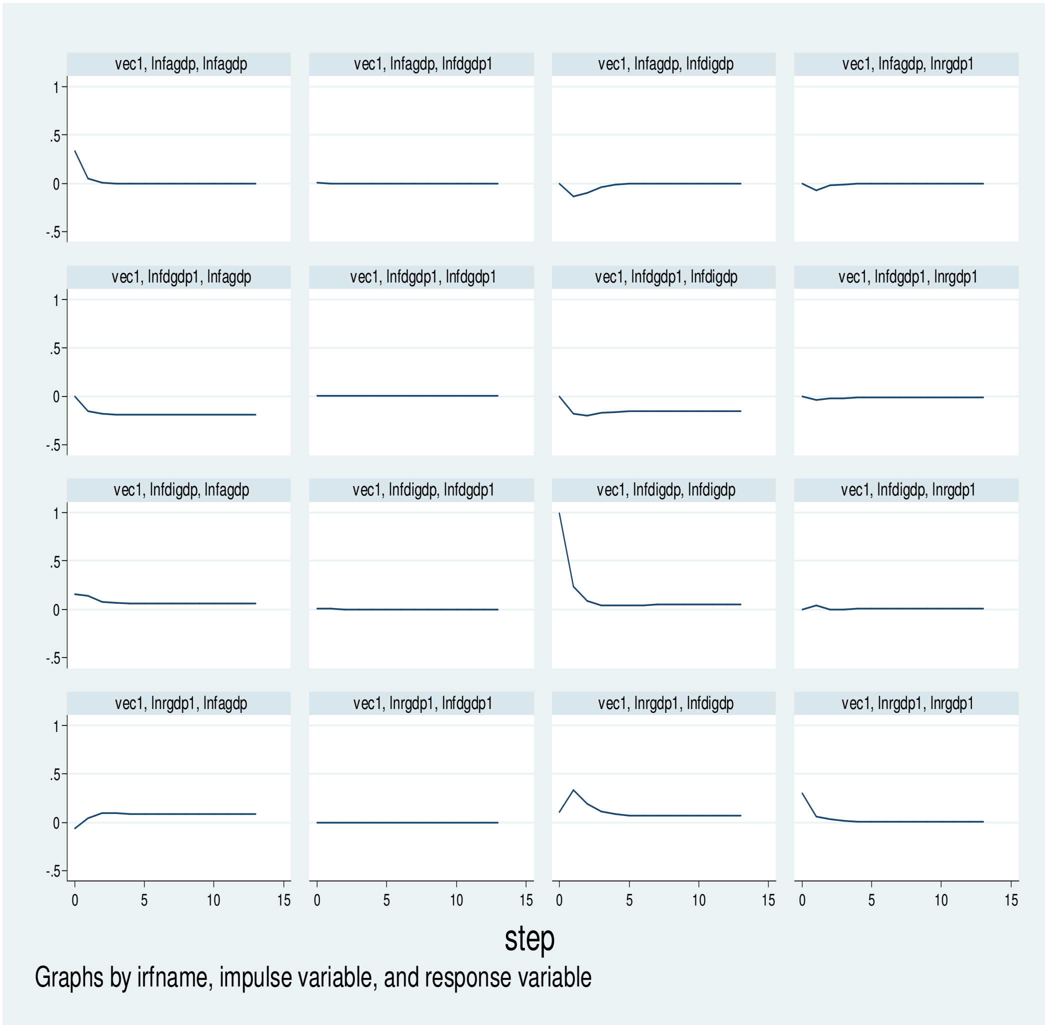
```
(1) irfname = vec1, impulse = lnrgdp1, and response = lnrgdp1
(2) irfname = vec1, impulse = lnrgdp1, and response = lnfdigdp
(3) irfname = vec1, impulse = lnrgdp1, and response = lnfagdp
(4) irfname = vec1, impulse = lnrgdp1, and response = lnfdgdp1
(5) irfname = vec1, impulse = lnfdigdp, and response = lnrgdp1
(6) irfname = vec1, impulse = lnfdigdp, and response = lnfdigdp
(7) irfname = vec1, impulse = lnfdigdp, and response = lnfagdp
(8) irfname = vec1, impulse = lnfdigdp, and response = lnfdgdp1
(9) irfname = vec1, impulse = lnfagdp, and response = lnrgdp1
(10) irfname = vec1, impulse = lnfagdp, and response = lnfdigdp
(11) irfname = vec1, impulse = lnfagdp, and response = lnfagdp
(12) irfname = vec1, impulse = lnfagdp, and response = lnfdgdp1
(13) irfname = vec1, impulse = lnfdgdp1, and response = lnrgdp1
(14) irfname = vec1, impulse = lnfdgdp1, and response = lnfdigdp
(15) irfname = vec1, impulse = lnfdgdp1, and response = lnfagdp
(16) irfname = vec1, impulse = lnfdgdp1, and response = lnfdgdp1
```

The next step in the post estimations test is to graph the orthogonalized impulse response functions as shown in Figure 4.5 below.

4.4.5.4 Orthogonalized impulse response functions

Figure 4.5 below shows the findings for the orthogonalized impulse response functions. The effect of lnRGDP1 on lnFDIshows presence of significant and transitory shocks from period 0 to 3 beyond which at period 4the shocks become permanent and insignificant, whilethe effect of lnRGDP1 on lnFA, lnFD1 is permanent and insignificantfrom period 0 to 13.However,the effect of lnFD1shocks on itself, lnFA, lnFDI, and lnRGDP1 is insignificant and permanent fromperiod 0to 13and therefore exhibits permanent shocks for all periods.Likewise, the effect of lnFA shocks on itself, lnFD1, lnFDI and lnRGDP1 is insignificantandpermanentfromperiod 0 to 13 and therefore exhibits permanent shocks for all periods. The effect of lnFDI shockson itself, lnFD1, lnFA is insignificant and permanent from period 0 to 13 and therefore exhibits permanent shocks for all periods, while the effect of lnFDI on lnRGDP1 shows presence of transitory shocks from period 0 to 2.

Figure 4.5: Orthogonalized impulse response functions results

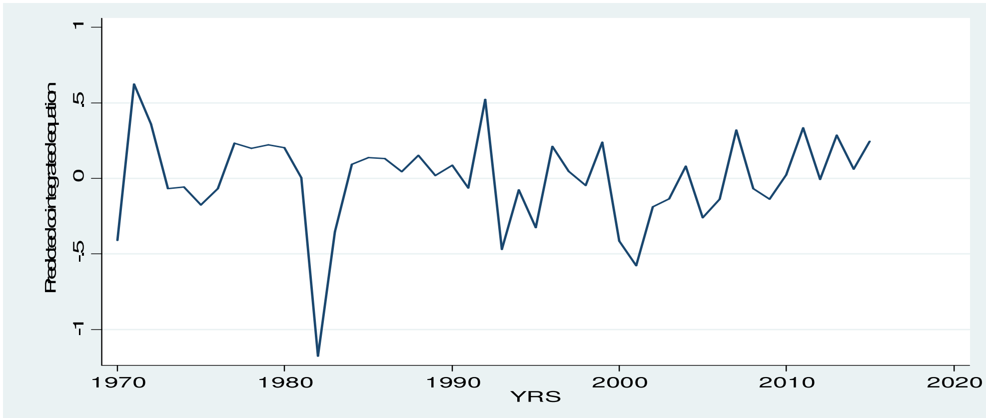


After the impulse response functions the next step in the post estimations test is to graph the predicted values of the co-integrating equations as shown in Figure 4.6 below.

4.4.5.6 Graph of the predicted values of co-integrating equation

The graph for the predicted values as shown on Figure 4.6 above show that the model is stable, and has the characteristics of a stationary series.

Figure 4.6: Graph of predicted values of co-integrating equations



After the robustness check and post estimation tests the model is fitted in the next section 4.5.

4.5 Model fitting

The ECM was represented by equations which are fitted as follows;

Equation in (3.12) was presented as follows;

$\Delta \text{LnGDP}_t = \varphi_0 + \sum_{i=1}^{k} \varphi_i \, \Delta \text{LnGDP}_{t-1} + \sum_{i=0}^{k} \beta_i \, \Delta \text{LnFDI}_{t-1} + \sum_{i=0}^{k} o_i \, \Delta \text{LnFA}_{t-1} + \sum_{i=1}^{k} \phi_i \, \Delta \text{Ln}$

$\text{FD}_{t-1} + \delta ECT_{it-1} + u_{1t}$ ……………………………………………………………….

(3.12)

The fitted equation is as follows for the short run and long run coefficients and ECT;

$\text{lnRGDP1}_t = 6.25 + 0.08_{\text{lnFDI}} - 0.03_{\text{lnFA}} - 1.81_{\text{lnFD1}} - 0.91_{\text{lnRGDP1}}$…………………….. (4.12)

Holding other factors constant the effect of TFP components on lnRGDP1 is 625 %. The variables do not present any disequilibrium caused by short run shocks of the previous period towards long run value. The long run coefficients show that lnFD1 has a negative effect on lnRGDP1 implying a 1% increase in lnFD1 results in a 181% decrease in lnRGDP1. lnFDI has a positive effect on lnRGDP1 which implies an increase in lnFDI by 1 percent results in an increase in lnRGDP1 by 8%, while lnFA has a negative effect onlnRGDP1 which implies an increase in lnFA by 1% results to a decrease inlnRGDP1 by 3%. The error correction term (ECT) isnegative and significant (-.91). This means that the dependent variable lnRGDP1 adjusts back to long run equilibrium following shocks in the short run and shows that a 1 percent increase in random shocks to equilibrium will lead to 0.91 percent correction in the equilibrium. This shows the speed at 91 percent at which there is adjustment of the model from short run to the long run.

Equation 3.13 was represented as follows;

$\Delta\text{LnFDI}_t = \phi_0 + \sum_{i=1}^{k} \phi_i\ \Delta\text{LnFDI}_{t-1} + \sum_{i=0}^{k} \tau_i\ \Delta\text{LnGDP}_{t-1} + \sum_{i=0}^{k} \pi_i\ \Delta\text{LnFA}_{t-1} + \sum_{i=1}^{k} \phi_i\ \Delta\text{Ln}$
$\text{FD}_{t-1} + \alpha_i ECT_{it-1} + u_{2t}$ .... (3.13)

The fitted equation is as follows for the short run and long run coefficients and ECT;

$\text{LnFDI}_t = 48.12 - 0.40_{\text{lnFDI}} - 0.28_{\text{lnFDI}} - 1.09_{\text{lnRGDP1}} + 0.56_{\text{lnFA}} + 3.87_{\text{lnRGDP1}} +$
$0.26_{\text{lnFA}} - 45.67_{\text{lnFD1}} - 0.47_{\text{lnFDI}}$ .... (4.13)

Holding all factors constant the effect of lnRGDP1, lnFA and lnFD1 on lnFDI is 481 per cent. The short run relationship represents the disequilibrium caused by short run shocks of the previous period towards long run value.1 % increase in lnFDI results in a decrease in lnFDI by 40% and significant at L2D, a decrease in lnFDI by 28% and insignificant at LD.1 % increase in lnRGDP1 results in a decrease in lnFDI by 109% and significant at D1 and 1% increase in lnFA results in an increase in lnFDI by 56% and significant at D1. The long run coefficients show that lnFA has a positive effect on lnFDI implying an increase in lnFA by 1% results in an increase in lnFDI by 26 percent. lnRGDP1 has a positive effect implying a 1% increase in lnRGDP1 results in 387 percent increase in lnFDI. lnFD1 has a negative effect on lnFDI which implies an increase in lnFD1 by 1% results to a decrease in lnFDI by 456 percent. The error correction term (ECT) is negative and significant (-0.47)and shows that a 1 percent increase in random shocks to equilibrium will lead to 0.47 percent correction in the equilibrium.This represents the speedat which there isadjustment of the model from short run to the long run.

Equation 3.14 was presented as follows;

ΔLnFA$_t$=ϕ_0+$\sum_{i=1}^{k} \phi_i$ ΔLnFA$_{t-1}$+$\sum_{i=0}^{k} \tau_i$ ΔLnGDP$_{t-1}$+$\sum_{i=1}^{k} \pi_i$ ΔLnFDI$_{t-1}$+$\sum_{i=1}^{k} \phi_i$ ΔLn FD$_{t-1}$+ $\alpha_i ECT_{it-1} + u_{3t}$ …………………………………………………………… (3.14)

The fitted equation is as followsfor the short run and long run coefficients and ECT;

lnFA$_t$ = 31.44 + 0.20_{lnFA}+0.16_{lnFA} + 0.06_{lnRGDP1} + 0.28_{lnRGDP1}+0.35_{lnRGDP1}- 0.19_{lnFDI}- 0.22_{lnFDI} - 0.16_{lnFDI} - 0.07_{lnFDI} +42.69_{lnFD1}–0.29_{lnFA} ……….......... (4.14)

Holding all factors constant the effect of lnRGDP1, lnFDI, lnFD1 on lnFA is 314%.The short run relationship represents the disequilibrium caused by short run shocks of the previous period towards long run value. 1% increase in lnFA results in an increase in lnFA at 20% and significant at LD, an increase in lnFA by 16% at L2D and significant. 1% increase in lnRGDP1 results in an increase in lnFA by 6% at D1 and insignificant, increase in lnFA by 28% and significant at LD and increase in lnFA by35% at L2Dand significant. A 1% increase in lnFDI results in a decrease in lnFA by 19% at D1 and is significant, decrease in lnFA by 22% at LD and significant, decrease in lnFA by 16% and significant at L2D and decrease in lnFA by 7% and significant at L3D. 1 unit increase in lnFD1 results in an increase in lnFA by 426% at D1 and is significant. The long run coefficients show that 1% increase in lnFDI results in an increase in lnFA by 81 % in the long run. lnFD1 is negative and significant implying a 1% increase in lnFD1 results in a decrease in lnFA by 429%,also the coefficient for lnRGDP1 is insignificant but there is a positive effect implying a 1% increase in lnRGDP1 results in 20% decrease in lnFA. The error correction term is negative and significant shows that a 1 percent increase in random shocks to equilibrium will lead to 0.29 percent correction in the equilibrium. This represents a low speed of 29 percent at which there isadjustment of the model from short run to the long run.

Equation 3.15 was presented as follows;

$\Delta \text{LnFD}_t = \phi_0 + \sum_{i=1}^{k} \phi_i \ \Delta \text{LnFD}_{t-1} + \sum_{i=0}^{k} \tau_i \ \Delta \text{LnGDP}_{t-1} + \sum_{i=1}^{k} \pi_i \ \Delta \text{LnFDI}_{t-1} + \sum_{i=1}^{k} \phi_i \ \Delta \text{Ln}$ $\text{FA}_{t-1} + \alpha_i ECT_{it-1} + u_{4t}$ ………………………………………………………… (3.15)

The fitted equation is as followsfor the short run and long run coefficients and ECT;

$\text{lnFD1}_t = 0.33 - 0.01_{\text{lnFA}} - 0.003_{\text{lnFA}} + 0.002_{\text{lnFDI}} + 0.001_{\text{lnFDI}} - 0.005_{\text{lnRGDP1}} - 0.01_{\text{lnFDI}} + 0.01_{\text{lnFA}} - 0.14_{\text{lnFD1}}$ ………………………………………………………… (4.15)

Holding all factors constant the effect of lnRGDP1, lnFDI, lnFA on lnFD1 is 33%. The short run relationship represents the disequilibrium caused by short run shocks of the previous period towards long run value. 1% increase in lnFDI results in an increase in lnFD1 by0.1% at D1 and insignificant, an increase in lnFD1 by 0.2% and significant at LD. 1% increase in lnFA results in an increase in lnFD1 by 1% and significant at D1, a decrease in lnFD1 by 0.3% and significant at LD. The long run coefficients show that lnFA has a positive effect implying a 1% increase in lnFA results in an increase in lnFD1 by 1%. lnFDI has negative effect implying a 1 percent increase inlnFDI results in a decrease in lnFD1 by 1%, lnRGDP1 has a negative effect implying a 1% increase in lnRGDP1 results in 0.5% decrease in lnFD1. The error correction term (ECT) is negative and insignificant and shows that a 1 percent increase in random shocks to equilibrium will lead to 0.14 percent correction in the equilibrium. This represents a speed of 14 percent at which there is adjustment of the model from short run to the long run.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of the findings, conclusions, recommendations for policy action and recommendations for future research.

5.2 Summary

The main objective of the study was to build a model to explain the effect of TFP on economic growth in Kenya. To achieve the objective time series data was compiled for the period 1970-2015 and an ARDL bounds test approach was used to estimate the short run and long run relationships to explain the effect of TFP on economic growth using the components Foreign Direct Investment, Foreign Aid and Financial Development.

5.2.1 Foreign Direct Investment

The first specific objective was to determine the effect of foreign direct investment on economic growth in Kenya. The findings show that Foreign Direct Investment has a positive and significant effect on economic growth.This implies an increase in Foreign Direct Investment by 1 percent results in an increase in economic growth by 8% in the long run. This finding rejects the null hypothesis that foreign direct investment has no effect on economic growth. The short run relationshipwhen Foreign Direct Investment is the dependent variable shows significant effects of Foreign Direct Investment on itself, and there are significant effects from economic growth.

The findings are similar toBorensztein et al (1998); Balasubramanyan et al (1996); & Bengoa et al (2003) who find that lnFDI has a significant positive effect on economic growth. Also Bende et al (2001) show that the impact of FDI on economic growth is positively signed and significant for Indonesia, Malaysia and Phillipines, while they identify a negative relationship for Singapore and Thailand.

The findings are also similar to Marwah and Tavakoli (2004) who find that FDI has a positive correlation with economic growth for all four countries and thus is similar to the finding of positive and significant correlation between FDI and economic growth in Kenya.In view of the findings the Eclectic paradigm theory of Professor Dunning (1988) partially explains the effect of the Ownership-Localisation and Internalisation advantages of Foreign Direct Investment as a component of TFP on economic growth in Kenya.

5.2.2 Foreign Aid

The second specific objective was to assess the effect of foreign aid on economic growth in Kenya. The findings show that foreign aid has a negative effect on economic growth but insignificant. This implies an increase in Foreign Aid by 1% results to a decrease in economic growth by 3% in the long run. This finding accepts the null hypothesis that foreign aid has no effect on economic growth. However,the short run relationship when Foreign aid is the dependent variable shows that Foreign Aid has a significant effect on itself and there are significant effects from Economic Growth, Foreign Direct Investment and Financial Development.

The findings are not similar to Nachega and Fontaine (2006) who finds that foreign aid has a positive and significant effect on economic growth in Niger. Also the findings though not similar can be explained by the findings of Chenery and Carter (1973) who looked at the effect of Foreign Aidon development performance over the period 1960-1970 for a group of developing countries Kenya included for the period 1962-1975 by determining aid requirements as a function of growth objectives and domestic performance, Findings indicated that unsuccessful development led to a reduction in the aid supplied. Therefore, although the total supply of public funds for external assistance can be given, its distribution depends both on donor policy and on performance of recipients. In view of the findings the two-gap model explains the negative effect of FAas a component of TFP on economic growth in Kenya.

5.2.3 Financial Development

The third specific objective was to evaluate the effect of Financial Development on economic growth in Kenya. The findings show that Financial Development has a negative effect on economic growth but insignificant.Financial Development has a negative effect on economic growth implying a 1% increase in Financial Development results in 181% decrease in economic growth in the long run. This finding accepts the null hypothesis that Financial Developmenthas no effect on economic growth. The short run relationship when Financial Development is the dependent variable shows that Financial Development hasinsignificant effects on itself, however there are significant effects from Foreign Aid and Foreign Direct Investment.

The findings show there is a negative and insignificant effect between Financial Development and economic growth which is not similar to the findings of Nachega and Fontaine (2006) who finds that Financial Development has a positive and significant effect on economic growth. Goldsmith (1969) reports a correlation between Financial Development and economic activity. Ram (1999) finds a positive association between financial factors and economic development only for high growth countries. It can be noted that from the findings the proxy for Financial Development M3 has a negative effect on economic growth. According toBenhabib and Spiegel (2000) there are other proxies which are credit and monetary aggregates which if included can proxy for broader country characteristics, In view of the findings the Mckinnon and Shaw complementarity theorycan be taken to explain the negative effect of Financial Developmentas a component of TFP on economic growth in

Kenya since it found mixed empirical support and could not explain the sustained increases in the growth rate of an economy.

5.3 Conclusions

One of the challenges of economic growth in Kenya as stated by the Economic Recovery and Strategy Paper for Wealth and Employment Creation (ERSPWEC) 2003-2007 is promoting efficiency by reversing the declining trend of TFP and raising it to a minimum level of 2.5 percent in order to achieve the vision 2030 targets. The trend of annual average growth rates of TFP in Figure 1.1 also show the low levels and the findings in this study show that the TFP components of Foreign Aid and Financial Development have insignificant effects on economic growth and the null hypotheses are accepted, However, Foreign Direct Investment has significant effect on Economic Growth and the null hypothesis is rejected. This study concurs with the findings of Kalio, Mutenyo and Owuor (2012) and supports the earlier view thatTFP growth has not been a significant factor in the observed aggregate performance in Kenya. However, the ECTs for Economic Growth, Foreign Direct Investment and Foreign Aid have negative and statistically significant coefficients implying long run causal relationship and therefore multidirectional causality between the variables, while the ECT for Financial Development is insignificant and this implies there is unidirectional causality between Financial development and Economic Growth, Foreign Direct Investment and Foreign Aid.

5.3.1 Foreign Direct Investment

The first specific objective's findings show that Foreign Direct Investment has a positive effect on economic growth and significant, thus rejecting the null hypothesis of foreign Direct Investment has no effect on economic growth in Kenya in the long run.However, the short run relationship shows significant effects of Foreign Direct Investment on itself, and there are significant effects from economic growth.

It can also be noted that from the findings that Foreign Direct Investment does not seem to have significant shocks on itself and on Economic growth, Foreign Aid and Financial Development, this can be concluded to be due to the stimulating effects of lower oil prices and accomodating monetary policy, and continued investment liberalization and promotion measures (World Bank, 2016). However, there are high transaction costs to businesses which seem to trade off the positive effects. The effect of the Ownership-Localisation and Internalisation advantages of Foreign Direct Investment on economic growth in Kenya have not yet reached their full potential this could be due to weak absorptive capacity in terms of physical and human capital whereby competition of new advanced methods stifle the domestic industries thus protectionist policy measures are enacted to protect domestic industries.

In terms of ownership advantages, according to Parente and Prescott (1996) there is limited use of foreign technology licenses and therefore there are major challenges in the generation, acquisition and absorption of technological capacity and therefore TFP has suffered on this account and this limits the realisation of competitive advantages and intangible assets in the form of intellectual properties, technology, copyrights, brand name, and patents. In terms of localisation advantages the challenge arises from common and specific political and government policies that affect FDI inflows.

5.3.2 Foreign Aid

The second specific objective's findingsshow that Foreign Aid has a negative effect on economic growth but insignificant, thus accepting the null hypothesis that foreign aid has no effect on economic growth in Kenya in the long run.However,the short run relationship shows that Foreign Aid has a significant effect on itself and there are significant effects from Economic Growth, Foreign Direct Investment and Financial Development.

The effect of Foreign Aid shocks on itself, economic growth, Foreign Direct Investment and Financial Development is insignificant and that there is presence of permanent shocks from period 0 to 13. The effect of the shocks can be concluded to be from regulatory and structural impediments that hinder the growth of TFP in the economy. It is also evident that earlier structural adjustment programmes under the Bretton Woods Institutions and other donors in the 1990s that were meant to aid economic recovery failed (African Economic Outlook, 2016).

From the findings of Chenery and Carter (1973) which indicated that unsuccessful development led to a reduction in the aid supplied and that the distribution of Aid depends both on donor policy and on performance of recipients. It is worth noting that Kenya has been ranking highly in the corruption index, and this has hampered its development efforts and its ties with development partners (ERSPWEC, 2003-2007).

5.3.3Financial Development

The third specific objective's findingsshow that Financial Development has a negative effect on economic growth but insignificant, thus accepting the null hypothesis that Financial Developmenthas no effect on economic growthin Kenya in the long run.However, the short run relationship shows that Financial Development has significant effects from Foreign Aid and Foreign Direct Investment.

It can also be noted from the findings that Financial Development showed the effect of insignificant and permanent shocks for all periods on itself, economic growth, Foreign Direct Investment and Foreign Aid.The effect of permanent shocks can be concluded to be the effects of fragmented goods and capital markets which prevents the leveraging of cross-border investment opportunities (African economic Outlook, 2016)and also weak financial systems which can cause negative effect on growth on the economy due to the microeconomic rationale that weak financial systems cause the existence of frictions in the trading system.

The effects of financial liberalization can also be attributed to the negative effect of Financial Development on economic growth as argued by neostructuralists who criticized the McKinnon-Shaw school and predicted that financial liberalization would slow down growth. However,It can be noted that due to the limitation that credit and monetary aggregates were not included as proxies for Financial Development and thus if included can proxy for broader country characteristics and thus eliminate the negative effects of Financial Development on economic growth.

In conclusion the findings revealed that there was multidirectional causality among Economic Growth, foreign Direct Investment, and Foreign Aid, and unidirectional causality with Financial Development and this implies that the variables are interdependent on each other since they have significant effects on each other as evidenced in the short run relationships, and thus any policy action to mitigate the shocks in one variable must also accompany policy actions in the other variables for TFP to have a significant effect on economic growth in Kenya.

5.4 Recommendations for policy action

To mitigate the declining levels of TFP and also to realise significant effect of TFP components of Foreign Aid and Financial Development on economic growth, the following policy actions are recommendedin addition to the ones proposed by the ERSPWEC 2003-2007 which are adoption of technology, improving governance and reducing transaction costs to businesses to counter the challenges as revealed by the conclusions.

5.4.1 Foreign Direct Investment

Thefindings and conclusion stated thatforeign direct investment has effect on economic growth in Kenya and this is evidenced by the rising trends of Foreign Direct Investment due to the stimulating effects of lower oil prices and accommodating monetary policy, and continued investment liberalization measures as stated by the African Economic Outlook (2016), however, the shocks to Foreign Direct Investment are still evidenced in the high transaction costs to business and weak absorptive capacity in terms of physical and human capital. The first policy action by the ERSPWEC 2003-2007 states that reducing transaction costs to businesses will enableto attract foreign direct investment, also in the same line simplifying of business rules and regulations and harmonizing competition law and sectoral regulatory law will also enable to reverse the declining trend in TFP growth.

The second proposed policy action is the improvement of policies for the adoption of technology such as the adoption of information and communication technology in government and education institutions in order to promote physical, human and TFP growth. This will help to alleviate the weak absorptive capacity in the business environment. TFP growth is unlikely to be achieved without investments in physical and human capital, which in turn facilitates the adoption of new technology, thus this will also alleviate the problem of limited adoption of foreign technology licences as cited by Parente and Prescott (1996) and thus reverse the declining trend of TFP growth.

5.4.2 Foreign Aid

The findings and conclusions stated that Foreign Aid has no effect on economic growth in Kenya and this has been attributed to the permanent shocks due to structural and regulatory impediments that hampered the success of the structural adjustment programmes in the 1990s. Thus the third proposed policy action is theaccelerating of economic and structural reforms as outlined under the ERSPWEC 2003-2007 in order to increase the efficiency of both physical and human capital and raise TFP.(Republic of Kenya, 2003)

The findings also stated hampered ties with development partners due to Kenya ranking highly in the Corruption Index, thus the fourth proposed policy action is improving governance through institutional reforms in both public and private sector and reinforcing the powers of agencies such as Ethics and Anti- Corruption Commission (EACC) to oversee corruption and economic crimes as this will in turn reinforce the stability of institutions which has been hampered by corruption practices.

5.4.3 Financial Development

The findings and conclusions stated that Financial Developmenthas no effect on economic growth in Kenya and this can be the effect of permanent shocks due to fragmented goods and capital markets which prevents the leveraging of cross-border investment opportunities (African economic Outlook, 2016)and also weak financial systems which can cause negative effect on growth in the economy due to the microeconomic rationale that weak financial systems cause the existence of frictions in the trading system. Therefore, the fifth proposed policy action is to strengthen financial systems to world class levels through financial sector reforms and this will raise the level of savings and investments. This is because financial systems play a role in the growth process because they provide funding for capital accumulation and diffusion of new technologies, and also in a world where writing, issuing and enforcing contracts consumes resources and also where information is asymmetric and its acquisition is costly, properly functioning financial systems can reduce the information and transaction costs and in the process savers and investors are brought together more efficiently, and ultimately economic growth is affected (Issakson, 2007).

5.5 Limitations of the study and Recommendations for future research

The researcher encountered a literature gap on effect of TFP on economic Growth, since few if not no research has been done in Kenya employing the ARDL bounds test of co integration and also the research was limited to the TFP components of Foreign Direct Investment, Foreign Aid and Financial Development, thus a recommended area for future research is the effect of other TFP components on Economic growth such as trade and stability of institutions or relationship of TFP components with economic growth.

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APPENDIX I: DATA COLLECTION TEMPLATE

YRS	FDI/GDP	FA/GDP	FD/GDP	RGDP1	RGDP
1975	44.28	464.12	0.19	18.91	-1.093
1976	117.14	548	0.23	20.15	0.147
1977	130.5	520.76	0.31	24.89	4.886
1978	74.29	701.51	0.34	23.26	3.2608
1979	159.59	852.96	0.34	23.82	3.81575
1980	150.03	987.14	0.34	23.36	3.36352

APPENDIX II: DATA ANALYSIS FINDINGS

Table 1

Variable	Obs	Mean	Std. Dev.	Min	Max
rgdp	46	-.0637272	6.190081	-14.11769	24.423
fdigdp	46	30188.59	38645.99	516.87	159593.3
fagdp	46	340609.9	291470.3	20413.3	987139.1
fdgdp	46	.3358696	.1055478	.05	.51

Table 2

Variable	Obs	Mean	Std. Dev.	Min	Max
lnrgdp1	46	2.946034	.3172916	1.771557	3.79369
lnfdigdp	46	9.543804	1.375616	6.247791	11.98038
lnfagdp	46	12.23658	1.107968	9.923942	13.80257
lnfdgdp	46	-1.162565	.4348038	-2.995732	-.6733446

Table 3

Variable	Obs	Mean	Std. Dev.	Min	Max
lnrgdp1	46	2.946034	.3172916	1.771557	3.79369
lnfdigdp	46	9.543804	1.375616	6.247791	11.98038
lnfagdp	46	12.23658	1.107968	9.923942	13.80257
lnfdgdp1	46	2.335569	.0102469	2.307573	2.352327

Table 4

	lnrgdp1	lnfdigdp	lnfagdp	lnfdgdp1
lnrgdp1	1.0000			
lnfdigdp	0.3016*	1.0000		
	0.0417			
lnfagdp	0.1839	0.7071*	1.0000	
	0.2212	0.0000		
lnfdgdp1	-0.2680	-0.2968*	-0.3428*	1.0000
	0.0717	0.0452	0.0197	

Table 5

lnrgdp1

Phillips-Perron test for unit root — Number of obs = 45; Newey-West lags = 3

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-34.160	-18.560	-13.140	-10.600
Z(t)	-5.092	-3.614	-2.944	-2.606

MacKinnon approximate p-value for Z(t) = 0.0000

D.lnrgdp1

Phillips-Perron test for unit root — Number of obs = 44; Newey-West lags = 3

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-48.197	-18.492	-13.108	-10.580
Z(t)	-11.598	-3.621	-2.947	-2.607

MacKinnon approximate p-value for Z(t) = 0.0000

lnfdigdp

Phillips-Perron test for unit root — Number of obs = 45; Newey-West lags = 3

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-17.893	-18.560	-13.140	-10.600
Z(t)	-3.380	-3.614	-2.944	-2.606

MacKinnon approximate p-value for Z(t) = 0.0117

D.lnfdigdp

Phillips-Perron test for unit root — Number of obs = 44; Newey-West lags = 3

		Interpolated Dickey-Fuller		
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-47.190	-18.492	-13.108	-10.580
Z(t)	-11.365	-3.621	-2.947	-2.607

MacKinnon approximate p-value for Z(t) = 0.0000

lnfagdp

Phillips-Perron test for unit root — Number of obs = 45; Newey-West lags = 3

		Interpolated Dickey-Fuller		
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-2.279	-18.560	-13.140	-10.600
Z(t)	-0.909	-3.614	-2.944	-2.606

MacKinnon approximate p-value for Z(t) = 0.7851

D.lnfagdp

Phillips-Perron test for unit root — Number of obs = 44; Newey-West lags = 3

		Interpolated Dickey-Fuller		
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-57.803	-18.492	-13.108	-10.580
Z(t)	-9.938	-3.621	-2.947	-2.607

MacKinnon approximate p-value for Z(t) = 0.0000

Lnfdgdp1

Phillips-Perron test for unit root Number of obs = 45
Newey-West lags = 3

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-22.074	-18.560	-13.140	-10.600
Z(t)	-3.955	-3.614	-2.944	-2.606

MacKinnon approximate p-value for Z(t) = 0.0017

D.lnfdgdp1

Phillips-Perron test for unit root Number of obs = 44
Newey-West lags = 3

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-62.391	-18.492	-13.108	-10.580
Z(t)	-16.045	-3.621	-2.947	-2.607

MacKinnon approximate p-value for Z(t) = 0.0000

Table 6

ARDL regression
Model: level

Sample: 1974 - 2015
Number of obs = 42
Log likelihood = -3.9329491
R-squared = .1186396
Adj R-squared = .02335739
Root MSE = .28310964

lnrgdp1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnrgdp1						
L1.	.0843394	.1709556	0.49	0.625	-.2620494	.4307283
lnfdigdp	.0748407	.0469309	1.59	0.119	-.0202503	.1699317
lnfagdp	-.0336836	.0554739	-0.61	0.547	-.1460844	.0787173
lnfdgdp1	-1.660458	5.212704	-0.32	0.752	-12.2224	8.901484
_cons	6.251297	12.35011	0.51	0.616	-18.77239	31.27499

Table 7

```
ARDL regression
Model: ec

Sample:      1974 -      2015
Number of obs  = 42
Log likelihood = -3.9329491
R-squared      = .44337081
Adj R-squared  = .38319468
Root MSE       = .28310964


Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship              F =  7.368
                                        t = -5.356
```

Critical Values (0.1-0.01), F-statistic, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_3	2.72	3.77	3.23	4.35	3.69	4.89	4.29	5.61

accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), t-statistic, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_3	-2.57	-3.46	-2.86	-3.78	-3.13	-4.05	-3.43	-4.37

accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)

Narayan (2005) Critical Values (0.1-0.01), F-statistic, Case 3 (N=40)

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_01	[I_1] L_01
k_0	6.76	6.76	8.57	8.57	13.07	13.07
k_1	4.24	5.00	5.26	6.16	7.63	8.82
k_2	3.37	4.38	4.13	5.26	5.89	7.34
k_3	2.93	4.02	3.55	4.80	5.02	6.61
k_4	2.66	3.84	3.20	4.54	4.43	6.25
k_5	2.48	3.71	2.96	4.34	4.04	5.90
k_6	2.35	3.60	2.80	4.21	3.80	5.64
k_7	2.26	3.53	2.68	4.13	3.64	5.46

Table 8

ARDL regression
Model: ec

Sample: 1974 - 2015
Number of obs = 42
Log likelihood = -3.9329491
R-squared = .44337081
Adj R-squared = .38319468
Root MSE = .28310964

D.lnrgdp1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
lnrgdp1						
L1.	-.9156606	.1709556	-5.36	0.000	-1.262049	-.5692717
LR						
lnfdigdp	.0817341	.0482805	1.69	0.099	-.0160916	.1795597
lnfagdp	-.0367861	.060787	-0.61	0.549	-.1599522	.08638
lnfdgdp1	-1.813399	5.707929	-0.32	0.752	-13.37876	9.751964
SR						
_cons	6.251297	12.35011	0.51	0.616	-18.77239	31.27499

ARDL regression
Model: ec

Sample: 1974 - 2015
Number of obs = 42
Log likelihood = -3.9329491
R-squared = .44337081
Adj R-squared = .38319468
Root MSE = .28310964

D.lnrgdp1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
lnrgdp1						
L1.	-.9156606	.1709556	-5.36	0.000	-1.262049	-.5692717
LR						
lnfdigdp	.0817341	.0482805	1.69	0.099	-.0160916	.1795597
lnfagdp	-.0367861	.060787	-0.61	0.549	-.1599522	.08638
lnfdgdp1	-1.813399	5.707929	-0.32	0.752	-13.37876	9.751964
SR						
_cons	6.251297	12.35011	0.51	0.616	-18.77239	31.27499

Table 9

Source	SS	df	MS
Model	2.3621755	4	.590543875
Residual	2.96558953	37	.080151068
Total	5.32776502	41	.129945488

Number of obs	=	42
F(4, 37)	=	7.37
Prob > F	=	0.0002
R-squared	=	0.4434
Adj R-squared	=	0.3832
Root MSE	=	.28311

D.lnrgdp1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnrgdp1						
L1.	-.9156606	.1709556	-5.36	0.000	-1.262049	-.5692717
lnfdigdp	.0748407	.0469309	1.59	0.119	-.0202503	.1699317
lnfagdp	-.0336836	.0554739	-0.61	0.547	-.1460844	.0787173
lnfdgdp1	-1.660458	5.212704	-0.32	0.752	-12.2224	8.901484
_cons	6.251297	12.35011	0.51	0.616	-18.77239	31.27499

Table 10

Variable	VIF	1/VIF
lnfdigdp	2.23	0.448997
lnfagdp	2.08	0.481682
lnrgdp1		
L1.	1.23	0.816094
lnfdgdp1	1.11	0.897541
Mean VIF	1.66	

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	0.247	1	0.6190

H0: no serial correlation

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of D.lnrgdp1

chi2(1) = 2.64
Prob > chi2 = 0.1045

```
Ramsey RESET test using powers of the fitted values of D.lnrgdp1
       Ho:  model has no omitted variables
                 F(3, 34) =      1.72
                 Prob > F =      0.1812
```

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
lnrgdp1	46	0.92286	3.398	2.596	0.00472
lnfdigdp	46	0.97819	0.961	-0.085	0.53388
lnfagdp	46	0.87906	5.328	3.550	0.00019
lnfdgdp1	46	0.94939	2.229	1.701	0.04443

Table 11

```
ARDL regression
Model: ec

Sample:      1974 -      2015
Number of obs  = 42
Log likelihood = -49.841154
R-squared      = .61712938
Adj R-squared  = .52431226
Root MSE       = .89434528
```

D.lnfdigdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
lnfdigdp						
L1.	-.4730408	.2802946	-1.69	0.101	-1.043304	.0972228
LR						
lnrgdp1	3.870153	2.682044	1.44	0.158	-1.586508	9.326813
lnfagdp	.2644419	.4947081	0.53	0.597	-.7420493	1.270933
lnfdgdp1	-45.6738	49.17901	-0.93	0.360	-145.7293	54.38165
SR						
lnfdigdp						
LD.	-.2805457	.214309	-1.31	0.200	-.7165606	.1554692
L2D.	-.4024936	.1712908	-2.35	0.025	-.7509874	-.0539999
lnrgdp1						
D1.	-1.094192	.544685	-2.01	0.053	-2.202362	.0139782
lnfagdp						
D1.	.5611294	.3685162	1.52	0.137	-.1886225	1.310881
_cons	48.12343	50.94883	0.94	0.352	-55.53274	151.7796

Table 12

```
ARDL regression
Model: ec

Sample:         1974 -      2015
Number of obs   = 42
Log likelihood = -49.841154
R-squared       = .61712938
Adj R-squared   = .52431226
Root MSE        = .89434528


Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship                       F =  3.059
                                                 t = -1.688

Critical Values (0.1-0.01), F-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_3	2.72	3.77	3.23	4.35	3.69	4.89	4.29	5.61

```
accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), t-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_3	-2.57	-3.46	-2.86	-3.78	-3.13	-4.05	-3.43	-4.37

```
accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)
```

Table 13

Source	SS	df	MS
Model	42.5450042	8	5.31812552
Residual	26.3951651	33	.799853488
Total	68.9401693	41	1.68146754

```
Number of obs =       42
F(  8,     33) =     6.65
Prob > F      =   0.0000
R-squared     =   0.6171
Adj R-squared =   0.5243
Root MSE      =   .89435
```

D.lnfdigdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnfdigdp						
L1.	-.4730408	.2802946	-1.69	0.101	-1.043304	.0972228
lnrgdp1	1.83074	.7064503	2.59	0.014	.3934564	3.268024
lnfagdp	.1250918	.294973	0.42	0.674	-.4750353	.7252189
lnfdgdp1	-21.60557	21.29042	-1.01	0.318	-64.92125	21.71011
lnfdigdp						
LD.	-.2805457	.214309	-1.31	0.200	-.7165606	.1554692
L2D.	-.4024936	.1712908	-2.35	0.025	-.7509874	-.0539999
lnrgdp1						
D1.	-1.094192	.544685	-2.01	0.053	-2.202362	.0139782
lnfagdp						
D1.	.5611294	.3685162	1.52	0.137	-.1886225	1.310881
_cons	48.12343	50.94883	0.94	0.352	-55.53274	151.7796

Table 14

Variable	VIF	1/VIF
lnfdigdp		
L1.	8.09	0.123611
lnfagdp	5.88	0.170010
lnfdigdp		
LD.	4.01	0.249579
L2D.	2.54	0.393897
lnrgdp1		
--.	2.10	0.476310
D1.	1.98	0.506028
lnfagdp		
D1.	1.90	0.527561
lnfdgdp1	1.86	0.536924
Mean VIF	3.54	

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	0.695	1	0.4045

H0: no serial correlation

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of D.lnfdigdp

         chi2(1)      =     0.00
         Prob > chi2  =   0.9535
```

```
Ramsey RESET test using powers of the fitted values of D.lnfdigdp
       Ho:  model has no omitted variables
                  F(3, 30) =      1.16
                  Prob > F =      0.3413
```

.

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
lnfdigdp	46	0.97819	0.961	-0.085	0.53388
lnrgdp1	46	0.92286	3.398	2.596	0.00472
lnfagdp	46	0.87906	5.328	3.550	0.00019
lnfdgdp1	46	0.94939	2.229	1.701	0.04443

Table 15

```
ARDL regression
Model: ec

Sample:      1974 -     2015
Number of obs  = 42
Log likelihood = 17.085525
R-squared      = .90236396
Adj R-squared  = .85173786
Root MSE       = .20092564
```

D.lnfagdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
lnfagdp						
L1.	-.2985151	.0753386	-3.96	0.000	-.4530972	-.143933
LR						
lnrgdp1	-.2060259	.8271323	-0.25	0.805	-1.903161	1.491109
lnfdigdp	.8147164	.1373321	5.93	0.000	.5329342	1.096499
lnfdgdp1	-42.96782	20.31615	-2.11	0.044	-84.65312	-1.28251
SR						
lnfagdp						
LD.	.2029096	.1037899	1.96	0.061	-.0100497	.4158688
L2D.	.169357	.0865829	1.96	0.061	-.0082964	.3470105
lnrgdp1						
D1.	.0686719	.2010454	0.34	0.735	-.3438392	.481183
LD.	.2896973	.1531632	1.89	0.069	-.0245676	.6039623
L2D.	.3561378	.1256551	2.83	0.009	.0983148	.6139608
lnfdigdp						
D1.	-.1923542	.0789076	-2.44	0.022	-.3542593	-.0304491
LD.	-.2264485	.0769238	-2.94	0.007	-.384283	-.068614
L2D.	-.1604968	.0654363	-2.45	0.021	-.2947611	-.0262325
L3D.	-.0774208	.0439161	-1.76	0.089	-.1675293	.0126877
lnfdgdp1						
D1.	42.69244	5.290601	8.07	0.000	31.83703	53.54786
_cons	31.44627	14.16549	2.22	0.035	2.381097	60.51145

Table 16

```
ARDL regression
Model: ec

Sample:      1974 -      2015
Number of obs   = 42
Log likelihood = 17.085525
R-squared       = .90236396
Adj R-squared   = .85173786
Root MSE        = .20092564


Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship                  F =  4.706
                                            t = -3.962

Critical Values (0.1-0.01), F-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_3	2.72	3.77	3.23	4.35	3.69	4.89	4.29	5.61

```
accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), t-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_3	-2.57	-3.46	-2.86	-3.78	-3.13	-4.05	-3.43	-4.37

```
accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)
```

Table 17

Source	SS	df	MS
Model	10.0740955	14	.719578247
Residual	1.09002006	27	.040371113
Total	11.1641155	41	.272295501

```
Number of obs =       42
F( 14,     27) =   17.82
Prob > F       =  0.0000
R-squared      =  0.9024
Adj R-squared  =  0.8517
Root MSE       =  .20093
```

D.lnfagdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnfagdp						
L1.	-.2985151	.0753386	-3.96	0.000	-.4530972	-.143933
lnrgdp1	-.0615019	.2458602	-0.25	0.804	-.5659653	.4429616
lnfdigdp	.2432052	.0715296	3.40	0.002	.0964387	.3899717
lnfdgdp1	-12.82654	5.899671	-2.17	0.039	-24.93167	-.7214196
lnfagdp						
LD.	.2029096	.1037899	1.96	0.061	-.0100497	.4158688
L2D.	.169357	.0865829	1.96	0.061	-.0082964	.3470105
lnrgdp1						
D1.	.0686719	.2010454	0.34	0.735	-.3438392	.481183
LD.	.2896973	.1531632	1.89	0.069	-.0245676	.6039623
L2D.	.3561378	.1256551	2.83	0.009	.0983148	.6139608
lnfdigdp						
D1.	-.1923542	.0789076	-2.44	0.022	-.3542593	-.0304491
LD.	-.2264485	.0769238	-2.94	0.007	-.384283	-.068614
L2D.	-.1604968	.0654363	-2.45	0.021	-.2947611	-.0262325
L3D.	-.0774208	.0439161	-1.76	0.089	-.1675293	.0126877

lnfdgdp1						
D1.	42.69244	5.290601	8.07	0.000	31.83703	53.54786
_cons	31.44627	14.16549	2.22	0.035	2.381097	60.51145

Table 18

Variable	VIF	1/VIF
lnfdigdp		
D1.	10.63	0.094050
--.	10.27	0.097353
LD.	10.23	0.097775
lnfagdp		
L1.	7.37	0.135657
lnfdigdp		
L2D.	7.34	0.136230
lnrgdp1		
D1.	5.33	0.187472
--.	5.04	0.198489
lnfdigdp		
L3D.	3.31	0.302360
lnfdgdp1		
D1.	3.22	0.310405
lnrgdp1		
LD.	3.19	0.313648
lnfagdp		
LD.	2.99	0.334511
lnfdgdp1	2.83	0.352928
lnrgdp1		
L2D.	2.15	0.464880
lnfagdp		
L2D.	2.06	0.484697
Mean VIF	5.43	

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	4.433	1	0.0352

H0: no serial correlation

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of D.lnfagdp

         chi2(1)      =     0.29
         Prob > chi2  =   0.5892
```

```
Ramsey RESET test using powers of the fitted values of D.lnfagdp
       Ho:  model has no omitted variables
                 F(3, 24) =      5.22
                 Prob > F =      0.0065


Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.4010
Iteration 2:  rho = 0.7122
Iteration 3:  rho = 0.8580
Iteration 4:  rho = 0.8713
Iteration 5:  rho = 0.8724
Iteration 6:  rho = 0.8725
Iteration 7:  rho = 0.8725
Iteration 8:  rho = 0.8725

Cochrane-Orcutt AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      45
-------------+------------------------------           F(  3,    41) =   31.16
       Model |  7.56327579     3  2.52109193           Prob > F      =  0.0000
    Residual |  3.31725943    41  .080908767           R-squared     =  0.6951
-------------+------------------------------           Adj R-squared =  0.6728
       Total |  10.8805352    44  .247284891           Root MSE      =  .28444

------------------------------------------------------------------------------
     lnfagdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lnrgdp1 |  -.0663137   .1170066    -0.57   0.574    -.3026133    .1699859
    lnfdigdp |   .0766519   .0370684     2.07   0.045     .0017907    .1515132
    lnfdgdp1 |   39.47117    4.57605     8.63   0.000     30.22965    48.71269
       _cons |  -80.95406   10.63727    -7.61   0.000    -102.4365   -59.47166
-------------+----------------------------------------------------------------
         rho |   .8724762
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.016687
Durbin-Watson statistic (transformed) 0.797444


                   Shapiro-Wilk W test for normal data

    Variable |    Obs       W           V         z       Prob>z
-------------+--------------------------------------------------
     lnfagdp |     46    0.87906      5.328     3.550    0.00019
     lnrgdp1 |     46    0.92286      3.398     2.596    0.00472
    lnfdigdp |     46    0.97819      0.961    -0.085    0.53388
    lnfdgdp1 |     46    0.94939      2.229     1.701    0.04443
```

Table 19

```
ARDL regression
Model: ec

Sample:      1974 -      2015
Number of obs  = 42
Log likelihood = 170.77763
R-squared      = .84445952
Adj R-squared  = .80675274
Root MSE       = .00467984
```

D.lnfdgdp1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
lnfdgdp1						
L1.	-.1419145	.1290224	-1.10	0.279	-.4044125	.1205835
LR						
lnrgdp1	-.0054319	.0197552	-0.27	0.785	-.0456242	.0347604
lnfdigdp	-.0181089	.0186495	-0.97	0.339	-.0560515	.0198338
lnfagdp	.015117	.0197701	0.76	0.450	-.0251056	.0553397
SR						
lnfdigdp						
D1.	.0014074	.0010903	1.29	0.206	-.0008107	.0036256
LD.	.0024309	.0008324	2.92	0.006	.0007374	.0041243
lnfagdp						
D1.	.0142573	.0020642	6.91	0.000	.0100576	.018457
LD.	-.003223	.0019425	-1.66	0.107	-.007175	.000729
_cons	.3332332	.3088326	1.08	0.288	-.2950915	.9615578

Table 20

```
ARDL regression
Model: ec

Sample:      1974 -      2015
Number of obs   = 42
Log likelihood = 72.72673
R-squared       = .84352336
Adj R-squared   = .80558963
Root MSE        = .04831823


Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship                  F =  1.564
                                            t = -1.088

Critical Values (0.1-0.01), F-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_3	2.72	3.77	3.23	4.35	3.69	4.89	4.29	5.61

```
accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), t-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_3	-2.57	-3.46	-2.86	-3.78	-3.13	-4.05	-3.43	-4.37

```
accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)
```

Table 21

Source	SS	df	MS
Model	.003923839	8	.00049048
Residual	.000722729	33	.000021901
Total	.004646568	41	.000113331

Number of obs =	42
F(8, 33) =	22.40
Prob > F =	0.0000
R-squared =	0.8445
Adj R-squared =	0.8068
Root MSE =	.00468

D.lnfdgdp1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnfdgdp1						
L1.	-.1419145	.1290224	-1.10	0.279	-.4044125	.1205835
lnrgdp1	-.0007709	.0027591	-0.28	0.782	-.0063843	.0048425
lnfdigdp	-.0025699	.0012599	-2.04	0.049	-.0051331	-6.70e-06
lnfagdp	.0021453	.001402	1.53	0.135	-.000707	.0049976
lnfdigdp						
D1.	.0014074	.0010903	1.29	0.206	-.0008107	.0036256
LD.	.0024309	.0008324	2.92	0.006	.0007374	.0041243
lnfagdp						
D1.	.0142573	.0020642	6.91	0.000	.0100576	.018457
LD.	-.003223	.0019425	-1.66	0.107	-.007175	.000729
_cons	.3332332	.3088326	1.08	0.288	-.2950915	.9615578

Table 22

Variable	VIF	1/VIF
lnfdigdp	5.87	0.170242
lnfagdp	4.85	0.206073
lnfdigdp		
D1.	3.74	0.267260
lnfdgdp1		
L1.	2.71	0.368507
lnfdigdp		
LD.	2.21	0.453019
lnfagdp		
D1.	2.17	0.460396
LD.	1.93	0.518080
lnrgdp1	1.17	0.855019
Mean VIF	3.08	

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	0.056	1	0.8126

H0: no serial correlation

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of D.lnfdgdp1

chi2(1) = 0.06
Prob > chi2 = 0.8133

Ramsey RESET test using powers of the fitted values of D.lnfdgdp1
Ho: model has no omitted variables
F(3, 30) = 6.18
Prob > F = 0.0021

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
lnfdgdp1	46	0.94939	2.229	1.701	0.04443
lnrgdp1	46	0.92286	3.398	2.596	0.00472
lnfdigdp	46	0.97819	0.961	-0.085	0.53388
lnfagdp	46	0.87906	5.328	3.550	0.00019

Table 23

Selection-order criteria
Sample: 1974 - 2015 Number of obs = 42

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	13.1267				7.6e-06	-.434606	-.373946	-.269113
1	94.302	162.35	16	0.000	3.4e-07*	-3.53819*	-3.23489*	-2.71073*
2	105.785	22.966	16	0.115	4.4e-07	-3.32309	-2.77716	-1.83366
3	120.551	29.533*	16	0.021	4.9e-07	-3.26435	-2.47577	-1.11295
4	129.334	17.564	16	0.350	7.7e-07	-2.92064	-1.88943	-.107274

Endogenous: lnrgdp1 lnfdigdp lnfagdp lnfdgdp1
Exogenous: _cons

Table 24

Johansen tests for cointegration

Trend: constant — Number of obs = 45

Sample: 1971 - 2015 — Lags = 1

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	4	52.848008	.	88.5908	47.21
1	11	73.241505	0.59602	47.8038	29.68
2	16	86.646694	0.44887	20.9934	15.41
3	19	97.073165	0.37086	0.1405*	3.76
4	20	97.143412	0.00312		

maximum rank	parms	LL	eigenvalue	SBIC	HQIC	AIC
0	4	52.848008		-2.01043	-2.111155	-2.171023
1	11	73.241505	0.59602	-2.32466	-2.601654	-2.766289
2	16	86.646694	0.44887	-2.497484	-2.900384	-3.139853
3	19	97.073165	0.37086	-2.707105*	-3.185549*	-3.469918
4	20	97.143412	0.00312	-2.625635	-3.12926	-3.428596

Table 25

Vector error-correction model

Sample: 1971 - 2015 — No. of obs = 45

AIC = -3.469918

Log likelihood = 97.07317 — HQIC = -3.185549

Det(Sigma_ml) = 1.57e-07 — SBIC = -2.707105

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_lnrgdp1	4	.299522	0.4519	33.80322	0.0000
D_lnfdigdp	4	1.00257	0.4166	29.27304	0.0000
D_lnfagdp	4	.378495	0.4799	37.82477	0.0000
D_lnfdgdp1	4	.008119	0.4214	29.85771	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_lnrgdp1						
_ce1 L1.	-.8727828	.1514072	-5.76	0.000	-1.169535	-.5760302
_ce2 L1.	.0608249	.0484798	1.25	0.210	-.0341938	.1558436
_ce3 L1.	-.0434326	.0453907	-0.96	0.339	-.1323966	.0455315
_cons	-7.55e-06	.0450607	-0.00	1.000	-.0883248	.0883097

D_lnfdigdp						
_ce1 L1.	.8905101	.5067975	1.76	0.079	-.1027948	1.883815
_ce2 L1.	-.7398339	.162274	-4.56	0.000	-1.057885	-.4217827
_ce3 L1.	.296394	.1519338	1.95	0.051	-.0013909	.5941788
_cons	-4.74e-07	.1508293	-0.00	1.000	-.2956204	.2956194
D_lnfagdp						
_ce1 L1.	.0939939	.1913281	0.49	0.623	-.2810022	.46899
_ce2 L1.	.0797575	.0612623	1.30	0.193	-.0403144	.1998294
_ce3 L1.	-.2633273	.0573586	-4.59	0.000	-.3757481	-.1509065
_cons	-.0000245	.0569416	-0.00	1.000	-.111628	.111579
D_lnfdgdp1						
_ce1 L1.	-.0028727	.0041041	-0.70	0.484	-.0109166	.0051711
_ce2 L1.	.0015312	.0013141	1.17	0.244	-.0010444	.0041068
_ce3 L1.	-.0049378	.0012304	-4.01	0.000	-.0073493	-.0025263
_cons	.0013433	.0012214	1.10	0.271	-.0010506	.0037373

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	1	4.864882	0.0274
_ce2	1	21.22338	0.0000
_ce3	1	37.10548	0.0000

Identification: beta is exactly identified

Johansen normalization restrictions imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
lnrgdp1	1	.	.	.	.	.
lnfdigdp	2.78e-17	.	.	.	.	.
lnfagdp	0	(omitted)				
lnfdgdp1	11.41889	5.177112	2.21	0.027	1.271933	21.56584
_cons	-29.62235	.	.	.	.	.
_ce2						
lnrgdp1	0	(omitted)				
lnfdigdp	1	.	.	.	.	.
lnfagdp	0	(omitted)				
lnfdgdp1	131.7438	28.59716	4.61	0.000	75.6944	187.7932
_cons	-317.1151	.	.	.	.	.

_ce3						
lnrgdp1	-3.33e-16	.	.	.	.	.
lnfdigdp	-1.11e-16	.	.	.	.	.
lnfagdp	1	.	.	.	.	.
lnfdgdp1	164.7498	27.04617	6.09	0.000	111.7402	217.7593
_cons	-396.8316	.	.	.	.	.

Table 26

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_lnrgdp1	60.823	2	0.00000
D_lnfdigdp	1.285	2	0.52610
D_lnfagdp	1.888	2	0.38901
D_lnfdgdp1	2.024	2	0.36352
ALL	66.019	8	0.00000

Skewness test

Equation	Skewness	chi2	df	Prob > chi2
D_lnrgdp1	-1.5285	16.743	1	0.00004
D_lnfdigdp	-.21879	0.343	1	0.55806
D_lnfagdp	-.46761	1.567	1	0.21064
D_lnfdgdp1	-.28295	0.574	1	0.44876
ALL		19.227	4	0.00071

Kurtosis test

Equation	Kurtosis	chi2	df	Prob > chi2
D_lnrgdp1	7.9601	44.080	1	0.00000
D_lnfdigdp	3.7249	0.941	1	0.33191
D_lnfagdp	3.4235	0.321	1	0.57084
D_lnfdgdp1	3.8996	1.450	1	0.22852
ALL		46.793	4	0.00000

Table 27

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	11.8605	16	0.75352
2	14.9996	16	0.52467

H0: no autocorrelation at lag order

APPENDIX III: RESEARCH TIME FRAME

	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Identifying the research problem								
Identifying the research topic								
Writing the concept								
Writing the proposal								
Proposal defense and corrections								
Data collection								
Data analysis								
Dissertation defense and corrections								
Binding and submission								

APPENDIX IV: BUDGET

ITEM	ESTIMATED COST KSHS
1. Printing papers and binding	5, 000
2. Printer Toners	5, 000
3. Data collection expenses – Internet	2, 000
4. Other expenses	5, 000
Total estimated expenses	17, 000