NEXUS BETWEEN SAVING RATE AND ECONOMIC GROWTH IN DEVELOPING COUNTRIES: ENDOGENOUS OR EXOGENOUS GROWTH MODEL?

By

SEIFU, Minyahel Desta

THESIS

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KDI School of Public Policy and Management
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ABSTRACT

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This study sought to analyse the nexus between domestic saving and economic growth in developing countries and tried to answer which growth theory (exogenous or endogenous growth theory) upholds. In doing so, the study used both cross sectional and panel data analysis method where, the study uses panel fixed effect model for longitudinal data analysis while OLS and Quantile regression technique is used for cross-sectional dataset from 1980-2013 to analyse the long-run as well as medium to short-run causal relationship between domestic saving rate and economic performance in developing countries.

The exogenous growth theory of Solow, stipulate that in the long-run saving rate will have only level effect on economic performance than growth effect. While endogenous theory of growth, articulate higher saving will translate both in to level effect and growth effect at steady-state. The result of regression analysis of the study shows that saving has level effect which is in tandem with both exogenous and endogenous growth theory. Moreover, higher saving also causes increase in economic growth. In summary the empirical result supports the endogenous growth model where domestic saving has both level and growth/rate effect at steady-state in developing countries. The policy implication of the study is that, capital accumulation will have a lasting effect on economic growth and transformation of developing countries through externalities and spill-over effect, knowledge and technological transfer, human capital accumulation etc. higher saving rate leads to increase in income and higher economic growth rate at steady-state.

Key words: Saving rate, GDP Per capita, growth Panel fixed effect, Economic performance, Quantile regression, steady-state, Exogenous, Endogenous theory.

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CHAPTER ONE

INTRODUCTION

What factors constitute for fast economic growth and transformation of countries and what is and should be the role of policy makers in this interplay. Different economists have tried to answer this fundamental question over time. The neoclassical theory of growth by Solow's (1956) hypothesised that developing countries tend to have lower capital stock and those countries with low level of capital stock tend to grow rapidly than the developed countries since capital stock can easily stimulate investment which is insulated by higher saving rate. Hence, the higher domestic saving is the higher investment will be which then translates in to fast economic growth and convergence to a higher steady state over long-run.

Lin (1992) suggested that the economic development of a country largely relays on its ability to mobilize the required savings to finance capital formation in order to raise nation's productive capacity. Following these economic theories, developing countries perceived investment as key for industrialisation and economic growth. However, national saving is low in most of developing countries, leading to low level of domestic investment. Different scholars and empirical work attributes much of the disparity in the economic performance among countries to the differences in the rates of saving and hence investment. Low domestic saving rates may force countries to maintain low-growth levels over time. Developing countries in general and those low income countries in African specifically rely on external saving surplus to fill-in the investment gap due to low level of domestic income and savings.

Although the bulk of academic and empirical research show the relationship between saving and economic growth, the direction of relation has been hugely debated, just like 'the chicken or the egg' concept.

While reliance on foreign savings has its own benefits, it also has limitation; it makes countries highly exposed to external shocks affecting macroeconomic sustainability and economic progress. Hence, domestic savings will continue to be a prior source of investment financing for its lowered risk of external shocks (Touny, 2008).

An examination of the direction of causality between the domestic savings rate and GDP per capita growth has vital importance for development of a country and its policy. For instance, if the direction of causality is in such a way that savings drives growth through an automatic translation of savings into capital formation, the main goal of development policy should be increasing savings; similarly if growth is resulted lesser from savings but more from other factors such as policies relating to technological innovation, human capital, international trade or foreign direct investment, then focus should be the main targets of development policy.

The controversy about the savings-growth nexus can be grouped into two leading schools of thought. The 'growth theorists' of Domar 1939, 1946, Romer 1986, and Lucas 1988 assumes all savings are automatically invested and translated into growth thus, savings leads to growth. On the contrary, the consumption theorists (Modigliani 1970, 1986; Deaton& Paxson 1994, 2000; Carroll& Weil, 1994) argue that income and its growth determines consumption and savings.

Exogenous theory of growth claims that for economy to sustain and advance, saving matter. According to this theory, saving will raise the supply to finance the investment need for capital that ultimately leads to improvement in the economic situation of a country. According to the

growth theory, developing countries accumulate capital more frequently than developed countries and through saving increase their output over time converging to steady state. Robert Solow the proponent of this theory hypothesized that saving will have income effect only in the long-run but not growth effect because at steady state, change per head capital will be zero and no increase in growth rate of output. The only source of economic growth in the long-run according to the exogenous growth model is technological progress that is exogenously determined.

This school of thought was the dominant economic growth theory and the theory that tries to answer one of the most challenging questions of why some countries are richer than the others for over 3 decades from 1950 to late 1980s. Although the mathematical backing and empirical evidence made the exogenous growth theory solid for quite some time, its inability to acknowledge the saving effect on economic growth however, made both empirical economist and theoretical economist start to raise concern.

Taking note of the shortcoming of the exogenous growth theory, a new school of thought started criticising the proposition of *diminishing marginal return* to capital by raising the argument of externalities that cannot be captured by a single firm. Claiming that innovation by one firm will have spill-over effect on other firms in the industry hence, return to capital tends to be *none-diminishing* due to research and development as well as technological transfer. The same idea holds for human capital development in one industry/firm and transmission of knowledge transfer which occurs easily and cheaply. Moreover, empirical evidence found that saving rate has impact on output growth and subsequently economic growth. Thus, the endogenous growth theory stipulate that in the long run steady state equilibrium with higher saving rate through growth in per head capital growth induces economic growth

1.2 Statement of the Problem

The dynamics of growth and engine of global economic recovery has shifted from the economically advanced countries of the world to the developing ones especially after the new millennia. While the world is in mild recession and the advanced countries are struggling to recover from the crisis, developing countries in Asia and Africa have managed to grow at remarkable rate over the last decades.

Thus, the study will first analyze the relationship between economic performance and domestic savings, by doing so it will diagnose whether saving rate affects economic growth or not in developing countries. In addition, the study will question as which (exogenous or endogenous) theory of growth explains the relationship between saving rate and economic performance in the long run in developing countries.

1.3 Objectives of the study

Economic growth is the common goal of all nations. Almost everybody lives with more comfort and overall better standard of living than ever before and holding a better welfare because of the surge in their economic growth (Rasmidatta, 2011). Thus, economist and policy makers are undertaking several measures to identifying possible factors causing economic growth for some. Among the growth theories that deals with extensively interaction between economic performances and causing factors are the exogenous and endogenous theories of growth. Hence, the study majorly made its bases in finding the relationship between saving and economic performance both in transition and long-run. Specifically the study intend to analyse the effect of saving rate on per capita income and growth rate in both transition period and the long-run thus, find which growth theory uphold for developing countries.

1.4 Significance of the study

Understanding of the inter-play between saving and economic performance is vital for development of policies that enable countries to develop fast economic growth path and to sustain the attained economic growth that enables skipping vicious circle of poverty and also overcome the middle income trap. Exogenous growth theory state that saving will not have a lasting impact on economic growth hence, for a country to sustain its economic progress/higher economic growth the only option is through technological progress hence, focusing on raising savings is not a viable option entailing technical progress as exogenously determined. Endogenous growth model claims that a higher saving rate vitally determines the future of the country in attaining higher economic growth, thus saving should also be part of the crucial policy variable developing countries need to pursue for a higher economic growth both in the short and long-run. However, in developing countries there is an absence of a study that analyzes the long-run relationship between saving and economic performance both at level and growth hence, knowledge of which growth theory uphold for developing countries is not well investigated moreover, following the 2007 global financial crisis the role of developing countries in the global structure have significantly changed thus, recent research work that analyze the dynamics is also lacking. Moreover, most of the studies that analyses the causal relationship between saving and growth using time series countries' detailed analysis is missing.

1.5 Hypothesis testing

The nexus between saving rate and economics growth has been debated global and in developing countries list of evidence to proof such nexus is limited to some region or countries. Taking note of this the study will test a list of hypothesis to address the research objective and research problems

Ho*: Saving will not affect income level of developing in the long and at transitory period*/stage

Ha: saving affects income level of developing countries both in the long-run and transitory stage

#Ho: Saving will not affect output growth rate of developing countries in the long-run.

Ha: saving does affect output growth rate of developing countries in the long run

CHAPTER TWO

LITERATURE REVIEW

Saving-growth nexus rooted its historic empirical and theoretical debate and galvanized the economic literature for years. Still the controversy of saving–economic growth causality and sequence don't seem to be resolved in the near future. However, identifying the link and direction of the relationship will have significant policy bearing especially for developing countries that need clear policy path of sustaining higher economic growth. Moreover, the causation is vital during policy design for instance to increase saving rate if an increase in interest rate does not lead to higher saving, government might consider other policy instruments such as tax incentives to foster economic growth and development.

2.1 Theoretical literature

The theoretical and empirical literature examining the relationship between saving and economic growth comprises examination of the sources of economic growth, besides, it helps in estimating effects of exogenous saving on income and output growth.

2.1.1 Neoclassical theory and economic growth

Marginal or neoclassical theory of growth is among the prominent growth theory that tries to explain economic performance and the factors that contribute to such inter-linkages. The theory emphasizes the interplay between saving decisions and capital accumulation. It explains the distributional and level of national output through the social and factor endowment of a country to explain the growth difference between countries. It uses endowment of production such as labor, capital, technical production performance and consumer preference among others to explain the growth different between countries (Cesaratto, 1998). According to the proponent of this growth model, economic growth emanate from endowment, similarly with regards to capital accumulation growth is thought to be endogenous.

Garegnani (1970) explains the channel through which saving affects growth using the neoclassical theory. Accordingly, profitability relies on scarcity of capital that helps to accumulate capital and thus the profitability condition depends on saving decision of household that also relieson capital accumulation endowment and thus, increase in wealth and income leading to growth in output by increasing employment and aggregate income.

2.1.1.1 Solow-Swan model:

The Solow-Swan growth model pioneer of neo-classical theory of growth hypothesizes that in the long-run, saving has only the *level/income* not growtheffects and thus according to Robert Solow, at steady state equilibrium which is a combination of per capita GDP and per capita capital, the economy will remain at rest hence, change in output and also capital per worker will be zero. According to this model, saving is exogenously determined and an increase in saving leads to accumulation of capital that transcend to higher output per capita in the steady-state, and to a higher rate of *growth* temporarily in the transition to steady-state hence, according to exogenous growth theory saving has income/level effect in the long-run.

$$Y = f(k)$$

$$Y = Af(K, L)$$

$$Y = Af(\frac{K}{L}, \frac{L}{L})$$

$$Y = Ak$$

$n = \Delta N/N$here we made assumption that population and labor force are equivalent, accordingly it is expected that the economy is demanded nk level of investment to meet new capital for the growing labor force.

Moreover saving is assumed to be a constant fraction of income and production at equilibrium and will equate with income according to the national income accounting identity. Hence,

$sy = sf(k)$, similarly change capital is the excess of saving over investment

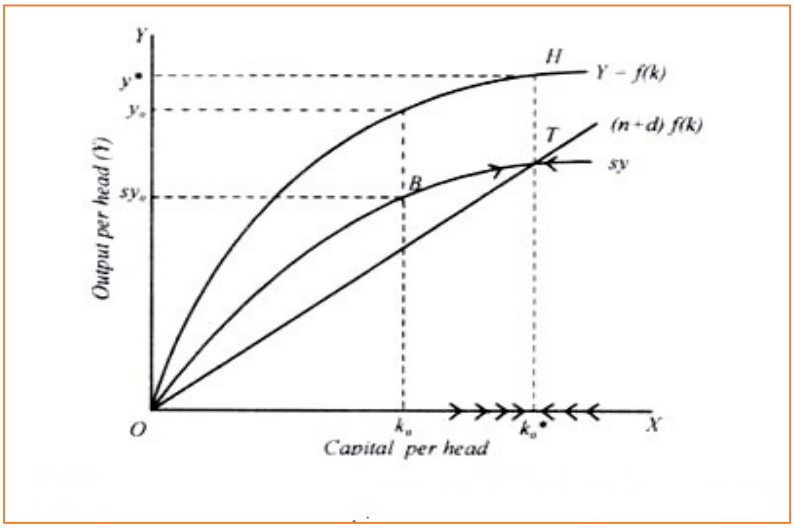
$$\Delta k = sy - (n + d)k$$

Where *n* is labor force growth *d* is rate of capital wear and tear or depreciation rate

At steady state the Solow-Swan growth model hypothesize that there will not be any change in capital stock i.e. $\Delta k = 0$ thus,

$$sy^* = sf(k^*) = (n + d)k^*$$

Figure 2.1 Slow-Swan Growth model: Growth saving interaction and Steady State Equilibrium[1]

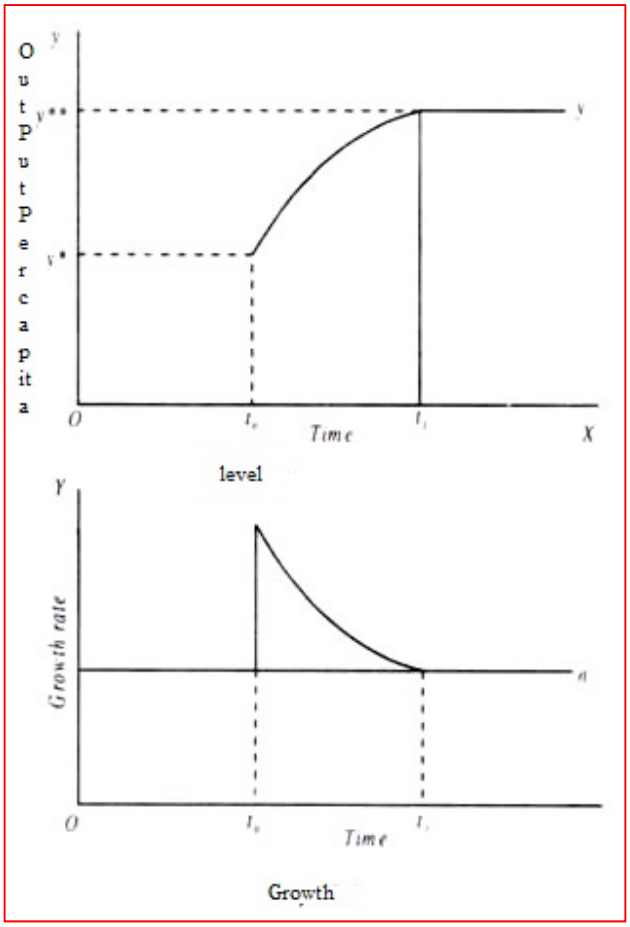


sy is a fraction of income saved at each capital labor ratio in the graph above hence saving increases over time and reaches its maximum at level of capital output ratio at point k^*. The amount of investment demand at every level of output per capita is denoted with straight line

[1] The graph is extracted from http://stratusnews.info

showing labor force growth rate and deprecation of capital$(n + d)k$this level sustain the capital output- ratio at point T saving and the necessary investment equate and the graph cross-each other showing the steady state balancing point and the corresponding capital growth k^*. The corresponding level of income at steady state equilibrium is noted H in the output graph $Y = f(k)$. According to the neoclassical growth model, whenever saving is higher than the investment requirement, capital output ration keeps on increasing hence, the economy continues producing and the return is positive. This can be noticed at point b in the graph above where the additional capital tend to increase output hence, more saving causing an increase in capital growth and hence output increases. However the process of adjusting to this scenario will be halted at a point where $sy = (n + d)k$ that is at point T where capital per head is k^* at point T demand for capital investment or capital investment requirement par with saving level meaning that capital requirement exactly matched (steady state) because neither is falling nor increasing in saving and per head capital requirement will be noticed at this point. The theory articulate that for similar level of saving and technological progress, population growth rate and also capital depreciation countries tend to converge at similar steady state income level.

Moreover, according to this theory, in the long run, saving does not affect economic growth. However, this does not mean that saving will not affect output at all hence, in the long run according to the neoclassical theory of growth saving have income effect only (Dornbusch et al, 2011)



With regards transitory period interaction and long run-relationship between saving and output, the neoclassical theory of growth stipulate that an increase in saving rate from original/initial steady state will temporarily increase output per capita and growth as shown in the figure above where Y increase from y* to y** over period of time from $t_0$then to $t_1$because capital per capita will shift from the initial steady state to other equilibrium point hence, at this juncture we would be forced to assume that the rate of growth of stock is higher and faster than growth of labor force. In relation to level effect, the increase in output from y^* to y^{**} increases at decreasing rate also called diminishing rate. However, with regards to increasing in saving rate on growth, the impact is immediate where output will rise sharply but as the stock of capital accumulates, output growth rate will start decreasing and return to the population growth rate hence, change in Y will

be zero(Dornbusch et al, 2011). In summary the neoclassical growth theory of Solow hypothesize that although saving have level/income effect, it will not have growth effect on output. For there to be growth in output, other variables should be considered that is technical progress or innovation. According to Solow model, it is only technological change that will have a positive effect on growth of output in the long-run.

Mankiw, et al(1992)conducted an in-depth empirical analysis to test the 1956 great growth model of all times by Robert Solow on sources and determinants of growth using augmented version of the Solow model by deploying Penn World Tables data between 1960-1985 and found out that in the long-run, steady-state level of per capital output is strongly and positively correlated with the saving rate (Bernanke& Gtirkaynka, 2001)

In general, the neoclassical growth model of Solow emphasis the relationship between saving and growth in the short-run arguing that countries reach higher steady state with higher saving rate. Growth is exogenously determined by saving rate. However, the endogenous growth model articulate that there exist a strong relationship between saving and economic growth in the long-run, where saving rate stimulate economic growth through the investment channel (Masih& Peters, 2010)

Bernanke& Gtirkaynka(2001) claim that the augmented slow growth model developed/ proposed by Mankiw, et al(1992), the four factors of production combine to produce output according to the following standard, constant-returns-to-scale Cobb-Douglas form (Note that Z_t multiplies raw labor Lt and thus may also be thought of as an index of labor productivity):

$$Y = K_t^{\alpha} H_t^{\beta} (Z_t L_t) 1 - \alpha - \beta$$

Cesaratto (1999) also confirm the fact that increased saving rate under the neoclassical growth model of slow –swan model will have majorly level effect only reaffirming as higher domestic saving affects level of income i.e. per capita only.Therefore, according to Solow-Swan model, saving does not have long-run effect on economic growth rate, similarly the impact of saving on per capita income is limited, moreover, it is claimed that saving might have growth impact if the economic is on transitory stage between two secular paths, where each path has its own distinctive nature and level of income. The other major policy implication of Slow model is impact of saving on economic growth for low income countries where it is claimed that if saving rate is so small and technological progress is at its infancy, there will not be balanced equilibrium and per capital income tends to fall for such income level saving leading to reduction in income (Cesaratto, 1999)

2.1.2 Endogenous growth theory

The neoclassical theory of growth dominated the international development economics scene for over three decades mainly due to solid theoretical and empirical backing. However, in the late 1980s, this changed following the inability of this theory in explaining the facts primarily saving and long-run output growth, factors that change with technological progress. Empirical researchers also claim that saving and long run growth should not have a relationship for neoclassical growth theory to hold which was unfortunate because saving has a relationship with growth in the long-run thus, a quest for other theory that fill the gap arose steadily. Then emerged the famous endogenous growth model theory

The endogenous theory of economic growth postulate that increase in saving rate increases growth permanently, thus according to this theory the channel of impact of saving on growth is through increase in capital accumulation and investment. Unlike the exogenous growth theory,

the endogenous theory states that the saving rate is not exogenously determined rather it is endogenously determined so as to affect economic growth (Romer, 1986, 1987, Lucas, 1988,Mankiw et al 1992; Barro &Martin, 1995)

Cesartto (1999) claims that the new endogenous growth model is an extension of neoclassical economic growth that state that economic growth is affected by capital accumulation through increased positive marginal return from capital, thus the endogenous growth model entails rate of economic growth dependence on consumption behaviors of the economy itself whether the economy forgo present consumption for future or not. Accordingly, if consumption is postponed for the future, the economy tends to growth fast. For neoclassical theory, saving endogenously determines economic growth in the long-run.

The assumption of diminishing marginal product of capital of the neoclassical model is challenged by the new growth theory. For instance, research and development, or innovation undertaken by a firm will have spill-over effect on other firms that tends to increase the productivity of the innovator and all the other firms in the industry or beyond. The same is true for human capital that is even more easier to spill-over to other firms cheaply thus, there will not be a diminishing return on capital according to the endogenous theory of growth because such investment on knowledge and R&D are key to understand long-run growth (Mankiw, 1995). In summary endogenous growth theory mainly relies on the proposition that there is significant external return or positive externality to capital in the long-run.

$$Y = f(K, AN)$$

$$A = \frac{\alpha K}{N} = \alpha k$$

$$\frac{\Delta A}{A} = \frac{\Delta K}{K} - \Delta N/N = \frac{\Delta k}{k},$$

$\frac{\Delta y}{y} = \frac{\theta \Delta k}{k} + \frac{(1-\theta)\Delta A}{A}$ by substituting $\frac{\Delta k}{k} for\ A\ wi\ will\ find\ out\ that$

$\frac{\Delta y}{y} = \frac{\theta \Delta k}{k} + (1-\theta)\Delta k/k$Hence, finally we will come up with

$$\frac{\Delta y}{y} = \frac{\Delta k}{k} = g = \frac{sy}{k} - (n+d) = sa - (n+d)$$

From this formula, the endogenous growth theory postulates that saving rate in the long run will generate higher economic growth. Similarly, the higher the variable on the negative sign i.e. population growth and depreciation will lead to lowering of output growth. In summary higher saving rate will have positive and significant effect on economic growth according to the endogenous growth theory (Dornbusch et al, 2011).

2.2 Empirical literature

Singh (2010) analyzed the long-run relationship between saving rate and economic growth in India using the maximum likelihood system. And tested the null hypothesis of non-causality between saving rate and its impact on economic growth, income level where his empirical finding supported the endogenous growth model suggesting long-run effect of saving on income and economic growth. For developing countries like India, a significant portion of saving comes from household saving, hence for India, household saving is a vital surplus because the private sector that has deficit of financing and saving finance their saving deficit from households saving to accumulate capital and hence enhance productivity that lead to increase in income and economic growth(Singh, 2010)

The causal relationship between savings and economic growth has been debated for over half a century. There are ample empirical studies done on the nexus between savings rate and economic growth, however most of the studies failed to provide clear evidence that has broader acceptance on the causal link between the two. Some empirical studies claimed that economic growth causes savings rate (Sinha&, 1998; Carroll et al., 2000; and Rodrik, 2000), while others defended the statement of saving causing economic growth throughits impact on capital formation by give list of reason where some empirical work underlined as there is no link at all while others claims economic growth cause higher saving rate. However, recent empirical evidence piled-up in support of the argument that higher saving rate causes economic growth

The economic growth is the common goal of all nations. Everybody lives with more comfort, better standard of living than ever before and holding a better welfare because of the surge in their economic growth. (Rasmidatta, 2011)

Similarly the lifecycle theory of saving and consumption hypostasize that changes in an economy's rate of growth will affect its aggregate saving rate by changing the lifetime resources of younger people relative to older people (Deaton&Paxson, 2000). Accordingly the saving rate of any economy and its impact on economic growth is majorly determined by the life cycle in the particular state or list of persons

Chor&Chua(2009) analyzed the saving and economic growth nexus by deploying Nonparametric Analysis approach using 1991-2006 period quarterly dataand found out that in Malaysia, savings and economic growth are co-integrated. Moreover, the same study using dynamic OLS estimation confirmed that savings and economic growth are positively related in the long run

Moreover, Misztal (2011) using data from advanced, developing and emerging countries analyzed the causal relationship between domestic saving and economic growth deploying granger causality to test the direction and magnitude of relationship, where they found out that for all categories of income levels, saving has a relationship with economic growth implying the highersaving rate serve as a source of financing for domestic investment and hence, translate to higher economic growth for advanced economies while for emerging and developing countries like many other studies Miszlat claims that these countries can finance the investment not necessary from domestic saving but rather from foreign saving i.e. through FDI and International market borrowing. In general, saving granger causes economic growth and not the other way round.

Contrary to what Misztal (2011) concluded, technology boosts economic growth in low income countries and cooperation of domestic investors and foreign investors is vital for poor countries to catch-up because foreign investor are versatile with the technology while the local are familiar with the domestic conditionsThus, domestic saving is crucial for innovation to take place and innovation enables economic growth. While for advanced economies, local investors are familiar with the latest technology hence demand for FDI is not a must implying that saving is not a necessity for growth in rich countries (Aghion et al, 2009). Empirical evidence using cross-country study found out that productivity in low income countries has strong relationship with lagged value of saving while the results do not hold for advanced countries.

Tang & Ch'ng (2012) analyzed the causal relationship between savings and economic growth for ASEAN- 5 countries using Bartlett-corrected tracetest for co-integration between 1970-2010 and found that the causality relationship between saving and growth runs from saving causing economic growth for all 5 ASEAN countries under consideration.

Thus accordingly, they concluded that high saving rate in the region led to higher economic growth while the evidence of other way relationship is weak or non-existent at least for those five countries. Hence, understanding such causal relationship will help in framing appropriate development policies especially for developing countries.

Similarly, Oladipo (2010) scrutinized the relationship between saving and economic growth in developing countries by taking Nigeria claiming small open country case using Toda and Yamamoto methodology to test the causation hence the empirical result of the study is that saving has positive co-integration with economic growth in the long-run and the relationship is stable where the direction of causation is unidirectional higher saving rate causing economic growth. Moreover, FDI also boost economic growth backed by higher saving rate (Aladipo 2010).

An ample number of scholarly work contradict the statements discussed above regarding the relationship between saving and economic growth where according to this school of thought rather than saving generating growth, it is higher and sustained economic growth that translate/leads to higher saving (Sinha& Sinha, 1998; Salz, 1999;Rodirk 2004; Andrei &Petrescu, 2013). However, most of the proponents of growth- lead saving increase empirical works lack backing of their empirical research findings with solid economic theories except Keynesian.

Abu (2010) contributed to the controversy on the causality relationship between saving and economic growth where the study analyzed Nigeria's saving and economic growth nexus by deploying Granger-causality as well as co-integration techniques during the period 1970-2007. Accordingly the result of Johansen con-integration test depict that there is co-integration between saving and economic growth while granger causality test proved that the direction of the relationship between saving and growth is that growth granger cause saving not the other way

round. Unlike the Solow-sawn hypothesis of higher saving rate causing higher economic growth and hence, convergence between developing and other countries the study concluded that Keynesian theory upholds for Nigeria.

Andrei &Petrescu (2013) also analyzed the long-run relationship between saving and economic growth in Euro countries by using granger causality to analyzing the direction of the causality and Johansen co-integration technique for testing as the long-run relationship between saving and growth holds, hence, the study found out that in euro area their exist relationship at least with lag between the two macroeconomic variables and growth granger cause saving at least for the selected euro area countries while the opposite does not hold.

Similarly in China at least for selected provinces of Beijing, Guizhou, Shanghai, and Xinjiang there is strong co-integration between saving and economic growth and the direction of relationship is single-line where economic growth causes higher saving rate for the five provinces in the long-run.(Hooi & Yingzhe, 2008)

Bassam (2015) using Autoregressive Distributed Lag (ARDL) co-integration approach for two countries in the MENA region Morocco and Tunisia foundthat there is bidirectional relationship/causation between saving and economic growth in Morocco while there is only unidirectional relations where higher saving rate cause higher economic growth in Tunisia.

With regards to specific country study in southern Africa region Kalebe (2015) analyzed the nexus between saving and economic growth for Lesotho using ARDL bound test approach by deploying annual time series data from 1980-2010 and proved that there exist long-run causal relationship between growth and saving both in the short and long-run.

CHAPTER THREE

METHODOLOGY AND DATA

3.1 Data

Noting the importance of investigating the relationship between economic performance and gross domestic saving the study selected group of 133 developing (upper middle income, lower middle income and low income) countries and 10 variables. The main data source for the analysis of the study from World Bank's World Development Indicators (WDI). Economic performance measured by logged annual GDP per capita and growth rate averaged 1980-2013 (33 year average) for cross-sectional analysis while five year average was used panel data analysis. Moreover, the study used saving rate measured by gross domestic saving share of GDP ratio i.e. average saving to GDP ratio during the same period.

However, domestic saving rate alone cannot exclusively explain economic performance (growth and income) otherwise, the study will be vulnerable to omitted variable bias, to reduce the vulnerability to such challenges and analyze other factors influencing economic performance the study introduced list of control variables such as openness measured by (export of goods and service)/GDP, to control for financial sector development the study included remittance and credit by bank, to control for population pressure the study introduce population, variables such as FDI, Debt, government consumption, etc. are also controlled forin the study and allcontrol variables are in log form. Moreover, all variables are 33 years average (averaged over the period of 1980-2013) for cross-sectional data while they are five year average for panel. Figure 1 below in the scatter plot depicting the relationship between economic performance growth measured by GDP per capita and savings rate (GDS % of GDP).

3.2 Cross sectional and Panel data set

Cross-sectional: Cross sectional data set helps to analyze the long-run relationship between growth/ income and domestic saving across countries. The cross sectional data is developed in such a ways that it will address the short coming of the data type i.e. Snapshot causal relationship between saving and economic growth across different countries thus, the data for all variables is averaged so as to show the long-run relationship between the two macroeconomic variables. In doing so the all other control variables are averaged from 1980 -2013

Panel/longitudinal: In analyzing the relationship between domestic saving and economic growth or /income level not only long-run relationship that take the snapshot causal relationship the study also utilized panel analysis method to show the relationship between saving and economic performance between countries and also over time both in the short-to- medium-term hence, the study used panel data nations and time to look in to the time dimension of the relationship

3.2.1 Ordinary Least-Squares (OLS)

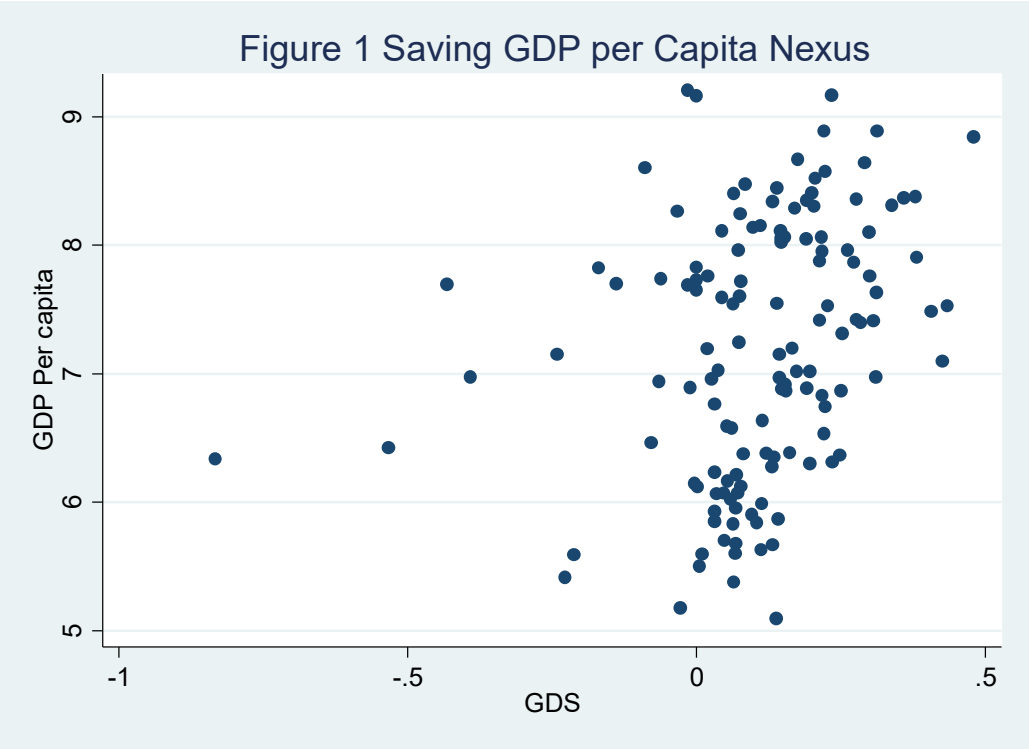
The widely used econometric technique for regression analysis is Ordinary least-squares (OLS) regression is used to model the relationship between explanatory and explained variables that have linear relationship recorded on at least an interval scale. The technique may be applied to single or multiple explanatory variables and also categorical explanatory variables that have been appropriately coded (Hutcheson, 2011).

Cross-sectional data is might be highly exposed to *multi-collinearity* and heteroscedasticity. To address the problem heteroscedasticity in cross-sectional data in general the study took both multi-collinearity and heteroscedasticity test. The result of the test show as there is the chance of exposure to collinearity is less because the result of VIF test shows as the probability of exposure

to serial collinearity is less for cross section analysis; OLS makes the assumption *Var* (u*j*) = σ2 constant variance of the error term or commonly homoscedasticity. However, this is very difficult assumption to hold because the probability of having constant variance is very less hence exposition to heteroscedastic is high however, the test heteroscedastic prevails that if Chi Square of BP test is very low probability of being heteroscedastic our OLS is thus BLUE.

3.2.2 Panel Fixed Effect

The first differencing of panel data that evolve over period will result in same output with fixed effect transformation of analysis under certain assumptions because both methods of analysis will eliminate the fixed effect a_i (Wooldridge, 2014). Fixed effect model is presented as $y_{it} = \beta_1 + a_i + u_{it} t = 1, 2, \ldots\ldots, T.$ where a_i is time invariant unobserved effect that have correlation with error term in our model. Thus fixed effect model will helps in getting rid of time invariant observation that have correlation with error term and affect the efficiency of the pooled OLS estimator. The fixed effect model of panel data assist in getting rid of the endogeneity problem face with most of the social science subject and macro-economic variables in particular because it address the relationship between the unobserved time invariant omitted variable and error term



The summary statistics on table 1&2 below depict the descriptive statistics of the data. Similar to the conventional expectation with regards to the stochastic variability of dataset gross domestic saving has higher volatility compared to the per capita GDP where the standard deviation of saving rate from its mean is estimated to be more than twice the size of deviation of income or growth from the mean. Moreover, the scatter plot of the two variables (saving rate and Income/growth) shows as saving and economic performance tend move together hence, saving and economic growth have a positive relationship; the higher the saving rate is the higher the economic performance there will be.

Table 5.1 summary statistics of cross-sectional variables

Variables	Observation	Mean	Std. Dev.	Min	Max
Income	133	7.191	1.012	5.095	9.207
Growth	136	1.492	1.754	-2.223	8.930
Saving	133	10.894	17.766	-83.304	48.044
FDI	133	3.554	3.570	-5.468	20.878
Trade	134	3.337	0.597	0.979	4.499
Debt	122	4.054	0.636	2.256	6.129
Population	136	1.843	0.979	-0.529	3.426
Remittance	131	5.440	7.678	0.005	58.465
Credit to Private	128	2.999	0.741	0.760	4.644
Initial GDP	133	7.016	0.998	5.064	9.263
Life Expectancy	135	4.126	0.149	3.69	4.341
Government Consumption	131	2.735	0.428	1.564	4.631

Log Mean income of developing countries is 7.2 or real income of 2100 USD while the standard deviation from the mean is over 2020 indicating huge difference between developing countries themselves where the minimum average income goes as low as $163 and the maximum goes up to $9970

Table 5.2 Summary statistics of panel data variables

Variables	observations	Mean	Std. Dev.	Min	Max
Income	856	7.134	1.045	4.537	9.543
Growth	952	1.116	3.558	-27.777	22.100
Saving	802	12.455	17.583	-114.563	81.509
FDI	823	3.318	4.845	-17.508	48.387
Trade	831	3.305	0.668	-1.092	4.927
Debt	772	3.914	0.834	0.175	6.885
Population	702	5.222	8.601	0.002	89.433
Remittance	793	2.933	0.894	-1.093	4.998
Credit to Private	948	1.837	1.229	-4.639	6.474
Initial GDP	856	7.106	1.043	3.913	9.446
Life Expectancy	932	4.124	0.163	3.359	4.378
Government Consumption	790	2.667	0.448	0.8518	4.8194

3.3 Model specification

The classical economic model articulate as output is function of saving rate previous output level& investment.

Y= $f(S, I, Yt-1)$……. (1)

$S = f(Y, St-1)$

3.3.1 Cross-Sectional Model Speciation

Growth Rate effect

$$growth_i = \beta_1 + \beta_2 saving_i + \beta_3 fdi_i + \beta_4 \exp ort_i + \beta_5 \text{remittance}_i + \beta_6 bankcredit_i + \beta_7 debt_i + \beta_8 pop + \beta_9 igdppc + \beta_{10} life\_\exp ect + \beta_{11} gov\_cons + u_i$$

……. (2)

Income effect

The exogenous growth theory of Solow-Swan growth model hypothesize that in the long-run saving has only the *level/income effect*. According to this model saving is exogenously determined and the channel of effect will be through capital accumulation that transcend to increase in income

$$Income_i = \beta_1 + \beta_2 saving_i + \beta_3 fdi_i + \beta_4 \exp ort_i + \beta_5 \text{remittance}_i + \beta_6 bankcredit_i + \beta_7 debt_i + \beta_8 pop + \beta_9 igdppc + \beta_{10} life\_\exp ect + \beta_{11} gov\_cons + u_i$$

…….(3)

Where i=1, 2,….,n is a country index growth is the long- run GDP per capita growth and β_0, β_1 ……β_k are parameters while $\hat{u}\imath$ is the disturbance term.

3.3.2 Longitudinal or panel data model

$$Income_{it} = \beta_1 + \beta_2 saving_{it} + \beta_3 fdi_i t + \beta_4 \exp ort_i t + \beta_5 \text{remittance}_{it} + \beta_6 bankcredit_{it} + \beta_7 debt_{it} + \beta_8 pop_{it} + \beta_9 igdppc_{it} + \beta_{10} life\_\exp ect_{it} + \beta_{11} gov\_cons_{it} + a_i + u_i$$

Saving rate share of GDP is assumed to have positive relation with growth thus β_2>0 the higher the saving rate is the higher the economic growth will be. Moreover, saving according to the

exogenous growth model saving rate is expected to have level effect that is assumed to be positively related to income.

Similarly FDI measure the capital inflow to an economy that helps to accumulate capital both physical and human ultimately enhance economic performance thus the study assumed and expected FDI to have positive impact on income meaning$\beta_3 > 0$

Integration to the global trading system will allow countries to reap the benefit of openness that help in increase in income of countries and there progress towards the eradication of poverty the study articulate openness proxy by export of goods and service expected to enhance economic development and growth hence have positive relationship $\beta_{4>}0$.

Availability of cheaper and easier credit enable increase in investment hence promoting growth thus positive relationship is expected β_6>0. Moreover, transfer or inflow of capital (scare resource in developing world) in the form of remittance has been praised by policy makers of those countries as one of the best alternative of finance investment hence, remittance will enhance capital inflow that translate in to increase in income and growth of nation $\beta_5 > 0$.

Accumulation of large stock of external debt is concern of discussion and debate by the academics for long especially for low income countries and developing once. While some scholar argue that debt stimulate investment and hence, income as well as growth for developing countries debt overhung is serious concern and after some threshold it will affect the foundation of economic growth in poor countries. Debt burden affect economic growth negatively for low income countries and the expected sign is$\beta_7 < 0$.

Population pressure will affect economic growth negatively specially in developing countries because cost of provision of basic service such as education, health, sanitation, and public

utilities will be higher having severe impact on fiscal stance of a country thus adversely affecting economic growth/income hence $\beta_8 < 0$

Initial economic growth rate a country and it is expected that initial level of development will have negative relations with present growth according to the classical convergence hypothesis thus developing countries grow faster than advanced countries and converge to steady state thus, the study expect a negative relationship between initial growth and current growth rate hence, $\beta_9 < 0$.

Mortality pose challenges to economic progress, because if the society is not health their ability to be productive will hinder economic performance of the nation. By the same talken the longer and healthier the society stays the higher they contribute to the betterment of the economy thus, productivity will be enhanced; the higher the life expectancy/ the longer the propensity to stay alive the higher the income/ economic progress will be hence, the study expect positive relationship between life expectancy at birth and economic performance$\beta_{10} > 0$.

In developing countries government is the big spender hence government consumption behavior and economic performance tend to have sound relationship. Government consumption sending is expenditure in recurrent/consumption with limited or no invest capabilities hence, these constraint government from spending on productive sector where the future return is promising and have spill-over effect on other sector hence, the higher the government consumption is the lower the economic performance will be $\beta_{11} < 0$

CHAPTER FOUR

EMPIRICAL RESULT

The nexus between economic growth and saving rate in developing countries have been extensively debated for decades. However, no consensus has been reached yet. Moreover, most of the studies undertaken so far lack extensive, holistic approach of analyzing the connection between the two variables and the whole list of other factors interplay on this interaction; noting this short fal, this study contributes to this empirical debate by analyzing the effect of gross domestic saving on economic performance of developing countries.

According to the classical growth theory pioneered by 'The Harrod–Domar' model of growth, saving is the principal determinant of growth. Moreover, the model stipulates that economic growth depends on the marginal propensity to save and capital-output ratio.

The neoclassical theory of growth by the Solow-Swan growth theory however, hypothesizes that in the long-run saving has only the *level* and some transitory effect but not growth effects. According to this theory an increase in saving leads to accumulation of capital that transcend to higher output per capita in the steady-state, and to a higher rate of *growth* temporarily in the transition to steady-state hence, according to exogenous growth theory saving has only income or level effect in the long-run.

The endogenous theory of economic growth postulate that the increase in saving rate increases growth permanently, thus according to this theory the channel of impact of saving on growth is through increase in capital accumulation and investment. Saving rate is endogenously determined so as to affect economic growth (Romer, 1986, 1987, Lucas, 1988 Mankiw et al, 1992; Barro &Martin, 1995)

4.1 Cross-Sectional regression results

The first case of the empirical result presents the long-run relationship between economic performances and saving rate to analyze the average causal relationship between the two variables across countries controlling for other factors affecting the nexus, where mean Ordinary Least Square (OLS) and quantile regression is deployed to analyze the impact of saving on income level and growth rate in the long-run. The conventional OLS regression analyzes the average relationship between the dependent and independent variables. Since it just shows a snap-shot causal relationship between the dependent and list of independent variables, it has short comings of just portraying partial relationship while it skips distributional impacts. Hence, to fill this shortfall, the study deployed quantile regression that enables a more comprehensive stochastic relationship between the outcome variable (GDP level and GDP growth rate) covariates, furthermore, quantile regression will also help in minimizing the outliers effect and present a more robust result that helps to analyze the relationship between repressors and outcome variable.

Accordingly, the mean effect of saving on income indicates that saving rate has a positive and significant effect on income of developing countries where on average a 1 percent increase in saving rate led to 0.64 percent increase in per capita income at 95 % level of significance. Moreover, the median (first 50%) regression analysis entails that controlling all other factors, a 1 percent increase in saving rate increases income by 0.84 percent which is significant at 5 percent significance level. Similarly quantile regression result of the first 25 quantile and last 75 % quantile shows that domestic saving rate affects per capita income positively and significantly at 5 percent level of significance consequently a 1 percent increase in saving rate increases income by 0.86% and 0.81% respectively for 25 and 75 quantile. The impact of domestic saving on per capita income decreases as income level of countries increase showing that raising domestic

saving to increase income level of the country is more crucial for low income countries than it is for upper middle income countries. Hence, under both scenarios, the study found that saving has long-run level effect on economic performance in developing countries which is consistent with both growth theories. Thus, the finding of the study is consistent with both exogenous and endogenous growth theory that hypnotizes that saving rate will have income effect on countries in the long-run.

Regarding the relationship between saving rate and economic growth, the result shows that saving has positive and significant effect on economic growth and hence, the higher the saving rate the higher the economic growth will be in the long-run. The regression result of standard OLS modelshows that saving rate have positive and significant effect on economic growth at 99% level of significance accordingly on average a 1 percent increasing in saving rate led to more than 4% increase in economic growth in the long-run. The result from median regression also supports the finding of standard OLS regression result where a 1 percent increase in saving rate increases economic growth by 4.5 percent.The result of quantile regression is statistically significant at 99 % level of significance. Moreover, the distributional effect of saving rate on income and growth shows that there is a difference across different levels of distribution. While the result of median regression is similar in direction and higher magnitude with standard OLS, the impact of saving effect on economic performance for the first 10 quantile and the last 90 quantile regression is not significant on both income level and growth rate in developing countries in the long-run. The result of quantile regression entails that the bottom/ poorest segment of the population will be constrained to save and saving does not translate in to capital accumulation that enables economic growth, rather it will be used for consumption smoothing in the next season.

Table 5.1 regression result of the relationship between income and saving via OLS and QR

	OLS	Q(0.1)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
Saving	0.64*	0.78	0.86*	0.84*	0.81*	0.77
	(0.30)	(0.43)	(0.34)	(0.37)	(0.41)	(0.58)
FDI	0.06	0.29	-0.41	0.95	2.11	0.54
	(0.85)	(1.22)	(0.97)	(1.03)	(1.15)	(1.64)
Export	0.04	-0.04	-0.02	-0.01	0.14	0.13
	(0.06)	(0.09)	(0.07)	(0.08)	(0.09)	(0.12)
Debt	-0.16***	-0.10	-0.10	-0.13*	-0.25***	-0.22*
	(0.04)	(0.06)	(0.05)	(0.05)	(0.06)	(0.09)
Population	-0.07*	-0.08	-0.06	-0.04	-0.10*	-0.16*
	(0.03)	(0.05)	(0.04)	(0.04)	(0.05)	(0.07)
Remittance	0.00	-0.01	-0.00	0.01	0.00	0.01
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Bankcredit	0.14**	0.26***	0.19***	0.11	0.04	-0.08
	(0.05)	(0.07)	(0.05)	(0.06)	(0.06)	(0.09)
Initial GDP	0.73***	0.75***	0.77***	0.74***	0.69***	0.67***
	(0.04)	(0.05)	(0.04)	(0.04)	(0.05)	(0.07)
Lifeexpect	0.78**	0.67	0.89**	0.97**	0.80*	1.10
	(0.30)	(0.42)	(0.34)	(0.36)	(0.40)	(0.57)
G. consumption	0.16	0.01	0.05	0.13	0.12	0.31
	(0.08)	(0.12)	(0.09)	(0.10)	(0.11)	(0.16)
Constant	-1.46	-1.29	-2.26	-2.31	-0.76	-1.75
	(1.17)	(1.68)	(1.33)	(1.42)	(1.57)	(2.26)
N	119	119	119	119	119	119

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

The result of the study is consistent with other empirical findings where for instance Deaton (1990) argue that saving in low income countries is all about smoothening consumption in the face of volatile and unpredictable income, and helping to ensure the living standard of poor people whose lives difficult and uncertain. Such households spend as often as they save, they don't accumulate assets over long-term, and have average or very small asset holding used for consumption purpose since consumption should be markedly smoother than their income.

While the last 90 quantile are not expected to mobilize finance through domestic saving, in the globalized economy, saving surplus countries can easily lend to saving deficit countries because

of their credit worthiness hence, developing countries of that segment can easily borrow from international credit market lowering the need to mobilize capital for investment.

Thus in general, developing countries savings have positive impact on growth and wellbeing of nations inferring that the higher saving rate will increase per capita growth in the long-run.

Given the equation $Y = AK^{\sigma} L^{\beta}$ the study found that marginal return on capital accumulation or saving rate demonstrate non-diminishing return to per head capital and $\hat{k} = \alpha Ak \; where \; \alpha \neq 0 \; \frac{\hat{k}}{k} = \alpha$ and change or rate of growth of $\dot{k} \neq 0$. The basic macroeconomic identity entails that Y=f (K, L) and $\Delta k = s = I$. Hence, growth and income has an inherent tendency to move/change at steady state and the change in capital output ratio is different from zero at steady state. The result of the regression analysis shows that in the long-run contrary to the exogenous growth theory that proclaims saving will have only a level effects on economic performance of developing countries, saving have income(level) as well as growth effect on output. Hence, change in capital accumulation in dynamic equilibrium does not assume diminishing rate of capital return due to many factors such as learning by doing, human capital, research and development, externalities, technological transfer,spillover effects etc. hence, all these factors contributed to positive and significant level and growth effect of saving on economic performance of developing countries in the long-run.

To the knowledge of the author, there are very limited recent research work that deployed cross-sectional and longitudinal data analysis at the same time and examined the relationship between saving and economic performance for a list of developing countries. Most of the research that analyzed the nexus between the two variables dwelled on time series analysis and instituted as there exist causal relationship between saving and economic performance. For instance, Singh

(2010) claims that saving rate had positive and significant effect on economic growth in India in the long-run and claims that endogenous growth theory uphold at least for India.

Table 5.2 regression result of relationship between growth rate and domestic savings

	OLS	Q(0.1)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
Saving	4.11**	2.28	5.97**	5.48**	4.26*	4.94
	(1.48)	(2.08)	(1.86)	(1.65)	(1.89)	(3.77)
FDI	7.99*	7.97	10.01	8.34*	18.16***	16.31
	(4.20)	(5.89)	(5.25)	(4.65)	(5.35)	(10.65)
Export	0.16	-0.22	-0.40	-0.02	0.51	1.05
	(0.32)	(0.44)	(0.40)	(0.35)	(0.40)	(0.80)
Debt	-0.75***	-0.47	-0.27	-0.73**	-0.92**	-0.94
	(0.22)	(0.31)	(0.28)	(0.24)	(0.28)	(0.56)
Population	-0.46**	-0.20	-0.16	-0.51**	-0.44*	-0.66
	(0.17)	(0.23)	(0.21)	(0.18)	(0.21)	(0.42)
Remittance	0.01	-0.06	-0.04	0.03	0.01	0.04
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.06)
Bankcredit	0.36	0.64*	0.68*	0.34	-0.03	-0.49
	(0.23)	(0.32)	(0.29)	(0.25)	(0.29)	(0.58)
Initial GDP	-1.33***	-1.13***	-1.18***	-1.27***	-1.41***	-1.50**
	(0.18)	(0.25)	(0.22)	(0.20)	(0.23)	(0.46)
Lifeexpect	4.34**	7.95***	5.62**	4.78**	4.28*	4.84
	(1.46)	(2.05)	(1.82)	(1.62)	(1.86)	(3.70)
G. Consumpti	0.50*	-0.41	0.13	0.46	0.50	0.59
	(0.41)	(0.57)	(0.51)	(0.45)	(0.52)	(1.04)
Constant	-7.04	-22.88**	-14.88*	-8.83	-5.25	-6.57
	(5.75)	(8.08)	(7.20)	(6.38)	(7.34)	(14.60)
N	119	119	119	119	119	119

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

With regards to other control variables that affect economic performance, FDIs have positive and significant impact on economic growth in the long-run but not income of developing countries hence, a 1 percentage point increase in FDI tends to increase economic growth by approximately 8 percent, at 90 % level of significance. Similarly the result of median regression that take-care of outlier effect also depicts the same result where on average a 1 percentage point increase in FDI tends to increase national economy by 5.5% at 90 % significance level thus similar to the conventional wisdom that economic FDI has positive and significant effect on growth.

Similarly, debt is a concern for most developing countries and debt overhung is a severe concern for low income countries especially those in Africa hence, the more indebted a country is the lower the economic performance is expected to be. The result of the study was in conformity with most of the empirical work that assess the relationship between debt and economic performance where a 1 percent increase in debt rate tends to decrease income by 0.16 percent and growth by 0.74 percent for standard OLS regression and the result of median regression depicts that debt will reduce income level by 0.13% and growth rate by 0.73 % all at 99% level of significance.

Convergence hypothesis is the other issues of consideration. Neoclassical growth theory is considered to be among the pioneer in articulating convergence hypothesis entailing convergence of low income countries growth and income level over time to that of advanced countries. Hence, according to the convergence hypothesis at initial stage of development, poorer countries exhibit lower capital-labour ratios meaning these countries end-up with higher marginal product of capital. Controlling for many other factors such as saving rate, productivity, capital accumulation etc. poorer countries tends to grow faster in capital-labour and capital-output ratio than advanced economies thus, converge to same stationary level. Similarly, the endogenous growth theory proposes conditional convergence where low income countries grow faster than the advanced economies. However, rather than converging to the same steady state they will converge to different steady state. The result of the study also supports the above proposition where initial per capita converges for low income countries and it is statistically significant effect at 99% level of significance.

Table 5.3 regression result of long-run relationship between income, growth rate and savings

	OLS GDP Income	OLS GDP Growth	Median GDP Income	Median GDP Growth
Saving	0.639**	4.112***	0.845**	5.483***
	(0.302)	(1.485)	(0.366)	(1.646)
FDI	0.056	7.993*	0.946	8.345*
	(0.854)	(4.196)	(1.035)	(4.653)
Export	0.038	0.159	-0.009	-0.023
	(0.064)	(0.316)	(0.078)	(0.351)
Debt	-0.161***	-0.746***	-0.127**	-0.726***
	(0.045)	(0.220)	(0.054)	(0.244)
Population	-0.072**	-0.455***	-0.035	-0.506***
	(0.034)	(0.166)	(0.041)	(0.184)
Remittance	0.000	0.011	0.010*	0.029
	(0.005)	(0.023)	(0.006)	(0.026)
Bank credit	0.140***	0.359	0.112*	0.336
	(0.047)	(0.229)	(0.056)	(0.254)
Initial Income	0.735***	-1.332***	0.744***	-1.271***
	(0.037)	(0.180)	(0.044)	(0.199)
Life expectan	0.779***	4.338***	0.967***	4.778***
	(0.297)	(1.458)	(0.360)	(1.617)
G. Consumpt	0.161*	0.501	0.135	0.460
	(0.083)	(0.408)	(0.101)	(0.453)
Constant	-1.463	-7.042	-2.314	-8.828
	(1.171)	(5.753)	(1.419)	(6.379)
Ad-square [2]	0.93	0.51	0.78	0.35
Observation	119	119	119	119

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

4.1.1 Initial value regression result

The initial value regression helps to address the average evolvement of the relationship between economic performance and saving rate. Hence, it helps in analyzing the initial relationship between saving and economic performance that assist in ensuring consistency of the relationship or deviation from the initial. Noting this, the study deployed initial value mean as well as median (quantile) OLS regression. The result from the study is consistent with cross-sectional data and

[2] The R-square for median regression is Pseudo R2

initial value regression results where saving has positive and significant impact on economic performance. Controlling for other factors, on average, a one percent increase in saving rate leads to more than 1 % increase in income level and a more than 10 % increase in economic growth rate of developing countries. The result is statistically significant at 95 percent level of significance. Similarly, the initial value quantile regression result also entails that on average a 1 percent increasing in domestic saving rate tends to increase per capita income by more than 1.5 percent which is statistically significant at 99% level of significance. The impact of saving on economic growth through the median regression is positive although it is not statistically significant.

Table 5.4 Initial value regression result nexus betweensaving and economic performance

	OLS Income	OLS Growth	Median Income	Median growth
Initial saving	1.096**	10.981**	1.558***	2.995
	(0.458)	(5.286)	(0.553)	(6.787)
Initial FDI	0.027	0.046	0.015	0.072
	(0.023)	(0.262)	(0.027)	(0.336)
Initial export	0.192	-0.762	0.062	0.555
	(0.116)	(1.344)	(0.141)	(1.725)
Initial debt	0.050	-0.298	0.019	-0.085
	(0.050)	(0.575)	(0.060)	(0.738)
Initial population	-0.083	0.778	-0.072	1.093
	(0.063)	(0.732)	(0.077)	(0.940)
Initial remittance	-0.004	0.259**	0.008	0.210
	(0.009)	(0.101)	(0.011)	(0.130)
Initial bank credit	0.120	-2.381***	0.203**	-1.418
	(0.074)	(0.857)	(0.090)	(1.101)
Initial life expe	2.948***	7.169	2.871***	12.138*
	(0.452)	(5.218)	(0.546)	(6.701)
Initial G. consumpt	0.120	0.886	0.177	-0.851
	(0.165)	(1.901)	(0.199)	(2.442)
Constant	-6.364***	-25.132	-6.036***	-47.082*
	(1.770)	(20.447)	(2.140)	(26.254)
R-Square [3]	0.58	0.16	0.4390	0.0536
N	119	119	119	119

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

[3] The R-square for median regression is Pseudo R2

4.2 Panel data regression result

Longitudinal model analysis aids in understanding the relationship between the dependent variable and variables of interest across observations and over time allowing the analysis of inter-individual differences and intra-individual dynamics, thus filling the limitation of cross-sectional data method that is the single snapshot causation between variables. Moreover, it also solves limitation of time series analysis that primarily explains particular observation of economic variables over different time spans. Similarly, models that deploy longitudinal data reduce the severe collinearity problems among independent variables. Moreover, it helps to solve the problem of omitted variable bias that are correlated with the independent variables that enables us in not violating one of the main econometric assumption of Least Square i.e. the assumptions that covariance of independent variables is zero. Panel fixed effect helps to solve the omitted variable bias encountered in most of econometric analysis with the assumption that those omitted variables are time-invariants and their effect will be constant.

$$Y = \beta_1 x_{it} + a_i + u_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

Where βis parameter and x_{it} is list of variables that vary across country i&time t,u_{it} is error term while a_i is time-invariants observation

According to the exogenous growth model, countries can increase their income and grow at faster rates through capital accumulation hence, saving will increase income of developing countries in the short-run. The panel fixed effect will enable us to get rid of time-invariant variables and the time dummy will help in addressing the time variant omitted observation. Consequently the study was able to estimate the effect of change in saving rate on economic performance, thus, saving rate has positive and significant effect on income level in the short-run in a developing country that is significant at 95 percent level of significance. However, saving

does not have growth effect. The result of the study is heteroscedasticity robust. A 10 percent increase in gross domestic saving rate will lead to a 1.2 percent increase in per capita income in developing countries. The regression result of Pooled OLS depict that saving rate have positive and significant effect on income as well as economic growth rate of developing countries. A 1 percent increase in domestic saving rate tends to increase per capita income by 0.12 percent.

Likewise, a 1 percent increase in saving increases growth rate by more than 3.8 percent. However, the pooled OLS analysis is claimed to be exposed to standard error bias hence, making test statistics of t-test and p-value accuracy unreliable. Although the result of Pooled OLS regression i.e. the coefficients, standard error and hence, the t- statistics and p-value might be exposed to bias, it is still consistent with the finding of fixed effect regression analysis that address time-invariant omitted variables. It can be concluded that allowing for diversity among countries and across time, saving has economic performance.

Hausman specification test

Hausman specification test of panel data regression analysis helps to test which model (fixed effect or random effect) to select for the analysis i.e.to check a more efficient model among the two but consistent model to make sure that the more efficient model also gives consistent results. Thus, the Hausman specification test panel data method tests the null hypothesis that the coefficients estimated of random effect that are efficient are as effective and consistent since fixed effect coefficient estimator although consistent is not efficient. Following the study, Hausman test rejected the null hypothesis that claims that random effect is consistent as fixed effect and also efficient at the same time.

Table 5.3 Nexus between saving and growth Panel Regression result

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

	Fixed Effect GDP Income	Fixed Effect GDP Growth	OLS GDP Growth	OLS GDP Income
Saving rate	0.116**	1.782	3.888***	0.121***
	(0.055)	(2.571)	(1.430)	(0.036)
FDI	0.002**	0.078**	0.124***	0.003***
	(0.001)	(0.031)	(0.025)	(0.001)
Export	0.025*	1.095**	0.310	0.007
	(0.013)	(0.492)	(0.224)	(0.007)
Debt	-0.003	-0.288	-0.582***	-0.009**
	(0.007)	(0.261)	(0.141)	(0.004)
Remittance	0.001	-0.001	0.031*	0.001**
	(0.001)	(0.028)	(0.018)	(0.000)
Bank Credit	0.028***	0.587**	-0.138	0.002
	(0.009)	(0.274)	(0.154)	(0.005)
Population	-0.005	0.172	-0.242	-0.010***
	(0.004)	(0.246)	(0.194)	(0.003)
Initial GDP	0.854***	-5.587***	-1.107***	0.970***
	(0.021)	(0.862)	(0.172)	(0.005)
Life expectancy	0.078	5.168**	6.310***	0.129***
	(0.050)	(2.474)	(1.306)	(0.026)
Government consumption	-0.029*	-0.643	-0.128	-0.007
Constant	0.634***	15.062	-16.102***	-0.282***
	(0.242)	(11.481)	(5.426)	(0.089)
R-Square	0.96	0.33	0.97	0.53
Observation	602	602	602	602

In summary, it can be stated that controlling for all other factors, saving does affect economic performance both income/level and growth rate across countries and over period of time hence, the higher the saving rate is the higher the economic progress of developing countries will be. The finding of both the panel study and the cross sectional study affirm that domestic saving is a very important factor for faster and sustained growth of developing countries and the fight against poverty at the same time.

Most macroeconomic models are vulnerable to endogeneity problem mainly due to the high interlinking nature of the variables. Similarly, if the regression model of the study is exposed to endogeneity, problem identification of the direction of bias will assist because if the direction of the bias is known although not fully addressing the challenge, it can partly signal the direction of

bias. From the relationship developed, saving and economic performance have positive relationship where increase in saving tends to increase economic performance, thus due to endogeneity, the result of the study might be underestimated because the covariance between the variables and error term$cov(x_i, u_i) \neq 0$ and will be smaller making downward bias and the coefficient of the parameters smaller that ultimately underestimating the coefficient of the variable of interest of the study. All in all, the result of the study is more confident of the strong and significant nexus between saving and economic performance. Moreover, the study also used panel fixed effect to reduce the endogeneity problem that emanate from time invariant unobserved variables that affect the model results and the regression results from panel and cross-sectional dataset.

To sum-up, since domestic saving rate has both level and growth effect on output, the finding of the study tally with endogenous growth model that propose non-diminishing marginal return on per capita heading due to innovation, research and developing learning by doing and human capital development such as transfer of know-how and technology all make saving endogenously determined and affect the economy.

CHAPTER FIVE

CONCLUSION

5.1 Introduction

When one explore the world from one end to the other it is apparent to notice significant difference in level of income of countries hence, difference in way and quality of life across countries (Mankiw, 1995). However, the rarely noticed fact is the prevailing factor for such difference among countries.

Understanding nation's source of growth and disparity between them has been the founding quest in the field of economics for centuries. The growth theory developed by neoclassical growth theory mainly the exogenous growth model of Robert Solow and the recent endogenous growth model such as the famous AK model are the prominent theories in the field that tried to answer this fundamental question

5.2 Summary of the study

Analysing the relationship between domestic saving rate and economic performance (income and growth) over short and long-runtime horizon was the major objective of the study. If there exist strong relationship between these two variables, which theory of growth uphold in developing countries? Answering this question was the other major interest of the study.

The nexus between economic growth and saving rate in developing countries have been extensively debated for decades. However, no consensus has been reached yet. Moreover, most of the studies undertaken so far lack extensive and holistic approach of analysing the connection between the two variables and other factors role over period of times. Noting this gap, this study

contributed to the empirical debate by analysing the effect of gross domestic saving on economic performance of developing countries.

Firstly, the study analysed the relationship between saving and economic performance using cross sectional data that helps in analysing the causal relationship between regressor and outcome variable across countries and secondly longitudinal data that helps to address cross-country causal relationship between the dependent and independent variable as well as over time interaction between the two was utilized for analysis of the nexus hence, this helps in addressing time dimension variability across countries

Accordingly, the study found out that in the long-run higher domestic saving rate will leads to an increase in per capita income. The result is positive and statistically significant at 95 percent level of significance, moreover, since the mean regression is exposed to outlier effect and neglect the distributional impact, the study used quantile regression analysis where the result of the quantile regression is consistent with the result from the conventional OLS. However, the first 10 quantile and the last 90 quantile are found to be not statically significant and impact of saving on income level decrease with increasing per capital income.

The result of the study is consistent with other scholars' findings that used different method of analysis and also data-set for instance Rober J. Barro 1991 analyzed the impact of saving on per capital GDP through investment (government and private) found out that saving affect per capita income thus, higher saving rate led to higher investment hence increase in GDP per capita in the long-run

In summary, the result of the regression is consistent with both growth theory of exogenous growth theory and also the endogenous growth that claims that saving will have income effect in the long-run.

Given the equation $Y = AK^{\sigma} L^{\beta}$ the study found that the marginal return on capital accumulation or saving rate is non-diminishing return to per head capital and $\dot{\hat{k}} = \alpha Ak \; where \; \alpha \neq 0 \; \frac{\dot{\hat{k}}}{k} = \alpha$ and change or rate of growth of $\dot{k} \neq 0$. The basic macroeconomic identity entails that Y=f (K, L) and $\Delta k = s = I$. Hence, growth and income have an inherent tendency to move or change at steady state and the change in capital output ratio is different from zero at steady state. Secondly, in analyzing the nexus between growths and saving, the regression result showed that in the long-run, saving has both income (level) effect as well as growth (rate) effect. This implies that change in capital accumulation in dynamic equilibrium does not assume diminishing rate of capital return due to many factors such as learning by doing, human capital, research and development, externalities, spillover effects, technological transfer etc. Therefore, all these factors contribute to positive and significant level and growth effect of saving on economic performance of developing countries in the long-run.

Similarly the study utilized longitudinal data method to analyze the dynamics of saving and output across country over a period of time from 1980-2013. The study used panel fixed effect with time dummy to analyze the evolving impact of domestic saving over time. The result of panel fixed effect depicted as saving have level effect but not growth effect while the result of panel OLS showed that there was both level and growth effect.

In conclusion domestic saving rate have positive and significant impact on economic performance (both level and growth rate) of developing countries and the result of the empirical investigation is in conformity with endogenous growth model.

However, many other factors besides saving affect income level and growth rate of countries hence, the study controlled for such factors to get consistent result. Regarding control variables FDI does not affect per capital income in the long run although it affects growth rate positively and significantly at 95 percent level of significance for cross sectional data set. In the meantime, for panel data FDI positively and significantly affect per capita income at 99% level of significance. Similarly, debt affects income level and growth rate negatively and the effect is statistically significant. In addition, financial sector development was found to be a significant factor of economic development in developing countries, while government consumption negatively affect economic growth rate in the long-run which is consistent with Barro (1991). Contrary to common expectation, openness does not affect income level and economic growth in developing countries.

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