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A contribution to the theory of economic growth: Old and New

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In this study it is possible to provide a simple theoretical and empirical literature framework that links the endogenous growth theory through to the classical economists' theory. There is also the following phenomenon that emphasises the proceeding to Harrod-Domar growth model, through to the model of the neoclassical growth theory. The study utilising the production function and, through to the developed new models of "new growth theory"/ or endogenous growth theory that consider policy influences on growth and divergent outcomes among countries. Within this recent approach, theoretical and empirical studies have attempted to find the relationship between development of financial markets and the new approach of endogenous growth theory. Economists working in this area should target their work directly to the analysis of policy options in developing countries. Policymaking generally will benefit from empirical results generated from more carefully constructed structural economic models.

Keyword: Economic growth, Harrod-Domar Growth Model, Neoclassical Growth Theory, New Endogenous Growth Theory, Financial structure.

INTRODUCTION

The growth and development theorists in both micro and macro-economic are concerned with collection activity, the level of national output and its growth over time. they also study the problems of stagnation, unemployment, inflation, interest rates, economic growth, wages, the exchange rate, the stock market and cyclical instability, and the policies (fiscal and monetary policy) adopted by governments to deal with these problems, economic conditions abroad (foreign level of activity and interest rates) also the price of oil, and the balance of payment within other countries. They also promote the economic welfare of the poor and wealthy households affected by fluctuation in interest rates or the rate of inflation which are called endogenous variables, the others endogenous variables are the object of analysis in the economic and financial model as Figure 1 shows. The relationships between endogenous and exogenous variables are random, as exogenous variables are not strictly independent of the endogenous variables (Burda and Wyplosz, 2001).

Within the emergence of the endogenous growth literature model, the focus would be shifted from relying on the unknown exogenous technological progress to explaining economic growth by different theoretical and empirical models where the engine of growth also,

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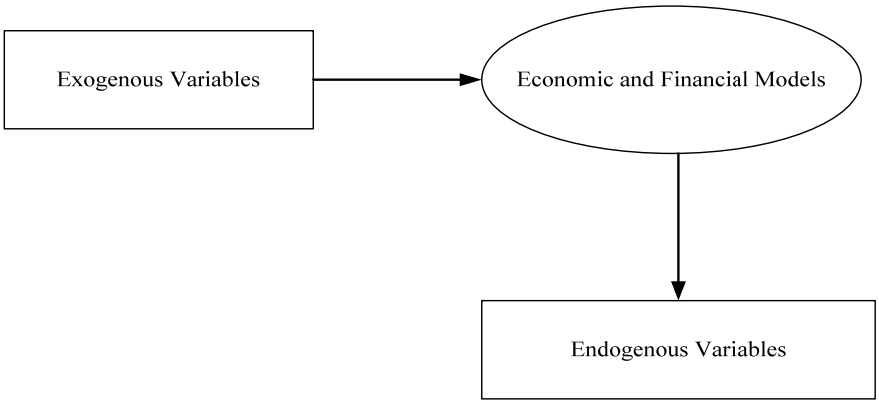

Figure 1. Relationships between endogenous and exogenous variables

concludes human capital or knowledge that is accumulated during a period of time.

However, periods of high unemployment and stagnation occur from time to time throughout the world (e.g. in the 1930s in the US, the early 1980s and the early 1990s in South East Asia). During the same period (1990s) Libya experienced the same economic problems of stagnation and unemployment. All development economists' structure and performance writing about forces determined the progress of the nation's economies as the countries of Europe improved the process of industrialisation, in the eighteenth and nineteenth centuries (Thirlwall, 2006). For these reasons, this continued to the theorists of the later 1950s and early 1960s who observed the process of development growth as a series of successive types of economic growth, in which the right quantity and mixture of saving, investment and foreign aid were all that was essential to enable the development of nations that had historically been followed more by developed countries (Bourne, 2006). Through the 1980s and early 1990s there was counterrevolution approach in economics such as the beneficial role policy of free market, open door economies and the privatisation of inefficient public enterprises projectiles (Todaro and Smith 2006).

Maddison (1995) considers the economic growth performance over the long-term to be due to three main causal influences which increase per capita output: technology progress; accumulation of physical capital; integration of global economies vis-à-vis trade in goods and services, investment, intellectual and entrepreneurial interaction. Within the fourth aspect are other elements: economic size; structural change; the relative scarcity or profusion of natural resources. For instance, Swan (1960:3) many years ago wrote:

"We also know that if we were asked to think about a five-year plan for India: we would need to learn a great deal about India, about people, about practical techniques, and we would not hope for more from economic theory that than it might help us with some basic insights as to how to set about the task".

However, the target of economic growth theories is to increase the welfare of human beings and, hence, determine the growth in the standard of living of the population of a country. Also, economic growth can be defined as growth per capita of gross domestic product (GDP). The other elements, for instance, distribution of income, the availability of health and access to education remain part of economic growth.

The rest of study, therefore, is divided into four main sections, related to the a contribution to the theory of economic growth: old and new. Section 2 discusses the literature review is divided into four main sub-sections as follows: In Sub-section 2.1, the classical economists' theory is identified. Sub-section 2.2, the Harrod-Domar's growth model is discussed. Sub-section 2.3, the neo-classical growth theory and the use of production function is provided. This followed by an explanation of the new growth theory, or endogenous growth theory in Sub-section 2.4. Section 3, empirical framework in variation study can be identified are provided. In Section 4, a summary and conclusion of this study are also provided.

Literature Review

Historically, both theoretical and empirical studies of financial development and growth within the endogenous growth literature focuses almost always on the role the banks play in the rate of financial market development (Cameron (1967) and Mckinnon (1973), among others). Furthermore, following the new growth theory, which was beneficial in re-emphasising the number of fundamental issues concerning the interdiction of technical progress, economies of scale and formation of physical "convergence" of countries where the institutional policy and repudiation of the notion of "unconditional" convergence (on global scale) is useful and one way of focusing

attention upon the interaction of "proximate" and "ultimate" causal influences, (Maddison, 1995). In the following Sub-sections 2.1, 2.2 and 2.3, we focus the review of previous studies to provide a simple theoretical and empirical literature framework that links the endogenous growth theory through to the classical economists' theory and then proceeding to Harrod-Domar growth model through to the neoclassical growth theory and the use of production function and, finally, to the so-called "new growth theory"/ or endogenous growth theory. Within this recent approach, theoretical and empirical studies have attempted to find the relationship between development of financial markets and the new approach of endogenous growth theory.

Growth Theory

The history of the economic theory growth of out-put and the distribution of income between wages and profits were presented by Adam Smith in 1776 as the "Wealth of Nations". The most important contribution was to introduce the notion of increasing returns, based on the division of labour. His major contribution was to the fundamental forces which underlie the development of economic policy (Farmer, 1997). Adam Smith's contribution is described as: "A poetic expression of the most fundamental economic balance relations, the equalisation of rates of return, as enforced by the tendency of factors to move from low to high returns" (Arrow and Hahn, 1971:1). According to Barkai (1969) the "Wealth of Nations" emphasized that technology was far more important than other factors which explained the nature and situation of the wealth of a nation[1].

Smith's theory has been discussed in relation to the advance of stock as interwoven within within his theory is the notion which depends on capital accumulation to consider market allocation of resources and income in such a manner that Bowley (1975:376) is led to comment that, "advances of stock are of overwhelming importance as the means of resource allocation". As the capital accumulation to the stocks plays a role in the economic growth process of circulating, fitted capital used to support productive labour in turn generates the capital necessary to support labour in the future. Smith indicated that the relationship of economic growth had for a long time been regarded as primary to the understanding of political policy and social environment by increased specialisation and division of labour and upon the accumulation of real capital. He created the simplest of production functions model of growth by the following equations:

$$Y = f(L, K, T) \quad (1)$$

where Y is output, L is labour, K is capital and T is land. In this case output is related to labour and where Y is output, L is labour, K is capital and T is land. In this case output is related to labour and land to inputs. While, output growth (G_Y) is measured by population growth (g_i), investment (g_k) and land growth (g_t), and in overall productivity (g_f) as follows:

$$_{Gy} = \phi(g_{\ f}, g_k, g_t) \quad (2)$$

Smith proposed that the population growth in the tradition of time was endogenous. Also, it was invest-ment endogenous, which was measured by the rate of saving. Land growth depended on new land/or techno-logical improvement of old land. Subsequently, the technological progress could also increase growth overall. Thus, Smith did not see growth as forever rising, and he posited in the form of the "strong state" where population growth and capital accumulation were zero. According to Eltis (1975:426) "Adam Smith's theory of growth has provided better predictions of the course that economic development was to follow in the nineteenth and twentieth centuries than the theories of his great successors, Malthus, Ricardo, and Marx, who predicted at best constant living standards for the great mass of population". In fact, Smith chose to emphasise the capital acclamation portion of his theory, rather than the level of contribution which he began within "Wealth of Nations". Thomas Malthus (1798) wrote his theory of population, called "Essay on the Principle of Population". His focus was on the importance for development of maintaining effective demand and the possible imbalance between the supply of savings and the planned investment of capitalists, which could increase development. He notes that the population goes on doubling itself every twenty five years or increases at a gradual rate.

David Ricardo was another of the great classical theorists. In 1817 he published "Principles of Political Economy and Taxation" and his model, like Smith's growth and development, is a function of capital accumulation, and the capital accumulation depends on re-investment. Karl Marx in his famous work "Das Kapital" (1867) presented the collapse of capitalism, and in the classical school agreed that the rate of profits on capital would be full as the economy grew, but this differed from Adam Smith and Ricardo, who argued that decline in profits, is the result of competition among capitalists. Ricardo also saw the fall as the result of diminishing returns to land and profits being pressed between rate and wages, leading to a stationary state. Marx's model however emphasise a many similarities to other classical economic models.

In early 1890, as economics came under the static neoclassical value theory, Alfred Marshall wrote "Principles of Economics", which treated growth and

[1] Also Schumpeter (1939:154) pointed out that: "*Without development there is no profit, without profit no development*".

development as a natural phenomenon; an evolutionary process similar to biological development in the natural world. Young (1928), provided a few point of framework on the older work of Marshall in 1890, pointed out the link between the internal productive economies and the external economies, and he agreed with Adam Smith's old idea that division of labour leads to inventions limited by the extent of the market, in which increasing to scale is realized into growth context, also pointed out the technological change progress of economic conditions as "*endogenous growth theory*"[2].

The Harrod-Domar Growth Model

The modern growth theory started with a classic article of British economists by Roy Harrod and Domar, "An Essay in Dynamic theory", now called the Harrod-Domar Growth Model. This model described the economic mechanism that more investment leads to more growth. According to Harrod (1939, 1948) and Domar (1946) the capitalist system is inherently unstable by using the production function. However, they explained how the aggregate supply expanded, which means the investment has two effects, one on the aggregate demand side such as business expends more, and the other on the aggregate supply side whereby more investment increases capital stock and produces more business as follows:

1) Production function (supply side)

$$Y=a.K \quad (3)$$

where a is the productivity of capital, so, the determent of changing in capital will be changing the income as:

$$\Delta Y = a.\ \Delta K \quad (4)$$

Also, how the capital was changed by business and government / or investment:

$$\Delta K = I \quad (5)$$

Return to the equilibrium conditions of (S) saving ratio, (s) is propensity to save of national income (Y) as follows:

$$S = sY \quad (6)$$

2) The investment (I) is defined as the change in the capital stock (K), and can be represented ΔK such that:

$$I = \Delta K \quad (7)$$

However because the total capital stock (K) is retentively direct to the total national income/ output (Y) as expressed by the capital-output ratio (k) it will follow that:

$$K = k\,\Delta Y \quad (8)$$

3) Additionally, because national saving (S) should be equal investment (I), the equation will be:

$$S = I \quad (9)$$

But from all equations (6, 7, 8, and 9) will be the following:

$$sY = k\,\Delta Y \quad (10)$$

Therefore, following that, the final question will appear as:

$$\frac{\Delta Y}{Y} = \frac{s}{k} \quad (11)$$

where (s) is the ratio of national saving, (k) the national capital-output ratio, ($\Delta Y/Y$) measures the growth of output. From the Equation 11 the most fundamental strategy of economic growth is simply to increase the proportion of national income saved, but this would raise s and then increase $\Delta Y/Y$ at the rate of GDP.

Nevertheless, the main obstacle for developing countries according to this theory was the relatively low level of new capital formation in most poor nations. Also, the capital constraint approach to growth and development became the justification in terms of cold war politics for transfers of capital and technical assistance from the developed to the developing nations. Kaldor (1955, 1956) indicated that the accumulation of capital has been observed and the quantity of labour available and the growth rate of the economic system determined by the share between increasing income and savings, in which the growth of the working population rose and, perhaps, the technological of the system will increase. The following equations of wages and saving/ or income ratio for the growth, have been used:

$$S = \boldsymbol{S}_w(w/y) + \boldsymbol{S}_P(P/y) \quad (12)$$

where $\boldsymbol{S}_w$ is the average of workers to save, and $\boldsymbol{S}_P$ is the average of capitalist to save, perhaps w/y and P/y are the shares between wages and profits, respectively. If $\boldsymbol{S}_w$=0 then workers save nothing. So, all the saving of the economic system being to carry thus, which will be the only case of equilibrium rate of profits $\pi = (P/K)$, which can be considered as the following:

$$\pi = g / \boldsymbol{S}_P \quad (13)$$

[2] Young (1928:583) pointed out that: "*Its internal economies dissolve into the internal and external economies of the more highly specialised undertakings which are its successors, and are supplemented by new economies.*"

where g exogenous to π unknown, this will lead the workers to save which is positive. The result of this theory is considered by Kaldorian, where Kaldor has called himself "Keynesion". Basically, this theory confirms the classical ideas of factors such as the production and the distribution of income.

According to Harrod-Domar is growth model, which has come under attack by new growth theory, investment does not matter for long-term growth (next part of "new" economic theory). The assumption and prospective of neoclassical growth theory will now consider how to understand the source of growth used in empirical models for developed and developing countries. The neoclassical growth theory was born as the result of Harrod-Domar is model and the new growth theory developed as the result of the neoclassical growth theory.

Neoclassical Growth Theory

The "neoclassical economic theory" tried to get closer to the Keynesian economics by development of the theory of expectations and of the real business cycle, where many problems could be faced today, both financial and social activities such as money and banking, organised securities, foreign exchange markets, large corporations, holding companies, business associations, organised labour, etc.

Neoclassical economics provided the framework since its arrival in the 1870s (Debraj, 1998), which paid attention to the choice of behaviour in analysing the statistics model's special point of view of the quantitative processes of response, rather than the qualitative mechanisms inherent in technological transformation. However, during the technological has been changed Second World War period the technological transformation altered rather than static quantitative model to increase in factor inputs, measured by increasing the economic growth rate (Brinkman and Brinkman, 2001). During the 1960s, neoclassical growth theory was practiced and people generally accepted its approach to modelling growth in the long-term, which has been driven by increasing returns: Ramsy (1928), Arrow (1962), Cass (1965), Koopmans (1965), Solow (1956) and Swan (1956). This kind of framework assumed the neo-classical model production of consumption rising as a function of the stock of knowledge increasing within constant return to scale, which returns to each input (labour and capital) as well as smooth elasticity of the substation between the inputs. For instance, Arrow (1962), in his model "learning-by-doing", argued that new machines are improved and more productivity will result as the function of the cumulative which will also increase investment for the industry, because new knowledge should be discovered as the result of investment. However, Arrow's model meant that two problems could be encountered which would increase any rates of growth model of increasing returns:

- Existing competitive equilibrium.
- The function of capital and labour increase returns to scale.

Smith (1776) pointed out the technological improvement in the form of "learning by doing" or "learning by using" with economies of scale through to the concept of division of labour in the process of the wealth of nations. Furthermore, according to some recent studies (Lucas 1988; Romer 1986 and Stiglitz 1987), it has been argued that the major difference between the more and less developed countries increased by learning-by-doing. Thus, "*learning-by- doing*" increased the stock of knowledge and human capital, and other factors such as yield quality[3].

The basic *neoclassical growth model* was developed by Solow-Swan. This model used the aggregate production function based on three key assumptions:

a. The labour force grows at constant exogenous rate, 1.

b. Output is function of capital and labour such as: $Y = F(\mathrm{K}, L)$ which the production functions relating output to constant returns to scale as shown in Figure 2.

c. There is no independent investment: $S = 1 = sY$.

Now from production function equation $Y = F(\mathrm{K}, L)$ will assumed consciously K, L as following:

$$Y/L = F(K/L, 1) \tag{14}$$

or, if $k = K/L$ we can write as:

$$y = f(k) \tag{15}$$

where $f(\cdot)$, is the intensive or per capita of the production function $F(\cdot)$, as the result from this equation of the macro-economic equilibrium condition will be:

$$i = sf(k) \tag{16}$$

From this equation, if the macro-economic equilibrium holds constantly, for example, (I=S) always, then $i = sf(k)$ will be referred as the actual investment per person. As Figure 3 shows the intensive production function is $y = f(k)$ with the actual investment function equilibrium $i = sf(k)$.

Although, from the neoclassical model growth assumed that the population grows exogenously at the rate n as follows:

[3] For more explanation see (Chang, 1997).

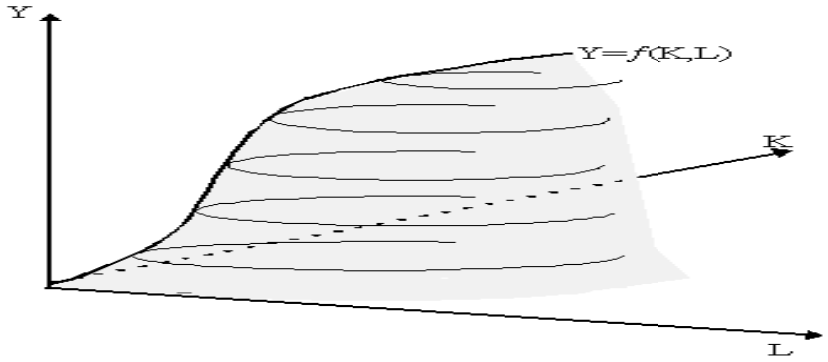

Figure 2. Production function for one –output/ two-inputs

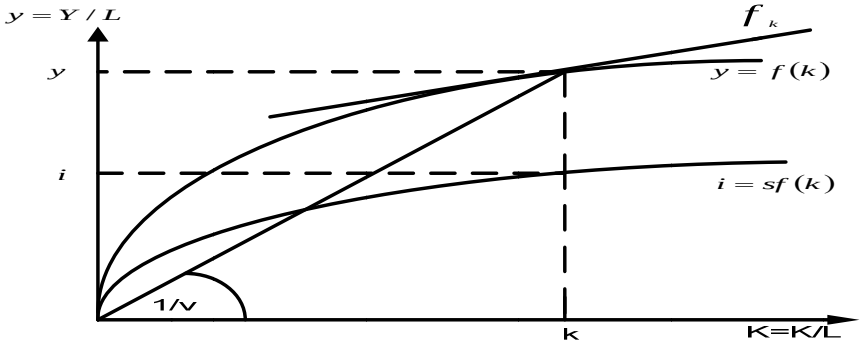

Figure 3. Intensive production function

$$g_l = (dL/dt)/L = n \quad (17)$$

So, if there is no investment, then $k = K/L$ which will automatically fall as the population grows, in which (k) will be constant, then there should be investment (capital must be grow) at rate (n):

$$gk^r = (dK/dt)K = n \quad (18)$$

where r is the required growth rate of capital to keep the capital-labour ratio (k) steady, as investment is defined as $I = dK/dt$, the following equation arises:

$$i^r = nK \quad (19)$$

where i^r is required investment, divided by labour, $Li^r / L = nK / L^r$, or: $i^r = nk$ in which the required investment per person to maintain steady k. the following figure shows steady-state of growth (Figure 4).

In addition, the basic *neoclassical growth model* is designed to show how the economy will tend to be in the long-term equilibrium capital-labour ratio (k^*) at which output or income per head (y^*) is also in equilibrium so all output, capital and labour growth are at the same rate,1. Therefore, the model predicts long-term growth equilibrium at the natural rate. Nevertheless, the *neoclassical growth model* usually used function production method within constant returns to scale using something called "*Cobb-Douglas production function*" as follows:

$$Y = bk^{\alpha} L^{1-\alpha} \quad (20)$$

where α is the output with respect to capital, $1-\alpha$ is the output respect to labour, and perhaps $\alpha + (1-\alpha) = 1$, that is, 1 *per cent* increase in K and L will lead to l *per cent* to scale. Also, Equation 20 developed by (*labour-intensive*) dividing both sides of the equation using L to give output per head as function of capital per head:

$$\frac{Y}{L} = \frac{bK^{\alpha} L^{\alpha}}{L} = b\left(\frac{K}{L}\right)^{\alpha} \quad (21)$$

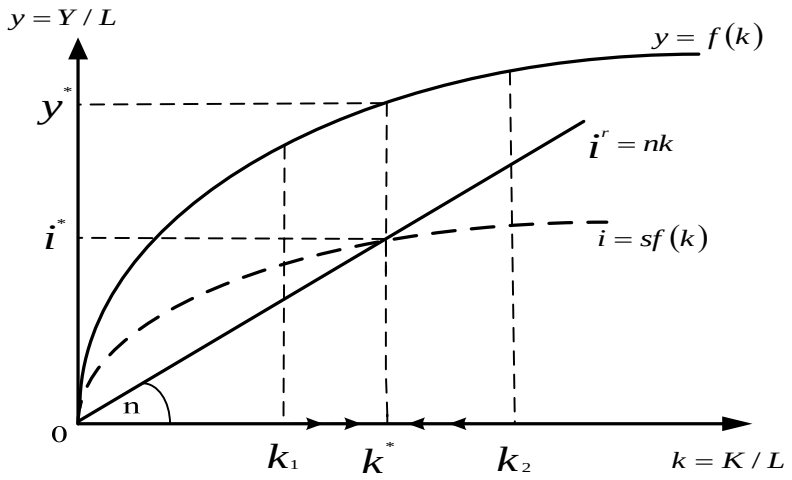

Figure 4. Steady-state growths

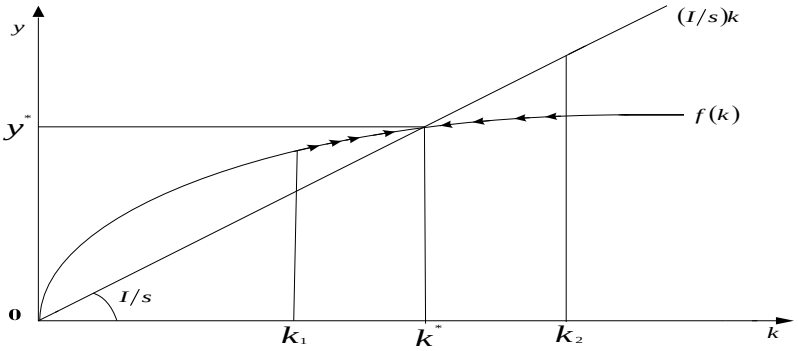

Figure 5. Equilibrium capital-labour ratios and out-put per-capita

or, for short equation:

$$y = b(K)^{\alpha} \tag{22}$$

Furthermore, the rate of growth of capital equals the rate of labour growth, so that the capital-labour ratio is constant and the capital-output ratio is constant. This is given by the equation:

$$y = (1/s)K \tag{23}$$

where s is the saving ratio, 1/s shows the level of y that will keep capital per head constant and the level of K that will keep output per head constant-given the rate of growth of labour force, l. From Figure 5 it is very clear where the two lines cross is the equilibrium capital-labour ratio (k^*) and output per head (y^*) defined.

Figure 5 shows where k^* reached equilibrium, y^* also reached equilibrium, so they should all grow at the same rate, l, and the neutral rate of growth, within the capital-output ratio is constant. Also, Figure 5 shows that the savings or investment ratio does increase to national income (s), in which leads *s* rises, the lower slope of the 1 s line, which lead to increases, the equilibrium level of per capita income and the capital labour ratio, but it does not change the level of equilibrium growth rate. This is because the savings or investment ratio does not affect the long-term equilibrium growth rate so that higher savings-investment ratio is offset by higher capital-out put ratio.

New Endogenous Growth Theory and the Macro-determinants of Growth

Over two century's year by year, decade after decade, the process of modern economic growth has occurred in developed countries, for instance, the richest 5 per cent of

the world's nations averaged a per capita income over the period 1960-1985 that was about twenty-nine times the corresponding figure for the poorest 5 per cent. In 1985, the richest nation in the US was Connecticut and the poorest was Mississippi and the ratio of per capita incomes worked out at approximately 2 (Debraj, 1998). The per-capita income of the aforementioned eight East Asian economies over the period 1965-1990 excluding China was increased at an annual rate of 5.5 per cent. For the entire data set between 1980 and 1993, China's per capita income grew at an annual rate of 8.2 per cent as truthfully phenomenal (Debraj, 1998). Furthermore, over the period 1960-1985, per capita growth averaged 1.9 per cent per year of 102 nations study by Parente and Prescoott (1993), and in other wealthy nation's the productive potential of the economy has been increased by capital accumulation, the opening up of new territories and increased supplies of better quality labour to their stock. In addition they have learnt so much more how to press output from resources through increasingly efficient for each other (Donaldson, 1971). According to Knight (1944: 32): "Technological advance, resting in new knowledge and occurring accidentally or mechanically, seems to be the only possible offset to this 'natural' tendency to diminishing returns".

Since the mid-1980s, there has been a new wave of literature and research on the applied economies of growth. This has led to the development and explanation of the difference in the rates of output growth and per capita income growth for the long-term across the world by the so-called new growth theory. However, the new model of endogenous growth theory began with authors such as Romer (1986, 1990), Lucas (1988) and Rebelo (1991) who developed models by non-decreasing returns to a broad class of capital goods including human capital. The difference between Rebelo's model and Solow's is simply the specification of the production function, in which presented output with capital in each period (t) is presented by the following equation:

$$\mathrm{Y}_t = \mathrm{A}\mathrm{K}_t \tag{43}$$

From this equation there is no exogenous technological change. Therefore, this type of framework of the Eq.43 has been built by Arrow (1962), who developed models characterised by non-decreasing returns. Lucas (1988) used the "*multi-good*" model, which was adapted from Krugman (1987). The idea is that good produce to choice can be viewed as chance choice of physical and human capital accumulation rate. He commenced his model with aggregate production function of the following equation:

$$Y_t = A_t F(K_t, H_t) \tag{44}$$

where Y, K and H are output, physical capital and human capital as different types of investment at t and the parameter A represents the level of technology. The new growth theorists who have followed Lucas his model in human capital incorporating have treated to differently from growth accountants who treat education as augmentation of labour quality, using relative earnings of people with given levels of education as weights. However, in general, use school enrolment rates as simple proxy measures for human capital. One of the main contributions was presented by Romer who published a series of papers on this area in the mid-1980s as the key factions of the endogenous growth models from the Solow type growth models.

1. In the endogenous growth model, the assumptions of constant return to scale and diminishing return of individual functions are given up, which means that the economy grows without bounds and no convergence around economies is predicted.
2. Technological change becomes endogenous; in this case it will be increased with aggregate capital stock by designing some kinds of externality of capital. This implies that it has a change of capital input which has both direct effects on output and indirect effect on technology changes. From this point it could be seen that the endogenous growth model may better reflect the reality of economic policy as the practice of today's economic transmission of advanced technology change and new knowledge.

Romer (1986:1003) argues that the technological change provides rising capital accumulation following the Solow (1956) model with technological change. He has explained that *"the creation of new knowledge by one firm is assumed to have a positive external effect on the production possibilities of other firms, because knowledge cannot be perfectly patented or kept secret"*. His model stressed integration within a competitive framework by rediscovering the simple $\mathrm{Y} = A\mathrm{K}$, dependent from production on knowledge, and function of physical capital. The knowledge stock (A) is public good, which, like (A) in Solow's model, introduces positive spill-over into competitive framework to increasing returns to scale to the production function. This model resultantly treats "*learning-by-doing*" as "*learning-by-investment*". To consider the following equation of production function depends only on the capital stock:

$$\mathrm{Y}_t = f(\mathrm{K}_t) \tag{45}$$

where Y_t and K_t denote the output and stock of capital at time t, respectively. However, in the following equation it is different from Eq.45.

$$G_y = \frac{dk_t}{y_t} f(k_t) = s_t \varphi_t \tag{46}$$

where G_t is the growth rate of output, (s) is the saving rate and φ is the marginal productivity of capital. In this case if decreasing φ, output growth will be goes to Zero as capital stock, and K grows over time. Keller (1998:1470) has discussed the general class of models developed by Grossman and Helpman (1991) and argued that cross-country R&D spill-overs are important sources of productivity growth, and Keller points out that the productivity spill-over exist if "*the importing country pays less than the intermediate good's full marginal product*", which made a second critique more relevant to this endogenous-exogenous comparison[4].

Barro (1991) has been found that human capital to be a significant contribution to growth rate, but in his regression analysis model he left behind a good deal of the weak performance, for example, Sub-Saharan African and Latin American countries unexplained. Romer (1990), however, extended his model to include a framework of competition to increasing returns of scale, through to fixed cost financial elements in intermediate goods sector, in which the treatment of knowledge stock is usually similar to physical capital as assumed to be dependent from cumulated Research and Development (R&D) activities. Therefore, this kind of model is incorporated in endogenous technical change (ETC).

Additionally, Mankiw et al. (1995) presented the endogenous growth theory by considering the production function, in which constant returns to the accumulated factor. Thus if the output of capital is doubled, then the amount of output is doubled too, as follows:

$$\dot{\mathrm{K}} = s\mathrm{Y} - \delta\mathrm{K} \tag{47}$$

This equation, together with the $\mathrm{Y} = \mathrm{AK}$ production function is:

$$\dot{\mathrm{Y}}\Big/\mathrm{Y} = \dot{\mathrm{K}}\Big/\mathrm{K} = s\mathrm{A} - \delta \tag{48}$$

So, as s A > δ, income will grow forever, even without the assumption of exogenous technological improvement from this equation saving leads to growth forever, but in the neoclassical model, saving leads to the rate of growth temporarily.

Levine (1997) examined two factors in financial function (capital accumulation and technological innovation) which could affect economic growth. Basically, in this situation the first class of growth models used capital accumulation (capital externalities or capital goods produced) discussed by Romer (1986), Lucas (1988), and Rebelo (1991) using constant returning to scale without using non-reproducible factors to generate steady-state per capita growth models. The result of these models affects the steady-state growth by influencing the rate of capital formation. Also, the financial system affects capital accumulation by using the savings rate or by reallocating savings with different capital producing technologies. On the other hand, Romer (1990), Grossman and Helpman (1991), and Aghion and Howitt (1992) used second class growth models to focus the invention of new production process and goods. The result obtained from these models was that the function performed by the financial system affected steady-state growth by altering the rate of technological innovation.

Empirical Framework in Variation Study

The majority of studies have examined empirical studies and economic growth theory by using statistic analysis for variables. These will be tested by authors such as Levine and Renlt (1992) and Levine and Zervor (1993) who used extreme-bounds and analysis (EBA) discussed in Leamer (1983, 1985) and Leamer and Herman (1983), focusing upon cross-country regressions. Thus, consideration is made of EBA general equations of the form:

$$Y = B_i I + B_m M + B_2 Z + u \tag{49}$$

where Y is both per capita GDP growth /or the share of investment in (GDP), I is a set of variables always in regression, M is the variable of interest and Z is a subset of variables added to the regression, μ the random error term represents the collective unobservable influence of any committed variables. The first step of variables estimate the regression included I variables; for example, the initial level of per capita income and the variable of interest M in such investment. Then the three Z-variables are identifying the maximum and lowest values for the coefficient on the variable of interest, B_m plus two standard deviations. The correlation between variables Y and M could be inferred from the coefficient B_m. If B_m, remains significant without changing its sign, the result is regarded as "*robust*". Otherwise, the result will be "*fragile*". The only robust variables found in the majority of studies are the ratio of savings and investment to GDP, population growth (GPO), the initial level of per-capita GDP and investment in human capital measured by the secondary-school enrolment (SEC). However, the other variables are fragile.

The group authors who considered this, as Table 2 demonstrates, feature Barro (1991), Mankiw et al. (1992), Levine and Renelt (1992), Levine and Zervor (1993) and Barro and Lee (1993). Barro (1991) investigated the new growth theory by using the neoclassical growth model such as that of Solow (1956), Cass (1956) and Koopmans (1965) measured by human capital to examine the growth of per capita income from 1960 to 1985 in a cross-section

[4] "Spill-over" means that the aggregate trading in financial market is related to the liquidity of individual equities, Levine and Schmukler (2006).

of 98 countries. The Table created by Summers and Heston (1988) shows this type of relationship for 98 countries; Barro discovered that there is no significant relation between the initial level of GDP and growth rate of per capita; the correlation is 0.09. This finding accords with recent models, such as Lucas (1988) and Rebelo (1991), in which it is assumed that non-diminishing returns to capital, while the growth rate of per capita GDP is positively related to initial human capital peroxide by school enrolment rates (SEC). Although, countries grew slowly with higher human capital will be predicted by growth rate. Countries with high ratios of human capital also seem to be having lower fertility rates and a higher ratio of physical investment to GDP. Furthermore, growth rates are positively related to political stability and inversely related to a proxy for market distortions.

Mankiw et al. (1992) examined that whether the Solow (1956) growth model is consistent with the international variation in the standard of living. They argued to include human capital and tested it with the Summers and Heston (1988) which used three samples of 98 non-oil countries in the period 1960-1985 in intermediate 76 developing countries, and 22 OECD countries with populations of more than one million. They used the level of GDP as the developed variable and found over 50 *per cent* of income made a difference between saving rate and population growth. The model assumed that difference between human capital (*proxied by secondary school enrolment rates*) and Solow's model explained 80 *per cent* of differences in GDP. Human capital is a significant variable in all three samples of countries given. Also, they found regress the growth rate on initial GDP levels no tendency conditional convergence in all samples if differences exist between investment ratio and population growth. The authors claimed that the data supported Solow's neoclassical model against the new endogenous growth models, which means the assumption of non-diminishing returns to capital predict the variation in initial per capita income between countries.

Knight et al. (1993) tested the model by examining samples of 76 developing countries and 22 OECD countries by using panel data to observe the specific effects of the countries, including the rate of technical progress of trade policy and stock of infrastructure investment *proxied by the flow variable* and the government fixed investment as proportion of GDP. The result of the growth is that output per worker is positively related to the saving ratio and negatively to the growth of population and the initial level of GDP, while the human capital investment is significant and increases the productivity of physical investment. Also, there are additionally significant positive effects and coefficient on physical capital.

Barro and Lee (1993) tested 116 countries during the 1965-1985 period and found that five factors, or variables, explained 80 *per cent* of the differing growth rate from rapidly to slowly growing between countries as follows (Table 2).

1. The initial level of real GDP per capita measured by education and health, which has negative effect.
2. The investment ratio has positive effect.
3. The ratio of government consumption to GDP has negative effect.
4. Market-distortions measured by the black market rate of foreign exchange has negative effect.
5. Political instability measured by the number of political revolution per year has negative effect.

Levine and Renelt (1992) used cross-country regression results for 119 countries over the 1960-1989 period for testing the average annual growth rate of GDP per capita (GYP) as dependent variables, including I variables consisting of investment ratio, the initial level of real GDP per capita from SH (RGDP60) in 1960 (often used to test the convergence hypothesis), the level of secondary school enrolment (SEC) and population growth (GPO). The pool of Z-variables used includes government expenditure to GDP (GOV), the exports ratio to GDP (X), inflation rate (PI), the growth rate of domestic credit (GDC), the variance of inflation (STDI), the standard of domestic credit growth (STDD) and political instability (REVC), etc. When the result of Z-variables need to be added to the I-variables, the investment ratio is robust; either the initial income variable remains robust, which has evidence of conditional convergence, or the secondary school enrolment rate is robust, but without population growth. In fact, this study repeats that of Barro (1991) and only finds investment ratio and initial level of rate GDP per capita robust, which suggests that the importance of trade may be improved through investment. However, this study discovered that a poor country tends to grow faster than a rich country. This was supported by DeLong (1988) and Romer (1987) for conditional convergence, as seen in Table 1, where countries grew faster in the period 1960-1989 due to higher share of exports in GDP, higher share of investment enrolment rates, lower inflation rates and lower black-market exchange-rate, than countries which grew at a slower rate.

Levine and Zervos (1993) adopted the EBA different set I and Z variables from new evidence on robustness; perhaps this new set of I (constant) variables was selected as corresponding to the "*Barro repressors*" cross-country in which variables used by Barro (1991) control variables of initial level of real GDP per capita, the log of the initial secondary school enrolment rate, and the number of revolutions and croups which occurred. The findings support the earlier study by Levine and Renelt (1992). However, they found that the black-market and exchange rate is related to long-term growth by using the Barro-repressors, but investment variable is not included. Also, they discovered that no Z-variables make growth and inflation negativity correlated, where countries with higher inflatio n rates have slower per capita income

Table 1. Showing cross-country averages over (1960-1989).

Variables [a]	Faster-growers	Slow-growers	*t*
Share of investment in GDP	0.23	0.17	5.18
Secondary-school enrolment rate in 1960	0.30	0.10	5.46
Primary-school enrolment rate in 1960	0.90	0.54	6.10
Government consumption/GDP	0.16	0.12	3.26
Inflation rate	12.34	31.13	-1.74
Black-market exchange-rate premium	13.57	57.15	-3.79
Share of exports to GDP	0.23	0.23	2.31

Mean growth rate = 1.92, the faster-growers are countries with greater than the mean growth rate, but slow-growers are countries with less than the mean growth rate.
Levine and Renelt (1992).

Table 2 Empirical in variation study

Factors	Barro (1991)	Mankiw et al. (1992)	Knight et al. (1993)	Barro and Lee (1993)	Levine and Renelt (1992)	Levine and Zervos (1993)
Case study	98 countries 1960-1985	98 countries 1960-1985	98 countries 1960-1985	116 countries 1965-1985	119 countries 1960-1989	98 countries 1960-1985
Depended variable	Growth of per capita income	Level of per capita income	Growth of output per worker	Growth of GDP	Growth of per capita income	Growth of per capita income
Convergence	Conditional	Conditional	Conditional	Conditional	Conditional	Conditional
Savings-investment ratio	Not considered	Significant positively	Significant positively	Significant positively	Significant positively	Not considered
Population growth	Not considered	Significant positively	Significant positively	Not considered	Not robust	Not considered
Education	Significant positively	Significant positively	Significant positively	Significant positively	Significant positively	Significant positively
Government consumption distortions	Significant negatively	Not considered	Not considered	Significant negatively	Not robust	Not considered
Political instability	Not considered	Not considered	Not considered	Significant negatively	Not robust	Significant negatively
Monetary and fiscal variables	Not considered	Not considered	Not considered	Not considered	Not robust	Weak
Trade variables	Not considered	Not considered	Significant positively	Not considered	Not robust	Weak
Inflation	Not considered	Not considered	Not considered	Not considered	Not robust	Not significant

Thirlwall (2006).

growth.

In addition, there are other studies not included in Table 2 using different analysis variables for their model. For instance, Thirlwall and Sanna (1996), Temple (1999), Pugno (1995) and Bond et al. (2004), etc. Thirlwall and Sanna (1996) show the growth of exports of 65 countries over the 1960-1988 period to be highly significant independent determinant of different growth rate, together with investment ratio, population growth and initial level of per capita income.

Temple (1999) found evidence that poor countries are catching up with rich countries between "*growth miracles*" and "*growth disasters*" over the 1960-1990 period, using a set of data from Heston and Summer (1996) and described in more detail in Summers and Heston (1988,1991). They discovered that many of the faster growing countries in East Asia, whereas the slowest countries are in Sub-Saharan Africa, as Table 3 shows. In which do not seem to be catching up with the USA's per-capita income grew around 2 *per cent* every year

Table 3. Growth miracles and disasters, 1960-1990, annual growth rates of output per-worker.

Miracle Countries	Growth	Disaster Countries	Growth
Botswana	5.9	Chad	-1.7
Hong Kong	5.8	Ghana	-0.3
Cyprus	4.4	Guyana	-2.1
Japan	5.2	Madagascar	-1.3
Korea	6.1	Mauritania	-0.8
Libya	4.0	Mali	-1.0
Lesotho	4.4	Mozambique	-0.7
Malta	4.8	Nicaragua	-0.7
Seychelles	4.4	Venezuela	-0.5
Singapore	5.4	Zambia	-0.8
Taiwan	5.8		

Calculated from CBL, statistical series and Monthly Bulletin, various issues. Temple (1999).

Table 4. Average per-capita GDP growth rates (1970-2000).

Country	Average growth	Standard Deviation of growth
Algeria	1.1	5.7
Bahrain	0.3	6.0
Djibouti	-4.6	3.0
Egypt	3.2	3.0
Iran	-0.3	7.6
Iraq	-5.1	21.3
Jordan	2.0	7.7
Kuwait	-2.6	11.7
Lebanon	3.2	18.4
Libya	-5.4	10.0
Mauritania	0.2	4.0
Morocco	1.7	4.6
Oman	2.7	7.3
Saudi Arabia	0.4	6.5
Sudan	1.5	6.1
Syrian	2.4	7.9
Tunisia	3.1	3.8
Turkey	2.2	3.8
UAE	-3.4	8.7
Yemen	1.6	4.9
MENA	0.2	4.8
East Asia and Pacific	5.6	2.3
Latin America and Caribbean	1.5	2.5
Sub-Saharan Africa	-0.1	2.6
World	1.5	1.3

World Bank, World Development Indicators (2003).

over this period also find that the higher population of India and China have average incomes rather less than the USA's countries. The correlation between growth in GDP per worker over 1960-1975 and over 1975-1990 is just 0.17 *per cent*.

On the other hand, the MENA nations including Libya as Table 4 demonstrate that the average per capita GDP growth rate during the period 1970-2000, was

Table 5. Determinates of growth rate (1960-1985).

Sample Period	1960-1985	1960-1970	1970-1985	1960-1985	1960-1985	1960-1985
Number of Observations	**113**	**113**	**113**	**61**	**98**	**54**
Intercept	-0.0070 (0.0079)	0.0064 (0.0092)	-0.0156 (0.0109)	-0.0034 (0.0113)	0.0141 (0.0084)	0.0243* (0.0094)
GDP Relative to US (1960)	-0.430** (0.0118)	-0.0444** (0.0137)	-0.0422* (0.0163)	-0.0408** (0.0146)	-0.0292* (0.0133)	-0.0251 (0.0160)
Primary enrolment (1960)	0.0264** (0.0065)	0.0169* (0.0076)	0.0324** (0.0090)	0.0247** (0.0082)		
Secondary enrolment (1960)	0.0262 (0.0139)	0.0192 (0.0162)	0.0309 (0.0192)	0.0078 (0.0180)		
Education attainment (1960)					0.0013 (0.0010)	-0.0002 (0.0013)
Growth of population(1960-1985)	0.1015 (0.2235)	-0.1638 (0.2592)	0.2738 (0.3083)			
Average investment/GDP (1960-1985)	0.0578* (0.0224)	0.1153** (0.0260)	0.0201 (0.0309)			
Average investment/GDP (1960-1985)				0.3050** (0.0721)		0.3100** (0.0743)
Adjusted R^2	0.3480	0.3424	0.1921	0.3646	0.1893	0.2614

* Statistically sacrificing at the 0.05 level.
** Statistically sacrificing at the 0.01 level.

Equation GDP $G = f(INV, ED, LFG, RGDp60)$, of cross-economy regressions studies by Barro (1991); and De Long and Summers (1991); and Dollar (1992), where GDPG is the average rate of real per capita income growth; INV is the average share of investment in GDP; ED is a measure of educational attainment; LFG is the rate of growth of the economically active population, and $RGDp60$ is the relative gap between per capita income in 1960 at 1980 US dollar price, and US per capita income in 1960.
World Bank (1993).

characterised by a high variability in comparison to the other nations and the world average growth. Therefore, the average growth variability as measured by the standard deviation of the real per capita GDP growth rate for the MENA nations, where accounted about four times that of the world and twice that of the low-performing Sub-Saharan Africa countries. Although, the high variability in the growth performance of the MENA nations, which might explained by various factors such as: oil exporting countries that are frequently to the vagaries of the international oil market; political instability and the permanent regional conflict; finally, the lack of economic diversification that increases vulnerability.

The World Bank (1993) examined the relationship between accumulation and growth, using Heston-Summer's data during the 1960-1985 period cross-economy regression. The finding was that their significant coefficients regressions at 0.05 levels, as Table 5 shows, that investment was insignificant over the 1970-1985 period. Delong and Summers (1991, 1993), however, argued that equipment investment, rather than total investment, was explanatory variable for per capita income growth. They also pointed out that school enrolment may not be a good indicator of human capital accumulation, as Barro and Lee's (1993) measure of education stock, based on population. The labour productivity change cannot be attributed to accumulation, investment in physical or human capital or to the component of TFP change associated with relative income levels.

Table 6 display that the gross domestic investment has followed also the growth pattern as mentioned in Table 4. During the 1980s and 1990s, investment has declined sharply. For instance, non-oil nations over the period investment rates reasonably stable due to the level of their low saving ratio. Oil-exporting nations, therefore, has borne the impact of this adjustment with substantial declines in the investment ratio.

Bond et al. (2004) presented evidence that the increasing investment as a share of GDP predicts a higher growth rate of output per worker in both short-term and steady-state, using data suggested by Islam (1995) and Caselli et al. (1996) based on a five-year analysis of 98 countries over the 1960-1998 period, followed by the approach of Pesaran and Smith (1995) and Lee et al.

Table 6. Gross domestic investment (*per cent* of GDP)

Countries	1961-1970	1971-1980	1981-1990	1991-2000
MENA	17.4	26.3	24.1	22.5
East Asia and Pacific	21.3	29.1	23.6	22.0
Latin America and Caribbean	14.9	24.1	24.4	22.1
Sub-Saharan Africa	19.1	28.6	31.8	34.4
World	20.4	23.6	20.3	20.8
MENA	16.9	21.1	17.5	17.1
East Asia and Pacific	24.3	25.3	23.2	22.6

World Bank, World Development Indicators (2003).

(1997). The result from this model determined that steady-state growth depends on the countries. A higher share of investment in GDP predicts a higher level of output per worker in the steady-state. They also found an increased share of investment in the short-term, and the steady-state which predicts a higher growth rate of output per worker. In the long-term the effect upon growth rates is quantitatively substantial, as well as statistically significant with the evidence from endogenous growth theory models, such as the *AK* model. The cross-section correlation between share of investment and average growth rates reported by Bernanke and Gurkaynak (2001) found that to be robust it was necessary to control unobserved heterogeneity in growth rates.

SUMMARY AND CONCLUSION

In this study it has been possible to provide a simple theoretical and empirical literature framework that links together the endogenous growth theory and the current theory on function of financial market and institutions, in order to study how financial markets development affects economic growth rate. The "*new*" endogenous growth theory, akin to many theories which consider various approaches of marginal productivity of capital, does not converge to zero as capital grows over time. As already indicated, it is possible for real per capita output to grow endogenously, even in the obstacles of exogenous productivity growth rate by altering the rate of human capital accumulation or technological development. Furthermore, investment in physical and human capital, respective of the endogenous growth theory, appropriate policies and options, assists private agents which could influence long-term steady growth. Therefore, in short, the overall policy regime of a country, including taxes, financial structures, market and regulatory regimes, liberalisation and macro-economic distortions, could alter savings and investment allocation in various ways that shape long-term growth rate. Solow (1956) argued that technological progress is the exogenous variables that affect the growth rate in the long-term. He also argued that financial markets could only affect the equilibrium level of capital stock market per worker, not the rate of economic growth.

Nevertheless, the birth of the *new endogenous growth theory* has facilitated the development of improved growth models where the long-term rate could be affected by a number of elements. These included technology, education and health policies in the process of economic development, capital accumulation, government policies and institutional activities in the role of financial development in economic growth. A responsible, there is room for historical cultural and sociological factors as a result of economic growth rate for the long-term. Additionally, the role of financial factors in the *steady-state* of long-term rate in the neo-classical model could be related to the level of capital stock per worker or to the level of productivity but not to their respective rates. Notwithstanding, external to the *steady-state*, financial elements could affect the transitional growth rate where it is not in the long-term growth rate.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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